



Vietnam Country Report

Evaluation of the development impact of PIDG

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Contents

Executive Summary	vi
1 Introduction	1
1.1 Evaluation overview	1
1.2 Brief background to PIDG	2
2 Vietnam context	4
2.1 Vietnam sector context	4
2.2 PIDG in Vietnam	10
3 Approach and methodology	12
3.1 Overall approach and methodology	12
3.2 Vietnam evaluation methodology	13
4 Findings: overall development results	20
4.1 PIDG results	20
4.2 CGE results	21
5 Findings: project-level case studies	25
5.1 Summary of case studies and results	25
5.2 Project rationales and relevance of PIDG's inputs	27
5.3 Project outputs	31
5.4 Short, medium and long-term outcomes	36
5.5 Demonstration effects	43
6 PIDG signature features and estimated contribution	46
7 Conclusions and recommendations	49
7.1 Lessons and planned actions for the evaluation going forwards	52
Annex 1: List of PIDG projects in Vietnam	57
Annex 2: List of project stakeholder interviews	60
Annex 3: CGE report	61
Annex 4: Evaluation framework	78

Annex 5: PIDG ToC	82
Annex 6: Coding framework	82
Annex 7: Sample evaluation interview guides	83
Project-level stakeholders	83
TLMT businesses beneficiaries	84

List of Acronyms

BOT	Build–Operate–Transfer
CGE	Computable General Equilibrium
CICT	Cai Lan International Container Terminal
COP26	2021 United Nations Climate Change Conference
DAC	Development Assistance Committee
DFI	Development Finance Institution
E&S	Environmental and Social
EAIF	Emerging Africa Infrastructure Fund
EPC	Engineering, Procurement and Construction
EQ	Evaluation Question
ESIA	Environmental and Social Impact Assessment
EU	European Union
EVN	Vietnam Electricity
FDI	Foreign Direct Investment
FiT	Feed-In Tariff
FMO	Dutch Entrepreneurial Development Bank (Nederlandse Financieringsmaatschappij voor Ontwikkelingslanden)
FTE	Full-Time Equivalent
GDP	Gross Domestic Product
GESI	Gender Equality and Social Inclusion
GSO	General Statistics Office
HCMC	Ho Chi Minh City
HSES	Health, Safety, Environment and Social
IAD	InfraCo Asia Development
IAI	InfraCo Asia Investment
IDI	In-Depth Interview
IFC	International Finance Corporation
IFI	International Finance Institution
ILO	International Labour Organization
IPP	Independent Power Producer
LCOE	Levelised Cost of Electricity
MIC	Middle-Income Country
NDC	Nationally Determined Contribution
O&M	Operations and Maintenance

OC	Owner Committee
ODA	Official Development Assistance
OECD	Organisation for Economic Co-operation and Development
PDP	Power Development Plan
PIDG	Private Infrastructure Development Group
PPA	Power Purchase Agreement
PPP	Public–Private Partnership
REDP	Renewable Energy Development Project
RTP3	Third Rural Transport Project
SAM	Social Accounting Matrix
SDG	Sustainable Development Goal
SFS	Signature Features Study
SHB	Saigon Hanoi Bank
SoE	State-Owned Enterprise
SSIT	SP-SSA International Container Services Joint Venture Company
SUT	Supply-and-Use Table
TA	Technical Assistance
TEU	Twenty-Foot Equivalent Unit
TLMT	Trung Luong–My Thuan
ToC	Theory of Change
TP	Testable Proposition
UAE	United Arab Emirates
UNDP	United Nations Development Programme
UNICEF	United Nations Children’s Fund
VGF	Viability Gap Funding
VND	Vietnamese dong
VPA	Vietnam Seaports Association
WEF	World Economic Forum

Executive Summary

Introduction

This report is the first of four country studies of the Private Infrastructure Development Group (PIDG). These studies are preceded and augmented by a Signature Feature Study (SFS), which laid the foundation for the country cases, and will be followed by a Synthesis Report, which will bring together the strands of the evaluation to answer the central evaluation questions.

The Vietnam country study looks at PIDG's activities in the country through the lens of three projects: Coc San (small hydropower); Ninh Thuan (utility-scale solar power); and Ho Chi Minh Infrastructure Investment JSC (CII), who are developers of the Trung Luong–My Thuan (TLMT) toll expressway linking the Mekong Delta and Ho Chi Minh City. In each case, a theory-based approach is applied to estimate PIDG's contribution to development results. We establish results from three main sources. First, we use PIDG's own reported results with respect to new and improved access to infrastructure and jobs created, and other secondary sources for avoided CO2 emissions. Second, we use stakeholder interviews and secondary data (where relevant) to complement these findings. Third, we estimate the impact of operational projects supported by PIDG in Vietnam with a computable general equilibrium (CGE) model.

Having established the micro and macro effects of PIDG projects in Vietnam, we then assess PIDG's contribution to these and wider demonstration effects through primary data collection with project stakeholders and beneficiaries. If the projects would have happened anyway, and in broadly the same way, this contribution would be negligible. If the projects would definitely not have happened without PIDG, then most or all of the results can be attributed to them. If the project may have happened, but PIDG influenced it in important ways, then the results related to these changes can be attributed to PIDG.

To assess contribution, we adapted PIDG's Theory of Change (ToC) to be specific to Vietnam, i.e. to focus on inputs from three PIDG companies – InfraCo Asia, GuarantCo, and PIDG Technical Assistance (PIDG TA). We then assessed PIDG's contribution at each stage of this ToC, from inputs to outputs, and on to short, medium and long-term outcomes.

Overall results

Table 1: captures the following results. 'Capital raised' refers to the quantity of private investment involved in each project. 'Avoided CO2' is specific to renewable energy projects and refers to the CO2 that would have been produced had this level of electricity been generated by fossil fuels. We then have two measures of direct jobs created by the construction of the infrastructure facility (short-term) and its ongoing operations and maintenance (long-term). These are augmented by our estimates of jobs generated across the economy because of the PIDG-supported infrastructure facility. These estimates are generated through a CGE model of the effect of operational PIDG projects in Vietnam. Finally the Table gives PIDG's estimates of the number of people with new or improved access to infrastructure services because of these projects, including the proportion of these that are women.

We can see, PIDG projects mobilised over \$1 billion of investment, generated around 23,000 direct and indirect jobs, and will provide over 4.1 million people with new or improved infrastructure access across the portfolio, with an average of 40% of whom are women. The renewable energy projects saw 316,000 tonnes of CO2 avoided per year.

Table 1: also presents these results and our assessment of PIDG's contribution. For the three case studies, we were able to make a direct assessment:

- in the case of Coc San, we conclude that the project would not have happened without PIDG, and therefore estimate the contribution at 100%.

- for Ninh Thuan, we conclude that PIDG and the developer, Sunseap, had roughly equal responsibility, and therefore estimate the contribution of each at 50%.
- for TLMT, we conclude that the project would probably have happened without PIDG, although at a later date. We therefore assume a pro rata contribution in line with PIDG's financing share (12.5%) and in line with the approach to mobilisation used by OECD. The main PIDG contribution for TLMT came in local capital market development (enabling local institutional investors to invest for the first time).

For investments where we have not conducted a case study, we also assume a pro rata contribution. While we assume pro rata contribution for the other projects, this is likely to underestimate the actual contribution, as PIDG focuses heavily on additionality and enabling frontier projects that would not have happened, or that would have happened but not in the form that they did due to PIDG. The share of contribution here should therefore be seen as a floor for the estimated contribution.

Table 1: Development results and PIDG contribution (italics = estimated future results)

	Coc San	Ninh Thuan	CII	Antara Cold Storage	Cai Lan Port	Cai Mep Port	Nam Long Investment	Water Supply – Bai Lai	Water Supply – Thuy Nguyen	EVN Finance
Estimated PIDG contribution	100%	50%	Pro rata	Pro rata	Pro rata	Pro rata	Pro rata	Pro rata	Pro rata	Pro rata
Operational	Yes	Yes	No	Yes	Yes	No	No	No	No	No
CGE modelling	Yes	Yes	No	Yes	Yes	No	No	No	No	No
Case study	Yes	Yes	Yes	No	No	No	No	No	No	No
Capital raised (\$ million)	44.53	166.6	537	28	155.3		100		6.25	75
Avoided CO2 per annum (tonnes)	76,000	240,000								
Short-term jobs	298	1300	2171	1200	500		350	107	210	150
Long-term jobs	35	52	120	200	340		25	10	10	55
% female	23	8	46				16			
Indirect jobs (CGE headcount method)	4,245	15,591	n/a	2,203	258	n/a	n/a	n/a	n/a	n/a
People with improved/new access to infrastructure	87289	153372	3806471	50000				35936	16814	
% female	39	61	39	39				39	42	

Understanding PIDG's contribution

Coc San

InfraCo Asia Development	\$7.54
InfraCo Asia Investment	\$10M
PIDG TA	\$25,000
PIDG Viability Gap Funding	\$5M
Year of Financial Close	2014
Year of Commercial Operation	2016

When PIDG became aware of it, Coc San hydropower was a distressed project, but one with high environmental, economic and social potential. The original developers had started the project but had been unable to raise sufficient finance to complete it. From the perspective of a number of interviewees, this was due to the inexperience of the developer (the EPC¹ contract was

¹ Engineering, procurement and construction.

reportedly unbankable), and unfortunate timing – i.e. capital raising coincided with the aftermath of the 2008 global financial crisis.

InfraCo Asia revived the project, restructured the EPC contract, invested in raising environmental and social standards, and helped dissuade EVN from changing the power purchase agreement (PPA) at the last minute in ways that would have rendered the project unbankable. These interventions were essential in achieving financial close. The project has since gone on to operate successfully and is seen as an example of how to do these types of hydropower projects well. InfraCo Asia was able to exit from the investment, selling its equity stake to a major Japanese utility company – TEPCO – which has brought new expertise to the project. This was TEPCO’s first investment in the hydropower sector outside Japan, which is testament to the high standards to which Coc San was developed and is operating and to the long-term viability of the investment. Although Coc San did not lead to a proliferation of small hydro projects, this is largely because much of Vietnam’s suitable hydro resources had already been developed, so there was little scope for this.

Ninh Thuan

InfraCo Asia Development	\$10.62M
InfraCo Asia Investment	\$9M
Year of Financial Close	2018
Year of Commercial Operation	2019

Ninh Thuan was one of the first few utility-scale solar project in the country (and, at commissioning, the only 100% foreign-owned project). Ninh Thuan sent market signals that such projects could be developed successfully and that potential risks arising from the PPA were lower

than feared – a large number of investors had been approached with respect to Ninh Thuan, but none was prepared to invest. InfraCo Asia was able to contribute financial and development expertise at various points of the process. Sunseap led on procurement and logistics, with InfraCo leading in areas relating to the bankability of the project – contract negotiations, loan documentation, compliance with International Finance Corporation (IFC) performance standards, and so on. For example, while Sunseap brought in the debt provider, which was a bank they had a previous relationship with, InfraCo Asia were heavily involved with the negotiation of commercial terms with the bank.

Prior to the Ninh Thuan project, the solar PPA in Vietnam was considered unbankable by international investors. In addition to requiring local rather than international arbitration, the contract could be cancelled with only 12 months of revenues payable as compensation (rather than the full contract term, as would normally be the case). All these elements are contrary to standard international practice. While there was limited ability to change the terms of the PPA, PIDG was able to address these concerns through the project. PIDG also led discussions between the debt provider and the Vietnamese authorities to discuss concerns around arbitration and ensuring the PPA was honoured. In addition, extensive modelling was done to show that it was very unlikely that the government would cancel the contract, due to Vietnam’s future energy needs. These activities were sufficient to provide comfort to lenders, allowing the project to go ahead.

Risks then proved lower than feared. To date, EVN has fully honoured the contract, with limited curtailment during the time InfraCo Asia was involved in the project. A generous tariff of 9.35 cents/kWh was offered in the PPA, compared with an average price of 5–6 cents in solar PV auctions in the Asia Pacific region at this time. Whilst key informant interview (KII) testimony was limited, it is plausible that the combination of a generous tariff and observably low risks as demonstrated by Ninh Thuan contributed to the following huge increase in investment in Vietnam solar, with 1.7 GW of generation capacity added. Cumulatively, this equates to 1 million tonnes of avoided CO₂ emissions. We estimated PIDG’s contribution to Ninh Thuan at 50%. The demonstration effect created by Ninh Thuan was not the only factor in the expansion of solar investment but it was an important factor, according to a range of stakeholders; PIDG’s contribution to this wider increase is also therefore significant.

CII/TLMT

GuarantCo	\$49.6M
PIDG TA	\$75,000
Year of Financial Close	2019
Year of Commercial Operation	2022

The CII/TLMT project is a key component of Vietnam's national expressway system, linking the country's largest agricultural producing region with its most populous city and main export hub. The project had been in the pipeline for a number of years but had been unable to raise finance.

This was a particular problem at the time GuarantCo became involved, as the country's banks were constrained in their ability to provide finance to these kinds of projects by financial regulators, who were seeking to reduce the concentration of risks as they implemented the Basel Capital Accord.² GuarantCo helped to circumvent these constraints by providing a guarantee that allowed domestic insurance companies to invest in bonds issued by the project developer.³ Other international investors – including DFIs – had declined the opportunity, citing concerns that health, safety, environment and social (HSES) standards were too low. PIDG shared this view and was able to provide technical assistance (TA) funding to raise standards to internationally accepted levels, a contribution that is likely to have wider effects in Vietnam as the project developer, CII, is the largest private developer of roads and bridges in the country and has applied this capacity across its portfolio.

Given the importance of the project for Vietnam's economic development and the temporary nature of the constraints on banks, we think it is likely that the project would ultimately have happened, though it would have been delayed. The most important contribution, in our view, concerns capital market development in Vietnam and connecting the pools of capital held by institutional investors with the country's large infrastructure financing requirements.

Demonstration effects

The evaluation found evidence of demonstration effects following all three interventions which took differing forms and/or scale

- For Coc San and Ninh Thuan, these showed that EVN would honour the commitments in its PPAs and that these contracts were indeed bankable. Coc San is reportedly used as an exemplar of how to design and implement a project of this kind, attracting visitors from developers from other countries.
- For CII the demonstration effect is narrower, as projects of this kind had been successfully implemented before. The project, however, successfully demonstrated how the participation of domestic institutional investors could be achieved within existing regulatory restrictions. However, it has not overcome barriers for local institutional investors to invest in similar projects without a guarantee.
- Across the three projects, the most significant long-term effect is the huge increase in investment in the solar sector that has occurred since Ninh Thuan. While we cannot directly attribute the growth of solar to Ninh Thuan, it is likely that the combined demonstration of the first successful utility-scale projects financed in time for the government feed-in tariff (FiT) contributed to the increased interest in investment in solar reported by project developers.

² Basel requires different levels of capital to be set aside with respect to loans, in order to protect the institution if the loans become problematic. Capital requirements vary according to risk, both for the individual loans and the degree of concentration in banks' portfolios. From the authorities' perspective, Vietnamese banks were already heavily exposed to these types of project and were therefore facing concentration risk.

³ These insurance firms were barred from investing in these types of project, as they did not produce the type of collateral they are required to hold. The guarantee from GuarantCo, however, changed this and was itself an acceptable form of collateral.

Conclusions and recommendations

PIDG can claim responsibility for a significant number of jobs created, CO2 avoided, and private investment mobilised in Vietnam. More than 4 million people have access to new or improved infrastructure as a result of PIDG-supported projects where PIDG's contribution is large. This has been possible in part because of PIDG's 'signature features', particularly the higher appetite for risk it has compared with its peers.

While these achievements are important, they also need to be seen in the wider context. As we have seen, solar capacity in Vietnam has increased sharply, not least based on stakeholder testimony because of the example of Ninh Thuan. Over the period that PIDG has been operating in Vietnam, however, the share of coal in the energy mix has increased enormously to more than 50%. Most recently, the commitments made at the 2021 United Nations Climate Change Conference (COP26) by the Vietnamese government suggest a greater commitment to renewables. Helping to deliver these is likely to require a strategic approach that goes beyond generating capacity and that would require complementary investments in storage and 'smart grid' technology.

While all three projects can be justified in terms of adding significant value, this does not mean that these were necessarily the most impactful projects PIDG could have undertaken. Within the terms of its mandate, PIDG operates largely on a reactive rather than a strategic basis. The Coc San project, for example, fitted PIDG's criteria at that time – a good renewable energy project, but also one that did not need to be started from scratch and therefore one that could enable PIDG to build a country portfolio more quickly. As described in detail in this report, the project has much to commend it, but it is also the case that hydro power is already well established in Vietnam, so there was limited scope to leverage investment into the sector through demonstration effects. Ninh Thuan, in contrast, appears to have done exactly that, helping to leverage investment and rapidly increase solar capacity in Vietnam.

The TLMT project is more nuanced, with the primary benefit being to allow domestic institutional investors to invest in these kinds of infrastructure projects. This has not generated major demonstration effects to date, but it has led to GuarantCo's involvement in the development of green bonds in Vietnam.

It may be that PIDG's approach is well suited to the frontier markets in which it operates. There is little benefit to developing a complex country strategy that cannot be implemented, and there is much to be said for building on potential projects, removing key obstacles to allow them to come to fruition. The limitation of such an approach, however, is that it is unlikely to systematically select projects that will have the greatest impact. In some cases this will happen, but a more strategic, forward-looking approach could increase the chances of it happening. Finally, while there are good arguments for PIDG operating at the project level rather than government level, it will be hard for them to maximise impact without a broader approach to influencing the policy environment, either directly or through closer collaboration with its Owners and DFI/MDB partners.

Overall findings

To summarise the key findings from this study:

- (1) Projects in Vietnam showcase the ability of PIDG facilities to address weaknesses across the infrastructure life cycle. In all the selected cases, more than one PIDG entity was involved, providing TA, early infrastructure development finance, debt, equity or viability gap funding in order to achieve the optimal outcome.
- (2) PIDG has taken an opportunistic approach to identifying projects in Vietnam, looking for investments that are already aligned with their goals. This has allowed them to respond to opportunities as they arise. While each can be justified on its own terms, this does not mean each was the optimal use of capital.

- (3) PIDG works at the project level, which plays to its strengths and experience. However, PIDG's ability to deliver impact directly and through demonstration effects would be strengthened if it were complemented by activities to address other (non-project-specific) barriers within the sectors (e.g. government concerns about intermittent nature of renewables) through engagement with government.
- (4) PIDG works on projects that are not fully bankable and, through these projects, addresses the issues that prevent bankability. In doing so, they clear the way for others to replicate, and thus have important spillover effects. This is key to the PIDG model and it relies on ensuring that additionality is addressed very seriously – if projects would have happened anyway, there is no major barrier to be removed, and so no potential for these kinds of spillover effects. In Vietnam, PIDG played an important role in recalibrating investor sentiment regarding the risk of large-scale solar investments. For example, international arbitration and curtailment risks in PPAs are only really needed if local arbitration proves insufficient or if curtailment and non-payment occur. Ninh Thuan helped prove this was not the case.
- (5) The PIDG projects examined in Vietnam do not, however, purposefully address differential impacts (gender and particular socioeconomic and marginalised groups). While providing energy to the grid and better roads create positive outcomes for all, beyond the viability gap funding criteria there was no established approach for targeting marginalised groups. The nature of such investments (grid energy, road transport) make it challenging for PIDG or its investees to identify and track end-users of the infrastructure as part of their ongoing monitoring exercises, increasing the challenge in understanding and improving differential impacts on different demographic groups. However, there are existing tools to support gender-sensitive design of infrastructure throughout the project cycle (which pre-date the sampled investments) and there was no evidence of these having been applied to the sampled investments.⁴
- (6) GuarantCo provided guarantees on a basis unavailable elsewhere in Vietnam (e.g. greenfield projects, guaranteeing bank loans) and there remains appetite to offer more of these in different sectors and at a larger scale. Where local institutional investors were not able to invest because their mandates restricted it, guarantees circumvented this by providing collateral (i.e. the guarantee) they could accept. This is helping to bring more actors into Vietnam providing similar services, e.g. Prudential replicating GuarantCo with Nam Long on an affordable housing project. However, investments within these projects are yet to provide substantial comfort to local institutional investors to invest without a guarantee in place.

Key changes made by PIDG since investments were made

1. Reporting on climate impact

At the time of the sampled investments, PIDG did not systematically collect and report data on climate-related indicators. Two of the sampled investments independently and publicly reported CO₂ emissions avoided, which was used for the analysis in this evaluation. However, the use of this indicator does not account for where emissions may be increased by an investment, such as by the TLMT road.

This shortcoming has already been addressed by PIDG. In January 2020, PIDG signed up as a supporter to the Task Force for Climate-Related Financial Disclosures (TCFD). It has developed a programme of actions under the four pillars of TCFD: governance, strategy, risk and metrics and targets to operationalise the commitment made to delivering PIDG's climate approach and achieving climate-related KPIs. PIDG has introduced an internal KPI which measures 'portfolio carbon intensity by 2023 against the forecast trajectory'. The carbon intensity is measured as tCO₂ (total carbon dioxide) equivalent for one year of typical operation per US\$ million invested in projects reaching financial close. The forecast figure is based upon PIDG's portfolio of investments. PIDG has set a cap on 2021–23 levels of carbon intensity (tCO₂

⁴ AfDB, 'CHECKLIST FOR GENDER MAINSTREAMING IN THE INFRASTRUCTURE SECTOR', (2009) is one such example.

equivalent per US\$ million invested) at 2015–2020 levels. Externally, PIDG will continue to report actual financed greenhouse gases (in line with the TCFD methodology). These measures will factor in the emissions created by PIDG investments (rather than just taking into account emissions avoided). For more information, please reference the inception report.

2. Gender equality and social inclusion lens

In the sampled investments, there was not an established approach to target marginalised groups as end-users of the infrastructure. Since the time of the investments, PIDG have developed a Gender Equity Action Plan and have integrated a gender assessment into the DI review throughout the investment decision-making process. Furthermore, PIDG has strengthened its approach to estimating the differential impact of its infrastructure on women and men.⁵ The Gender Equity Action Plan for 2021 outlined that all potential investments are screened both for gender risk as well as the potential for generating positive gender outcomes against five gender-lens domains – company and project governance, workforce, supply chain, consumer market (products and services) and community. For more information on PIDG’s current approach to gender equity, please see the inception report.

3. Need for guarantees in Vietnam at large scale

In July 2022, GuarantCo provided a VND 1,150 billion (approximately US\$ 50 million) partial credit guarantee to support a bond issuance by EVN Finance in Vietnam. This is Vietnam’s inaugural onshore, local currency, international verified green bond, attracting international institutional investors. Therefore, PIDG has already identified the opportunity to provide further guarantees in Vietnam and at large scale.

Areas to take forward

The country evaluation of Vietnam is part of a suite of four country studies which, when combined, provide an assessment of PIDG at the organisational and portfolio levels. As such, this country study is an inherently partial evaluation of the portfolio, with a specific focus on the energy sector in particular and on the operations of GuarantCo and InfraCo Asia. Therefore, the following recommendations should be considered in this light and are divided into those areas that require further assessment throughout the remainder of the evaluation and those that can be acted upon by PIDG and/or its Owners.

To be taken forward in the remaining country evaluations

1. Identify projects in future country evaluations which are considered by PIDG to be ‘empowering’ or ‘transformative’ from a gender perspective to allow for more detailed analysis of tools used and results achieved by these projects. This may require a reconsideration of the projects currently selected for each country study.
2. Continue to evidence the link between PIDG’s Signature Features and its contribution to projects to determine the extent to which PIDG is able to have a disproportionately high impact on its investee projects – and therefore on their development impact achievements.
3. Assess the extent to which PIDG’s Signature Features (and therefore potentially outsized contribution to projects) may be impacted by its need to become financially sustainable and therefore decrease its risk appetite. The project cases demonstrated the additionality of PIDG working in frontier markets – such as addressing the bankability of Ninh Thuan solar. In virtually all cases, PIDG is able to do things that other institutions cannot, because of its higher appetite for risk. This in turn is in large part due to the fact that unlike other DFIs, PIDG has not had to be self-sustaining financially. The current shift towards financial self-sufficiency at the PIDG level risks undermining the very structures that allow PIDG to be additional and generate the value it does.

⁵ By bringing together a national-level gender inequality metric (from the UN Gender Inequality Index) with an assessment of the project’s attempts to mainstream gender to establish a quantitative estimate of the ratio of women to men reached by a project.

To be taken forward by PIDG and Owners

- 1. Selection of projects informed by a documented country strategic plan.** At the project level, there is often a strong rationale to invest on a case-by-case basis, and yet there is also an opportunity cost of doing so. While this is a significant strategic challenge given the realities of how investment works, we suggest a shift towards a country strategic plan which outlines the opportunities and limitations for infrastructure investment in the given country and assesses the key barriers to maximising development impact through infrastructure investment. This would identify opportunities such as the recent investments in a group of water projects in Vietnam. Similarly, in the renewables sector, such a country strategic plan would prioritise strategic investments that address challenges identified by the Government of Vietnam (e.g. 'smart grid' and storage technology, due to government concerns over the intermittent nature of renewables).
- 2. Use the country strategic plan to engage Owners and other partners to enable impacts above the project level.** The example of Vietnam shows how PIDG's macro-level effects result from spillovers from individual projects, rather than from strategic engagement with government or planning agencies in Vietnam. While PIDG is not necessarily best placed to influence the Vietnamese government, there may be opportunities for them to work more closely with those that have the remit and influence, such as PIDG Owners and other partners, to unlock some of the barriers to maximising development impact through infrastructure investment (e.g. in persuading regulators to modify the regulation of institutional investors so that guarantees are not needed, or enabling the acceptance of guarantees as banks' assets). Despite the CO2 avoided through the renewable energy projects supported by PIDG, the share of coal in Vietnam's energy mix has increased sharply – dwarfing any gains made. Given recent Vietnamese government commitments to COP26, there is an opportunity to consider how different energy investments might contribute to a more stable and balanced energy mix and to a just transition. This is likely to require stronger coordination with other IFIs and with the agencies operated by PIDG's owners.
- 3. Adopting practical tools to support the consistent review of gender and social inclusion throughout the project life cycle.** The portfolio in Vietnam, particularly the solar and hydropower energy investments (supplying to the grid) and the TLMT expressway (toll roads), do not purposively address differential impacts amongst end-users. PIDG have developed a process to review gender and social inclusion as part of the DI review of individual investments;⁶ and have a Gender Equity Action Plan at organisational level.⁷ However, the use of practical checklists and/or tools to integrate gender mainstreaming and social inclusion into all stages of the project cycle, and for all types of projects, would be beneficial in ensuring that all investments assess and manage their potential impact on different demographic groups, broadening this to social inclusion beyond gender. This would include following a gender-lens through from investment-decision making and selection, to infrastructure design and implementation to support an increase in the likelihood of impacts for different demographic groups. Moreover, also following this process through on investments that are inherently less-well targeted (such as grid energy and roads).

⁶ For more information on the existing processes, please reference the inception report.

⁷ PIDG, PIDG Gender Equity Action Plan, 2020; PIDG, PIDG Gender Equity Action Plan 2021, 2021.

Introduction

1.1 Evaluation overview

1.1.1 Rationale

The Private Infrastructure Development Group (PIDG) encourages and mobilises private sector investment into infrastructure in the poorest and most fragile countries. It consists of a number of companies, each of which focuses on addressing different barriers to infrastructure investment in frontier markets through project development, capacity building and financial products. In recent years PIDG has been seeking to act in an increasingly coordinated way, with its companies collaborating more towards strategic goals, supported by a unified PIDG-level governance structure.

This independent evaluation has been commissioned by members of PIDG's Owner Committee (OC). As well as informing PIDG's strategic direction and operations, the owners have their own accountability requirements to taxpayers and their respective government departments to evaluate PIDG's results.

1.1.2 Objectives

This evaluation aims to:

- estimate historical **development outcomes and impacts** through an **in-depth assessment of PIDG activities** in a range of different-sized economies and geographies across **Sub-Saharan Africa and Asia**.
- provide PIDG's **owners with evidence** of its overall development outcomes and impact as a private sector infrastructure delivery vehicle.
- generate evidence that can be used primarily for **lesson-learning** and **to inform future programming** for all owners.

The evaluation will complement PIDG's own approach to defining and assessing development impact, endorsed by the OC, in order to evaluate the direct and indirect results of PIDG's activities.

1.1.3 Scope

The evaluation consists of a PIDG Signature Features Study (SFS), four separate country evaluations and a synthesis. Details on how countries have been sampled to ensure appropriate coverage of geographies, sectors, PIDG companies be found in Section 3.2.1. The country evaluation approach limits how representative the sample of projects will be.

All investments in the PIDG database, with the earliest dating from 2004, were considered within the sample frame of the evaluation. While the evaluation will show flexibility to accommodate the evolving nature of PIDG activities during the evaluation lifetime, the team does not envisage introducing new projects that are yet to become live.

1.1.4 Audience

The primary audience for this evaluation is PIDG's owners, who are keen to understand the impact of PIDG's work over time. PIDG and its owners will also use the evaluation to make evidence-based decisions on future programming and donor ambitions for PIDG.

1.1.5 Reporting structure

This report builds on the earlier Inception Report and SFS. The rest of this first chapter provides an overview of PIDG companies and the investment portfolio. Chapter 2 then provides details on Vietnam, focusing on infrastructure trends, investment and climate and gender. It ends with an overview of the PIDG investments in Vietnam. Chapter 3 explains the approach and methodology for the evaluation,

which focuses on establishing development results and assessing PIDG contribution. Chapter 4 presents these findings in two parts: firstly for the investment overall, drawing on PIDG’s assessments augmented with our own primary results based on CGE modelling; and secondly by examining PIDG’s contribution to these results, which provides an estimation of PIDG’s causal claim to the overall results. Chapter 5 summarises these findings and recommendations, with lessons for the subsequent country studies as part of this evaluation.

1.2 Brief background to PIDG

This section provides a brief overview of PIDG and its portfolio. This is primarily to help orient the reader, with further details provided in the SFS.

1.2.1 Signature features

Many international finance institution (IFIs) provide long-term finance and project preparation. Where PIDG is unusual is that it works in frontier countries more than others and absorbs greater risks in the early stages of project development, including in middle-income countries (MICs). Another unusual feature is its holistic nature, whereby PIDG companies can intervene at different points across the full

PIDG’s signature features	
What	<ul style="list-style-type: none"> Supply long-term dollar finance Supply early-stage equity Develop domestic capital markets to supply local currency finance through supply of guarantees Build public/private capacity with technical assistance (TA) Support bankability with viability gap funding (VGF) Develop and prove innovative approaches Create positive demonstration effects Mobilise private capital
How	<ul style="list-style-type: none"> Apply commercial mindset Intervene holistically across project cycle Take rapid decisions and actions
Where	<ul style="list-style-type: none"> Frontier countries Middle-income countries Infrastructure focus High-impact sub-sectors

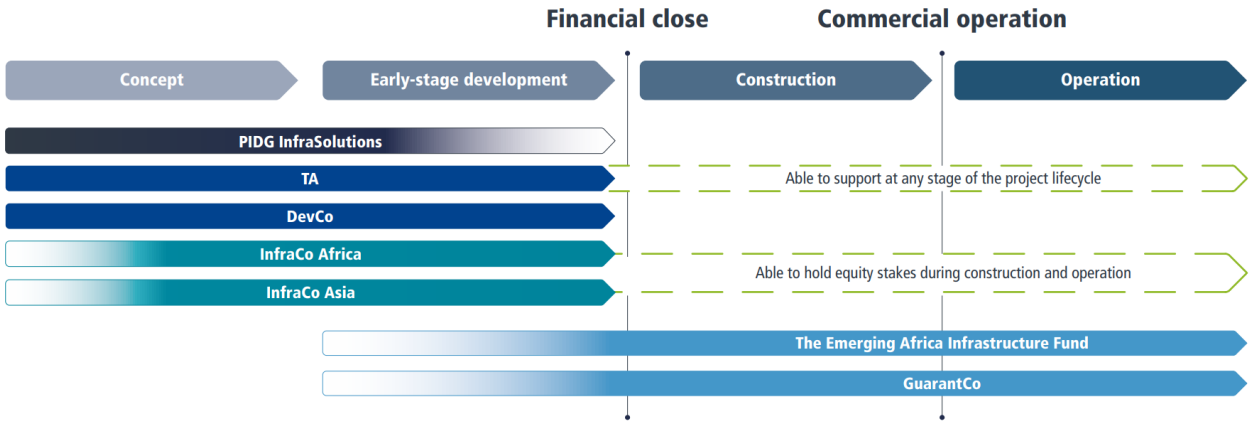
project cycle. Perhaps because of this, PIDG has sought to address issues others have not. The most notable of these is guarantees for local currency financing. Given its importance as a constraint to investment, supporting the wider enabling environment is an area where PIDG could make more formal contributions, while noting that investors may not always be in a position to do so.

The sidebox (left) describes PIDG’s signature features in terms of **what** it does, **how** it works and **where** it operates. These activities are based on a set of assumptions about the reasons for the infrastructure financing gap, and thus the solutions needed to overcome these obstacles. PIDG’s Theory of Change (ToC) describes how inputs lead to more investment and infrastructure (output), which create outcomes for people, the planet, and the wider economy, including financial markets. These in turn lead to positive impacts on multiple sustainable development goals (SDGs).

1.2.2 Strategy

PIDG has evolved continually since its foundation. Most recently, this saw a shift to a unified model in 2018, with a single governance structure and investment policy, coordination between companies, programmatic targeting of high-impact sectors and reform of the upstream business to support this, and a five-year strategy focused on poverty reduction and economic development through scalable, replicable and transformative interventions, with a new emphasis on affordability. Importantly, PIDG committed to becoming financially sustainable over time, excluding its upstream advisory business.

Figure 1: Structure of PIDG companies



1.2.3 Portfolio and country selection

A review of data.pidg.org states that PIDG has supported a total of 230 projects (excluding PIDG TA and DevCO investments), of which 130 were operational. Investments in the projects to date totalled a combined \$35.3 billion. PIDG has committed close to \$4.24 billion across current and completed projects. By company, the Emerging Africa Infrastructure Fund (EAIF) has 38.3% of projects, GuarantCo 24.8%, InfraCo Asia (Investment and Development) 16.1% , InfraCo Africa (Investment and Development) 12.2% and ICF 8.3%. For operational projects EAIF has just over half (60 projects). EAIF also accounts for for 46% of commitments (\$1.94 billion). GuarantCo has 30 operational projects (\$1.35 billion).

Regionally, 67% of PIDG investments are in Sub-Saharan Africa, which corresponds to 69.5% of commitments. This is followed by South Asia (17.0% projects/15.1% commitments) and East Asia and Pacific (11.3% projects/6.8% commitments). According to the PIDG database, the countries with the highest number of PIDG investments are Nigeria (21), India (17), Uganda (17), Pakistan (14), Kenya (13), Ghana (12) and Vietnam (12). PIDG investments are classified across 11 sectors, with energy (42.2%), digital communications (14.8%) and transportation (10.0%) the largest.

Vietnam was selected as one of four countries for evaluation. As highlighted above, PIDG engages in many of the early stages of the investment cycle through different entities. PIDG projects in Vietnam represent a range of PIDG offerings, including TA, viability gap funding, equity, debt and guarantees. Of Asian countries invested in by PIDG, Vietnam has attracted the second-highest number of investments and the first in Southeast Asia, which is a region receiving increased focus from the organisation. In addition, the focus on the energy sector in Vietnam is representative of the PIDG portfolio more broadly and provided the opportunity for the evaluation team to explore this sector in more detail through this evaluation.

2 Vietnam context

This chapter provides an overview of infrastructure investments in Vietnam, with a focus on energy, transport and water – as well as cross-cutting issues of climate and gender. It provides the context in which PIDG’s investments are situated and in which to understand the significance (or otherwise) of the results (as presented in the next chapter). This chapter ends with an overview of PIDG’s portfolio of investments in Vietnam, with its dominant focus on energy (over 40%), followed by investments in bulk storage/logistics and water, sewerage and sanitation, plus transport and social infrastructure.

2.1 Vietnam sector context

Between 2002 and 2020, gross domestic product (GDP) per capita in Vietnam increased 2.7 times, reaching almost \$2,800. Poverty rates (\$1.90/day) fell from over 32% in 2011 to below 2% in 2020. Economic reforms propelled Vietnam from being one of the world’s poorest nations to being a middle-income economy in one generation.

The economy has proven resilient through different crises, the latest being COVID-19. Vietnam was one of the few countries to post positive growth in 2020 when the pandemic hit. That said, the Delta variant has dealt a shock to Vietnam, with growth in 2021 being more impaired than in many other countries.

2.1.1 Infrastructure

In Vietnam, access to a range of infrastructure services has increased dramatically over 25 years. In 2016, 99% of the population used electricity as their main lighting source, up from 14% in 1993. Access to clean water in rural areas improved from 17% in 1993 to 70% in 2016 (above 95% for urban areas). The top priorities for Vietnam infrastructure investment are transportation and electricity, with the majority of spending planned to improve the transportation network and electricity generation and distribution.

Vietnam was 47th out of 160 countries in the World Bank’s most recent infrastructure rankings, and 103rd on the World Economic Forum’s Road Quality rankings. Infrastructure spending surged by 35% in 2020 to \$20 billion (or 6% of GDP). The government plans to increase infrastructure spending over the next five years by 38% (to \$120 billion) compared with 2016–20. The World Bank expects that about 20% of infrastructure spending in Vietnam over 2020–25 will come from the private sector. Previously, private sector financing had accounted for around 10% of Vietnam’s infrastructure spending.

The following subsections provide further details of the specific infrastructure sectors where PIDG has made investments in Vietnam. The section concludes with a brief review of trends in two important cross-cutting areas with respect to the PIDG strategy: climate and gender.

Energy

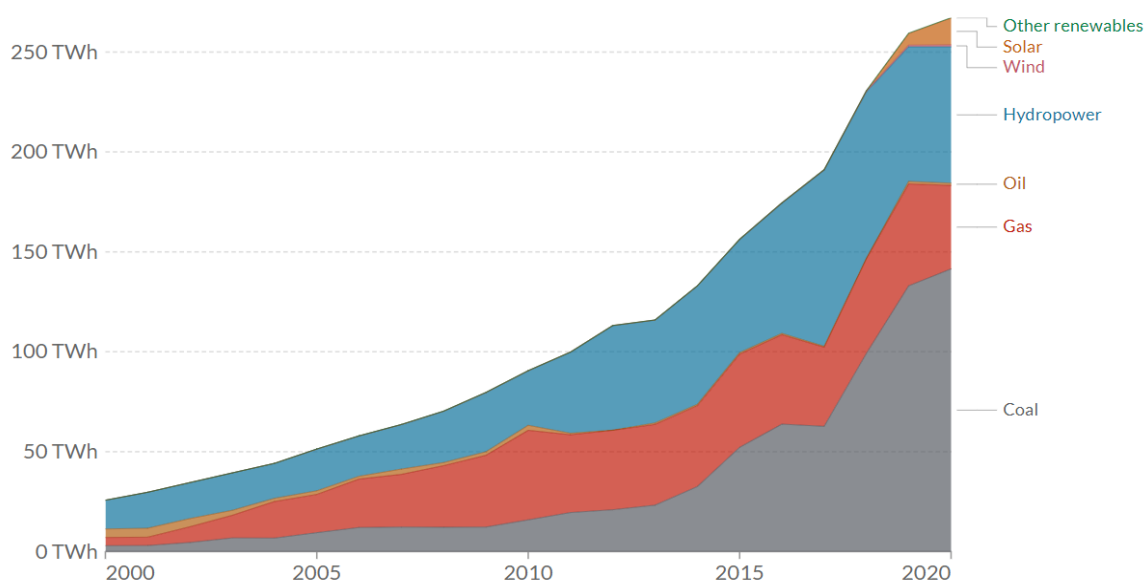
Vietnam has forecast that power generation will need to rise to 130,371 MW by 2030⁸ from 76,620 in 2021,⁹ effectively doubling the installed capacity in less than 10 years. Once largely reliant on hydropower, more recently Vietnam has turned to cheap coal to boost electricity generation. Vietnam’s coal use in the five years to 2017 grew 75%, faster than that of any other country in the world¹⁰ (see Figure 2: below for share of energy by source from 2000 to 2020).¹¹

⁸ https://insightplus.bakermckenzie.com/bm/attachment_dw.action?attkey=FRbANEucS95NMLRN47z%2BeeOgEFct8EGQJswJiCH2WAUTleh6%2BAJHruNkrWNztLuO&nav=FRbANEucS95NMLRN47z%2BeeOgEFct8EGQJswJiCH2WAUTleh6%2BAJHruNkrWNztLuO&fromContentView=1

⁹ EVN. <https://en.evn.com.vn/d6/news/Vietnam-Electricity-Ready-to-adapt-safely-flexibly-and-efficiently-66-163-2676.aspx#:~:text=By%20the%20end%20of%202021,for%2027%25%20of%20the%20system>

¹⁰ Dapice, D. (2018). Vietnam’s Crisis of Success in Electricity: Options for a Successful Clean Energy Mix. Harvard Kennedy School.

¹¹ <https://ourworldindata.org/energy/country/vietnam>

Figure 2: Share of energy by source, 2000–20¹²

The draft version of Vietnam’s 10-yearly Power Development Plan (PDP8) assumes 10% annual growth in Vietnam’s electricity usage for the foreseeable future, which is in line with historical growth rates. The government plans to spend nearly \$130 billion over the next 10 years to expand Vietnam’s electricity generation and transmission capacity by 8% over 2020–25 and to grow capacity by 15% by 2030. Renewables (wind, solar and biomass) are set to increase their share of electricity production to nearly 25% from 5% from 2020 to 2030, but non-renewables will make up the majority of electricity production until 2045.

Table 2: Planned electricity production to 2045

	Energy produced share 2020 (TWh)	Planned installed capacity 2030 (MW)	Planned installed capacity 2045 (MW) ¹³
Total	267.18	130371	261951
% share renewables	5.46	24.26	40.04
% share hydro	25.53	20.47	13.62
% share non-renewables	69.01	52.25	43
% share import		3.02	3.34

Hydropower

Hydropower has traditionally provided a cheap source of power in the country. In 2012, when InfraCo Asia invested in Coc San, hydro provided about 46% of Vietnam’s electricity.¹⁴ This has since fallen below 30% and under the new power plan is expected to drop to below 20% as Vietnam develops other renewable and non-renewable sources. The majority of large and medium hydropower sources have been fully exploited, with smaller facilities now being targeted.

Solar

Rising demand for electricity, combined with good natural resources, has spurred the government of Vietnam to incentivise investments in solar energy. In under five years Vietnam went from being an emerging PV market, producing next to zero solar electricity, to being one of the top 10 countries for

¹² <https://www.bp.com/en/global/corporate/energy-economics/statistical-review-of-world-energy.html>

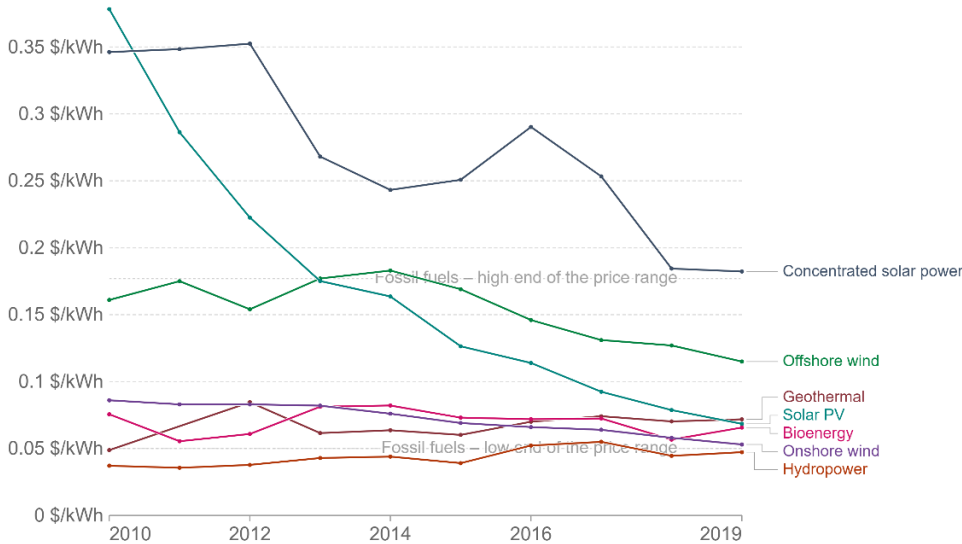
¹³ From Vietnam Power Development Plan 8 October 2021 draft.

¹⁴ All energy data available from <https://ember-climate.org/data/data-explorer/>

installed solar energy capacity.¹⁵ Favourable market conditions have created an opportunity for investment in utility-scale solar power, including the decrease in costs of electricity generated by PV. Between 2016 and 2019 costs for PV fell by over 55% – for wind generation the cost dropped by 38% over the same period, and coal saw a 6% increase.

McKinsey reports that renewables are now the cheapest form of new power generation in Vietnam on a levelized cost of electricity (LCOE) basis.¹⁶ As shown in Figure 3:, solar LCOE has fallen globally from more than \$0.35/kWh in 2010 to around \$0.07 a decade later. In Vietnam this can be attributed to the country’s natural endowments and the reduction in the costs of solar panels.¹⁷ Despite this, prevailing challenges have been barriers to the development and expansion of solar in Vietnam, including a lack of project development capacity, limited access to mainstream financing, and perceived sovereign risks.

Figure 3: Levelised cost of renewable electricity (world)¹⁸



Transport

Roads

Roads carry 86%–90% of transport in Vietnam. For the remainder, inland waterways play a significant role in the Mekong Delta, representing 4.5%–7.5% of transport. Railways account for just 1%–2%, with even less use of planes.¹⁹ Currently, just 20% of the country’s national roads are paved.²⁰ Growing urban populations have already strained and exceeded the capacity of existing transport networks, with half of Vietnam’s population expected to be living in Hanoi and Ho Chi Minh City (HCMC); the cities’ investment in rapid transit systems is exceeding \$22 billion. Various expressway projects are planned or under way to improve connectivity within and between major cities.²¹

In terms of overall investment in infrastructure, Vietnam performs well when compared to many of its neighbours. However, for road maintenance only 10% of capital investments were allocated in 2020; this is notably lower than the 30% in most Organisation for Economic Co-operation and Development (OECD)

¹⁵ <https://www.irena.org/Statistics/View-Data-by-Topic/Capacity-and-Generation/Country-Rankings>
¹⁶ <https://www.mckinsey.com/featured-insights/asia-pacific/exploring-an-alternative-pathway-for-vietnams-energy-future>
¹⁷ Ibid.
¹⁸ <https://www.irena.org/publications/2020/Jun/Renewable-Power-Costs-in-2019>
¹⁹ <https://www.stimson.org/2021/vietnam-country-profile/>
²⁰ Depending on the definition used of ‘paved’.
²¹ <https://www.mordorintelligence.com/industry-reports/infrastructure-sector-in-vietnam>

countries.²² The government has been making efforts to facilitate more private sector participation in the roads sector and to attract foreign direct investment to develop its infrastructure needs.²³

Ports

According to the World Economic Forum (WEF), Vietnam ranks 80th among 139 countries on the quality of port infrastructure. Regionally, Vietnam ranks lower than China, India, Thailand and Sri Lanka. Vietnam has 44 seaports with a total capacity of 470–500 million tons per year. The main challenge facing the biggest ports in Vietnam is the use of smaller ports and vessels, which account for 80% of container imports and exports.

Some ports also suffer from a lack of capacity, which has led to congestion and significant delays. For example, Cat Lai is preferred over Cai Mep despite the latter being a deep-water port that can accommodate vessels with a capacity of 18,000 twenty-foot equivalent units (TEUs). Trans-shipments through Cat Lai can lead to delays and increase costs by around 30%. The increasing use of Cat Lai has also led to gridlock issues due to delays in weigh stations and road intersections.²⁴ On the other hand, some Vietnam ports are contending with massive underutilisation, including the Cai Lan Port,²⁵ which is a PIDG investment.

Water

A 2020 report from the Vietnam Ministry of Agriculture and Rural Development found that only 51% of rural households have access to clean water that meets the Ministry of Health's water quality standard. Vietnam has made significant progress in providing reliable water supply, increasing access from 10% of the population in rural areas in 2000. However, further progress has been slow due to water service coverage diminishing in remote and mountainous communities.²⁶

The 2020 survey measuring the SDG indicators on children and women – conducted by the General Statistics Office (GSO) with support from the United Nations Children's Fund (UNICEF) – shows substantial gaps in safely managed water and sanitation, particularly in the quality of drinking water. 44% of household members whose water source was tested had E. coli contamination. One-fifth of children under the age of five in Vietnam suffer from stunted growth; this increases to 32% among ethnic children.²⁷ The lack of clean water and improved sanitation is a significant contributing factor to this finding.

2.1.2 Investment

Figure 4 below shows the foreign direct investment (FDI) flows as a share of GDP for all lower-middle-income countries in East Asia as per the World Bank definition. As we can see, Vietnam attracts more FDI relative to all the countries in the region except for Cambodia, and much the same as Lao PDR. Vietnam's inflows are also more stable than the other countries, staying very close to 6% of GDP. In contrast, Bangladesh, India, Indonesia, Pakistan, the Philippines and Sri Lanka see FDI flows at 2% or less of GDP over the same 10-year period.²⁸

²² World Bank Group (2020, May). *Vibrant Vietnam Forging the Foundation of a High-Income Economy*.

²³ <https://infrastructurevietnam.com/>

²⁴ <https://www.vietnam-briefing.com/news/port-infrastructure-vietnam-3-hubs-for-importers-exporters.html#:~:text=Related%20services&text=According%20to%20the%20World%20Economic,%2C%20Thailand%2C%20and%20Sri%20Lanka>

²⁵ Thuy, B. (2020). *Stumbling seaport companies seeking international flavour*. *Vietnam Investment Review* 9 January 2020. <https://vir.com.vn/stumbling-seaport-companies-seeking-international-flavour-73015.html> [accessed 31 March 2022]

²⁶ <https://www.worldbank.org/en/news/feature/2020/02/04/results-based-financing-provides-sustainable-water-supply-in-rural-vietnam>

²⁷ <https://www.unicef.org/vietnam/press-releases/national-strategy-rural-water-supply-and-sanitation-2030-vision-2045>

²⁸ Data from World Bank Development indicators.

Figure 4: FDI flows as a percentage of GDP

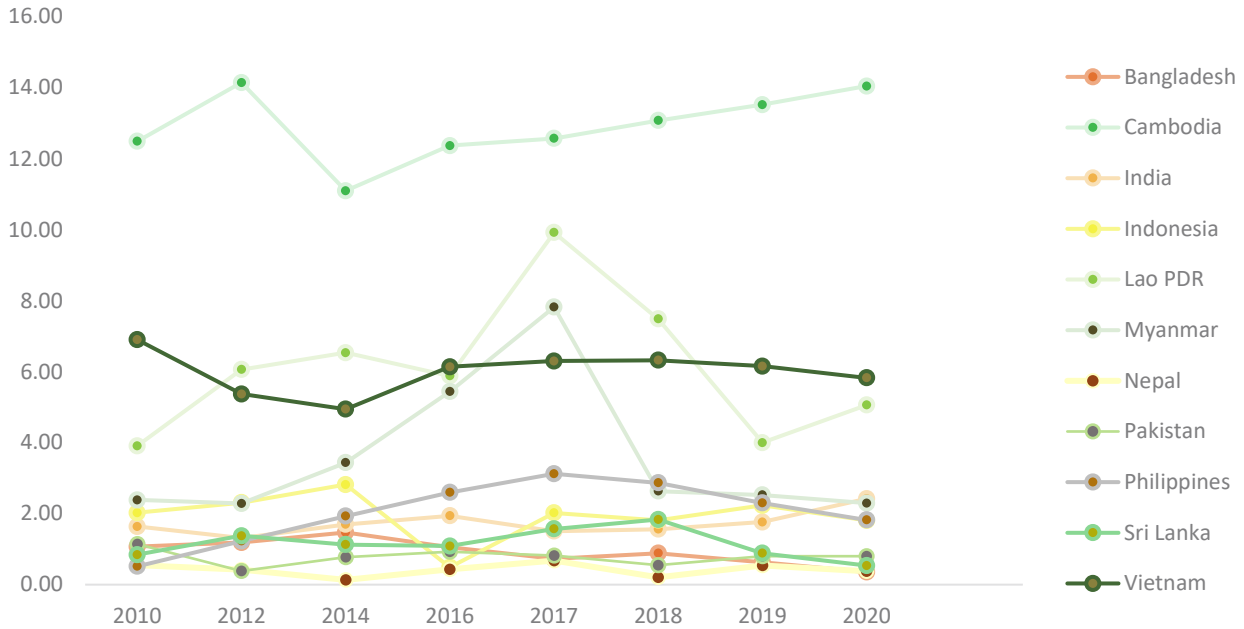


Table 3: below shows the inflows of investment into sectors where PIDG are involved, as well as the performance of Vietnam in terms of ease of doing business.

Table 3: Inflows of investment and Vietnam’s performance in \$USD millions

Indicator ²⁹	2010	2012	2014	2016	2017	2018	2019	2020
FDI inflows	8,000	8,368	9,200	12,600	14,100	15,500	16,120	
Investment in water & sanitation with private participation				88.9			159.14	
Investment in transport with private participation	155			4.5			1,025	
Investment in energy with private participation	943	317	1,790	200	2,400	3645	3288	2,687
Ease of doing business score: 0 to 100 (best)				65.3	67	68.5	69.8	70

As we can see, investment in the energy sector is by far the largest, accounting for as much as a quarter of all FDI inflows in some of the most recent years covered. Vietnam’s overall score on the World Bank’s ease of doing business index has improved over the period, as has the country’s corresponding ranking. Vietnam was ranked 70th out of 180 countries in 2020, compared with a position of 90th in 2010. The country performs less well in specific areas, having a rank of 122nd out of 180 for ‘resolving insolvency’, 115th out of 180 for ‘starting a business’, 104th out of 180 for ‘trading across borders’ and 97th out of 180 for ‘protecting minority investors’.³⁰

2.1.3 Climate

Vietnam’s rapid economic growth and increasing energy demand have led to a sharp increase in greenhouse gas emissions and the second-highest air pollution levels in Southeast Asia.³¹ Given this and the country’s high vulnerability to climate change (vulnerable to extreme weather events, including typhoons, flooding, droughts and landslides, the Mekong region is particularly vulnerable to climate

²⁹ Data from World Bank Development indicators.

³⁰ <https://archive.doingbusiness.org/en/data/exploreeconomies/vietnam>

³¹ <https://www.iqair.com/world-air-quality-report>

change impacts due to its low elevation and rising sea levels), the government has recognised the importance of mobilising climate finance. It is estimated that \$30 billion will be needed for the green growth strategy³² by 2030. Since 2017 Vietnam has been a (lower) middle-income country and will therefore have increasingly limited access to official development assistance (ODA) grants and concessional loans. Accordingly, there is a strong emphasis on the need to mobilise climate finance from other sources, especially the private sector.

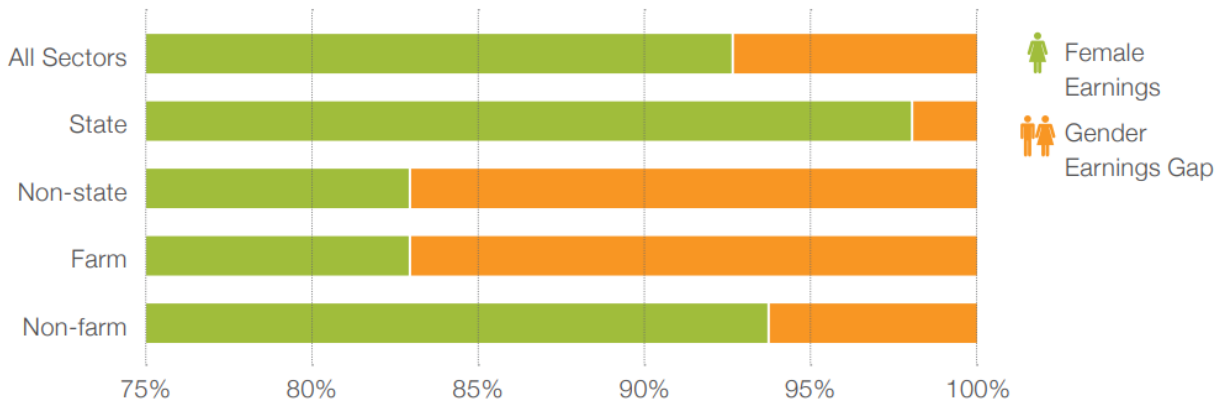
As per the Nationally Determined Contribution (NDC),³³ Vietnam has targets to reduce greenhouse gas emissions by 9% with domestic resources by 2030, raising this up to 27% with international support through bilateral as well as multilateral cooperation and the implementation of new mechanisms. Prime Minister Pham Minh Chinh stated that Vietnam will reach its net zero carbon emission target by 2050.

This sentiment has not yet been reflected in Vietnam’s PDP. The most recent version, published in October 2021, contained reduced projections for wind (12,500 MW less than the target for 2045) and solar power (3,550 GW less than the target for 2045) compared to the previous version of March 2021. The difference was made up by coal-fired power capacity, which is projected to double Vietnam’s current capacity to 41 GW from 20.7 GW in 2020, as well as gas and hydro. In the weeks following the publication of this version, the prime minister travelled to Glasgow for the 2021 United Nations Climate Change Conference (COP26) and committed to phasing out coal-fuelled power generation by 2040. The next version of the PDP is expected to better reflect this commitment.

2.1.4 Gender

In 2021, Vietnam released a National Strategy on Gender Equality 2021–30, showing renewed commitment to an equal and inclusive society. The strategy aims to foster gender equality and female entrepreneurship in the 2021–30 period. The gender earnings gap is estimated at 29.5%.³⁴ A recent research brief published by the International Labour Organization (ILO) highlighted that COVID-19 was exacerbating old labour market inequalities and creating new ones, as women faced especially severe reduction in working hours and left the labour market in larger shares than men.³⁵ In the strategy, the country also aims to reduce, by 2025, the average time women spend doing unpaid housework to 1.7x the time spent by men on such activities – and to reduce this number further to 1.4x by 2030.

Figure 5: Graph showing female earnings relative to male earnings in across different sectors in Vietnam³⁶



³² Vietnam’s green growth strategy is ‘A strategy to promote the process of restructuring and improving economic institutions towards more efficient use of natural resources, improved competitiveness of the economy which will be achieved through increased investments in technological innovation, natural capital and economic instruments. This will contribute to respond to climate change, reducing poverty and ensuring sustainable economic development.’ <https://www.giz.de/de/downloads/VietNam-GreenGrowth-Strategy.pdf>

³³ NDCs represent the commitment by each country to reduce national emissions and adapt to the impacts of climate change.

³⁴ <https://www.vietnam-briefing.com/news/vietnam-implements-gender-equality-strategy-but-challenges-remain.html/>

³⁵ ILO (2021). Gender and the labour market in Viet Nam: An analysis based on the Labour Force Survey.

³⁶ World Bank, Australian Aid and Umbrella Facility for Gender Equality (2018). Gender Gap in Earnings in Vietnam: Why Do Vietnamese Women Work in Lower Paid Occupations?

Globally and in Vietnam, not all women can benefit from improved road infrastructure. A recent impact evaluation by the World Bank of the Third Rural Transport project (RTP3) in Vietnam found that while better roads improved economic opportunities for agricultural production and trade, only households headed by men were able to capitalise on these opportunities to increase agricultural output and income. Female-headed households were constrained by inadequate household labour and capital, which limited their ability to make up-front investments to increase production and income. Coordinating road improvement programmes with complementary interventions, such as access to credit programmes, could help vulnerable households overcome these constraints.³⁷

A report published by the United Nations Development Programme (UNDP) in 2020, 'Empowering Women and Delivering Electricity Access to the Off-Grid Population in Vietnam', emphasises the vital role access to electricity can have for transforming women's, and in particular rural women's, lives. Women, who bear the brunt of household chores, are able to spend more time on non-household tasks when switching to electric appliances. This enables free time for them to take up educational activities and allows access to information through TV and radio, which contributes to closing the gender gap.³⁸ However, grid-connected electricity offers less opportunity to target women and low-income households specifically, often not being enough to overcome barriers and resulting in disproportionately greater impact for men.³⁹

2.2 PIDG in Vietnam

PIDG does not design and seek to implement country strategies but works flexibly across sectors and geographies to identify projects that fulfil their mandate and have the potential to be bankable. This allows PIDG to respond to opportunities as they arise. Three PIDG facilities – two PIDG companies, GuarantCo and InfraCo Asia, and PIDG Technical Assistance (PIDG TA) – are currently active in Vietnam. GuarantCo made its first investment in 2018 with a guarantee for a \$29 million seven-year bond issued by Nam Long Investment Corporation for the development of affordable housing. In the subsequent year GuarantCo provided a \$50 million guarantee to Ho Chi Minh Infrastructure Investment JSC (CII) for the issuance of the bond to construct the Trung Luong–My Thuan (TLMT) toll road. InfraCo Asia was incorporated in 2009 and became fully operational in 2010. It made its first investment in Vietnam in 2012 in the Coc San Hydropower project.

We also see other examples of sector development. In Vietnam, a number of projects are emerging in the water sector, for example, as part of a coordinated portfolio. These are not yet at a stage to be suitable for evaluation, but a more established example in the countries is PIDG's role in helping the transition to a grid that is compatible with renewable energy generation.

PIDG has committed \$207.3 million into 12 investments across 10 projects in Vietnam. Currently, PIDG projects in Vietnam fall into five sectors, with the largest being energy. The estimated total value of these investments is \$1031.0 million, of which \$882.52 million is expected to come from the private sector. InfraCo Asia (Development) has supported 33.3% of the projects, GuarantCo 25%, ICF and InfraCo Asia (Investments) have supported 16.7% each, and InfraCo Africa has supported the remaining 8.3%.⁴⁰

An overview of PIDG's portfolio in Vietnam is presented in the tables below. After reviewing the PIDG portfolio in Vietnam, the team selected projects that represented investments by InfraCo Asia Development, InfraCo Asia Investment, and GuarantCo, with two in the renewable energy and one in the transportation sector.

³⁷ <https://openknowledge.worldbank.org/bitstream/handle/10986/33435/Gender-Specific-Impacts-of-Road-Improvement-What-Can-Be-Done-to-Ensure-that-Better-Roads-Expand-Economic-Opportunities-for-All.pdf?sequence=1>

³⁸ <https://www.ndcs.undp.org/content/ndc-support-programme/en/home/impact-and-learning/library/empowering-women-and-delivering-electricity-access-to-the-off-gr.html>

³⁹ Climate Investment Funds (2017). Gender And Renewable Energy: Entry Points For Women's Livelihoods And Employment.

⁴⁰ Prior to the establishment of InfraCo Asia.

Table 4: PIDG sectors in Vietnam

Sector	# commitments made	% commitments made
Bulk Storage / Logistics	3	25.00%
Power/Energy	5	41.67%
Social Infrastructure	1	8.33%
Transportation	1	8.33%
Water, Sewerage and Sanitation	2	16.67%
Grand Total	12	100.00%

Table 5: PIDG facilities in Vietnam

PIDG facility	# commitments made	% commitments made
GuarantCo	3	25.00%
ICF – DP	2	16.67%
InfraCo Africa Development	1	8.33%
InfraCo Asia Development	4	33.33%
InfraCo Asia Investment	2	16.67%
Grand Total	12	100.00%

3 Approach and methodology

3.1 Overall approach and methodology

PIDG aims to play a critical role in each of its invested projects but the specific role varies greatly, as do the types of impact generated. The evaluation focuses on two core elements to make its assessment. First we establish the development results associated with PIDG projects. Second, we estimate PIDG's contribution to these results.

As detailed in the Inception Report, PIDG's approach to results monitoring (and evaluation) is generally robust. While much of this relates directly to what PIDG does at the project level (e.g. job creation), it is likely that the indirect impacts – if successful – will be many times larger than the direct impacts. To assess this, we augment PIDG's reported results with computable general equilibrium (CGE) modelling of impact and, where feasible, additional primary data from users. We then apply a contribution analysis approach to establish credible claims of how PIDG activities have contributed to outcomes and impact.

3.1.1 Establishing development results

We identified development results in three main ways:

- (1) **Identifying development results.** First, we captured secondary development results through PIDG's own reported results and other data sources in the following areas: (i) private investment mobilised; (ii) CO2 emissions avoided;⁴¹ (iii) short-term and long-term jobs created; (iv) people with new or improved access to infrastructure services (disaggregated by gender).

In addition to these secondary results, we generated primary results data in the following ways.

- (2) **Estimating macroeconomic impacts through CGE modelling:** CGE analysis is a tool for the simulation of the economic effects of policy interventions and other exogenous shocks. CGE models consider all sectors in an economy simultaneously and take consistent account of economy-wide resource constraints, intersectoral intermediate input–output linkages and interactions between markets for goods and services on the one hand and primary factor markets, including labour markets, on the other. CGE models simulate the full circular flow of income in an economy from (i) income generation through productive activity to (ii) the primary distribution of that income to workers, owners of productive capital, and recipients of the proceeds from land and other natural resource endowments, to (iii) the redistribution of that income through taxes and transfers, and to (iv) the use of that income for consumption and investment. For more details on the CGE methodology and application, see Section 3.2 ('Vietnam evaluation methodology') and Annex 3.
- (3) **Capturing primary evidence.** For establishing PIDG's contribution to direct impacts, primary evidence comes from the projects selected in the meso-country studies. For the projects we construct a ToC to capture the rationale, and test this using contribution analysis. For this, we have two main sources of evidence. First, *interviews with project-level stakeholders* provide evidence on PIDG's contribution in each case and to broader sector/regional effects – how important was its contribution relative to other factors? How likely is it that the project would have happened without PIDG? What features of it were influenced by PIDG and how did they affect results? The second source is *beneficiary data* collected for one selected project to assess the scope of impact of the project and triangulate results from the PIDG database from the bottom up.

⁴¹ Although PIDG did not systematically collect and report this indicator in its annual reporting at the time of these investments, this measure was reported on publicly by the relevant sampled investments. See footnotes 42 and 43 for the specific data sources. PIDG has since integrated carbon intensity measurements into its current data management and reporting, in line with the Taskforce for Climate-related Financial Disclosure methodology, as outlined in the inception report.

From these two sources, we collected evidence to build the contribution story at the project level, sector/regional level and institutional level.

3.1.2 Estimating PIDG’s contribution to development results

Given the complex nature of the causal pathways, it is not appropriate for this evaluation to attempt to establish attribution – i.e. whether PIDG’s activities have directly caused an observed outcome using an experimental or quasi-experimental approach. It is widely accepted that these approaches are not applicable to evaluation of investments. These are better suited to more linear cause–effect models. In this study we have used a robust and systematic approach to establishing PIDG’s contribution to observed results through a theory-based evaluation approach.

Specifically, we applied a contribution analysis approach to establish how PIDG activities have contributed to development results.⁴² Contribution analysis interrogates a ToC to understand whether and how a contribution has been made at different points and the scale of this contribution relative to other factors, and makes an assessment of the total contribution of an intervention. To support this, the PIDG ToC (Annex 5) provided the basis for an adapted and elaborated country version (see next section for Vietnam version).

The country-level ToC is used to assess PIDG’s contribution systematically at each point of the ToC as well as cumulatively. This is elaborated at the start of the country study and made specific to Vietnam – i.e. focusing on the PIDG companies that operate in the country. Evidence gathered from interviews and relevant documents are coded to the relevant part of the ToC using MAXQDA⁴³ and analysed to assess PIDG’s contribution relative to other actors.

This elaborated ToC formed the basis for interview design, the results of which were coded systematically using MAXQDA to the relevant areas of the ToC structure – see Annex 6. The interviews sought to understand the contribution PIDG made at each stage, the contributions made by others, and how important – in relative terms – these contributions were.

3.2 Vietnam evaluation methodology

3.2.1 Establishing development results

According to the steps above, in Vietnam we first collated PIDG’s reported results and other secondary data with respect to investment, avoided CO₂, jobs created and people benefiting from new or improved access to infrastructure. Second, a CGE analysis was undertaken to estimate the macroeconomic impact of operational PIDG projects in Vietnam. Third, primary qualitative data collection was conducted with businesses operating in the Mekong Delta. The second and third of these are detailed below.

3.2.1.1 CGE modelling in Vietnam

For the first stage, a social accounting matrix (SAM) for Vietnam was constructed, which provides a disaggregated representation of the input–output structure of production and the commodity composition of domestic demand and trade for a benchmark year. The main data sources for the construction of the SAM are the unpublished Supply-and-Use Tables (SUTs) for 2016. The SUTs explicitly identify the following as distinct production activities:

- sea and coastal, inland passenger water transport services
- sea and coastal, inland freight water transport services
- electricity generation and distribution.

⁴² Mayne, J. (2012). Contribution Analysis: Coming of age? *Evaluation* 18(3): 270–280.

⁴³ MAXQDA is a software packaged used to undertake qualitative and mixed method analysis.

Accordingly, the SAM identifies these sectors and their output as separate activities/commodities. In the second stage, the CGE model was calibrated to the SAM, so that the baseline equilibrium solution of the model exactly replicates the observed structure of the economy in 2016. In the third stage, the model simulated forwards to generate a dynamic baseline which replicates the observed GDP growth over the period 2016–2020 at annual time steps. In the fourth stage, PIDG investments are simulated as exogenous additions to the productive capital stocks of the target sectors.

Table 6: lists the PIDG-supported operational investment projects in Vietnam included in the simulation analysis. The size of the target sector capital stock increments is calibrated on the basis of the ‘Total Investment’ figures reported in Table 6; under the assumption that 10% of the totals are used to cover planning costs and other administration costs during the implementation phase.

As the 2016 SAM to which the model is calibrated records transactions in current 2016 prices, the Producer Price Index data obtained from GSO’s online database are used to transform the investment figures for the PIDG projects implemented prior to 2016 into capital stock increments valued at 2016 replacement cost. Annex 3 provides the full CGE report, including an elaborated methodology.

Table 6: PIDG-supported operational investment projects in Vietnam included in simulation analysis

Investment Project	Model Sector	Date of Operation	PIDG Commitment (\$ million)	Other Investment (\$ million)	Total Investment (\$ million)	Increase in Sector Capital Stock (%)
Antara Cold Storage Project	STORAG	June 2010	0.28	27.83	28.11	0.41
Cai Lan Port	PORTSV	May 2013	27.20	128.1	155.30	0.53
Coc San Hydro Power Project	ELECTR	April 2016	17.54	26.96	44.50	0.19
Ninh Thuan Solar Power	ELECTR	June 2019	10.62	155.98	166.60	0.70
Total			55.64	338.87	394.51	

3.2.1.2 Project-level data collection

i) Project selection

The Vietnam country evaluation is focused on three projects, augmented by an exploration of PIDG’s wider role in supporting the development of renewable energy in Vietnam; the selected projects are detailed in Table 7: below. Projects for the Vietnam study were selected in conjunction with those for the other three countries with the following aims. First, to enable a good assessment of PIDG’s historical performance, we aimed for sector coverage to broadly reflect PIDG’s portfolio. More than half of the case study projects are therefore in the energy sector. Second, PIDG’s future priority will not be reflected in its historical portfolio, so we selected one study in the inclusive housing sector to address this potential gap. Third, we sought to get reasonable coverage across PIDG companies. Finally, we liaised with PIDG in detail over the potential cases, primarily to ensure practical feasibility.

Table 7: Selected projects in Vietnam, with view of PIDG contribution, impact, Eqs and planned methods

PIDG contribution to be assessed	Intended pathway to impact	Eqs and planned methods
Project: Ninh Thuan Solar Power Sector: Energy Generation PIDG Company: InfraCo Asia		
Date of investment: 2018 Project status: Operational 2019		
A 168 MWp utility-scale solar farm located in My Son commune	<ul style="list-style-type: none"> ▪ Viable infrastructure project is established and private sector is mobilised (microeconomic impact). ▪ Direct jobs created in construction and operation and indirect jobs created in the supply chain and households have improved access to clean energy (beneficiary impact). ▪ Greening of Vietnam’s energy grid supported through creation of positive 	<p>Eqs: 1a, 1d, 3a, 3b, 4a, 4b, 4c, 5a, 6a.</p> <ul style="list-style-type: none"> ▪ Interviews with InfraCo Asia to construct ToC. ▪ Desk review of secondary data and documents on energy sector – PIDG database and documents. ▪ Semi-structured interviews with Sunseap, co-investors, regulatory authorities (energy), project developers (demonstration effects).

PIDG contribution to be assessed	Intended pathway to impact	Eqs and planned methods
	demonstration effects leveraging future private investment (systemic impact).	
Project: Coc San Hydro Power Sector: Energy generation PIDG Company: InfraCo Asia		
Date of investment: 2014 Project status: Operational 2016		
A 29.7MW run-of-river hydro power project in the Lao Cai province	<ul style="list-style-type: none"> ▪ Viable infrastructure project is established and private sector is mobilised (microeconomic impact). ▪ Direct jobs created in construction and operation and indirect jobs created in the supply chain and households have improved access to clean energy (beneficiary impact). ▪ Enhanced productivity and growth resulting from increased supply of reliable energy (macroeconomic impact). ▪ Greening of Vietnam’s energy grid supported through creation of positive demonstration effects leveraging future private investment (systemic impact). 	<p>Eqs: 1a, 1d, 3a, 3b, 4a, 4b, 4c, 5a, 6a.</p> <ul style="list-style-type: none"> ▪ Interviews with InfraCo Asia to construct ToC. ▪ Desk review of secondary data and documents on energy sector – PIDG database and documents. ▪ Semi-structured interviews with Lao Cai Renewable Energy, previous developers (i.e. <2012), co-investors, regulatory authorities (energy), project developers (demonstration effects).
Project: Ho Chi Minh Infrastructure Investment JSC (CII) Sector: Transport PIDG Company: GuarantCo		
Date of investment: 2019 Project status: Operational 2022		
51km expressway connecting My Thuan to Trung Luong as part of a longer road connecting Ho Chi Minh to Can Tho	<ul style="list-style-type: none"> ▪ Viable infrastructure project is established and private sector is mobilised (microeconomic impact). ▪ Direct jobs created in construction and operation and indirect jobs created in HCMC and Mekong Delta due to improved, faster transport links (beneficiary impact). ▪ Enhanced productivity and growth resulting from improved transport links (macroeconomic impact). ▪ Indirect investment mobilised through creation of demonstration effects around viability of toll road model (systemic impact). 	<p>Eqs: 1a, 1b, 1d, 2a, 2b, 2c, 3a, 3b, 3c, 4a, 4b, 6b, 7a.</p> <ul style="list-style-type: none"> ▪ Interviews with GuarantCo to construct ToC. ▪ Desk review of secondary data and documents (HCMC/Mekong trade; estimates/modelling of transport impacts) – PIDG database and documents. ▪ Semi-structured interviews with HCM II, co-investors, local government (HCMC), bond investors. ▪ Transport survey of road users. ▪ Survey of business users.

The selection of **Ninh Thuan Solar Power** allows us to examine PIDG’s role in developing a large-scale solar project that was one of the country’s first foreign-owned utility-scale independent power producers (IPPs) and which showed that profitable exit is possible with focus on proper project development and risk assessment in the renewable energy sector in Vietnam.

The **Coc San Hydro Power Project** also links to the analysis of renewable energy sector development, and is an example of PIDG rehabilitating a distressed asset and steering it to operation. At exit, the Coc San Hydro Power Project attracted investors who had never invested in the hydro energy sector in Vietnam.

The final project, **CII**, is the only roads project in the full sample. This is important for representativeness as transport is a substantial part of the PIDG portfolio overall, with roads the largest single element. This project was also selected for primary data collection. Road projects are particularly associated with significant development impacts – they are consistently found to generate the largest impacts in the literature.

Initially we intended to conduct a survey of users of the toll road to assess the impact of the new infrastructure. Due to COVID-19 the road had not commenced operations at the time of the evaluation, which made it impossible to implement the survey. Instead we purposefully selected a range of businesses for key informant interviews (KIIs) that were representative of the types of businesses operating along the highway – described more in the next section. In addition we considered geospatial analysis to assess the impact of the road on land use but, again, as the road was not yet operational this

would not have yielded useful impact data. We also considered undertaking an analysis of property price increase, which was an emergent outcome from KIIs with businesses, but there was not a complete enough set of data over time to draw a full analysis.

ii) Project stakeholders

At project level we interviewed 19 project stakeholders. We intended to interview the PIDG stakeholders involved in the project deal and the project developers before using snowball sampling to reach other investors, the people’s committees for the relevant regions, and government stakeholders (which, as discussed above, we were unable to obtain). Table 8: below summarises whom we interviewed across the case studies; the full list is available in Annex 2.

Table 8: Stakeholder groups reached through evaluation project-level KIIs

Project	PIDG facility	Project developer	Investors	People’s committee	Gov. stakeholder
CII	✓	✓	✓		
Ninh Thuan	✓	✓		✓	
Coc San	✓	✓	✓	✓	

iii) Beneficiary data collection in the Ho Chi Minh Infrastructure Investment

In addition to project stakeholders, CII was selected for additional beneficiary data collection to better understand the contribution of the PIDG project to the anticipated outcomes and to gather more evidence against differentiated impacts of the road.

Identifying key (potential) actors: The four main products of the Mekong Delta are rice, catfish, fruit and seafood. In 2020, export of rice in the region was valued at \$3 billion, accounting for 80% of the country’s export turnover of rice. Catfish production was \$2.2 billion, or 95% of the country’s export turnover of catfish; fruit production was \$1.7 billion, or 65% of the country’s export turnover of fruit; and shrimp production was \$2.1 billion, or 60% of the country’s export turnover of shrimp.

The report identifies different actors’ involvement in the four key commodities: businesses, cooperatives, business households, and farmers. Detailed information about the actors is described in Table 9: below. For each business, we interviewed the business representatives of companies or owners. The markets of enterprises and cooperatives reflect the four main products represented in the Mekong Delta.

Table 9: List of the 14 participants in qualitative data collection for the CII investment

	Sector	Places	Production(s)	Market(s)
1	Cooperation (manufacturing and service)	Hau Giang	Fruit: fresh and cane products	International: Asia, European Union (EU), America, Africa, East Asia, Australia
2	Commercial	Can Tho	Seafood: catfish and shrimp	International: Latin America, Asia, United Arab Emirates (UAE), EU
3	Manufacturing	Can Tho	Seafood: shrimp, crab, fish, frog	Domestic; International: Asia, China
4	Commercial	Can Tho	Fruit: fresh fruit; other products	Domestic
5	Manufacturing	Can Tho	Seafood: shrimp	International: Asia, America, EU
6	Family business	Dong Thap	Fruit: mango	Domestic; International: China
7	Family business	Can Tho	Fruits: seasonal	Domestic; International: Asia, Russia
8	Family business	Vinh Long	Fruit: dried longan	Domestic

	Sector	Places	Production(s)	Market(s)
9	Cooperative group	Hau Giang	Fruit: lemon	Domestic
10	Limited Company	Soc Trang	Frozen agricultural and aquatic products; fried vegetables; dried shrimp and processing	International: Japan, EU, Australia, America, Korea
11	Cooperation	Soc Trang	Aquatic product processing	International: America, Japan, EU, China, India, Australia, Korea
12	Farmer	Vinh Long	Fruit: orange	Local
13	Farmer	Soc Trang	Fruit: milk fruit, guava	Local
14	Customs Officer	Can Tho	Export and import process	Regional (Mekong Delta)

Questionnaire design: This evaluation set out to identify how the construction of the expressway contributes to the business activities of each actor. The questionnaire was divided into three parts: (i) an inquiry into the current barriers to accessing HCMC and wider markets; (ii) demographics to determine how different groups are affected; (iii) perceptions of how the road will address these barriers.

Interviews were carried out by Ly Quoc Dang, a member of the evaluation team based in Can Tho – located at the southern end of the expressway. We applied in-depth interview (IDI) techniques to interview the participants. Due to the COVID-19 pandemic, we could not reach all the participants. In the list of 14 participants above, the study met 11 participants for face-to-face interviews; the remainder were interviewed by phone.

3.2.2 Triangulating and analysing PIDG’s contribution in Vietnam

As described in the methodology section, the PIDG ToC was adapted for Vietnam (i.e. to include only those PIDG companies operating in the country) and elaborated at the different stages of the ToC (to enable a granular assessment of PIDG’s contribution at each stage). This ToC is shown in Figure 6:

Interviewees were selected to represent a range of actors within the projects to understand PIDG’s contribution from different angles. Interviews were structured to link PIDG’s inputs to outputs and short-term, medium-term and long-term outcomes, with questions designed to elicit the importance of PIDG activities to these results relative to that of other factors. This included identifying demonstration effects of PIDG and likely contribution of the projects to those perceived effects. The evaluation team then developed a coding framework against which all the different sources of evidence were coded: the framework was built around the ToC using MAXQDA software, which supported (i) systematic analysis across sources and (ii) understanding of the strength of evidence underpinning the findings presented in the following sections. The coding framework is available in Annex 6.

3.2.3 Limitations

Each section within the findings begins with a discussion of the strength of evidence and limitations for the work presented. A more general discussion of overall limitation is presented here.

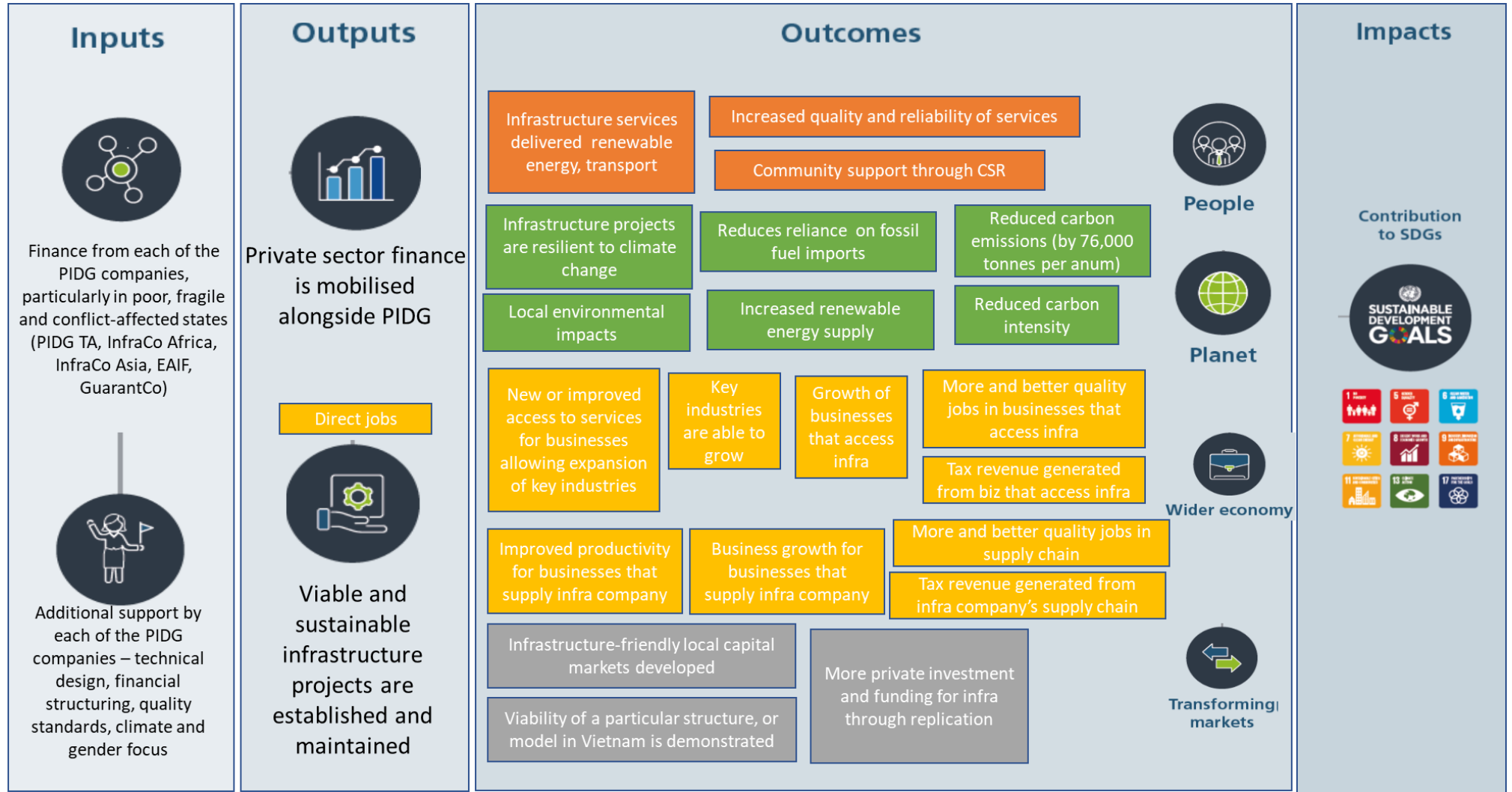
Overall, the capture of development results (outcomes, direct and indirect impacts) across the selected PIDG investments was comprehensive through the use of a combination of PIDG monitoring and evaluation data augmented by CGE modelling. The differentiated impacts (such as by gender) were partly constrained in this particular country study, as both Ninh Thuan Solar Power and the Coc San Hydro Power Project feed electricity into the grid – thus dissipating the impacts. Hence, the focus was deliberately on the road infrastructure of the Ho Chi Minh Infrastructure Investment. Due to COVID-19-related delays to the construction of the road, the initial plan to survey beneficiaries of the expressway to Ho Chi Minh was not feasible. While not as representative as a survey, this limitation was mitigated by a series of KIIs with purposively selected businesses located along the highway – providing qualitative insights, including some disaggregated insights, into the likely impact.

Other aspects were also shaped by the ongoing COVID-19 pandemic. Both international and domestic travel were restricted in Vietnam and meant that stakeholder interviews were done remotely and that the qualitative data collection for the expressway were more time and budget-intensive. Without a typical 1–2 week country visit, it was more challenging to plan and arrange interviews, as respondents were also juggling their own challenges due to the pandemic. However, this is not thought to affect the quality of the interviews conducted but simply to extend the period over which data was collected.

Lastly, as described in the Inception Report, we had planned to undertake a sector-based (“macro”) study on PIDG’s role supporting the renewable energy sector in Vietnam – engaging government officials and other actors to assess PIDG’s contribution. At the time of the design, however, it was understood that PIDG engaged beyond the project level. As our understanding deepened during the course of the Vietnam study, it became apparent that these wider effects are inextricably linked to project activities (i.e. PIDG does not generally engage with the Vietnamese government in regulatory areas, etc., except where there is an impact on project viability). These are therefore captured within three project assessments rather than an additional layer of analysis.

In terms of gender equality and social inclusion (GESI) impacts, the understanding of the evaluation team is that, beyond applying for VGF, selected PIDG projects in Vietnam did not systematically apply a framework for GESI during the selection, design or procurement processes. In addition, as two projects selected supply energy to the grid and the road project was not operational, and considering the GESI challenges outlined in these sectors in Section 2.1.3, findings in this area were limited.

Figure 6: Country-level Theory of Change – based on selected cases



4 Findings: overall development results

The findings are presented in separate chapters. The first of these chapters presents here the overall development results, and this provides the ‘big picture’ of direct and indirect impacts of the investments – the vast majority of which are funded by private capital. It is important to note that this part of the analysis presents the development results of the portfolio of investments *in which PIDG have been involved* – which is not the same as saying these are impacts to which PIDG can claim a contribution (which is analysed later in section 5).

4.1 PIDG results⁴⁴

Table 10: describes all PIDG projects that have been initiated in Vietnam. As we can see from the first row, four of the ten projects are now operational. As confirmed in row 2, these are the projects that have been used for the CGE modelling, on the basis that only operational projects can have an economic impact. The third row highlights the three projects selected for case study analysis.

The total investment across the projects is over \$1 billion, \$882 million (over 85%) of which comes from private sources. These projects are estimated to have directly generated (or will directly generate when operational) over 6,000 short-term jobs and close to 850 long-term jobs. 4.1 million people will have new or improved access to infrastructure as a result of these projects, 1.7 million (or 40%) of whom are female.

It is estimated that PIDG’s renewable energy projects in Vietnam will reduce CO2 emissions by 316,000 tonnes per annum. We do not have estimates of the emissions increases that will result from the projects through the expansion of economic activity or through an increase in traffic (in the case of CII with the TLMT road).

Overall, the percentage share of long-term jobs that are taken up by women is slightly better than the percentage share of short-term jobs, which may be in part due to prevailing social norms for work in construction. Regardless, on both fronts this is an area where targeted interventions may have potential to improve gender outcomes. In 2016 the share of workforce participation of women in construction and industry was over 40%, suggesting that, while still a predominantly male sector, there is opportunity for PIDG to improve outcomes in this area.

Table 10: PIDG projects originated in Vietnam⁴⁵

	Coc San	Ninh Thuan	CII	Antara Cold Storage	Cai Lan Port	Cai Mep Port	Nam Long Investment	Water Supply – Bai Lai	Water Supply – Thuy Nguyen	EVN Finance	Total
Operational	Yes	Yes	No ⁴⁶	Yes	Yes	No	No	No	No	No	
CGE modelling	Yes	Yes	No	Yes	Yes	No	No	No	No	No	
Case study	Yes	Yes	Yes	No	No	No	No	No	No	No	
PIDG commitment (\$ million)	17.54	19.62	49.6	0.28	27.2	10	29	2.45	1.57	50	207.26
Total investment (\$ million)	44.53	166.6	537	28	155.3		100	7.82	6.25	75	1031.5
Private investment (\$ million)	30.6	147	445	20	54.35		100	2.55	4.68	75	882.18
Development Finance Institution (DFI) investment (\$ million)	8.9	19.6		8	100.95			2.45	1.57		141.47
% mobilised	69%	88%	83%	71%	35%		100%	33%	75%	100%	78% average

⁴⁴ The evaluation is using PIDG data as a key source as this data follows robust methods and is checked by an independent panel. It is unlikely that we would get better data by repeating the exercise ourselves and so instead we chose to focus the evaluation resources on the CGE model.

⁴⁵ Figures in italics are predicted.

⁴⁶ Not operational at the time of this evaluation; but has since become operational as of May 2022.

Avoided CO2 emissions per annum (tonnes) ⁴⁷	76,000 ⁴⁸	240,000 ⁴⁹									316,000
Short-term jobs	298	1300	2171	1200	500		350	107	210	150	6286
Short-term jobs female	28	0	212				10		26		276
% female	9	0	10				3		12		
Long-term jobs	35	52	120	200	340		25	10	10	55	847
Long-term jobs female	8	4	56				4				72
% female	23	8	46				16				
People with improved/new access to infrastructure	87289	153372	3806471	50000				35936	16814		4149882
People with improved/new access – female	34197	93219	1492911	19622				14095	7163		1661207
% female	39	61	39	39				39	42		

4.2 CGE results

Table 11: lists the projects included in the simulation analysis.⁵⁰ From a modelling perspective, the PIDG-supported investments increase the productive capital stock of the target sectors – the ‘Total Investment’ figures reported in Table 11:.⁵¹

In the case of the Cai Lan International Container Terminal (CICT), actual capacity utilisation from 2013 to date remained well below 20% of its annual throughput capacity (520,000 TEU).⁵² To estimate the actual increase in capital resulting from the project, data from the Vietnam Seaports Association (VPA, 2022) is used to calculate the market share of CICT in Vietnam’s total seaport freight throughput (about 0.7% on average), along with data on the share of sea freight in the model’s water transport sector (77%) from GSO (2020). The last column of Table 11: shows the resulting estimated percentage change in the target sector capital stocks relative to a counterfactual ‘without PIDG investment’ equilibrium.

Table 11: PIDG Vietnam investment projects in operation⁵³

Investment Project	Model Sector	Date of Operation	PIDG Commitment (\$ million)	Other Investment (\$ million)	Total Investment (\$ million)	Increase in Sector Capital Stock (%)
Antara Cold Storage Project	STORAG	June 2010	0.28	27.83	28.11	0.41
Cai Lan Port	PORTSV	May 2013	27.20	128.1	155.30	0.53
Coc San Hydro Power Project	ELECTR	April 2016	17.54	26.96	44.50	0.19
Ninh Thuan Solar Power	ELECTR	June 2019	10.62	155.98	166.60	0.70
Total			55.64	338.87	394.51	

⁴⁷ Although PIDG did not systematically collect and report this indicator in its annual reporting at the time of these investments, this measure was reported on publicly by the relevant sampled investments. PIDG has since integrated carbon intensity measurements into its current data management and reporting, in line with the Taskforce for Climate-related Financial Disclosure methodology, as outlined in the inception report.

⁴⁸ <https://www.pidg.org/project/coc-san-hyrdo-power/>

⁴⁹ http://infra.coasia.com/wp-content/uploads/2020/01/INFRACO-ASIA_PROJECT-FACT-SHEETS_COMBINED.pdf

⁵⁰ The PIDG project data provided by Itad (file: PIDG Vietnam investments.xlsx) list a further six projects (see Appendix Table A-1 in Annex 2), which do not appear to be operational yet as of 2021.

⁵¹ We assume 10% of the totals are used to cover planning costs and other administration costs during the implementation phase.

⁵² See VPA (2022). For further reference to the causes (and consequences) of the CICT capacity underutilisation problem, see e.g. Thuy (2020), Nguyen and Kim (2020), VietnamNet (2015). Blancas *et al.* (2014) anticipate the problem early on.

⁵³ Source: PIDG project data provided by Itad and author’s calculation.

In view of the absence of econometric evidence on the elasticity of the supply of labour (ϵ)⁵⁴ for Vietnam, the simulation analysis considers three alternative values for this key parameter, which measures the percentage change in the labour supply quantity associated with a 1% increase in the real wage: $\epsilon = 0.5$, $\epsilon = 1$ and $\epsilon \rightarrow \infty$.⁵⁵

Table 12: displays the estimated annual aggregate economy-wide real income gains – as measured by the induced changes in GDP – attributable to the PIDG-supported investments under investigation.

Since the PIDG investments are small in relation to the total economy-wide productive capital stock of Vietnam,⁵⁶ the small size order of the percentage changes in the bottom panel of the Table is not surprising.

Table 12: Impact on aggregate real GDP

	Low $\epsilon = 0.5$	High $\epsilon = 1$	Extreme $\epsilon \rightarrow \infty$
<i>Investment Project</i>	<i>S million</i>		
Antara Cold Storage	13.4	15.1	25.3
Cai Lan Port	2.0	2.5	5.1
Coc San Hydro Power	17.2	21.0	44.0
Ninh Thuan Solar Power	63.1	77.3	161.8
	%		
Antara Cold Storage	0.005	0.006	0.010
Cai Lan Port	0.001	0.001	0.002
Coc San Hydro Power	0.007	0.009	0.018
Ninh Thuan Solar Power	0.026	0.031	0.066

Table 13: sets out the economy-wide income gains, which constitute recurrent flows each year over the lifetime of the projects. This provides an indication of the economy-wide annual social rate of return on investment for each project. In most cases, the rate of return is around 50%, with the low figure for Cai Lan Port reflecting the aforementioned capacity underutilisation problems.

Table 13: Annual social rate of return on investment (Δ GDP/Total Investment in %)

<i>Investment Project</i>	Low $\epsilon = 0.5$	High $\epsilon = 1$	Extreme $\epsilon \rightarrow \infty$
Antara Cold Storage	47.8	55.2	90.0
Cai Lan Port	1.3	1.6	3.3
Coc San Hydro Power	38.6	47.3	98.9
Ninh Thuan Solar Power	37.9	46.4	97.1

Using the default labour elasticity of 1, Table 14: displays the impacts on aggregate primary household income – that is, gross labour and capital income prior to income tax deductions – decomposed into its constituent parts. As we can see, the four projects generate annual increases in household income of more than \$100 million, largely through the employment (labour) channel.

⁵⁴ This is the responsiveness of labour supply to an increase in wages resulting from the increased economic activity triggered by the PIDG project. The default assumption is that a 1% wage increase leads to a 1% increase in the supply of labour - $\epsilon = 1$.

⁵⁵ The specifications $\epsilon = 0.5$ and $\epsilon = 1$ are taken to span the plausible range from 'Low' to 'High'. The 'Extreme' case of an infinite labour supply elasticity (which means unlimited supplies of labour at initial real wage levels) provides an absolute upper limit for the estimated employment effects. A simplistic traditional fixed-price SAM multiplier analysis, which implies the presence of unlimited supplies of labour, would generate figures of a similar order of magnitude, and the results for this 'Extreme' case are included for purposes of comparison.

⁵⁶ Without the PIDG-supported investments, the aggregate economy-wide capital stock of Vietnam in 2019 would have been about 0.035% smaller, according to the SAM-based estimates.

Table 14: Impact on primary household income and decomposition into labour and capital income

$\epsilon = 1$	Labour	Capital	Household Income
	\$ million		
Antara Cold Storage	7.4	5.8	13.2
Cai Lan Port	1.9	0.2	2.1
Coc San Hydro Power	16.7	2.6	19.3
Ninh Thuan Solar Power	61.4	9.3	70.7
Total	87.4	17.9	105.3
	%		
Antara Cold Storage	0.005	0.008	0.006
Cai Lan Port	0.001	0.000	0.001
Coc San Hydro Power	0.012	0.003	0.009
Ninh Thuan Solar Power	0.044	0.012	0.032
Total	0.062	0.023	0.048

These effects are presented in more detail in Table 15:, which presents the aggregate economy-wide permanent employment effects from the CGE analysis – these are jobs that are created as a result of the project becoming operational and which will persist as long as the infrastructure is operational.

The job headcount figures in the left-hand panel do not take account of intra- and intersectoral differences in average hours worked and hourly earnings per employed person. In contrast, the full-time equivalent (FTE) average wage figures in the right-hand panel transform the headcount number into equivalent numbers of full-time (48 hours per week) that pay the economy-wide average wage. A decomposition of employment effects by production sector is provided in Annex 3.

If we take the central case ($\epsilon = 1$) we see that the four projects are estimated to generate a total of 22,297 jobs using the headcount measure, or 16,784 as FTEs.

Table 15: Economy-wide employment effects

Investment Project	Job Headcount			Average Wage FTE Jobs		
	Low	High	Extreme	Low	High	Extreme
	$\epsilon = 0.5$	$\epsilon = 1$	$\epsilon \rightarrow \infty$	$\epsilon = 0.5$	$\epsilon = 1$	$\epsilon \rightarrow \infty$
Antara Cold Storage	1,723	2,203	5,070	1,379	1,756	4,003
Cai Lan Port	132	258	1,008	47	145	733
Coc San Hydro Power	3,159	4,245	10,730	2,333	3,185	8,268
Ninh Thuan Solar Power	11,596	15,591	39,433	8,566	11,698	30,395
Total	16,610	22,297	56,241	12,325	16,784	43,399

Table 16: compares these indirect effects with the direct employment effects of the infrastructure facility estimated by PIDG. Short-term jobs are those involved with the construction of the facility, while long-term jobs are those needed for operations and maintenance (O&M). A total of 3,925 short-term and long-term direct jobs were created, but the great majority (3,298) were short-term. Only 627 long-term permanent jobs were estimated as being created. In contrast, the central estimates of the CGE modelling find that between 17,000 and 22,300 permanent jobs have been created.

Table 16: Direct employment effects estimated by PIDG

Jobs created	Coc San	Ninh Thuan	Antara Cold Storage	Cai Lan Port	Total
Short-term	298	1300	1200	500	3298
Long-term	35	52	200	340	627
Total	333	1352	1400	840	3925

Ninh Thuan is the largest contributor by far, accounting for around three-quarters of all jobs estimated by the CGE modelling. This is much greater than the project’s share of direct jobs. Reflecting the underutilisation issue discussed above, Cai Lan Port has a very limited economy-wide employment impact – lower, in fact, than the direct employment effects estimated by PIDG.

Most of the new permanent jobs attributable to the PIDG-supported infrastructure investments are in the labour-intensive manufacturing, wholesale and retail trade and other services sectors.⁵⁷

Summary of overall development results

- There are ten PIDG projects with PIDG investment in Vietnam. The total investment across the projects is \$1,031 million, of which \$880 million (85%) is from private sources.
- PIDG-supported investments are responsible for significant effects on employment – both directly, as a result of the construction and operation of new infrastructure facilities, and indirectly, through the macroeconomic effects they generate. PIDG estimates that these projects will directly generate (or will directly generate when operational) 3,982 short-term jobs and 707 long-term jobs.
- CGE modelling estimates that between 17,000 and 22,300 permanent jobs have been created across the economy (i.e. indirectly) as a result of PIDG-supported projects in Vietnam.
- Ninh Thuan is the largest contributor by far, accounting for around three-quarters of all jobs estimated by the CGE modelling.
- The gender distribution of these employment effects will depend on the social and economic characteristics of Vietnam. Although these are beyond the scope of this study to assess, there are good reasons to believe that men will capture a disproportionate share, with the structure of the Vietnamese labour market being skewed towards male workers.
- For access to new or improved services, PIDG estimate that 40% of those benefiting are, or will be, women, again showing a disproportionate benefit accruing to men.
- PIDG’s renewable energy projects in Vietnam are estimated to reduce CO2 emissions by 316,000 tonnes per annum – though this does not include estimates of increased emissions, such as increased traffic from the TLMT expressway.

⁵⁷ See Annex 3 for estimates of impacts on prices and productions costs broken down by sector.

5 Findings: project-level case studies

The results described above provide prima facie evidence that PIDG is creating strong impacts, but the real magnitude of these is determined by PIDG’s contribution – it is the projects that generate the results, not PIDG. If they would have happened anyway, and in the same form, then little or none of the results generated can be attributed to PIDG. If they would not have happened without PIDG’s investment, most or all of the results can be said to have been caused by PIDG. There may also be projects that would have happened, but not in the same way, or at the same time, if PIDG had not been involved. In these cases, PIDG’s contribution will fall somewhere between the two extremes.

To address these questions, three project-level studies were undertaken to determine PIDG’s contribution. In each case, a ToC structure was used to link PIDG inputs to outputs and to short-term, medium-term and long-term outcomes. We also sought to assess PIDG’s country contribution above the project level, specifically with respect to the development of the solar sector in Vietnam. Following OECD Development Assistance Committee (DAC) criteria, inputs were also assessed from a relevance⁵⁸ perspective.

The following sections present a summary of the project-level cases followed by comparative findings for the three, organised by position in the ToC: (i) inputs and relevance; (ii) outputs; (iii) short and medium-term outcomes. Each section also presents an overview of sources of evidence and limitations against the output and outcome area. The section finishes with an assessment of PIDG’s wider contribution to solar energy in Vietnam, the demonstration of the selected cases, a discussion of how PIDG activities relate to its ‘signature features’, and conclusions on PIDG’s overall contribution to development impacts.

5.1 Summary of case studies and results

5.1.1 Coc San Hydro Power Project

InfraCo Asia Development	\$7.54	Coc San was the first PIDG investment in Vietnam. With them, PIDG brought experience of delivering projects of the same scale and nature and a commitment to high international standards, especially in ESG. Coc San is a run-of-the-river hydropower project in the Lao Cai province – a low-income region facing energy constraints. PIDG joined Coc San when it was a distressed project and was unable to obtain the required funding. Despite hydropower being well established in Vietnam, there was limited investor appetite, in part due to shortcomings with the developer.
InfraCo Asia Investment	\$10M	
PIDG TA	\$25,000	
PIDG VGF	\$5M	
Year of Financial Close	2014	
Year of Commercial Operation	2016	

PIDG provided TA to restructure the engineering, procurement and construction (EPC) contract to international best practice and prevented a change to the power purchase agreement (PPA) that would have made the project unbankable; thus PIDG improved the bankability of the project. PIDG also provided equity investment to help the project reach financial close, and provided further VGF to ensure project affordability in order for Vietnam Electricity (EVN) to purchase the power at a price point that allowed low-income households to pay a low tariff. In addition, the project provided direct employment to and raised the skills base of the local population. In terms of differentiated impact, no specific GESI lens was applied for this project. Coc San provides energy to the grid, and as such there is limited ability to tailor energy provision to the needs of populations with protected characteristics. Outcomes for these groups will be determined largely by factors outside of the project scope. In terms of

⁵⁸ Relevance: The extent to which the intervention objectives and design respond to beneficiaries, global, country and partner/institution needs, policies and priorities, and continue to do so if circumstances change.

outcomes for the planet, the addition of renewable energy capacity to the grid from Coc San has led to an estimated 76,000 tonnes of CO2 emissions per year avoided.

PIDG sold its stake in Coc San to TEPCO, a Japanese energy company; this represented the company’s first international energy project investment. This was achieved through the delivery of high technical, environmental and social (E&S) standards on Coc San. The project had strong demonstration effects in terms of proving the reliability of EVN to honour PPA contracts on IPPs. The project itself has also been toured by other countries, with the intention to implement similar hydropower projects. Without PIDG investment, the evidence suggests that this project would not have been completed – at least, not to the timescale or quality at which it was.

5.1.2 Ninh Thuan Solar Power Project

InfraCo Asia Development	\$10.62M
InfraCo Asia Investment	\$9M
Year of Financial Close	2018
Year of Commercial Operation	2019

PIDG invested in Ninh Thuan at a time where there was no installed solar capacity in Vietnam. The project represented a major expansion of solar energy and the potential for strong positive demonstration effects for utility-scale solar in the country, especially for the IPP model at utility scale; thus, attracting private investment into these types of projects was a key goal. Through Ninh Thuan, PIDG aimed to demonstrate the bankability of solar

in Vietnam, theorising that this is an important step in the transition to green energy system. In addition, Ninh Thuan is a poor region, with existing electricity access constraints.

Domestic and international investor appetite for a project of this scale was lacking; the PPA was not considered bankable, due to a number of reasons, including curtailment risks; and the project developer, Sunseap, did not have a strong enough track record to overcome this barrier. As such, despite various attempts at obtaining financing – including participation in a roadshow – investors were not interested. InfraCo provided equity and mezzanine debt to the project to share development risk, co-fund feasibility and impact studies and support the project reaching financial close. Finance was also provided by a regional bank that was ultimately facilitated by Sunseap following PIDG involvement. While it was not possible to amend the PPA, PIDG did manage to work with EVN to clarify a foreign exchange clause. Ninh Thuan was constructed, improving the grid stability and increasing the skills base in the community. PIDG proved the bankability of the PPA and showed that EVN honoured payments. This was supported, in part, by reducing the curtailment risk, through a decision between PIDG and the project developers to extend the transmission line to a power station located further from the site that, at that time, had less existing energy supply. As with Coc San, Ninh Thuan provides energy to the grid, and as a result there is little to report in terms of differentiated impacts. A GESI lens was not applied in the design. In terms of outcomes for the planet, it is estimated that the supply of renewable energy from Ninh Thuan to the grid accounts to 240,000 tonnes of CO2 avoided per year.

As per the contracted agreement, PIDG sold its share in Ninh Thuan to Sunseap, who sold part to another party at a profit. Solar supply in Vietnam increased rapidly in the years following Ninh Thuan. However, while the project was successful, the theory that it will be a step towards greening the Vietnam energy system is not supported. Use of coal has increased rapidly in Vietnam, and the new power plan includes a large increase of coal and gas to meet power needs. In real terms, Vietnam is producing less of its electricity from renewable sources than it was 10 years ago. The question remains whether these projects alone, while generating positive outcomes and demonstration affects, are enough to accelerate Vietnam towards renewables.

5.1.3 Ho Chi Minh Infrastructure Investment JSC (CII)/TLMT

GuarantCo	\$49.6M
PIDG TA	\$75,000
Year of Financial Close	2019
Year of Commercial Operation	2022

The TLMT road formed a critical part of the Vietnam national highway plan, connecting the high agricultural exporting Mekong Delta region to Ho Chi Minh and connecting ports. The road is also intended to have a demonstration effect to show that this kind of build–operate–transfer (BOT)⁵⁹/toll road structure could be financed with the participation of local institutional investors. GuarantCo got involved at a point where the project was unable to obtain sufficient finance from local

banks or IFIs, and where local institutional investors were unwilling to be involved without a guarantee.

GuarantCo co-designed a bond issuance to meet investor needs and gave a guarantee which resulted in the project being 100% funded through local finance, including local institutional investors. Beyond supplying the guarantee, PIDG worked with the project developer to close the health, safety, environment and social (HSES) gap to meet international standards. In terms of impact for people, it is expected that the road will cut journey times contributing to time savings. The value of the time savings in GDP per capita in 2013 is estimated at 28,86 VND million/year, equivalent to more than \$12,000. There are major expected benefits to local businesses and farmers in terms of travel time, profitability and enabling new business development strategies. Early evidence also suggests that property prices around the road have seen an increase of 20%–30%. In terms of impact for the planet, there has not been an assessment of the amount of additional CO₂ that is expected to be generated from increased use of the road.

While this project had a positive demonstration effect for local institutional investors that projects of this kind were bankable, there is still a reluctance to invest without a guarantee. While PIDG were not the first to offer guarantees in Vietnam, since their involvement in this project other organisations, for example Prudential, have come in on PIDG projects to offer follow-up funding at a lower rate, crowding out PIDG.

5.2 Project rationales and relevance of PIDG's inputs

The following sections take the reader from the project rationales and PIDG's inputs through to outputs, then the short- and medium-term outcomes, and finally the demonstration effects. Whereas the preceding chapter summarised the big picture impacts, this section assesses the ToC, starting from PIDG's contribution (inputs) through to the wider effects.

Starting on the left-hand side of the ToC for Vietnam, Figure 6, this shows inputs from the three facilities operating in Vietnam: InfraCo Asia; GuarantCo; and the PIDG TA. Respectively, these have supplied early-stage equity investments, guarantees to support local currency bond issuance, and TA to enhance bankability through project development, as well as VGF in one instance.

⁵⁹ Build–operate–transfer: the private sector builds the facility, operates it for a period to recoup investment, and then transfers ownership to the government.

5.2.1 Project rationales

Box 1. Strength of evidence: project relevance/rationales

Project rationales were determined through desk review, with the relevance triangulated through KIIs with PIDG and non-PIDG (project developers and co-investors) testimony. Seven key informants (3 project developers and 4 co-investors) informed our understanding of the rationale and relevance of the selected case study projects.

The evaluation team had intended to triangulate the relevance of the interventions through interviews with government stakeholders. For example, they intended to ask how Coc San and Ninh Thuan fit with national energy strategies and how CII with the roads network. With EVN, the national offtaker, in particular, they intended to discuss PIDG and the additionality of their investment in solar in Vietnam and the impact of this on the take-up of the solar PPA. As a result, findings related to project relevance to Vietnam's national strategies as well as the contribution of PIDG projects to wider market development are comparably weaker.

Before assessing how well targeted ('relevant' in OECD DAC terms) PIDG's inputs were, we first consider the rationale for the interventions – i.e. what PIDG was trying to achieve through these types of project, and why the particular projects and locations were chosen. The *general* row of Table 17: concerns the rationale for project type. For both Coc San and Ninh Thuan, the most important factor was the desire to expand renewable energy in the country. For Coc San, this was a continuation of Vietnam's use of hydropower, whereas Ninh Thuan represented a major expansion of solar energy. In both cases, the desire to create a positive demonstration effect for the IPP model (at utility scale in the case of Ninh Thuan) to attract private investment into these types of projects was a key goal. CII also had a demonstration effect rationale, with the goal being to show that this kind of BOT/toll road structure could be financed with the participation of local institutional investors. From an impact perspective, the rationale for CII was to support economic development through the completion of a key part of the national expressway network.

The *project level* row of Table 17: explains why this general rationale was applied to these particular projects. For Coc San the location was ideal for a run-of-the river hydro facility, with excellent natural resources, combined with low E&S costs and high economic, social and environmental benefits. It was also a distressed project that was well advanced and therefore fulfilled two criteria: firstly, as a distressed project there was a strong case for the additionality of InfraCo Asia investment; and secondly, as the first investment from PIDG in Vietnam it fitted PIDG's preference at that time for projects which did not have to start from scratch and which could achieve rapid results, building the track record of PIDG in-country. Ninh Thuan also had excellent solar resources, combined with low potential social impacts. The site was sparsely populated. It had been earmarked for a nuclear energy facility and had not been developed subsequently for this reason. The TLMT expressway links the Mekong Delta with HCMC. The former is Vietnam's main producer of agricultural products, fish and seafood, while HCMC is the country's largest city and industrial hub, and is also a primary export location. Linking the two with a modern, fast expressway should therefore create large economic benefits for producers in the Delta, consumers in HCMC, and processing/exporting firms.

Table 17: Analysis of rationales for PIDG engagement

Rationale	Coc San	Ninh Thuan	CII/TLMT
General	Proven renewable technology in Vietnam; demonstrate IPP model could work in small hydro	Important step in transition to green energy system; demonstrate bankability of utility-scale solar in-country through IPP model	Part of national transport links/expressways to support economic development; demonstrate finance structure

Project level	Low social and (local) environmental costs & high economic/environmental benefits; project semi-complete	Very good solar resources & limited social challenges due to demarcation for nuclear; good position to feed into grid	Mekong Delta major national producer of goods for HCMC and export
Beneficiary level	Very poor region of Vietnam with electricity access constraints	Very poor region of Vietnam with electricity access constraints	Very poor region with lacking/low quality/slow road link to HCMC

The final row contains the rationale with respect to intended beneficiaries. As well as economic benefits from better electricity supply and transport links, local people in each of the three areas would be expected to benefit from the projects. In each case, projects were located in very poor regions of Vietnam, which were deficient in the infrastructure service in question (electricity or transport links) and therefore likely to disproportionately benefit from the investment.

5.2.2 Relevance of financial and non-financial inputs

In terms of financial inputs, InfraCo Asia invested \$17.5 million of equity and debt in Coc San, supported by \$5 million of VGF from the PIDG TA. In Ninh Thuan, InfraCo provided \$10.6 million of equity, and \$9 million of mezzanine debt was invested. CII also saw \$5 million of TA used to support the guarantee of a \$50 million bond issuance. How appropriate – or relevant – were these inputs to each of the projects?

Table 18: Analysis of relevance of financial inputs

	<i>Coc San</i>	<i>Ninh Thuan</i>	<i>CII/TLMT</i>
Gap	Distressed project halted due to inability to raise sufficient finance. Due to developer shortcomings but also limited investor appetite	Domestic and international investor appetite for project of this scale lacking	Local banks unable to provide sufficient finance; IFIs unable/unwilling to provide; local institutional investors unable to provide finance without guarantee
Financial solution	Equity funded changes need for project development and to reach bankability (still needed InfraCo Asia Investment (IAI) to reach financial close)	Provided equity (and mezzanine debt to fill project finance gap) to share development risk and co-fund feasibility and impact studies	GuarantCo co-designed bond issuance to meet investor needs and gave guarantee
Supporting finance	VGF needed to offset additional sunk costs and ensure bankability/affordability		TA used to fund non-financial inputs (see below)

The *gap* row of Table 18: describes the gap that PIDG finance was designed to fill. In all cases, there was a clear lack of financing. Both Coc San and CII had a long history by the time PIDG became involved. The former was a distressed project that had stalled because of the failure of the developers to raise sufficient equity and debt. In CII, most of the elements for constructing the TLMT had been in place for a decade, but it had not proved possible to raise finance. Ninh Thuan was a newer initiative but was among one of the first few utility-scale solar projects in Vietnam, and it had proved impossible to raise finance. As well as local and domestic private investors, IFIs did not have the appetite to invest in any of the three projects, despite having been approached.

The next row considers whether PIDG’s financial inputs were suited to addressing these gaps. For Coc San, InfraCo Asia’s equity investment provided the funding needed to complete the project development process and ensure bankability was attained. Coc San was an InfraCo Asia Development (IAD) project, where it was not intended that IAI would participate as an investor. Ultimately, IAI funds were needed to invest to reach financial close, the necessity of which was demonstrated by the inability to attract other investors, despite ~100 institutions being approached. For Ninh Thuan, certain project development expenses, including feasibility and impact studies, were co-funded with the developer Sunseap using IAD’s equity investment, and an additional \$9 million of mezzanine debt was provided by IAI to fill the gap in

capital needed to reach financial close. The guarantee from GuarantCo was structured specifically to meet the needs of institutional investors in Vietnam, allowing them to invest in the bond issuance.

The third row details the supporting finance needed to support the core investment. For Coc San, VGF was required to offset sunk costs incurred prior to PIDG involvement and ensure that project development could be completed at a cost compatible with commercial viability and a sustainable tariff level. CII also received TA funding to support the non-financial inputs examined in Table 19:.

Table 19: Analysis of relevance of non-financial inputs

	<i>Coc San</i>	<i>Ninh Thuan</i>	<i>CII/TLMT</i>
Issue identification	E&S standards insufficient to attract private investors; environmental resource management plan (ERM) commissioned to conduct E&S impact assessment (ESIA); EPC contract not bankable; PPA risk (emerged late)	Grid connectivity and curtailment risk created risk to project revenues; 2x site issues (regulatory restrictions on removing boulders from the site & unexploded ordnances); PPA not considered bankable	HSES standards operating at local not international level; ERM commissioned to conduct gap analysis
Non-financial solutions (project level)	Environmental safeguards put in place; social and economic measures designed to compensate local people adversely affected; EPC contract rewritten and signed	Curtailment risk addressed by enabling energy supply to power station further from site and reserves built up to cover potential losses); site assessment and risk mitigation (boulder issue); mine clearance	HSES plan developed to close gap over time with regular milestones and reporting
Non-financial solutions (supra-project level)	Good PPA terms secured and maintained (with other actors) in pre-close EVN crisis	PPA adjusted, clarified and resultant risks mitigated to address bankability issues	

For both Coc San and TLMT, higher E&S (HSES for TLMT) standards were needed. For Coc San this was to attract investors and raise standards to a level acceptable to PIDG, while for TLMT it was solely to raise standards to a level acceptable to PIDG. In both cases, detailed studies were undertaken to identify issues that needed to be addressed. In Ninh Thuan, two issues were identified as construction risks and two as commercial risks. For the former, the site had some unexploded ordnance that had to be safely removed. There was also an issue with multiple boulders that could not be moved beyond the site boundary due to regulations that made the physical construction of the solar array difficult. On the commercial side, the scale of Ninh Thuan created significant curtailment risk whereby the planned power station might not be able to take all the electricity at certain peak times, threatening project revenues.

Most fundamentally, Vietnam’s solar PPA template was considered unbankable to debt providers for three reasons. First, contrary to international standards, arbitration had to be local rather than international. Second, the Vietnamese authorities were obliged to compensate only the equivalent of one year of revenue payments in the event the PPA was cancelled, whereas the international norm would be for the full contract revenues to be payable. Finally, the PPA did not address the issue of curtailment risk, with EVN having the ability to curtail the quantity of offtake if circumstances required this.

The *non-financial solutions (project level)* row in Table 19: describes the project-level solutions designed by PIDG to address these concerns. In Coc San, environmental safeguards were put in place to protect fish stocks and prevent silt accumulation. While no relocation was required, the ability of some local farmers to access the river was adversely affected, requiring compensation schemes and other support facilities. The EPC contract was restructured and rewritten to align with industry standards – i.e. removing the intermediary to contract directly with the EPC supplier, plus the inclusion of incentives on cost and completion timetable. For the TLMT project, local HSES standards were being followed but were below international (International Finance Corporation (IFC) equivalent) standards. As the project was to be funded through local investment, it is likely that the attainment of international HSES standards would not

have been addressed without PIDG involvement and provision of financing through PIDG TA. Through PIDG TA, a plan was developed to progressively close the HSES gap over time. In Ninh Thuan, curtailment risk was addressed through connection to a second transmission line. Though smaller, this had more spare capacity than the first route, reducing the risk that supply from Ninh Thuan could be curtailed. Revenue risk resulting from curtailment was further mitigated through the creation of a reserve fund to cover any losses.

While project-level inputs were important for Coc San and Ninh Thuan, the PPAs upon which the bankability of both projects depended were more fundamental. As previously discussed, InfraCo Asia was heavily involved in this process. Although scope to change the main documentation was limited, the key issues undermining bankability were addressed in other ways.

The PPA for Coc San only became an issue shortly before financial close. At that point, EVN proposed a revision to the PPA whereby the tariff would no longer be guaranteed for the life of the project but would be determined annually on the basis of conditions at that time. This would have rendered the project instantly unbankable, leading to a collapse. In conjunction with other actors, InfraCo Asia was able to prevent this change taking place, with the PPA reverting to the previously agreed terms.

To summarise, both financial and non-financial inputs provided by PIDG were relevant to the projects in terms of their suitability. There was also an ability to adapt as circumstances changed, which was valuable in the case of Coc San, where IAI investment was made available to reach financial close despite this not having been part of the original intention.

5.3 Project outputs

Box 2. Strength of evidence: outputs

Output analysis was based primarily on PIDG results, alongside triangulated interviews to gather information on PIDG’s role during the construction of the infrastructure and in mobilising capital. 11 informants, of whom 8 were PIDG stakeholders and 3 were non-PIDG stakeholders, provided evidence against outputs.

Interviews with government stakeholders would have provided a further source of evidence on the relevance of PIDG financial instruments in the context (guarantees) and the additionality of PIDG providing financing and mobilising financing against national PPAs. However, as previously highlighted, we were unable to obtain these.

The PIDG ToC links the inputs discussed above to three types of output: (i) private capital mobilised; (ii) public capital mobilised; (iii) viable and sustainable infrastructure facilities built and operated. Table 20: below considers PIDG’s contribution in each of these areas.

For Coc San and Ninh Thuan, extensive searches for debt finance were unable to attract private sector interest initially. In the case of Coc San, the Asian financial crisis of 2007/8 was still deterring investors. International investors had no experience of the offtaker – EVN – creating perceptions of payment risk, and there were no third-party credit assessments of EVN to address this. Ultimately, Saigon Hanoi Bank (SHB) agreed to provide finance, reportedly because (a) the general banking environment was on the brink of change at this point, and (b) the bank had previous experience of working in the energy sector with EVN and was therefore able to take an independent view of risk.

As described below with respect to public sector capital, discussions had also been held with the Dutch Entrepreneurial Development Bank (FMO) at this time to join a loan syndicate, but there was a preference for domestic capital, to avoid currency risk and also to help bring domestic institutions into the sector. While SHB’s finance was relatively expensive, therefore, the decision was taken to go with them as the debt provider. Subsequently, InfraCo Asia was able to lower the debt financing costs considerably through accessing the World Bank’s Renewable Energy Development Project (REDP).

New equity post-financial close was mobilised in two stages in Coc San. First, Nexif⁶⁰ bought out the original developer, Colben, and took over the latter's stake in 2016. Second, InfraCo Asia sold its own stake in Coc San in 2018. This was a competitive process, the winner of which was the leading Japanese power company, TEPCO. Coc San was TEPCO's first investment in the hydropower sector outside Japan and was carefully selected by InfraCo Asia ahead of other candidates. The site's natural advantages, combined with the strong foundations that had been built by InfraCo in terms of governance and E&S issues, were strong attractions. As well as equity, TEPCO brought considerable technical and operational expertise.

In Ninh Thuan, domestic debt was also initially preferred due to currency risk, which was more of an issue given the scale of financing needed. While discussions were held with all the major domestic banks and IFIs, all were unable to provide a debt facility to the project because of the size of the project and lack of precedents. The non-bankable terms in the PPA template also posed as obstacles to raising debt internationally. These were addressed – including clarification and mitigation of currency risk – and Sunseap was able to bring in a large regional bank which had worked with them before. While Sunseap was responsible for introducing potential debt providers, InfraCo Asia assisted in loan document negotiation through capacity building, knowledge sharing sessions and attending meetings. During negotiations, InfraCo Asia reportedly guided Sunseap on a number of clauses within the loan agreement.

InfraCo Asia provided funds to the project as equity (IAD) and mezzanine debt (IAI), with the equity portion having a pre-agreed return with Sunseap. The pre-agreed return helped provide certainty to InfraCo Asia regarding returns at a time when the market feedback was quite adverse regarding the PPA template and the tight timeline to start operations to become eligible for the published tariff. In addition, this helped reduce the time, resources and funds required to find a buyer for IAD and IAI interests in the project.

This can be seen as the mobilisation of equity to the extent that Sunseap would not have been able to make the original (and thus subsequent) investment into the project without InfraCo agreeing to share the project development risk. In addition, the project's successful operation served to attract a new South Korean investor (by way of Sunseap selling a share of its equity at a profit) into the project company (Vietnam-based), something that may not have been possible without PIDG's involvement in de-risking the project.

In the CII project, GuarantCo was directly responsible for the mobilisation of \$50 million in debt through a bond issuance. Without its guarantee, the Vietnamese insurance companies that bought the debt would not have been able to do so, as they are not permitted to accept non-tangible assets (such as the project company's concession rights) as collateral. GuarantCo worked closely with the project developer and bond issuer (CII) and the insurance firms to structure the guarantee to overcome these constraints.

CII were unable to raise sufficient finance from domestic banks at this point, due to constraints imposed by financial regulators in Vietnam. The regulators were concerned about the concentration of banks' exposure to these types of projects, which was exacerbated by changes to banking regulation under the Basel Capital Accords.⁶¹ These changes increased the capital banks needed to hold in general, but this was amplified where there was a concentration of exposure to sectors. As a result, financial regulators prevented banks from lending more, closing off what would have been the normal route for CII to raise finance. The proceeds of the bond issuance enabled CII to provide the equity investment needed to initiate the project, which in turn provided the foundation for much larger debt finance needed to fund

⁶⁰ Nexif was responsible for all aspects of origination, due diligence, development, investment, financing and exit on behalf of InfraCo Asia. Nexif completed its management contract period with InfraCo Asia in June 2015 and completed its transition from that role in December 2015. Since then, Nexif has founded Nexif Energy for power sector investments.

⁶¹ The Basel Capital Accords are international standards for the regulation and supervision of banks. The first Accord in 1988 set minimum levels of regulatory capital that banks needed to hold against loans. The purpose was to prevent a 'race to the bottom' where banks held less and less capital in an attempt to gain a competitive advantage, threatening the stability of the banking system. Since then there have been a series of Accords – Basel I–III – that have reformed the approach, primarily by linking the level of capital that needs to be held more precisely to the riskiness of banks' activities and the degree to which these are diversified or concentrated. As a result, banks implementing the Accords have seen the requirement to hold more capital against particular types of concentrations of loans, disincentivising such activities.

construction cost of the expressway. This was raised by the lead construction firm, the Deo Ca Group, through their contacts with a syndicate of local banks.

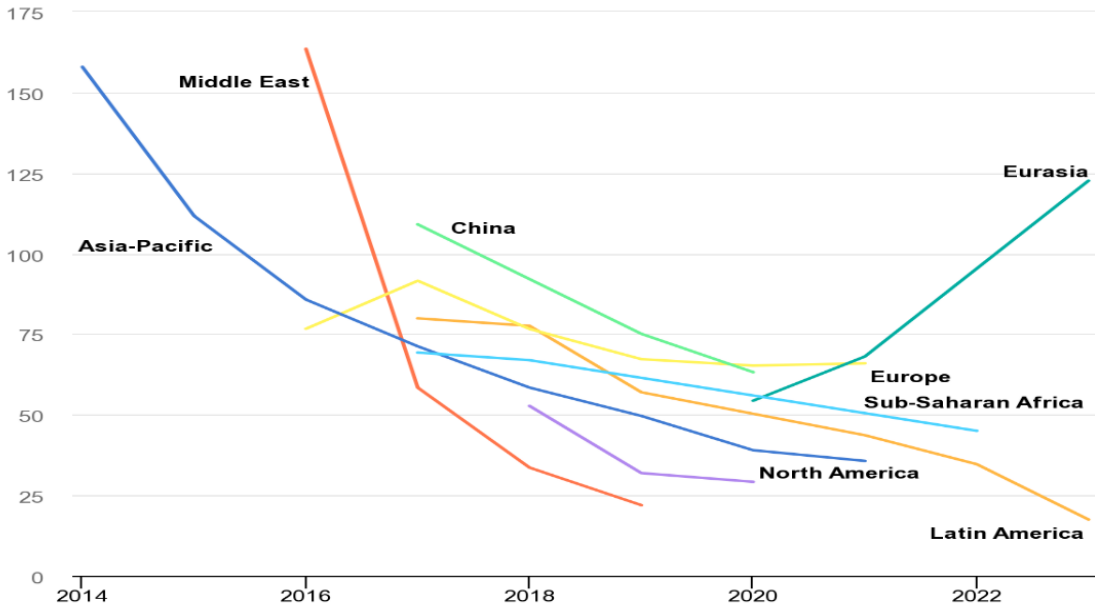
Although no other public finance was involved in TLMT, a number of other IFIs were approached before GuarantCo. They were unwilling to commit to the project, however, with the misalignment with international HSES standards being the main stumbling block. GuarantCo participated on the basis that standards would reach this level over time following an agreed implementation plan. What made this possible was that GuarantCo, unlike other IFIs, could access TA funding to support the required improvement in HSES standards. Without this it would not have been possible to achieve these changes. The availability of TA was described as a “game-changer” by CII.

Table 20: Analysis of output contribution

<i>Coc San</i>	<i>Ninh Thuan</i>	<i>CII/TLMT</i>
Private capital mobilised		
Debt – Little private interest at this time; agreement reached with SHB. They had appetite as brink of change and experience of sector/EVN.	Debt – Domestic debt preferable to avoid currency mismatch. Discussions with all major banks, but none prepared to lend due to scale of project. Sunseap brought in a regional bank where they had existing relationship. PPA amended to mitigate resultant currency risk.	Debt – \$50 million raised in bond issuance from domestic insurance companies. First time they had undertaken such a transaction. Guarantee enabled them to lend as they could not take concession as collateral. Project finance debt raised from syndicate of local banks to fund construction costs.
Equity (x2) – (i) Nexif bought out original developer (Colben); (ii) InfraCo sold its equity stake in 2018 in competitive process to TEPCO in its first foreign hydropower investment.	Equity – InfraCo shared the development risk & got certainty on its return through a pre-agreed price and time frame for Sunseap to acquire InfraCo’s stake. With the project sufficiently de-risked and as per the mandate, InfraCo exercised its out option. The de-risking of the project also allowed Sunseap to sell a share of its equity to a Korean investor at profit.	Equity – \$50 million from bond issuance provided CII with additional equity needed.
Public capital mobilised		
Agreement reached with FMO to join syndicate (went with SHB as domestic finance preferred but expensive); InfraCo helped access REDP funded by World Bank to refinance loans (-150bp).	Discussions with IFIs to provide debt did not come to fruition.	Other IFIs approached (by CII) but were more rigid than GuarantCo on HSES – i.e. not prepared to take a phased approach to reaching required standards.
Viable and sustainable infrastructure built		
Coc San built to time and budget.	Ninh Thuan built to time and budget.	Construction delayed by COVID-19-related restrictions, but has remained within budgetary limits.
Operating successfully with revenues above expectations.	Tariff ‘generous’ but is providing electricity at stable price relative to fossil fuels (e.g. coal costs doubled in same time frame).	BOT structure guarantees investors are repaid, with tariff and pre-transfer duration negotiated to achieve this.
Environmental impacts being carefully managed – e.g. monitoring the accumulation of silt in river; strong local support for facility.	Governance and E&S standards raised to IFC PS level. Good community relations.	Governance and E&S standards raised to IFC PS level; question marks over the process of relocation and resettlement prior to PIDG involvement.

In Table 20:, the first row of ‘private capital mobilised’ focuses on the construction phase and the second on the commercial performance of the operational phase. The ‘public capital mobilised’ section examines impact and HSES performance. The final section considers whether ‘viable and sustainable infrastructure’ has been constructed. For construction, both Coc San and Ninh Thuan were built to time and budget, reflecting robust EPC contracts and management. On commercial performance, both are generating revenues above expectation, with tariffs seen as ‘generous’, no payment issues arising from EVN, and curtailment limited and manageable. The solar tariff for Ninh Thuan, for example, is 9.35 cents/KWh.

Figure 7: Regional PV auction results 2014–22⁶²



This tariff was agreed in mid-2018 and is much higher than many tariffs being agreed in solar PV auctions at this time. As we can see in Figure 7, tariffs in the Asia Pacific region in mid-2018 averaged 5–6 cents, while those in the Middle East were around 2.5 cents. Given concerns about the PPA, it seems likely that a high tariff was needed to attract investors. This is something of a trade-off, where a PPA with more standard terms – such as international arbitration – could have allowed a lower tariff to be paid. The pattern in renewable energy, however, is for countries to offer feed-in tariffs (FITs), which often have to be relatively generous. Once confidence is established that the offtaker will honour the commitments made, it is possible to attract investors at a lower rate, usually through competitive auctions. Vietnam has not moved to this stage, but could potentially do so in the future.

There appears to be strong local support for the projects, with E&S issues well managed at a level compatible with IFC performance standards.

TLMT is due to open in the first half of 2022, having been delayed somewhat due to COVID-19-related restrictions. Construction has, reportedly, remained within budget, however. OT projects of this kind in Vietnam are commercially sustainable by definition. The toll rate is negotiated between developers and local authorities and is set at a level to cover construction and funding costs while yielding a reasonable return to developers. The duration of the concession is the other variable used to achieve this balance – i.e. the period is as long as needed to cover the costs.

We cannot comment on community relations as we were unable to access those affected or relevant local groups. A potential issue that was raised by a number of interviewees – including PIDG – was that up to 90% of the land had been acquired from previous residents before GuarantCo became involved. This

⁶² <https://www.iea.org/data-and-statistics/charts/average-auction-prices-for-solar-pv-by-region-and-commissioning-date-2016-2022>

process of compensation followed local rather than international standards, and we have no way of verifying how acceptable this was to those affected.

For PIDG’s contribution to outputs, it is clear that Coc San would not have been built without investment from InfraCo. It is possible that the advantages of the location for hydropower would have led to a project being initiated in time, but this would have been a different project with different actors. We can therefore conclude that PIDG’s contribution is essentially 100%, as there would have been no outputs – and thus no outcomes – without PIDG’s investment and other support.

For Ninh Thuan the situation is less clear. Sunseap wanted to invest in Vietnam, and learned of the Ninh Thuan opportunity before InfraCo. They were looking for a partner to share development risks, not least because they had not previously invested in Vietnam or in a project of this scale anywhere. PIDG had experience of both, as well as the risk appetite to pursue a utility-scale solar project in Vietnam with a PPA that was widely seen as unbankable. While the PPA remained largely unchanged, InfraCo was able to clarify the approach to exchange rates with respect to revenues, mitigating risks in this regard. The question of curtailment risk was addressed through connecting the plant to a secondary transmission cable, as discussed above; while the project still faced curtailment risk, this was greatly reduced in a practical sense. Compensation in the event of contract cancellation remained at one year, but the likelihood that the Vietnamese authorities would do this was clarified through detailed modelling on the country’s growth trajectory and energy needs. This provided comfort to lenders, as did the lengthy discussions held with Vietnamese authorities, where InfraCo Asia reportedly took the lead in clarifying risks around contracts and the question of local arbitration. EVN had (and has) never defaulted on a payment to a project company where the project is owned by an international investor, and these discussions were successful in providing sufficient comfort to the lending bank.

InfraCo could not have undertaken the project without Sunseap, and Sunseap would not have invested without the risk-sharing and expertise that InfraCo Asia bought to the table. It therefore seems reasonable to allocation half of the credit – or 50% contribution to results – to each of them.

The TLMT project had been planned for a number of years before GuarantCo became involved. The project developer, CII, was unable to raise sufficient finance from domestic banks at that time to support their development costs, due to constraints on particular types of bank lending imposed by the Vietnamese authorities. The GuarantCo guarantee unlocked finance from local institutional investors through a bond issuance of \$50 million, enabling the project to proceed. While this was key to initiating the project at that point in time, it was a relatively small part of total project costs. Secondary research and testimony from stakeholders also highlight that, given the Mekong Delta’s economic importance as an agricultural producer (Section 3.2.1.2), the expressway linking it to HCMC represents a key part of the national transport network, with this project just one part of the total expressway. Given these factors, it is likely that the finance would have been found from another source, though this would have certainly delayed the project and may have resulted in lower HSES standards. From a pure mobilisation perspective, therefore, PIDG’s contribution is less than in the other two projects, and we would therefore limit PIDG’s contribution to its pro rata share of financing. Where this differs is in the type of capital mobilised – domestic insurance companies would not have invested without the guarantee from GuarantCo. Enabling Vietnamese institutional investors to support infrastructure projects in the region is very important from the perspective of local capital market development, which is a major part of the PIDG ToC.

A second important contribution to TLMT project outputs was with respect to HSES. As described above, the TA provided by PIDG was crucial in enabling the project developer to raise HSES standards to internationally acceptable levels.

Summary of project outputs and PIDG contribution

- Both financial and non-financial inputs provided by PIDG were relevant to the three projects in terms of their suitability. PIDG has also demonstrated the ability to adapt as circumstances changed, such as in the case of Coc San.
- The analysis of PIDG's contribution to outputs shows that:
 - Coc San would not have been built without investment from InfraCo. It seems reasonable to conclude that PIDG's contribution is essentially 100%, as there would have been no outputs – and thus no outcomes – without PIDG's investment and other support.
 - for Ninh Thuan, InfraCo could not have undertaken the project without Sunseap, and Sunseap would not have invested without the risk-sharing and expertise that InfraCo Asia brought to the table. It therefore seems reasonable to allocate half of the credit – or 50% contribution to results – to each of them.
 - for TLMT, the GuarantCo guarantee unlocked finance and while this was key to initiating the project at that point in time, it was a relatively small part of total project costs. It seems likely that the finance would have been found from another source, and therefore we limit PIDG's contribution to its pro rata share of financing.
- Importantly, where TLMT differs is in the type of capital mobilised – domestic insurance companies would not have invested without the guarantee from GuarantCo. So, while finance would likely have been found without PIDG's involvement, PIDG played an important role in securing domestic capital.

5.4 Short, medium and long-term outcomes

The PIDG ToC links these inputs and outputs to outcomes at three levels: short-term, medium-term and long-term. In line with the ToC, short-term outcomes are organised into four groups:

- i) *People*: more essential service access and direct construction jobs
- ii) *Planet*: climate resilience of infrastructure and local environmental effects
- iii) *Wider economy*: improved business access to infrastructure; increase in supply chain business activity (from infrastructure companies)
- iv) *Markets*: infrastructure-friendly local capital markets fostered.

The corresponding sequential categories for medium-term outcomes are:

- i) *People*: affordable service access; O&M jobs; better HSES standards; community support (e.g. through corporate social responsibility inputs)
- ii) *Planet*: reduced carbon emissions and carbon intensity of growth
- iii) *Wider economy*: business productivity benefits from more/better infrastructure service access and increased supply chain activity
- iv) *Markets*: demonstration effects created for new approaches in new markets.

Long-term outcomes follow the same logical progression. For *people*, these are the improved human development outcomes resulting from affordable access to infrastructure or the direct jobs these support, broken down by gender. For the *planet* category, we include climate change effects (mitigation and adaptation) resulting from reduced CO2 emissions and adaptive behaviours, and more sustainable use of land and natural resources. Effects in the *wider economy* are grouped according to the number and quality of (indirect) jobs supported, including who gets these jobs, and the increased taxes generated across the economy. Finally, *market* development progresses from demonstration effects to the increase in external investment that these trigger.

While no one would suggest that PIDG can influence these long-term outcomes directly, it is important to remember the ultimate purpose of its activities, which is to contribute as much as possible to these goals as enshrined in the SDGs. Understanding the causal links from PIDG inputs to long-term outcomes makes it possible to see how interventions at different stages can influence the ultimate outcomes that result, and therefore to tailor activities to maximise these effects.

Box 3. Strength of evidence: outcomes

Outcomes for people and the wider economy are strongly evidenced, especially for CII, where the evaluation team collected qualitative data from businesses located close to the highway. For Coc San and Ninh Thuan, we interviewed the people’s committees to generate more evidence against these outcomes beyond PIDG stakeholders. PIDG documents, 9 PIDG stakeholders and 13 non-PIDG stakeholders informed our analysis of outcomes for *people*. PIDG documents, 5 PIDG stakeholders and 16 non-PIDG stakeholders informed our analysis on the *wider economy*. Non-PIDG stakeholders consisted of both investors/developers in the projects but also businesses located along the TLMT road.

The evaluation team intended to collect data through a survey of businesses located in the areas along the road, in order to understand how their use of the road had changed and the impact this had on their business. However, the road construction was delayed and not completed at the time of the evaluation. As a result, the evaluation team were unable to gather this evidence against *wider economy* outputs, improving the strength of evidence of PIDG impact in this area. As Ninh Thuan and Coc San were the energy project supplying the grid, they were not suitable for a survey of effects on use of specific stakeholder groups. Instead of the survey, the evaluation team carried out a number of KIIs with businesses located along the road, purposefully selected to represent the Mekong Delta’s main exports, including (among other questions) an inquiry on existing use and barriers. This is presented in more detail in Section 5.4.2.

Outcomes for the *planet* were least evidenced, with all sources coming from PIDG documents and PIDG testimony. Outcomes under transforming *markets* were also strongly evidenced, with documented evidence and with testimony from 9 PIDG stakeholders and 4 non-PIDG stakeholders, who included a co-investor, project developers and a debt provider.

In addition, interviews with government stakeholders would have triangulated evidence of the development of infrastructure-compatible local capital markets through collecting additional testimony on the influence of PIDG or PIDG projects on government policies and approaches – related in particular to the upcoming new national power plan. However, through interviews with PIDG it became clear that, in Vietnam, PIDG were not interacting with the government in this way beyond the project level. This testimony would, therefore, not have added much more strength of evidence against this finding.

5.4.1 Short and medium-term outcomes: people

Table 21 compares short and medium-term outcomes from the three projects with respect to ‘people’. For short-term impacts in each case, we see (or will see for TLMT) increased delivery of essential services. As a result of Coc San and Ninh Thuan, 87,000 and 153,000 people benefit from new or improved access to electricity. It is estimated that 50,000 vehicles per day will use the TLMT expressway. TLMT has generated 4,300 jobs during construction, with Ninh Thuan and Coc San creating around 200 construction jobs each. In Coc San, and to a lesser extent Ninh Thuan, these were taken largely by local people.

Table 21: Analysis of outcome contribution (1): people

	<i>Coc San</i>	<i>Ninh Thuan</i>	<i>CII/TLMT</i>
Short-term	<i>Delivery of essential services:</i> 87,000 people benefit from new/better supply <i>Direct jobs:</i> ~200 local people employed during construction	<i>Delivery of essential services:</i> 153,000 people benefit from new/better supply <i>Direct jobs:</i> ~1300 people employed during construction	<i>Delivery of essential services:</i> 50,000 vehicles a day <i>Direct jobs:</i> ~4,300 during construction
Medium-term	<i>Delivery of affordable services:</i> VGF ensured affordability <i>Direct jobs:</i> 30–35 O&M <i>Job quality:</i> working conditions in line with IFC standards. Local prioritisation/training <i>Social impacts/CSR:</i> good early consultation. Affected farmers compensated; road improved market access; school scholars funded <i>Indirect jobs (CGE):</i> 4,245	<i>Delivery of affordable services:</i> 1% electricity free to 2,000 households (CSR) <i>Direct jobs:</i> ~50 O&M <i>Job quality:</i> Working conditions in line with IFC standards <i>Social impacts/CSR:</i> social studies undertaken. Risk of social tension from influx of foreign workers mitigated <i>Indirect jobs (CGE):</i> 15,591	<i>Delivery of affordable services:</i> Toll set to recoup capital, service expensive debt, and generate return <i>Direct jobs:</i> 60 O&M <i>Job quality:</i> HSES plan completed by CII and now in line with IFC performance standards. <i>Social impacts:</i> reduced congestion; fewer accidents; outcomes with respect to resettlement process unclear (see above)

Medium-term impacts are shaped by the affordability as well as the physical accessibility of services, since it is this combination that will determine how much they are used. As we have seen, the presence of sunk capital costs at Coc San necessitated the use of VGF to ensure viability, given the level of tariffs offered in the relevant PPA, and to make these affordable for low-income households. In Ninh Thuan, electricity was fed into the grid at a price fixed in the PPA and was already compatible with maintaining this balance. A small proportion – 1% – of supply is being made available to 2,000 local households as part of the project’s CSR programmes.

The relevant variable in the TLMT project is the level of the toll. As with all BOT projects in Vietnam, this is determined by negotiation between the project developers and authorities, and is set at a level – and for a duration – sufficient to cover capital costs, service project debt and generate a reasonable return. BOT projects are fully privately funded, so the cost of domestic debt is the key driver. This is expensive compared to international finance, as well as the cost at which the government could borrow. As a result, tolls remain quite high through the (long) BOT period, potentially restricting the extent to which people – particularly poorer people – can access the infrastructure.

All the projects generate direct employment for O&M, but in small numbers compared with the construction phase. Job quality in all cases is in line with IFC performance standards. For Coc San, standards appear to have been high from the outset. In Ninh Thuan some improvements were required to reach this level, while a more comprehensive plan was designed and funded at TLMT.

TLMT is expected to have important social impacts, with sharp falls in congestion and traffic accidents. Part of this is a natural consequence of the improved transport link, but considerable effort also went into the expressway design to minimise the risk of accidents in the new road. Unlike TLMT, Ninh Thuan and Coc San both have significant social programmes. In the former, studies were undertaken to assess social and cultural risks. The first identified potential tension through an influx of foreign workers, which was mitigated by increasing the employment of local people and supporting education facilities. Culturally, an issue was identified with the boulders on the site, which were found to be sacred to local people. While they could be moved, they had to remain within a specified distance, and this was done to enable the solar park to be constructed. As described above, 2,000 local households are also receiving free electricity from Ninh Thuan.

Although there was no relocation required at Coc San, the rerouting of the river through a 6km tunnel prevented farmers in this area being able to access the river. As well as providing direct compensation, they were provided with high-yielding seeds and livestock, along with training in techniques, particularly

for women. As with Ninh Thuan, the project provided support for education (scholarships in this case), and local people were able to access improved local roads resulting from the projects construction in both cases.

One potentially negative social impact in the TLMT project relates to resettlement. By the time GuarantCo joined the project, more than 90% of people along the route of the expressway had been relocated. This was done according to local rather than international standards, and we have no way of verifying how equitable this process was.

Finally, as described in the results section, PIDG-supported projects will also generate significant numbers of indirect jobs through their macroeconomic effects. As TLMT is not yet operational, we do not have estimates for this case, but CGE modelling finds that Coc San and Ninh Thuan will generate 4,245 and 15,591 permanent jobs respectively, using the headcount methodology.

5.4.2 Short and medium-term outcomes: planet

Table 22: covers the same short-term and medium-term impacts with respect to the ‘planet’ category.

Table 22: Analysis of outcome contribution (1): planet

	<i>Coc San</i>	<i>Ninh Thuan</i>	<i>TLMT</i>
Short-term	Local environmental impacts assessed and mitigated in ESIA. Low impact	Local environmental impacts assessed and mitigated in ESIA. Low impact	Environmental impact assessment undertaken by local contractor (2009). Largely focused on waterways. Numerous measures implemented reportedly but unverified
Medium-term	Estimated to reduce CO2 emissions by 76,000 tonnes per year	Estimated to reduce CO2 emissions by 240,000 tonnes per year	No evidence/information on potential climate change impacts

As described above, short-term effects in this category concern the climate resilience of the infrastructure facility and the extent to which local environmental effects were assessed and mitigated. For climate resilience, we have no evidence that these issues were a factor in any of the three projects in terms of design and operations. ESIA's were conducted in all three cases. In Coc San, potential impacts to downriver fish stocks were identified and mitigating steps were taken. For TLMT, an environmental impact assessment was conducted in 2009, when the project was first proposed. As well as the risk of accidents discussed above, this highlighted environmental risks to waterways in particular, with the project design addressing the issues identified.

For medium-term effects, Coc San and Ninh Thuan are estimated to have reduced (or, more accurately, averted future) carbon emissions by 76,000 and 240,000 tonnes of CO2 per year respectively. While TLMT will increase carbon emissions, as would any major road project, we find no evidence that this was a factor in the decision to initiate, participate or invest in the project.

Table 23: presents evidence of short-term and medium-term outcomes for the wider economy and capital market development. Economy effects concern the ability of businesses to access better infrastructure services, the positive effects on productivity this would have, and increased business activity in supply chains. In all three cases there are strong short-term effects in this regard, with increased access to better electricity supply resulting from Coc San and Ninh Thuan. The latter also saw an expansion of the domestic skills base for the construction of facilities of this kind, due to training and knowledge transfer from Sunseap, while the former also saw domestic training and is likely to benefit further from the partnership with TEPCO of Japan. The TLMT expressway is expected to cut journey times from six hours to one hour, according to reports of journey times by businesses operating in the region. The time value of savings was estimated at 29 VND million in terms of GDP per capita, which is equivalent to more than \$12,000 per year.

Although Coc San is assumed to have led to increased local procurement, this has not been assessed in this evaluation or by PIDG, and no efforts appear to have been made to target local suppliers based on stakeholder testimony or PIDG documentation. The same is true of Ninh Thuan, which procured solar panels and other equipment from China as is the norm in the solar sector globally. TLMT was managed by a local construction firm, with materials procured on a least-cost basis from a range of domestic and international sources.

5.4.3 Short-term and medium-term outcomes: wider economy and market development

Turning to the wider economy and markets, this section will look at short-term outcomes for both and medium-term outcomes for the wider economy, with medium-term market development outcomes explored through the following section on demonstration. Short-term effects focus on support for the local capital markets, with medium and longer-term effects turning to international investment. For the former, all three projects had important impacts. In Coc San, the project developers (and national industry body), InfraCo Asia, and development agencies from donor countries successfully prevented EVN from changing the PPA terms just before financial close. The proposed changes would have made the project, as well as future hydro projects, unbankable and were thus a crucial element to consider when supporting investment in these kinds of infrastructure projects. While formal changes to the solar PPA made for the Ninh Thuan project were minor, risks were mitigated in other ways, as discussed above, showing that the PPA was bankable and risks were lower than had previously been thought. For TLMT, the guarantee provided by GuarantCo enabled Vietnamese institutional investors to invest in infrastructure projects of that kind for the first time, establishing a precedent and a model for future engagement.

Table 23: Analysis of outcome contribution (3): wider economy and capital market development

	<i>Coc San</i>	<i>Ninh Thuan</i>	<i>CII/TLMT</i>
Short-term wider economy	Better energy supply for poor region on unstable Chinese transmission line; improved domestic skill base. Local procurement assumed to flow from project and not targeted	Better connectivity, fewer curtailments than alternatives; improved grid stability; increased domestic skills base	Journey time cut from 6 hours to 3 hour. Time value in GDP per capita in 2013 is 28,86 VND million/year, equivalent to more than \$12,000.
Medium-term wider economy	No systematic assessment	No systematic assessment	Property prices up by 20%–30%. No systematic assessment of economic effects, but major expected benefits to local businesses and farmers in terms of travel time, profitability and enabling new strategies
Short-term market development	Prevented changes to PPA for hydro key to sector bankability	Developed bankable PPA for use in the solar sector	Developed structure to enable institutional investors to participate in infrastructure projects of this kind

TLMT Spotlight: Impact for businesses

The TLMT project was selected for primary data collection, this focused on better understanding potential impacts of the road for businesses and in particular for women workers. As mentioned in the context section, roads generate benefits for all but these may not be equally distributed. Our research highlighted a range of areas where businesses who would be users of the expressway could benefit. These are: (i) improved travel time and experience; (ii) increased profit; (iii) business development and access to new markets. Depending on the characteristics of businesses along the highway, each actor will benefit differently once the project is operational. It also highlighted particular impacts for women working within these businesses.

Overall, improved access, productivity and market access lead to respondent perceptions that their business will grow as a result of the road, with more products produced, shipped more efficiently and sold more profitably. It is anticipated that this will lead to further employment and/or increased income of workers, including women. However, generating impacts specifically for women was not a part of the project design and it is likely these will remain constrained in the prevailing gender earnings gaps and gender labour market share.

Improved travel time

Incomplete transport systems and high levels of traffic were identified by all participants as key barriers to their business. In particular, businesses with international markets identify the road as critical for improving access to onwards transportation (e.g. the port and airport). A Can Tho City customs officer reflected that often products have to reach the port or airport and face difficulties with small, narrow roads and high traffic volumes. Another respondent from a business in the region shared that there is always the risk of arriving late to the port, which means that produce misses connections.

“While transporting the goods from Soc Trang to Ho Chi Minh City, traffic jams are common, which leads to late arrival to the ports, and the risk is not being able to catch the ships”

Respondents report travel times of up to seven hours to travel 170km and anticipate reductions in travel times by at least a third. All respondents highlighted that potential increase in the cost of using the road (the toll) is likely to be offset by gains from improved transport. Most companies prefer the highways and experience traffic on the current national roads, spending more costs on gas and time. The new road would reduce the costs of transporting products between their companies’ locations in the Mekong Delta and HCMC.

Figure 8: Image of Mekong fish processing plant



Besides direct impacts for the businesses in the region, one respondent highlighted the broader efficiencies that will be gained elsewhere in the supply chain. Reflecting on the transport of production materials from elsewhere, one respondent stated that:

“When the materials arrive quickly, the production time will be shortened. When the production time is shortened, the output will be increased and the export of goods will be faster and more abundant”

Business development and access to new markets

Three respondents noted that the expressway will enable broader business development strategies and will support new relationships in markets and with actors who are further away. One respondent commented that the highway will provide the opportunity to conduct more business trips, and another that the highway will contribute to the fulfilment of their growth strategy. A cooperative in the Hau Giang Province shared that “If the highway is smooth and good, the cooperative will plan to access the new markets”

Increased profit

Businesses anticipate that the time and cost saved transporting goods, especially when connecting with ports, will lead to more goods being transported. As transport along the roads currently takes a long time, companies send fewer containers than would be possible with a shorter travel time.

“Instead of doing the documents for the two containers a day because of moving slowly, in the future we can do three or four containers because of this expressway”

Besides improved time, some businesses, especially those exporting fruit and fish, noted that a better expressway would contribute to improved quality of goods (fresher, less damage), leading to both higher-value products and fewer losses, and therefore increased profits. A cooperative in Hau Giang Province that exports fruits noted:

“Smoother and faster roads will ensure that the goods of the cooperative are fresh, not damaged, and stamped. In the past, sometimes the goods shipped were damaged, not fresh”

Gender

The evaluation has found that women working in these businesses are most often working in logistical roles related to transporting of goods, as such their roles would be directly impacted by the easing of transportation of products. A positive impact of the expressway that women working in these roles identified was the easing of job-related stress:

“I am often worried when the goods are transported to Cat Lai seaport, Ho Chi Minh City. The containers are late due to the traffic jams. In the past, it was stuck a few times and affected business activities of the company. Maybe I’ll be less worried when I have this expressway”

Beyond this, women anticipate that higher productivity may increase the need for roles in logistics, leading to further employment opportunities, and potentially more employment for women. One firm based in Can Tho City shared:

“[When efficiency is improved] the workers and officials in the company will have more income, including recruiting more outside labour sources [including more women]”

Figure 9: Image of highway



5.5 Demonstration effects

Table 24: Analysis of demonstration effects

	<i>Coc San</i>	<i>Ninh Thuan</i>	<i>CII/TLMT</i>
Medium-term market development (demonstration)	Medium demo effects: EVN honoured PPA, good returns with strong E&S and impact	Strong demo effects: PPA bankable for external investors; EVN honoured PPA payment terms mitigating local arbitration concerns	Focused demo effect specific to domestic institutional investors. Positive, but guarantee structures still needed

As previously noted, the strength of evidence behind the PIDG contribution to demonstration effects is limited as we were unable to talk to government stakeholders. However, looked at from a medium-term perspective, the evaluation found evidence of demonstration effects following all three interventions which took differing forms and/or scale. For Coc San and Ninh Thuan, the most important effects concerned the reliability of the offtaker – i.e. that EVN would honour the commitments in its PPAs and that these contracts were indeed bankable. The impact on investor appetite that this created was quite different in each case, though. Coc San is a relatively small hydro project, of a kind that is quite common in Vietnam. The success of the project has not, therefore, triggered a large increase in investment in these kinds of facilities, as many/most of the most promising hydro sites have already been exploited. The demonstration effect is thus a piece of evidence to support EVN’s reputation (e.g. that EVN has never missed a payment to a foreign investor). Coc San is reportedly used as an exemplar of how to design and implement a project of this kind, attracting visitors from developers from other countries.⁶³ However, we were unable to determine examples of replication through the evaluation.

Ninh Thuan, in contrast, was Vietnam’s first utility-scale solar park. The scale of the investment and the lack of a precedent focused investor attention on the bankability of PPA, with particular concern over the lack of international arbitration and the ability of EVN to curtail electricity purchases and cancel the contract unilaterally. EVN’s reputation is significant in this respect – if arbitration is not needed, it matters little whether it is domestic or international. The example of Ninh Thuan demonstrated that EVN was a reliable offtaker, mitigating concerns over arbitration and contract compliance. Curtailment has also been very limited. Sunseap suggest that no one today is concerned about the bankability of solar in Vietnam, a sharp contrast with the pre-Ninh Thuan situation, where they found it impossible to attract investment because of such concerns. The fact that Sunseap was a specialist in rooftop solar and had no experience of utility-scale facilities, nor of operating in Vietnam more generally, is unlikely to have made this task easier.

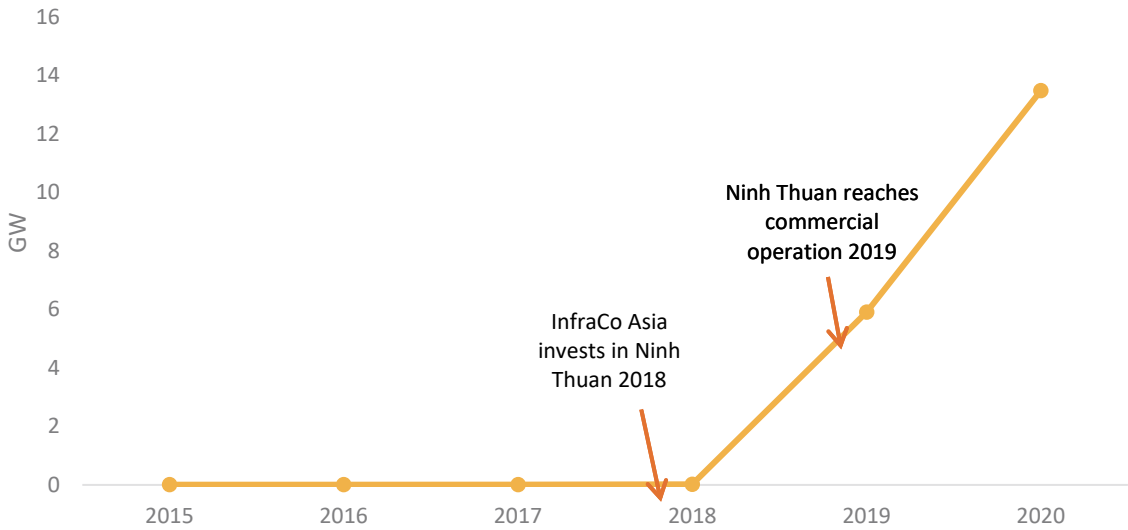
For TLMT the demonstration effect is narrower. BOT projects of this kind had been successfully implemented before. What was new was the participation of domestic institutional investors: the project successfully demonstrated how this could be achieved within existing regulatory restrictions – e.g. on the types of collateral that could be accepted through the use of guarantees. In the case of another PIDG investment, this led to replication in follow-on investment to Nam Long Investment company from Prudential. Stakeholder testimony suggests that while interest and access to guarantees is increasing in Vietnam there remains: (i) scope to improve and scale up the offering in this area, in particular in green bonds and the housing and water sectors; (ii) hesitancy from local institutional investors to invest in projects of this nature without a guarantee in place.

While Table 23: concentrated on short-term and medium-term outcomes, these should be seen in the light of the long-term outcomes to which they lead. Across the three projects, the most significant long-term effect is the huge increase in investment in the solar sector that has occurred since Ninh Thuan, where 168 megawatts of solar energy has been installed, as shown in Figure 10: below. As mentioned previously, Ninh Thuan was one of the first few utility-scale projects in Vietnam; and while we cannot

⁶³ https://www.ifc.org/wps/wcm/connect/industry_ext_content/ifc_external_corporate_site/hydro+advisory/news/events/small+hydropower+study+tour+to+vietnam

directly attribute the growth of solar to Ninh Thuan, it is likely that the combined demonstration of these projects contributed to the increased interest in investment in solar reported by project developers.

Figure 10: Installed solar energy capacity



If Ninh Thuan has avoided 240,000 tons of CO2 per year, then the total expansion of solar energy will avoid ten times this amount, or 1 million tons per year. It should be noted, however, that this period has also seen a huge increase in the share of coal in the Vietnamese energy system.

There has not been an equivalent expansion in investment in small-scale hydro or TLMT-type transport projects, but as these were not starting from such a low base this is to be expected. In this regard, questions have been raised about the longer-term desirability of retaining the fully private BOT model. As discussed, this results in tariffs being set to reflect very high local financing costs, with the result that these are considerably higher than they would be with a different funding model, perhaps where government – with its access to cheaper finance – takes a share of the costs. Having said that, our primary data collection in the Mekong Delta suggests that businesses are happy to pay the toll, as benefits are expected to far outweigh these costs. While outside the scope of this study, it would be interesting to see how this trade-off differs depending on the size of businesses – with small and medium enterprises, for example, perhaps being less able to absorb the additional transport costs.

This raises an important point about the link between short-term and medium-term outcomes and longer-term effects. The latter are focused on human development and environment impacts. For human development, these flow either from access to new or better infrastructure facilities, from the direct or indirect employment these facilitate, or from the multiplication of these effects through local capital market development and the attraction of more external investment. How these effects are distributed, however, including on a gender basis, will be determined by the extent to which access to services is affordable and open to different groups and the extent to which these groups can benefit from employment and livelihood-enhancing opportunities.

Finally, as well as quantity, the quality of jobs created/livelihoods enhanced is key. PIDG can influence this with respect to direct employment in the infrastructure facilities it supports, but has little ability to influence the quality of indirect jobs created, except through the demonstration effects it can create and the influence it has on its partners. In relation to this, the HSES support given in the TLMT project may prove to have long-term effects, as it has positively influenced CII’s approach to other projects – including their discussions with domestic regulators – and CII are the largest private developers of road and bridge projects in the country.

From a social perspective, CSR-type inputs can have positive local effects and can support a licence to operate. They remain voluntary, however, and are not built into contract arrangements in Vietnam. That

said, good local relations in both Coc San and Ninh Thuan are, at least in part, predicated on these arrangements, and the benefits the projects gain from this would seem to comfortably exceed their costs.

Summary of outcomes and PIDG contribution

- For short-term impacts in each case, we see (or will see for TLMT) increased delivery of essential services. As a result of Coc San and Ninh Thuan, 87,289 and 153,372 people benefit from new or improved access to electricity. It is estimated that 50,000 vehicles per day will use the TLMT expressway. TLMT has generated 4,300 jobs during construction, with Ninh Thuan and Coc San creating around 200 construction jobs each.
- Spillover effects from project-level involvement in Coc San and Ninh Thuan improved bankability of PPAs for other investors.
- Early evidence of property price increase from 20%–30% alongside TLMT expressway.
- PIDG VGF supported affordability of energy from Coc San for low-income households; businesses along the TLMT expressway also highlight potential positive employment and income outcomes for women. Besides these, there is little in terms of improving differential impacts.
- Better HSES standards on TLMT as a result of PIDG involvement, with the potential for longer-term influence across country due to CII integrating into projects.
- All three interventions created demonstration effects:
 - for Coc San and Ninh Thuan, these showed that EVN would honour the commitments in its PPAs and that these contracts were indeed bankable. Coc San is reportedly used as an exemplar of how to design and implement a project of this kind, attracting visitors from developers from other countries.
 - for CII, the demonstration effect is narrower as projects of this kind had been successfully implemented before. The project, however, successfully demonstrated how the participation of domestic institutional investors could be achieved within existing regulatory restrictions.
 - across the three projects, the most significant long-term effect is the huge increase in investment in the solar sector that has occurred since Ninh Thuan. While we cannot directly attribute the growth of solar to Ninh Thuan, it is likely that the combined demonstration of the first successful utility-scale projects financed in time for the government FiT contributed to the increased interest in investment in solar reported by project developers.

6 PIDG signature features and estimated contribution

This chapter considers what differentiates PIDG from other investors and development actors, bringing together the overall impacts and assessments of PIDG's contribution.

There are a number of things that distinguish PIDG from other institutions. The SFS found that PIDG does some things that few, if any, others do. The provision of local currency guarantees and ability to support project bankability with VGF were examples of this. More generally, the SFS found that PIDG's diagnosis of the constraints to infrastructure investment was consistent with that of other actors:

- a lack of long-term debt
- limited early-stage financing
- underdeveloped local capital markets
- weak public and private project development capacity
- excessive risks, or the perception of risks.

What really differentiates the PIDG approach is that it seeks to address these problems in frontier markets to an unusual degree, is able to take on significantly more risk than others can, and can approach constraints holistically, operating across the full project cycle. This in turn is enabled by a combination of PIDG's mandate and its financing structure: it has not historically been required to achieve a particular rate of return, and has therefore been able to construct and maintain a riskier portfolio than would otherwise be the case.

These features led us to develop 'testable propositions' (TPs) to be examined in the country studies.

1. PIDG's upstream advisory business funds public-private partnership (PPP) advisory services to governments, through the IFC, to realise the potential of infrastructure projects in terms of bankability.
2. PIDG builds the capacity of private developers to develop bankable infrastructure projects.
3. PIDG's early-stage investments are a key bridge to bankability in frontier markets.
4. PIDG's TA supports project bankability in frontier markets by covering development costs to reach international standards, which are not normally covered by working capital.
5. The supply of long-term debt from PIDG provides long-tenure finance that infrastructure projects need to be viable but which is lacking in frontier markets.
6. The supply of long-term debt from PIDG is essential in mobilising the capital needed to create successful projects.
7. PIDG's guarantees facilitate local currency investment and unlock new and/or deeper pools of domestic and external capital, improving the bankability of projects and helping to develop domestic capital markets to fund infrastructure.
8. PIDG supports and successfully demonstrates the viability of unproven approaches in frontier markets, increasing investor appetite for such investments in the future.

The cases examined in Vietnam provide useful insights to these propositions. CII and Ninh Thuan are clear examples of private sector capacity building (TP2). As a result of support provided by PIDG and funded by TA (TP4), CII is now applying international HSES standards across its portfolio. Sunseap has gone from a specialist in rooftop solar to a developer capable of implementing and running utility-scale renewable energy projects, and as a result a stake in Ninh Thuan project has recently been acquired by a large South Korean conglomerate. In Coc San, PIDG's early-stage investment (TP3) backed by TA/VGF to cover development costs (TP4) was the key to the project being bankable.

Ninh Thuan also demonstrated the viability of utility-scale solar in Vietnam, helping to attract significant investment into solar energy in the country (TP8), while the use of guarantees in the TLMT project was instrumental in unlocking capital from domestic institutional investors (TP7).

Collectively, the three cases support the validity of these propositions but also show how they manifest themselves differently in different types of projects.

In the preceding sections we have seen how PIDG made a series of contributions at different stages of the ToC. In the case of Coc San, we conclude that the project would not have happened without PIDG, and therefore estimate the contribution at 100%. For Ninh Thuan, PIDG and the developer Sunseap had roughly equal responsibility, in our view, and we therefore estimate the contribution of each at 50%. For CII, it seems likely that the project would probably have happened without PIDG, though at a later date; we therefore assume a pro rata contribution in line with PIDG’s financing share. It should be noted that the main PIDG contribution for CII came in local capital market development – i.e. enabling local institutional investors to invest for the first time.

For investments where we have not conducted a case study, we also assume a pro rata contribution. This is likely to underestimate the actual contribution, however, as PIDG focuses heavily on additionality and enabling frontier projects that would not have happened, or would have happened but not in the form that they did.

6.1 Summary of findings on PIDG’s contribution to development results in Vietnam

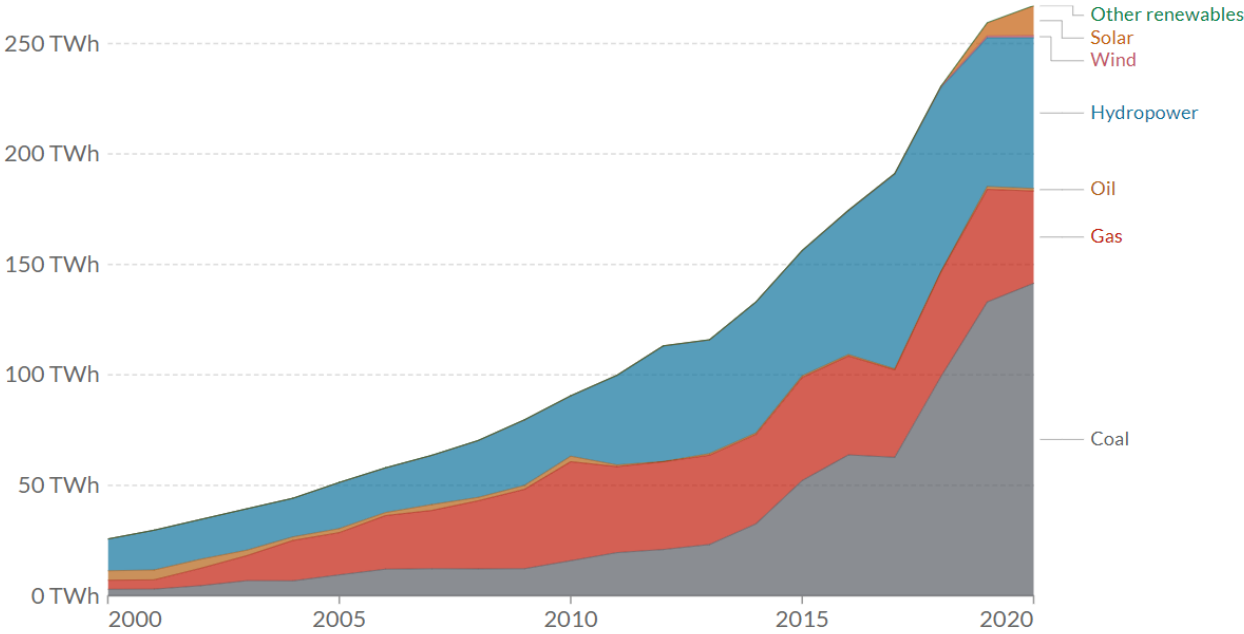
Table 25: summarises the development results generated by PIDG projects and our assessment of the contribution made in each case.

Table 25: Development results and PIDG contribution (italicised = estimated future results)

	Coc San	Ninh Thuan	CII	Antara Cold Storage	Cai Lan Port	Cai Mep Port	Nam Long Investment	Water Supply – Bai Lai	Water Supply – Thuy Nguyen	EVN Finance
Operational	Yes	Yes	No	Yes	Yes	No	No	No	No	No
CGE modelling	Yes	Yes	No	Yes	Yes	No	No	No	No	No
Case study	Yes	Yes	Yes	No	No	No	No	No	No	No
Total investment (\$ million)	44.53	166.6	<i>448</i>	28	<i>155.3</i>		<i>100</i>		<i>6.25</i>	<i>75</i>
Avoided CO2 per annum (tonnes)	76,000	240,000								
Short-term jobs	298	1300	<i>2171</i>	1200	<i>500</i>		<i>350</i>	<i>107</i>	<i>210</i>	<i>150</i>
Long-term jobs	35	52	<i>120</i>	200	<i>340</i>		<i>25</i>	<i>10</i>	<i>10</i>	<i>55</i>
Indirect jobs (CGE headcount method)	4,245	15,591	n/a	2,203	258	n/a	n/a	n/a	n/a	n/a
People with improved/new access to infrastructure	87289	153372	<i>3806471</i>	50000				<i>35936</i>	<i>16814</i>	
Estimated PIDG contribution	100%	50%	Pro rata	Pro rata	Pro rata	Pro rata	Pro rata	Pro rata	Pro rata	Pro rata

The largest contribution results from the Coc San and Ninh Thuan projects. For Ninh Thuan, we estimate PIDG’s contribution at 50%. This equates to 106,023 tonnes of CO2 avoided per year, around 8,500 jobs generated, and 76,000 people gaining new or improved access to electricity. For Coc San, we estimate the contribution at 100%. This equates to 4,500 jobs generated, 87,000 people with new or improved access to electricity, and 76,000 tonnes of CO2 avoided.

Figure 11: Increased coal use



Despite the CO2 avoided through the renewable energy projects supported by PIDG, the share of coal in Vietnam’s energy mix has increased sharply, as shown in Figure 11: above. The Vietnamese government has expressed concern about the impact on grid stability of increasing the share of intermittent renewables, which is an important factor in its switch to coal, which is dispatchable (i.e. can be turned on and off as needed).⁶⁴

Most recently, the commitments made at COP26 by the Vietnamese government suggest a greater commitment to renewable energy. Helping to deliver these commitments is likely to require a strategic approach which directly addresses government concerns over the intermittency of renewable energy supplies. This goes beyond generating capacity, and would require complementary investments in storage and ‘smart grid’ technology. Although PIDG operates primarily at the project level, it is important to think about how different projects might contribute to addressing these concerns as part of a stable and balanced energy mix, and such thinking suggests the need for a somewhat more strategic and coordinated approach to complement the flexibility and nimbleness which characterise the PIDG business model.

While PIDG has good relations with other development institutions, we did not find evidence of strong coordination with the activities of others. The World Bank Group is more involved in discussions with government over energy strategy. We would not suggest that PIDG seek to replicate this, but a greater degree of coordination could enable PIDG to identify strategic gaps in Vietnam’s energy system, which could then be targeted at the project level. As well as other international finance institutions, greater coordination with other agencies operated by PIDG’s owners could support the same strategic approach.

⁶⁴ <https://www.worldbank.org/en/news/speech/2022/01/24/towards-a-just-energy-transition-in-vietnam>

7 Conclusions and recommendations

PIDG can claim responsibility for a significant number of jobs created, CO2 avoided, and private investment mobilised in Vietnam. More than 4 million people have access to new or improved infrastructure as a result of PIDG-supported projects where PIDG's contribution is large. This has been possible in part because of PIDG's 'signature features', particularly the higher appetite for risk it has compared with its peers.

While these achievements are important, they also need to be seen in the wider context. As we have seen, solar capacity in Vietnam has increased sharply, not least based on stakeholder testimony because of the example of Ninh Thuan. Over the period that PIDG has been operating in Vietnam, however, the share of coal in the energy mix has increased enormously to more than 50%. Most recently, the commitments made at the 2021 United Nations Climate Change Conference (COP26) by the Vietnamese government suggest a greater commitment to renewables. Helping to deliver these is likely to require a strategic approach that goes beyond generating capacity and that would require complementary investments in storage and 'smart grid' technology.

While all three projects can be justified in terms of adding significant value, this does not mean that these were necessarily the most impactful projects PIDG could have undertaken. Within the terms of its mandate, PIDG operates largely on a reactive rather than a strategic basis. The Coc San project, for example, fitted PIDG's criteria at that time – a good renewable energy project, but also one that did not need to be started from scratch and therefore one that could enable PIDG to build a country portfolio more quickly. As described in detail in this report, the project has much to commend it, but it is also the case that hydro power is already well established in Vietnam, so there was limited scope to leverage investment into the sector through demonstration effects. Ninh Thuan, in contrast, appears to have done exactly that, helping to leverage investment and rapidly increase solar capacity in Vietnam.

The TLMT project is more nuanced, with the primary benefit being to allow domestic institutional investors to invest in these kinds of infrastructure projects. This has not generated major demonstration effects to date, but it has led to GuarantCo's involvement in the development of green bonds in Vietnam.

It may be that PIDG's approach is well suited to the frontier markets in which it operates. There is little benefit to developing a complex country strategy that cannot be implemented, and there is much to be said for building on potential projects, removing key obstacles to allow them to come to fruition. The limitation of such an approach, however, is that it is unlikely to systematically select projects that will have the greatest impact. In some cases this will happen, but a more strategic, forward-looking approach could increase the chances of it happening. Finally, while there are good arguments for PIDG operating at the project level rather than government level, it will be hard for them to maximise impact without a broader approach to influencing the policy environment, either directly or through closer collaboration with its Owners and DFI/MDB partners.

Overall findings

To summarise the key findings from this study:

- (7) Projects in Vietnam showcase the ability of PIDG facilities to address weaknesses across the infrastructure life cycle. In all the selected cases, more than one PIDG entity was involved, providing TA, early infrastructure development finance, debt, equity or viability gap funding in order to achieve the optimal outcome.
- (8) PIDG has taken an opportunistic approach to identifying projects in Vietnam, looking for investments that are already aligned with their goals. This has allowed them to respond to opportunities as they arise. While each can be justified on its own terms, this does not mean each was the optimal use of capital.
- (9) PIDG works at the project level, which plays to its strengths and experience. However, PIDG's ability to deliver impact directly and through demonstration effects would be strengthened if it

were complemented by activities to address other (non-project-specific) barriers within the sectors (e.g. government concerns about intermittent nature of renewables) through engagement with government.

(10)PIDG works on projects that are not fully bankable and, through these projects, addresses the issues that prevent bankability. In doing so, they clear the way for others to replicate, and thus have important spillover effects. This is key to the PIDG model and it relies on ensuring that additionality is addressed very seriously – if projects would have happened anyway, there is no major barrier to be removed, and so no potential for these kinds of spillover effects. In Vietnam, PIDG played an important role in recalibrating investor sentiment regarding the risk of large-scale solar investments. For example, international arbitration and curtailment risks in PPAs are only really needed if local arbitration proves insufficient or if curtailment and non-payment occur. Ninh Thuan helped prove this was not the case.

(11)The PIDG projects examined in Vietnam do not, however, purposefully address differential impacts (gender and particular socioeconomic and marginalised groups). While providing energy to the grid and better roads create positive outcomes for all, beyond the viability gap funding criteria there was no established approach for targeting marginalised groups. The nature of such investments (e.g. grid energy and roads) make it challenging for PIDG or its investees to identify and track end-users of the infrastructure as part of their ongoing monitoring exercises, increasing the challenge in understanding and improving differential impacts on different demographic groups. However, there are existing tools to support gender-sensitive design of infrastructure throughout the project cycle (which pre-date the sampled investments) and there was no evidence of these having been applied to the sampled investments.⁶⁵

(12)GuarantCo provided guarantees on a basis unavailable elsewhere in Vietnam (e.g. greenfield projects, guaranteeing bank loans) and there remains appetite to offer more of these in different sectors and at a larger scale. Where local institutional investors were not able to invest because their mandates restricted it, guarantees circumvented this by providing collateral (i.e. the guarantee) they could accept. This is helping to bring more actors into Vietnam providing similar services, e.g. Prudential replicating GuarantCo with Nam Long on an affordable housing project. However, investments within these projects are yet to provide substantial comfort to local institutional investors to invest without a guarantee in place.

Key changes made by PIDG since investments were made

4. Reporting on climate impact

At the time of the sampled investments, PIDG did not systematically collect and report data on climate-related indicators. Two of the sampled investments independently and publicly reported CO2 emissions avoided, which was used for the analysis in this evaluation. However, the use of this indicator does not account for where emissions may be increased by an investment, such as by the TLMT road.

This shortcoming has already been addressed by PIDG. In January 2020, PIDG signed up as a supporter to the Task Force for Climate-Related Financial Disclosures (TCFD). It has developed a programme of actions under the four pillars of TCFD: governance, strategy, risk and metrics and targets to operationalise the commitment made to delivering PIDG’s climate approach and achieving climate-related KPIs. PIDG has introduced an internal KPI which measures ‘portfolio carbon intensity by 2023 against the forecast trajectory’. The carbon intensity is measured as tCO2 (total carbon dioxide) equivalent for one year of typical operation per US\$ million invested in projects reaching financial close. The forecast figure is based upon PIDG’s portfolio of investments. PIDG has set a cap on 2021–23 levels of carbon intensity (tCO2 equivalent per US\$ million invested) at 2015–2020 levels. Externally, PIDG will continue to report actual financed greenhouse gases (in line with the TCFD methodology). These measures will factor in the

⁶⁵ AfDB, ‘CHECKLIST FOR GENDER MAINSTREAMING IN THE INFRASTRUCTURE SECTOR’, (2009) is one such example.

emissions created by PIDG investments (rather than just taking into account emissions avoided). For more information, please reference the inception report.

5. Gender equality and social inclusion lens

In the sampled investments, there was not an established approach to target marginalised groups as end-users of the infrastructure. Since the time of the investments, PIDG have developed a Gender Equity Action Plan and have integrated a gender assessment into the DI review throughout the investment decision-making process. Furthermore, PIDG has strengthened its approach to estimating the differential impact of its infrastructure on women and men.⁶⁶ The Gender Equity Action Plan for 2021 outlined that all potential investments are screened both for gender risk as well as the potential for generating positive gender outcomes against five gender-lens domains – company and project governance, workforce, supply chain, consumer market (products and services) and community. For more information on PIDG’s current approach to gender equity, please see the inception report.

6. Need for guarantees in Vietnam at large scale

In July 2022, GuarantCo provided a VND 1,150 billion (approximately US\$ 50 million) partial credit guarantee to support a bond issuance by EVN Finance in Vietnam. This is Vietnam’s inaugural onshore, local currency, international verified green bond, attracting international institutional investors. Therefore, PIDG has already identified the opportunity to provide further guarantees in Vietnam and at large scale.

Areas to take forward

The country evaluation of Vietnam is part of a suite of four country studies which, when combined, provide an assessment of PIDG at the organisational and portfolio levels. As such, this country study is an inherently partial evaluation of the portfolio, with a specific focus on the energy sector in particular and on the operations of GuarantCo and InfraCo Asia. Therefore, the following recommendations should be considered in this light and are divided into those areas that require further assessment throughout the remainder of the evaluation and those that can be acted upon by PIDG and/or its Owners.

To be taken forward in the remaining country evaluations

- 4. Identify projects in future country evaluations which are considered by PIDG to be ‘empowering’ or ‘transformative’ from a gender perspective to allow for more detailed analysis of tools used and results achieved by these projects. This may require a reconsideration of the projects currently selected for each country study.
- 5. Continue to evidence the link between PIDG’s Signature Features and its contribution to projects to determine the extent to which PIDG is able to have a disproportionately high impact on its investee projects – and therefore on their development impact achievements.
- 6. Assess the extent to which PIDG’s Signature Features (and therefore potentially outsized contribution to projects) may be impacted by its need to become financially sustainable and therefore decrease its risk appetite. The project cases demonstrated the additionality of PIDG working in frontier markets – such as addressing the bankability of Ninh Thuan solar. In virtually all cases, PIDG is able to do things that other institutions cannot, because of its higher appetite for risk. This is turn is in large part due to the fact that unlike other DFIs, PIDG has not had to be self-sustaining financially. The current shift towards financial self-sufficiency at the PIDG level risks undermining the very structures that allow PIDG to be additional and generate the value it does.

To be taken forward by PIDG and Owners

- 1. **Selection of projects informed by a documented country strategic plan.** At the project level, there is often a strong rationale to invest on a case-by-case basis, and yet there is also an

⁶⁶ By bringing together a national-level gender inequality metric (from the UN Gender Inequality Index) with an assessment of the project’s attempts to mainstream gender to establish a quantitative estimate of the ratio of women to men reached by a project.

opportunity cost of doing so. While this is a significant strategic challenge given the realities of how investment works, we suggest a shift towards a country strategic plan which outlines the opportunities and limitations for infrastructure investment in the given country and assesses the key barriers to maximising development impact through infrastructure investment. This would identify opportunities such as the recent investments in a group of water projects in Vietnam. Similarly, in the renewables sector, such a country strategic plan would prioritise strategic investments that address challenges identified by the Government of Vietnam (e.g. ‘smart grid’ and storage technology, due to government concerns over the intermittent nature of renewables).

2. **Use the country strategic plan to engage Owners and other partners to enable impacts above the project level.** The example of Vietnam shows how PIDG’s macro-level effects result from spillovers from individual projects, rather than from strategic engagement with government or planning agencies in Vietnam. While PIDG is not necessarily best placed to influence the Vietnamese government, there may be opportunities for them to work more closely with those that have the remit and influence, such as PIDG Owners and other partners, to unlock some of the barriers to maximising development impact through infrastructure investment (e.g. in persuading regulators to modify the regulation of institutional investors so that guarantees are not needed, or enabling the acceptance of guarantees as banks’ assets). Despite the CO2 avoided through the renewable energy projects supported by PIDG, the share of coal in Vietnam’s energy mix has increased sharply – dwarfing any gains made. Given recent Vietnamese government commitments to COP26, there is an opportunity to consider how different energy investments might contribute to a more stable and balanced energy mix and to a just transition. This is likely to require stronger coordination with other IFIs and with the agencies operated by PIDG’s owners.
3. **Adopting practical tools to support the consistent review of gender and social inclusion throughout the project life cycle.** The portfolio in Vietnam, particularly the solar and hydropower energy investments (supplying to the grid) and the TLMT expressway (toll roads), do not purposively address differential impacts amongst end-users. PIDG have developed a process to review gender and social inclusion as part of the DI review of individual investments;⁶⁷ and have a Gender Equity Action Plan at organisational level.⁶⁸ However, the use of practical checklists and/or tools to integrate gender mainstreaming and social inclusion into all stages of the project cycle, and for all types of projects, would be beneficial in ensuring that all investments assess and manage their potential impact on different demographic groups, broadening this to social inclusion beyond gender. This would include following a gender-lens through from investment-decision making and selection, to infrastructure design and implementation to support an increase in the likelihood of impacts for different demographic groups. Moreover, also following this process through on investments that are inherently less-well targeted (such as grid energy and roads)..

7.1 Lessons and planned actions for the evaluation going forwards

The evaluation aims to assess the outcomes and long-term development impact of PIDG companies across a range of different sized economies and geographies in Sub-Saharan Africa and Asia (TOR, pages 3 and 5). Our proposed approach adds value to the existing PIDG monitoring and evaluation data in three principal ways (see Inception Report): firstly, by extending this dataset to consider *broader, economy-wide impacts through CGE analysis*; secondly, to deepen the analysis of *differentiated impacts on socio-economic groups* through primary data collection in selected project investments; and thirdly, to better understand the link between *PIDG’s contribution and investment-level outcomes/impacts* (through Contribution Analysis). This last element is largely based on triangulated, qualitative analysis of PIDG’s contribution vis-à-vis other factors – and although more subjective, is critical to differentiate the ‘general impact of a

⁶⁷ For more information on the existing processes, please reference the inception report.

⁶⁸ PIDG, PIDG Gender Equity Action Plan, 2020; PIDG, PIDG Gender Equity Action Plan 2021, 2021.

project/investment’ from ‘the impact that can be associated with PIDG’ (i.e., a contribution that is additional as it either would not have occurred or would not have been as successful without PIDG’s involvement). In the context of PIDG’s companies, this is especially important as its role is often in the early stages of an investment cycle (such as improving the bankability of a project); and, where a relatively small contribution can have a disproportionate effect.

The evaluation is structured around four country studies. The Vietnam study (and its sampled projects) was the first of these studies. This first study experienced a number of challenges, including: needing to undertake the study remotely due to Covid restrictions in Vietnam at the time (with associated challenges in remotely securing commitments to interviews); challenges in obtaining sufficient leverage and the time necessary to obtain a wide range of stakeholder perspectives (especially government stakeholders in Vietnam); limitations to the primary data collection of the effects of the road investment, as the expressway was further delayed due to Covid; and also, limits in undertaking the proposed macro-study of PIDG’s spill-over effects - as contrary to initial claims, it later transpired through further enquiry, that PIDG’s activities/influence beyond the individual project was minimal.⁶⁹

There are a number of lessons for the methodology and its implementation that we can usefully carry forwards in subsequent country studies. These are structured below in response to the three concerns highlighted by the Owners’ Committee. For each, we set out our practical steps to address the issue for the remainder of the evaluation.

1. The need to generate more robust data. The challenges (noted above and elsewhere in this report) of conducting the Vietnam study remotely due to Covid restrictions at the time – plus the logistics of gaining access to some stakeholders - meant that for some investments there were fewer interviews (and from a narrower range of perspectives) than planned. In addition, by undertaking interviews remotely it can introduce biases and affect the quality of the data collected as it can be difficult to build a rapport with the interviewee, explore sensitive topics and additional data, or read visual cues. The improvements for the next country study, in Nigeria, will address this particular challenge through several practical steps:

- Firstly, increasing the lead-in time, and advance preparation and planning required to identify stakeholders and leverage networks through PIDG, the Owners and our own contacts (including our consultant based in Nigeria). For the Vietnam study, we did not make the best use of the Owner’s networks and leverage to secure access – and in Nigeria, there is a long history of engagement. This improvement will allow enough time to include frontloading stakeholder lists, logistics and timetables, so that there is limited reliance on snowball sampling than in Vietnam (i.e., where interviewees are unknown until the first set of interviews have been undertaken). Nonetheless, when in the field, the evaluation team will leverage scheduled interviewees to identify additional interesting stakeholders to interview that than add value to our evaluation.
- Agreeing a minimum set of interviews (by stakeholder group) for each investment (agreed with the Owners in advance, so as to improve triangulation and reduce confirmation bias). This will depend on the specific investment and its context but is likely to include PIDG staff (HQ and respective PIDG companies); DFIs that have co-invested; the senior leadership of the investee company; plus, other private investors, expert observers, other DFIs active in the space and government stakeholders in Nigeria.⁷⁰ We recognise that in some instances, informed stakeholders may be reluctant to be interviewed for confidentiality reasons.
- Conducting a physical visit to Nigeria by our team, rather than solely working remotely as was the case of Vietnam. The country evaluation leader will be supported by our in-country consultant that will be able to support in confirming meetings, and be able to carry out additional interviews scheduled beyond the country visit, and do so, either face-to-face or by telephone. This, we know

⁶⁹ We have already proposed to incorporate the ‘macro study’ into the project assessment process, as PIDG primarily operates at the project-level and with limited activities beyond the investment cycle.

⁷⁰ As a further addition, we can also create a formal strength of evidence rating, which is a succinct way to present the extent of perspectives and triangulation achieved in each case – and may help with transparency when presenting findings.

from experience, is more effective in securing interviews than doing so remotely. Our in-country consultant has experience in the investment space and she also has her own network that we can leverage during our stakeholder identification process.

- In circumstances where the required/minimum range of stakeholder views has not been possible, we will improve the robustness of the assessment (and triangulation) by drawing on documentary evidence, and the views of external observers. For Nigeria specifically, where the focus is on local currency markets, there is likely to be more documentary evidence available and a broader set of potential stakeholders.
- Plus unlike in Vietnam, we will be able to collect primary data (additional to PIDG’s monitoring) for a selected investment. This will help better understand the differential benefits to consumers, households, employees and companies. This was not possible in Vietnam due to Covid delays in the road becoming operational – something that only later transpired. This data will be triangulated with all the other sources of evidence from key informants, project case studies (and associated documents and data), analysis of PIDG datasets and our CGE modelling.

Addressing the counterfactual, which we understand in this context is reference to insufficient cross-referencing of views with other stakeholders operating in the market.⁷¹ Theory-based approaches, such as Contribution Analysis applied here, assume multiple causation with combinations of causes leading to an effect. This is viewed as appropriate for this study as the bankability of a project and its subsequent impacts are likely to be the result of a combination of factors – in which PIDG is more or less important. Our improvements to the methodology are therefore focused primarily on more robustly differentiating the importance of PIDG relative to alternative explanations. We therefore plan to iterate the Contribution Analysis applied in Vietnam with several additions:

- Based on an initial review of the documents and secondary data, produce a list of key alternative explanations or contributory factors.⁷² It is generally suggested that this initial list is screened (potentially through a workshop or meeting), as there are often far too many contributory factors to practically test.⁷³ This helps mitigate the risk that the team’s efforts (and associated support from PIDG) are diverted from the primary focus of the evaluation.
- We will then add these ‘key alternative explanations’ as hypotheses to be explicitly tested alongside the current focus on PIDG’s contribution and subsequent impacts. During planning for each country evaluation, we will develop a contribution analysis framework in which each hypothesis to be tested (both those related to PIDG’s contribution and the ‘alternative explanations’) will be listed. For each hypothesis, we will clearly indicate the evidence that is required to test the hypothesis, the data collection method and the data source (including stakeholder type) to be used to seek the evidence.
- In terms of practical changes to data collection, the contribution analysis framework will ensure a systematic approach to testing alternative explanations through specific questions in interview checklists (based upon these alternative explanations / hypotheses), as well as additional codes to capture and analyse the importance of other explanations vis-à-vis PIDG. This will differ from the first country study in that interview questions related to alternative explanations will be specific,

⁷¹ This interpretation is based on a clarification with the Owners. The TOR (page 7), proposal and Inception Report state in various forms the expectations that a counterfactual framework of causation (and associated experimental methods) is not expected.

⁷² Other contributory factors were assessed as part of the Vietnam study, as they emerged through the data collection and subsequent analysis as either more or less important. This change formalizes the testing of a few key hypotheses, and puts this upfront in the process.

⁷³ For practical reasons, we will need to be really selective on how we interrogate alternative hypothesis within the interview guides. In some cases, we have had only 30 minutes with an interviewee and very rarely more than an hour.

based on earlier desk research and validation (detailed in the above point); whereas in the Vietnam study, these questions were more open-ended and exploratory.

- Following data analysis stage, the contribution analysis framework will be updated with a summarised version of the evidence found against each hypothesis and the strength of the evidence. This will be provided to PIDG and the Owner Committee alongside the sharing of early findings, before the report-writing stage. It is expected that this will provide the Owners with better sight of the evidence (and its strength) behind the contribution narrative.

These additional changes will also be further enhanced by the increase in the number and range of stakeholders interviewed – as outlined in the steps set out under ‘generating more robust data’.

Whether the current project sample size will be sufficient for generalisability. This we understand relates to the Owners’ confidence in having a set of findings that are useful for PIDG learning at a portfolio and organisational levels, rather than being too narrow and context-specific to be applicable.

The ability to generalise from this evaluation is based on three features of the methodology:

- Firstly, selecting countries and projects that reasonably capture the diversity of the PIDG portfolio (by geographies, PIDG companies, sectors, types of investments, etc). There are inevitably trade-offs in this process, but after consultation with the Owners and PIDG during the Inception period, it was agreed that the final (purposive) selection captures a reasonably representative sample given the requirement for four country studies. We recognise that the applicability of learning from Vietnam may be more challenging (than for future sampled countries); however, its inclusion in the evaluation was in response to the specific needs of one of the Owners at Inception stage. Our expectation, now and at the time of the inception report, is that the remaining three countries will generate learning that is more readily applicable for PIDG itself.
- Secondly, as a theory-based evaluation, generalisability occurs through empirically testing the theory of how things should happen (the PIDG theory of change) against how it actually occurred – and by finding common patterns across different contexts to explain what works and under what circumstances. At this stage, we would not expect to see portfolio / organisation level findings, as we have completed one country context and are only one quarter (25%) of the way through the evidence collection.
- Thirdly, the coding structure (which is based on the PIDG theory of change) will allow us to ‘aggregate’ findings against the overall theory of change once all projects/countries are complete. The context and specific nature of individual projects will increasingly diminish as we draw patterns from the empirical data from across the PIDG portfolio. We should expect to see this starting to occur after the second and third country studies.

There is no statistical basis to conclusively judge generalisability for a theory-based evaluation such as this one – i.e., simply adding to the number of projects does not necessarily make a theory-based evaluation more generalisable. We can however address the following:

- For the next country report, we will be able to analyse the patterns and emerging themes based on the accumulation of evidence (to date) using qualitative coding against the PIDG theory of change. This will enable us to draw out emerging lessons at the portfolio/organisational levels.
- The CGE modelling will provide a quantitative basis to assess a larger proportion of the portfolio. In the Vietnam study for example, CGE modelling was applied to 4 operational projects – *two of which were additional to the projects selected for the in-depth analysis*. Across the four country studies, we estimate that this analysis will cover 20+ of the 70 operational projects in the

portfolio. While PIDG’s contribution will only be assessed in detail for the 4 selected projects, we are still able to estimate contribution using a pro-rata estimate (which if anything, will be an underestimate). This will provide a detailed analysis of PIDG’s contribution⁷⁴ to key outcomes/impacts: avoided CO2; short- and long-term jobs (+ percentage female); indirect jobs; and, access to infrastructure (+ percentage female).

- And finally, the synthesis report, will provide a detailed analysis of the PIDG portfolio, using the latest figures available from the organisation’s monitoring and evaluation data.

⁷⁴ This is a combination of in-depth assessments of contribution for selected PIDG projects, alongside pro-rata contribution estimates for others.

Annex 1: List of PIDG projects in Vietnam

Project	PIDG company	Description
Antara Cold Storage Project	InfraCo Africa	IFC made an equity investment of US\$1.2 million, provided an A loan of US\$7 million and mobilised a B loan for US\$7 million to Preferred Freezer Services (formerly Antara) to construct a modern cold warehouse facility. Despite difficulties in the cold storage sector in Vietnam, IFC was committed and increased its equity position, which helped to turn the difficulties around, and PFS became a market leader. In 2019 PFS repaid the IFC loan in full and IFC sold its equity stake.
Cai Lan Port	ICF – DP	<p>In Northern Vietnam, Hanoi, Hai Phong and Ha Long form a triangle of regional development buoyed by expanding manufacturing and agricultural industries. The continued economic growth and expansion of this region require the development of additional port facilities at Cai Lan Port to provide infrastructure for importing and exporting cargos.</p> <p>The project is part of a Vietnam port master plan to improve port infrastructure in North Vietnam and the Hai Phong/Can Lan areas and to reduce the inefficiencies and congestion resulting from the current location of port terminals.</p>
Cai Mep Port	ICF – DP	SP-SSA International Container Services Joint Venture Company (SSIT, or the Company) is developing a greenfield container terminal on the Cai Mep River in Ba Ria-Vung Tau province (the Terminal) to serve the HCMC area in Vietnam. Container volumes in the HCMC area have increased significantly in recent years, causing congestion at the region’s ports and within HCMC. The Terminal will help address this situation by providing much needed container handling capacity to relieve existing congestion. It will also be well positioned to capitalise on the region’s projected growth in container volumes. Located approximately 85km southeast of HCMC, the Terminal will have a draft of 14m and the latest container handling equipment, enabling it to serve today’s large containerships, which cannot call at existing HCMC ports due to draft and LOA (turning) restrictions.

Coc San Hydro Power Project	InfraCo Asia (Investment & Development)	Coc San Hydro Power Plant is a run-of-river project located in the Lao Cai province in the far north of Vietnam; it provides more than 120 GWh of renewable energy per year and supports grid stability in the region. The participation of InfraCo Asia enabled the project to go ahead, and the hydro power project has been operational since April 2016. The plant sells power to Northern Power Corporation, which is a subsidiary of EVN, under a 20-year PPA under the Avoided Cost Tariff regime. In November 2018 InfraCo Asia divested its shareholding in the project to TEPCO.
Vietnam Water Supply Portfolio – Thuy Nguyen distribution	InfraCo Asia (Development)	<p>InfraCo Asia is co-developing a portfolio of water supply projects with Singapore-listed company Darco Water Technologies. Through the Vietnam Water Supply Portfolio, InfraCo Asia aims to increase private sector participation in water supply projects in Vietnam to help meet its water supply and sanitation-related development goals, including universal access to safe drinking water by 2030. The Vietnam Water Supply Portfolio currently includes two water distributions systems.</p> <p>The two water distribution systems aim to provide piped and treated water 24/7 to 13 communes and one industrial area in Ben Tre province, and to nine communes in Hai Phong municipality, where individuals are highly dependent on the collection of rainwater. Upon completion of the first development phase for both distribution systems, the projects are expected to see a combined increase of 30,000 m³/day of clean water supply, piped directly to rural households and industrial facilities.</p>
Vietnam Water Supply Portfolio – Ba Lai distribution	InfraCo Asia (Development)	<p>The two water distribution systems aim to provide piped and treated water 24/7 to 13 communes and one industrial area in Ben Tre province, and to nine communes in Hai Phong municipality, where individuals are highly dependent on the collection of rainwater. Upon completion of the first development phase for both distribution systems, the projects are expected to see a combined increase of 30,000 m³/day of clean water supply, piped directly to rural households and industrial facilities.</p>
Ho Chi Minh Infrastructure Investment JSC (CII)	GuarantCo	GuarantCo provided a \$50 million guarantee to CII to support the issuance of the bond provided by local bond investors. The proceeds of the bond will be used to construct the Trung Luong–My Thuan expressway, which is a 4-lane, 51km long toll road intended to ease congestion along the key economic corridor running between HCMC and the Mekong Delta.
Nam Long Investment Company (NLIC)	GuarantCo	The first deal in Vietnam for GuarantCo, who guaranteed a seven-year corporate bond of US\$29 million issued by Nam Long Investment Corporation, due in 2025. Proceeds from the bond will be used in the development of affordable housing in order to meet increasing demand and improve living conditions. GuarantCo hopes this will have a catalytic effect by encouraging corporate issuers to consider the same approach.
Ninh Thuan Solar Power	InfraCo Asia (Development)	The Ninh Thuan Solar Power plant is a 168 MWp utility-scale solar farm located in My Son commune and was developed through a joint venture between Sunseap International and InfraCo Asia. Operational since 2019,

and
Investment)

the power generated from the solar farm is sold to EVN through a 20-year PPA that provides FiT in Vietnamese Dong, which is equivalent to 9.35 US cents/kWh. In March 2020 InfraCo Asia divested their equity stake.

Annex 2: List of project stakeholder interviews

Project	Organisation	Name	Role
CII	GuarantCo	Alex Hazoury	Client Relationship Director
CII	PIDG	Cameron Bain	HSES Director
CII	GuarantCo	Lois Davidson	HSES/ESG Director
CII	GuarantCo	Nishant Kumar	Managing Director
CII	GuarantCo	Anh Nguyen	Client Relationship Manager
CII	CII	Hieu Le	Head of Capital Management
CII	Deo Ca Group		Investor
Ninh Thuan	Sunseap	Lawrence Wu	Developer
Ninh Thuan	My Son People’s committee	Doan Nhat Vuong	Community organisation
Ninh Thuan	InfraCo Asia	Prabaljit Sarkar	Business Development Director
Coc San/Ninh Thuan	InfraCo Asia	Karen Tsang-Hounsell	Head of Business Development
Coc San	InfraCo Asia	Claudine Lim	Interim CEO & Chief Operating Officer
Coc San	Coc San	Nhu Quynh Tra	CEO
Coc San	Nexif	Ids Groenhout	Developer
Coc San	TEPCO	Jozaki Chiyuki	Investor
Coc San	Trung Chai People’s Committee	Nguyen Van Quyen	Community organisation
Coc San	Debt provider		Investor
Portfolio	PIDG	Marco Serena	Head of Sustainable Development Impact
Portfolio	PIDG	Saeed Ibrahim	Senior Manager, Sustainable Development Impact

Annex 3: CGE report

**Impact Evaluation
of
Private Infrastructure Development Group Investments
in
Vietnam:**

**Computable General Equilibrium Analysis of Economy-Wide
Employment and Income Impacts**

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Rev. April 2022

Report for ITAD under SUBCON05590 – PIDG, Evaluation of Development Impact
Project number: 2019-146, IDS001

Abbreviations

CGE	Computable General Equilibrium
CICT	Cai Lan International Container Terminal
CPI	Consumer Price Index
DFI	Development Finance Institution
FTE	Full-Time Equivalent
GDP	Gross Domestic Product
GSO	General Statistics Office of Vietnam
GTAP	Global Trade Analysis Project
GWh	Gigawatt Hours
ILOSTAT	International Labour Organization Department of Statistics Database
ISIC	International Standard Industrial Classification
LES	Linear Expenditure System
MW	Megawatt
PIDG	Private Infrastructure Development Group
SAM	Social Accounting Matrix
SUT	Supply and Use Table
TEU	Twenty-Feet-Equivalent Unit
TFP	Total Factor Productivity
TWh	Terawatt hours (1 TWh = 1000 GWh)
UNDESA	United Nations Department of Economic and Social Affairs
USD	United States Dollars
VND	Vietnam Dong

1. Overview

As part of the evaluation of Private Infrastructure Development Group (PIDG) investments in Vietnam, a computable general equilibrium (CGE) analysis is used to estimate the economy-wide impacts on employment and aggregate income, taking systematic account of indirect ripple effects on the economy beyond the PIDG target sectors.

Such indirect effects include in particular (i) effects on the final demand for goods and services across all sectors of the economy, as the additional income generated by the capital investments is spent on consumer goods or saved, entailing an increase in demand for capital goods; (ii) effects on the demand for additional intermediate inputs required by firms that raise their output in response to the additional demand (backward linkage effects); (iii) effects on output prices across the whole spectrum of goods and services due to the direct PIDG-induced supply effects and resulting demand effects under (i) and (ii); (iv) economy-wide factor price effects due to the PIDG-induced changes in domestic production; (v) sectoral factor employment re-allocation effects; and (vi) effects on international trade flows and the exchange rate, as part of the additional demand under (i) and (ii) will be demand for import goods and part of the directly induced production increases will be exported.

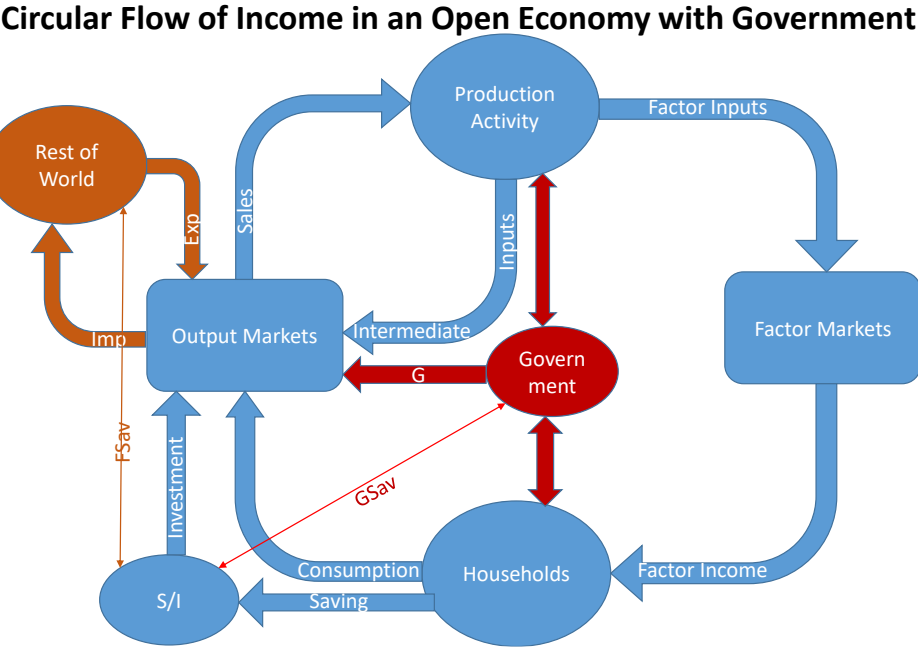
This report provides a concise non-technical account of the CGE model, explains the methodological approach to the representation of PIDG-induced investments in the model and presents the main results.

The following section sets out the analytic framework, explains the empirical calibration of the CGE model and specifies the simulation design. Section 3 presents the simulation results along with brief explanatory notes.

2. Analytic Framework

CGE analysis is a tool for the simulation of the economic effects of policy interventions and other exogenous shocks. CGE models consider all sectors in an economy simultaneously and take consistent account of economy-wide resource constraints, intersectoral intermediate input-output linkages and interactions between markets for goods and services on the one hand and primary factor markets including labour markets on the other. CGE models simulate the full circular flow of income in an economy from (i) income generation through productive activity, to (ii) the primary distribution of that income to workers, owners of productive capital, and recipients of the proceeds from land and other natural resource endowments, to (iii) the redistribution of that income through taxes and transfers, and to (iv) the use of that income for consumption and investment (Figure 1).

Figure 1



In the context of the evaluation of sector-specific interventions, the CGE approach solves the problem that partial-analytical methods, which focus exclusively on the direct impacts on the target sectors do not capture potentially significant indirect effects arising due to intersectoral linkages and macroeconomic feedback effects.

2.1. The Computable General Equilibrium Model for Vietnam

In terms of theoretical pedigree, the CGE model for Vietnam employed in this study can be characterized as a dynamic extension of a standard comparative-static single-country CGE model for a developing country in the tradition of Dervis, de Melo and Robinson (1982), Robinson et al (1999) and Lofgren et al (2002). Models belonging to this class have been widely used in applied development policy research. The dynamic extension of the comparative-static framework incorporates capital accumulation, population growth, labour force growth and technical progress. The following paragraphs provide a concise informal outline of the core features of the model.

2.1.1. Domestic Production and Input Demand

Domestic producers in the model are price takers in output and input markets and maximize intra-temporal profits subject to technology constraints. The technologies for the transformation of primary

inputs into real outputs are described by sectoral constant-returns-to scale production functions. Intermediate input requirements are described by a Leontief technology specification.

2.1.2. Primary Factor Supply

The dynamic labour force growth path is exogenous while actual labour market participation is endogenized via an iso-elastic aggregate labour supply function. This specification enables an assessment of the sensitivity of results to assumptions about the elasticity of labour supply with respect to the real wage. Labour is intersectorally mobile. When the model is run in a recursive-dynamic mode, the productive capital stock in each sector a evolves according to the dynamic accumulation equation

$$K_a(t+1) = I_a(t) + (1 - \delta_a)K_a(t),$$

where K_a denotes the installed real capital stock, $I_a(t)$ is real gross investment flowing to sector a in period t and δ is the rate of physical capital depreciation. Sectoral gross investment is a positive function of a sector's rate of return to capital relative to the economy-wide average return to capital, i.e. the sectoral allocation of aggregate real investment is determined by return differentials.

2.1.3. Final Domestic Demand

Consumer behaviour is derived from intra-temporal utility maximizing behavior subject to within-period budget constraints. Utility functions take the Stone-Geary form, yielding a Linear Expenditure System (LES) demand specification. The commodity composition of investment and government demand is kept constant according to the observed shares in the benchmark SAM while the total volumes of government and investment demand grow in line with aggregate income and are determined by the macro closure rules detailed below.

2.1.4. International Trade

In all traded commodity groups, imports and goods of domestic origin are treated as imperfect substitutes in both final and intermediate demand. Agents' optimizing behaviour entails that the expenditure-minimizing equilibrium ratio of imports to domestic goods in any traded commodity group varies endogenously with the corresponding relative price of imports to domestically produced output in that commodity group.

On the supply side, the model takes account of product differentiation between exports to the rest of the world and production for the domestic market in all exporting sectors. The technologies for conversion of output into exports are described by sectoral constant-elasticity-of-transformation (CET) functions. This entails that the profit-maximizing equilibrium ratio of exports to domestic goods in any exporting sector is determined by the price relation between export and home market sales.

Vietnam is treated as a small open economy – i.e. changes in the country's export supply and import demand quantities have no influence on the structure of world market prices.

2.1.5. Equilibrium Conditions and Macro Closure

The prices for goods, services and primary factors⁷⁵ are flexible and adjust in order to satisfy the market clearing conditions for output and factor markets. Foreign savings and hence the current account balance follow an exogenous time path. This external sector closure entails that the real exchange rate adjusts endogenous to maintain external balance-of-payments equilibrium. Aggregate government spending is a

⁷⁵ Except for labour if a perfectly elastic supply of labour is assumed.

fixed share of total absorption and tax rates are fixed, hence government savings are endogenous. Aggregate investment is saving-driven.

2.2. Benchmark Data, Model Calibration and Dynamic Baseline Specification

The model is initially calibrated to a social accounting matrix (SAM) for Vietnam which reflects the input-output structure of production, the commodity composition of demand and the pattern of income distribution for the country in the benchmark year 2016 at a disaggregated level. The SAM has been assembled for this study from the latest (unpublished) Supply-and-Use Table (SUT) for the year 2016 obtained from the General Statistics Office of Vietnam (GSO, 2020).

The source SUT file distinguishes 166 production activities. For purposes of the present study, these production activities have been aggregated such that the PIDG target sectors are represented at the finest level of disaggregation supported by the data set, while the non-target sectors have been aggregated in a way that facilitates a straightforward mapping to additional disaggregated labour data at ISIC-Level 2 obtained from ILOSTAT. The resulting SAM – and hence the CGE model - distinguishes 14 production activities (Table 1) and synonymous commodity groups, 2 primary production factors (labour, capital) and one aggregate private household.

The numerical calibration process involves the determination of the initial model parameters in such a way that the equilibrium solution for the benchmark year exactly replicates the benchmark SAM. The selection of values for the sectoral factor elasticities of substitution, the elasticities of substitution between imports and domestically produced output by commodity group, and the target income elasticities of household demand is informed by available econometric evidence from secondary sources and uses estimates provided by the GTAP behavioral parameter database (Hertel and van der Mensbrugghe, 2016).

Starting from the 2016 benchmark equilibrium solution, the CGE model is then solved forward in a dynamic mode at annual time steps up to the end of 2019 to generate a baseline for the evaluation of the PIDG investment project that became operational post-2016. In this dynamic simulation, which effectively generates a synthetic updated SAM for 2019, the total factor productivity (TFP) parameters of the model are calibrated residually such that the dynamic baseline path over the simulation period exactly replicates the observed/estimated World Bank (2020, 2022) GDP growth rates for Vietnam between 2016 and 2019.

Table 1: Model Production Sectors, Sectoral GDP and Employment Shares

Short Code	Production Activity	GDP Share	Employment 1,000s	Employment Share
aAGFOFI	Agriculture, Forestry and Fishing	0.121	22,314	0.419
aEXTRAC	Natural Resource Extraction	0.026	214	0.004
aMANUFA	Manufacturing	0.281	8,776	0.165
aRESBLD	Residential Buildings	0.025	1,657	0.031
aOCONST	Other Construction	0.045	2,150	0.040
aELECTR	Electricity	0.036	160	0.003
aWATRSV	Water	0.003	58	0.001
aOUTILS	Other Utilities	0.004	76	0.001
aPORTSV	Water Transport Services	0.003	84	0.002
aOTRNSV	Other Transport Services	0.022	1,322	0.025
aSTORAG	Warehousing	0.024	163	0.003
aOTRADE	Other Trade Services	0.108	6,881	0.129
aPUBLSV	Public Services	0.096	4,185	0.079
aOSERVI	Other Services	0.207	5,261	0.099

1.000 53,303 1.000

Sources: 2016 SAM compiled from 2016 SUT (GSO, 2020); Employment by economic activity Vietnam 2016: ILOSTAT and authors' calculations.

2.3 Specification of the CGE Model Simulations

Table 2 lists the PIDG-supported operational investment projects in Vietnam included in the simulation analysis.⁷⁶ From an economic general equilibrium perspective, the PIDG-supported investments constitute exogenous additions to the productive capital stock of the target sectors. The size of the target sector capital stock increments is calibrated on basis of the 'Total Investment' figures reported in Table 2 under the assumption that ten percent of the totals are used to cover planning costs and other administration costs during the implementation phase. As the 2016 SAM to which the model is calibrated records transactions in current 2016 prices, Producer Price Index data obtained from the on-line data base of the General Statistics Office of Vietnam (GSO) are used to transform the investment figures for the PIDG projects implemented prior to 2016 into capital stock increments valued at 2016 replacement cost.

In the case of the Cai Lan International Container Terminal (CICT), the calibration of the effective capital stock increment takes into account that in all years of its operation from 2013 to date, actual capacity utilization remained well below 20 Nam percent of its annual throughput capacity (520,000 TEU).⁷⁷ Therefore, the capital stock increment calibration for CICT uses data from the Vietnam Seaports Association (VPA, 2022), which allow to calculate the market share of CICT in Vietnam's total seaport freight throughput (on average about 0.7 percent), along with data on the share of sea freight in the model's Water Transport Sector (77 percent) from GSO (2020).

The last column of Table 2 shows the resulting estimated percentage change in the target sector capital stocks relative to a counterfactual 'without-PIDG investment' equilibrium. For the three investment projects implemented prior to 2016, the figures represent the share of the respective 'observed' target sector capital stock attributable to the PIDG-mobilized investment – e.g. in a counterfactual world without the PIDG-induced Antara Cold Storage investment, the total productive capital stock of the STORAG sector in Vietnam would have been some 0.4 percent smaller than the actual observed (i.e. SAM-derived) 2016 STORAG capital stock. For the Ninh Thuan Solar Power project, which started operations in 2019, the reported figure is relative to the synthetic model-generated 'without-Ninh Thuan Solar Power' 2019 equilibrium.

Table 2: PIDG Vietnam Investment Projects in Operation

Investment Project	Model Sector	Date of Operation	PIDG Commitment (USD mill)	Other Investment (USD mill)	Total Investment (USD mill)	Increase in Sector Capital Stock (%)
Antara Cold Storage Project	STORAG	Jun-10	0.28	27.83	28.11	0.41
Cai Lan Port	PORTSV	May-13	27.20	128.1	155.30	0.53
Coc San Hydro Power Project	ELECTR	Apr-16	17.54	26.96	44.50	0.19
Ninh Thuan Solar Power	ELECTR	Jun-19	10.62	155.98	166.60	0.70
Total			55.64	338.87	394.51	

Source: PIDG project data provided by Itad and author's calculation.

⁷⁶ The PIDG project data provided by Itad (File: PIDG Vietnam investments.xlsx) list a further six projects (see Appendix Table A-1), which do not appear to be operational yet as of 2021. These projects have no entry for the actual date of operation, have apparently attracted no actual DFI or private sector investment on top of the PIDG commitment so far, and zero entries in all other 'actual' (as opposed to 'predicted' and 'expected') columns of the data file.

⁷⁷ See VPA (2022). For further reference to the causes (and consequences) of the CICT capacity underutilization problem see e.g. Thuy (2020), Nguyen and Kim (2020), VietnamNet (2015). Blancas et al (2014) anticipate the problem early on.

Thus, for the three investment projects implemented prior to 2016, the CGE model is used to compute a series of counterfactual equilibria, in which – separately for each investment project – the target sector capital stock is *reduced* by the respective percentage given in the last column of Table 2. In these cases, the comparison with the actual 2016 baseline equilibrium provides an estimate of the size order of the economic effects triggered by the PIDG-supported investments. For the simulation of the Ninh Thuan Solar Power project, in turn, the PIDG investment is *added* to the 2019 baseline electricity sector capital stock.

In view of the absence of econometric evidence on the elasticity of the supply of labour (ϵ) for Vietnam, the simulation analysis considers three alternative values for this key parameter which measures the percentage change in the labor supply quantity associated with a one-percent increase in the real wage: $\epsilon = 0.5$, $\epsilon = 1$ and $\epsilon \rightarrow \infty$.

As Bargain and Peichl (2016) note in the context of a meta-analysis of the respective empirical evidence, ‘the variation in the magnitude of labor supply elasticities found in the literature is huge (see Evers et al. 2008), and there is little agreement among economists on the elasticity size that should be used in economic policy analyses’.⁷⁸ With respect to the appropriate selection of values for this parameter in simulation studies, the same author conclude that ‘(m)aking the “right” choice is not easy, and we suggest using a range of “plausible” values for sensitivity checks’.

Here the specifications $\epsilon = 0.5$ and $\epsilon = 1$ are taken to span the plausible range from ‘Low’ to ‘High’. The ‘Extreme’ case of an infinite labour supply elasticity (which means unlimited supplies of labour at initial real wage levels) provides an absolute upper limit for the estimated employment effects. A simplistic traditional fixed-price SAM multiplier analysis, which implies the presence of unlimited supplies of labour, would generate figures of a similar order of magnitude, and the results for this ‘Extreme’ case are thus included for purposes of comparison in the following section.

3. Simulation Results

Section 3.1. reports simulated impacts for macroeconomic aggregates at the economy-wide level while section 3.2. turns to sectoral results.

3.1. Macroeconomic Impacts

Table 3 displays the estimated annual aggregate economy-wide real income gains – as measured by the induced changes in GDP - attributable to the PIDG-supported investments under investigation. Since the PIDG investments are small in relation to the total economy-wide productive capital stock of Vietnam⁷⁹, the small size order of the percentage changes reported in the bottom panel of the Table is not surprising. Table 4 sets the absolute annual economy-wide income gains from Table 3, which constitute recurrent flows that are realized each year over the lifetime of the investment projects - in relation to the corresponding PIDG-mobilized investment totals (see Table 2) to obtain an indication of the size orders of the economy-wide annual social rate of return on investment for each of the projects. The low return estimates for the Cai Lan Port investment are a reflection of the aforementioned capacity underutilization problems.

Table 3: Impact on Aggregate Real GDP

Investment Project	Low	High	Extreme
	$\epsilon = 0.5$	$\epsilon = 1$	$\epsilon \rightarrow \infty$
USD Million			

⁷⁸ However, the overwhelming majority of empirical ϵ estimates for European countries and the USA reported in this meta-study remains well below unity.

⁷⁹ Without the PIDG-supported investments the aggregate economy-wide capital stock of Vietnam in 2019 would have been about 0.035 percent smaller according to the SAM-based estimates.

Antara Cold Storage	13.4	15.1	25.3
Cai Lan Port	2.0	2.5	5.1
Coc San Hydro Power	17.2	21.0	44.0
Ninh Thuan Solar Power	63.1	77.3	161.8
	%		
Antara Cold Storage	0.005	0.006	0.010
Cai Lan Port	0.001	0.001	0.002
Coc San Hydro Power	0.007	0.009	0.018
Ninh Thuan Solar Power	0.026	0.031	0.066

Table 4: Annual Social Rate of Return on Investment
($\Delta GDP / Total Investment$ in percent)

Investment Project	Low	High	Extreme
	$\epsilon = 0.5$	$\epsilon = 1$	$\epsilon \rightarrow \infty$
Antara Cold Storage	47.8	55.2	90.0
Cai Lan Port	1.3	1.6	3.3
Coc San Hydro Power	38.6	47.3	98.9
Ninh Thuan Solar Power	37.9	46.4	97.1

Table 5 displays the impacts on aggregate primary household income – that is gross labour and capital income prior to income tax deductions – decomposed into its constituent parts.⁸⁰

⁸⁰ The absolute changes in primary household income in Table 5 are slightly lower than the absolute GDP changes in Table 3 due to the presence of indirect taxes on production (net of production subsidies) paid by production establishments.

Table 5: Impact on Primary Household Income and Decomposition into Labour and Capital Income (a) $\epsilon = 1$

$\epsilon = 1$	Labour	Capital	Total Primary Household Income
USD Million			
Antara Cold Storage	7.4	5.8	13.2
Cai Lan Port	1.9	0.2	2.1
Coc San Hydro Power	16.7	2.6	19.3
Ninh Thuan Solar Power	61.4	9.3	70.7
Total	87.4	17.9	105.3
%			
Antara Cold Storage	0.005	0.008	0.006
Cai Lan Port	0.001	0.000	0.001
Coc San Hydro Power	0.012	0.003	0.009
Ninh Thuan Solar Power	0.044	0.012	0.032
Total	0.062	0.023	0.048

(b) $\epsilon = 0.5$

$\epsilon = 0.5$	Labour	Capital	Total Primary Household Income
USD Million			
Antara Cold Storage Project	6.5	5.2	11.7
Cai Lan Port	1.7	0.0	1.7
Coc San Hydro Power Project	14.6	1.3	15.9
Ninh Thuan Solar Power	53.8	4.5	58.3
Total	76.5	11.0	87.6
%			
Antara Cold Storage Project	0.005	0.007	0.005
Cai Lan Port	0.001	0.000	0.001
Coc San Hydro Power Project	0.010	0.002	0.007
Ninh Thuan Solar Power	0.038	0.006	0.027
Total	0.054	0.014	0.040

(c) $\epsilon \rightarrow \infty$

$\epsilon \rightarrow \infty$	Labour	Capital	Total Primary Household Income
USD Million			
Antara Cold Storage Project	12.9	9.3	22.1
Cai Lan Port	3.4	1.1	4.5
Coc San Hydro Power Project	29.1	10.4	39.5
Ninh Thuan Solar Power	107.0	38.1	145.1
Total	152.3	58.8	211.1
%			
Antara Cold Storage Project	0.009	0.012	0.010
Cai Lan Port	0.002	0.001	0.002
Coc San Hydro Power Project	0.021	0.013	0.018
Ninh Thuan Solar Power	0.076	0.049	0.066
Total	0.108	0.076	0.096

The aggregate economy-wide permanent employment effects suggested by the CGE analysis are reported in Table 6. The job headcount figures on the left-hand panel do not take account of intra- and intersectoral differences in average hours worked and hourly earnings per employed person. In contrast, the full-time-equivalent (FTE) average-wage figures on the right-hand panel transform the headcount number into equivalent numbers of full-time (48 h per week) jobs that pay the economy-wide average wage. A decomposition of the employment effects by production sector is provided in section 3.2.

Table 6: Economy-Wide Employment Effects

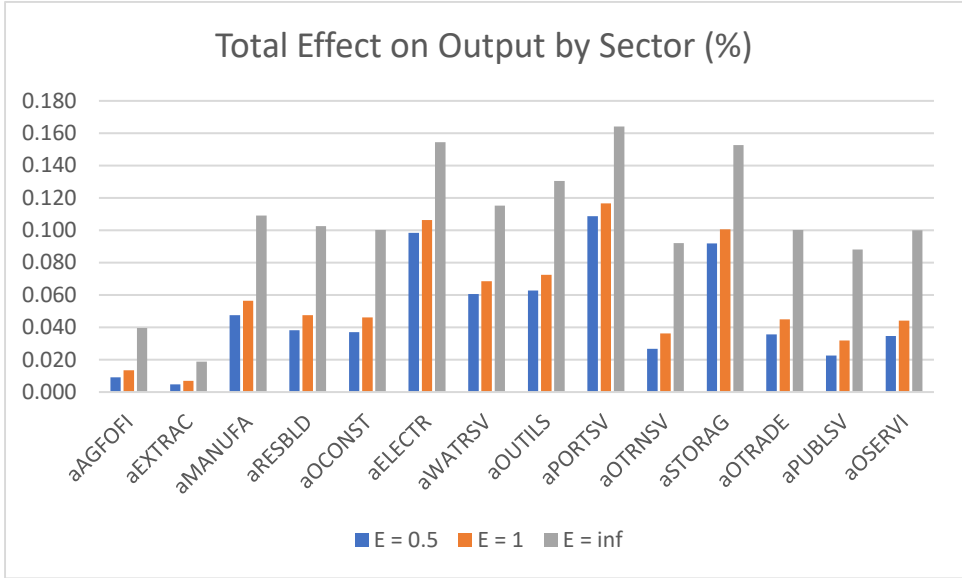
Investment Project	Job Headcount			Average-Wage FTE Jobs		
	Low $\epsilon = 0.5$	High $\epsilon = 1$	Extreme $\epsilon \rightarrow \infty$	Low $\epsilon = 0.5$	High $\epsilon = 1$	Extreme $\epsilon \rightarrow \infty$
Antara Cold Storage	1,723	2,203	5,070	1,379	1,756	4,003
Cai Lan Port	132	258	1,008	47	145	733
Coc San Hydro Power	3,159	4,245	10,730	2,333	3,185	8,268
Ninh Thuan Solar Power	11,596	15,591	39,433	8,566	11,698	30,395
Total	16,610	22,297	56,241	12,325	16,784	43,399

3.2. Sectoral Impacts

In percentage terms, the effects on domestic production by economic activity are most pronounced in the target sectors of the PIDG-supported infrastructure investments (Figure 1). Relative to the baseline, the output expansion effect is strongest in the Electricity sector, which is the sector where the PIDG investments entail the largest relative expansion of the sector-wide productive capital stock (Table 2). The model-based estimate of the output effect for the power sector is broadly in line with a back-of-the-envelope triangulation calculation of the joint contribution of the Coc San Hydro and Ninh Thuan Solar Power plants to Vietnam’s total electricity generation.⁸¹ The indirect ripple effects on domestic production in all non-target sectors are positive throughout but remain generally well below +0.1 percent of baseline production levels.

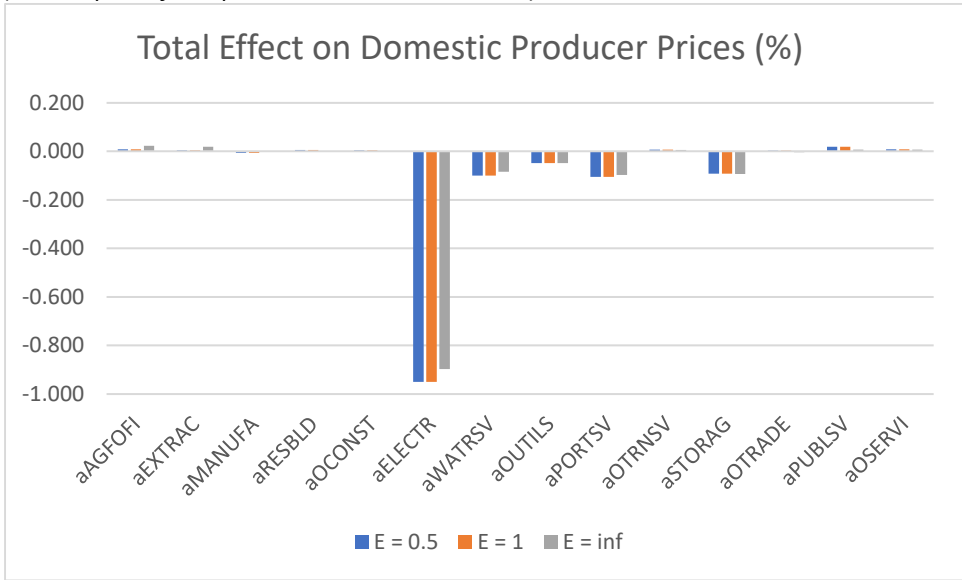
⁸¹ Coc San Hydropower generates about 120 GWh of electricity per annum (InfraCo Asia, 2018a), which amounts to 0.053 percent of Vietnam’s total annual electricity generation in 2019 (227.5 TWh; BP, 2021). Ninh Thuan Solar Power has a peak capacity of 168 MW (InfraCo Asia, 2018b), but annual generation data are not reported. Using the ratio of Vietnam’s total annual solar power generation to installed solar capacity for 2019 (4.1 TWh/4.9 GW; BP, 2021) to transform capacity into an estimate of annual generation, one obtains a figure of about 140 GWh per annum for the PIDG Ninh Thuan Solar Power project, i.e. 0.062 percent of Vietnam’s total annual electricity generation in 2019. Thus, the model-based estimates of the output effect for the electricity sector (which includes indirect impacts due to the increased power demand of other expanding sectors) are closely in line with the figure suggested by this back-of-the envelope calculation.

Figure 1: Effects on Real Output by Domestic Production Sector
(Joint impact of all operational PIDG investments)



As shown in Figure 2, the additional supply due to the capacity expansion of the PIDG target sector entails a mild downward pressure on domestic producer prices in these sectors, while the indirect effects on output prices of other sectors are barely noticeable. Production cost reductions due to the drop in electricity prices are most pronounced for the water and other utility sectors, because these are sectors with a far higher share of electricity costs in total costs than all other sectors according to the GSO input-output data. However, even for these sectors the output price reduction is less than 0.05 percent.

Figure 2: Effects on Domestic Producer Prices
(Joint impact of all operational PIDG investments)



Note: Sectoral price changes are expressed relative to the domestic consumer price index (CPI).

Finally, Table 7 displays the decomposition of the total employment effects in terms of average-wage full-time-equivalent jobs by production sector. Most of the new permanent jobs attributable to the PIDG-supported infrastructure investments are in the labour-intensive manufacturing, wholesale and retail trade and other services sectors.

Table 7: Employment Effects by Sector
(Joint impact of all operational PIDG investments)

Sector	Average-Wage FTE Jobs			Percentage Change		
	Low $\epsilon = 0.5$	High $\epsilon = 1$	Extreme $\epsilon \rightarrow \infty$	Low $\epsilon = 0.5$	High $\epsilon = 1$	Extreme $\epsilon \rightarrow \infty$
aAGFOFI	1,147	1,820	6,100	0.010	0.016	0.054
aEXTRAC	15	23	74	0.006	0.010	0.031
aMANUFA	4,590	5,854	12,989	0.060	0.076	0.168
aRESBLD	411	549	1,358	0.034	0.045	0.111
aOCONST	527	705	1,756	0.033	0.044	0.111
aELECTR	24	31	70	0.013	0.017	0.038
aWATRSV	50	61	117	0.097	0.118	0.227
aOUTILS	48	59	122	0.070	0.087	0.180
aPORTSV	47	62	143	0.052	0.068	0.158
aOTRNSV	425	616	1,800	0.030	0.043	0.126
aSTORAG	65	89	231	0.037	0.050	0.131
aOTRADE	2,273	3,078	7,869	0.039	0.052	0.134
aPUBLSV	929	1,415	4,469	0.023	0.035	0.109
aOSERVI	1,773	2,422	6,303	0.040	0.055	0.143
Total	12,325	16,783	43,399	0.032	0.044	0.113

Appendix

Table A-1: Planned / Non- Operational PIDG Investment Projects in Vietnam

		Expected Date of Operation	PIDG Commitment (USD mill)	Other Investment (USD mill)
Cai Mep Port	PORTSV	<i>Jun-18</i>	10	0
Vietnam Water Supply Portfolio - Kim Lien Project	WATRSV		0.98	0.00
Vietnam Water Supply Portfolio - Thuy Nguyen Project	WATRSV	<i>Jun-12</i>	1.57	0.00
First Ninh Thuan (IASI)	ELECTR		9.00	0.00
Ho Chi Minh Infrastructure Investment JSC	OTRNSV	<i>Apr-21</i>	49.60	0.08
Nam Long Investment Company ('NLIC')	RESBLD	<i>Dec-27</i>	29.00	0.00
Vietnam Water Supply Portfolio	WATRSV	<i>Nov-20</i>	2.45	0.35
			102.6	0.43

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Annex 4: Evaluation framework

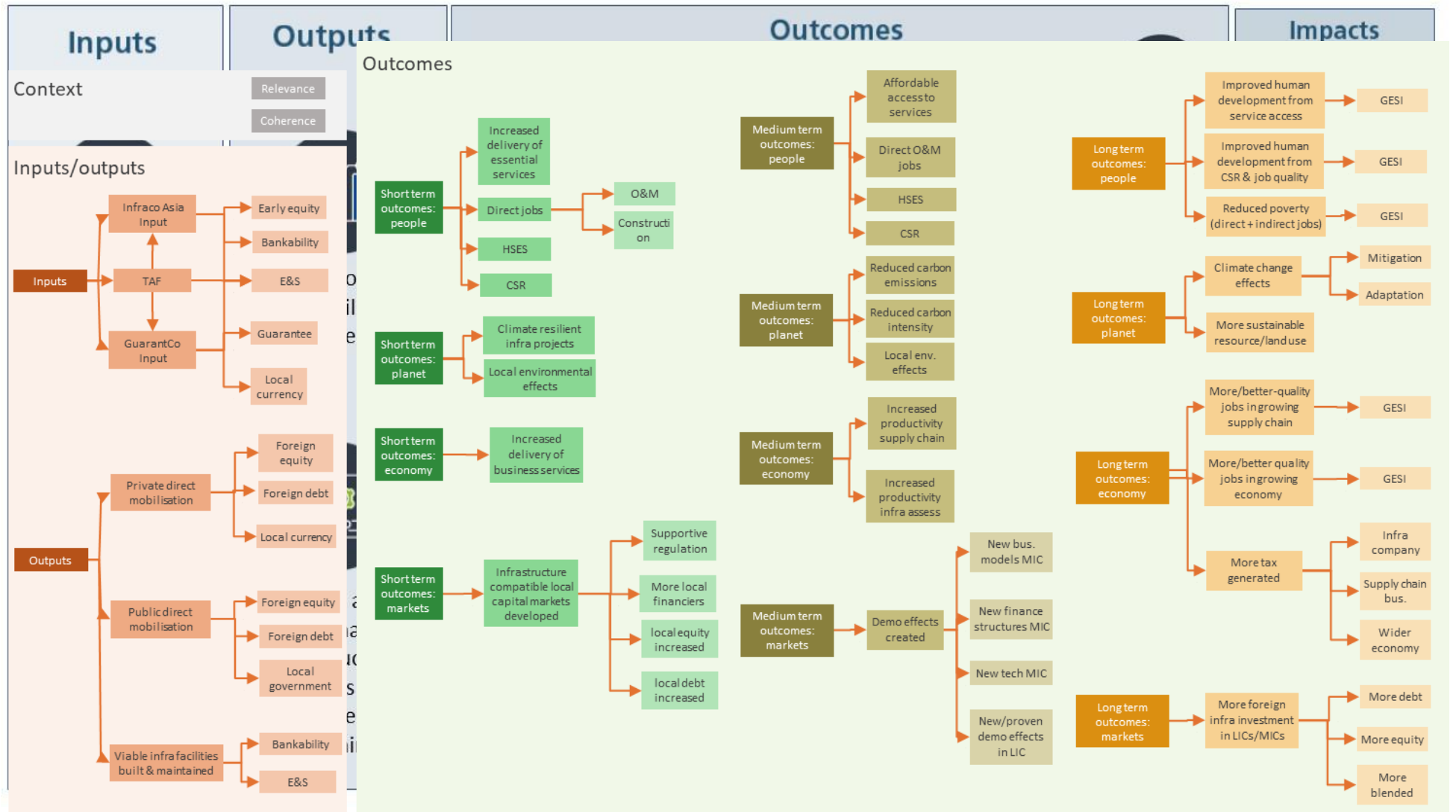
DAC criteria	Evaluation question	Sub-questions	Indicators	Methods	Source of evidence	Eval. stage
Microeconomic						
Impact, effectiveness	1. What impacts has PIDG had on the supply and characteristics of infrastructure projects?	1a. To what extent have the activities of the PIDG led to an increased supply of bankable infrastructure projects?	<u>Additional indicators:</u> Qualitative evidence that the number of bankable projects developed is increasing. Qualitative evidence of PIDG contribution to additional bankable infrastructure.	Semi-structured interviews.	PIDG employees, infrastructure investors, project developers, market experts, regulatory agencies, government ministries	Micro
		1b. To what extent have PIDG projects resulted in strengthened institutional and contractual private/PPP frameworks?	<u>PIDG Indicators:</u> Domestic Private Sector Investment of which (Commercial Equity and Commercial Debt) State-Owned/ Controlled Enterprises SoE Equity, SoE Debt.	Review of PIDG documents and data.	PIDG database (all projects).	Micro
		1c. What impact have PIDG projects had on the regulatory environment that government puts in place to support private sector investment in infrastructure?	<u>Additional indicators:</u> Regulatory changes reflect PIDG's work in supporting private sector investment in infrastructure, including sensitivity to priority groups.	Semi-Structured Interviews. Review of policy documents.	Regulatory bodies institutional standards, national policies (all countries).	Micro
		1d. To what extent have PIDG projects mobilised private sector co-investors?	<u>PIDG indicators:</u> Investment Mobilised.	Review of PIDG documents and data.	PIDG database (all projects).	Micro
Systemic						
Impact, effectiveness	1. What impacts has PIDG had on the supply and characteristics of infrastructure financing?	2a. To what extent have EAIF and GuarantCo influenced the loan tenors and conditions of local finance for infrastructure, including lending from local commercial banks and institutional investment?	<u>PIDG indicators:</u> Description of current context of local capital markets and any expected effect on local capital markets development, including sensitivity to priority groups. <u>Additional indicators:</u> Qualitative evidence of the link between perceived evidence and PIDG investments.	Review of PIDG documents and data. Review of investment and policy documents. Semi-structured interviews.	PIDG database (all projects). Investment Credit Committee papers, policies and regulations. Investee firms and financial institutions.	Macro - study
		2b. To what extent have PIDG projects affected (positively or negatively) the availability of local currency for infrastructure projects?	<u>PIDG indicators:</u> Sum of domestic commercial finance mobilised (equity/ debt). <u>Additional indicators:</u> Increase in capital flows to [relevant sector] infrastructure investments in sampled country.	Review of PIDG documents and data. Review of investment documents.	PIDG database (all projects). Investee firms, infrastructure investors, local financial institutions	

		2c. To what extent has the PIDG indirectly mobilised private investment	<u>Additional indicators:</u> Qualitative evidence on demonstration effects created by PIDG projects	Document review Semi-structure interviews	Industry publications PIDG employees, infrastructure investors, market experts	Micro/macro studies
Beneficiary						
	1. To what extent have PIDG projects contributed to poverty reduction?	3a. What has been the direct contribution of PIDG projects in terms of access to increased/improved and affordable infrastructure for beneficiary households, paying particular attention to vulnerable groups?	<u>PIDG indicators:</u> Number of Additional People Served [by infrastructure]; of which: Female: Male. Direct jobs created (short-term effects during construction, long-term effects during operation). <u>Additional indicators:</u> Number of People Below Poverty Line.	Review of PIDG documents and data. Secondary data	PIDG and PIDG investee data, disaggregated by priority groups. Project feasibility studies. National statistics	Micro
		3b. What has been the direct contribution of PIDG projects in terms of increase in direct employment and employment within the supply chain?	<u>Additional indicators:</u> Number of jobs created indirectly within firms in investee supply chain. Quality of jobs created.	Survey Semi-structured interviews	Surveys of users and businesses (sample of projects), disaggregated by priority groups. investee firms, supply chain firms, infrastructure investors.	Micro
		3c. To what extent have PIDG interventions enabled better outcomes for poor and vulnerable (e.g., women and girls) people through improvements to business climate (enabling entrepreneurship)?	<u>Additional indicators:</u> Qualitative evidence that priority groups are more able to overcome obstacles in business enabling environment.	Survey FGDs	Surveys of users/households (in selected projects), disaggregated by priority groups. CBOs, local communities	Micro
		3d. What have been the net, indirect impacts on poverty of PIDG investments at the national level?	<u>Additional indicators:</u> Quantitative evidence of change in national poverty levels as a result of infrastructure investment	CGE modelling	National statistics; academic studies	Macro - CGE
Macroeconomic						
Impact, effectiveness	1. To what extent have PIDG projects contributed to jobs and productivity growth?	4a. What has been the direct contribution of PIDG projects in terms of access to increased/improved infrastructure for businesses and entrepreneurs?	<u>PIDG indicators:</u> Access to infrastructure. <u>Additional indicators:</u> Qualitative evidence of link between PIDG and improved access to infrastructure for businesses.	Review of PIDG data Survey Semi-structured interviews FGDs	PIDG database, disaggregated by priority groups. Survey of businesses (in selected projects), disaggregated by priority groups. investee firms, infrastructure investors, EAIF, GuarantCo, managers of the grid. Business organisations	Micro

		4b. What has been the direct contribution of PIDG projects in terms of tax effects within infrastructure and related businesses?	<u>PIDG indicators:</u> Taxes paid to Govt (e.g. Corporation Tax, VAT) during first 5 years of operation. Direct long-term jobs created during operations.	Review of PIDG documents and data.	PIDG and PIDG investee data, disaggregated by priority groups.	Micro
		4c. To what extent have PIDG projects supported the growth in renewable energy?	<u>Additional indicators:</u> Percentage change in productivity of firms in supply chain in renewable energy sector. Percentage growth in renewable energy in sampled country.	Review of secondary evidence: company financial data, Energy authority statistics.	Economic research. Managing authorities.	Micro
		4d. What have been the net, indirect impacts in employment and productivity growth at the national level	<u>Additional indicators</u> Quantitative evidence of change in national employment and business growth as a result of infrastructure investment	CGE modelling	National statistics; academic studies	Macro - CGE
All						
Sustainability	1. To what extent are the results PIDG has contributed to sustainable?	5a. How will direct impacts of investments change after PIDG exits?	<u>Additional indicators:</u> Evidence of viability of infrastructure Qualitative evidence of PIDG strategies to maintain impacts after exit	Semi-structured interviews	Project developers, PIDG employees, market experts	Micro
		5b. How will indirect impacts change after PIDG exits?	5a results	Extrapolation of 5a findings to macro impacts	5a + CGE modelling	
Relevance, coherence	1. To what extent are PIDG investments additional?	6a. To what extent are PIDG investments financially additional?	<u>Additional indicators:</u> Qualitative evidence that project would not have been funded without PIDG. Qualitative evidence of improved investor sentiment for infrastructure projects in PIDG markets and Improved capital flows.	Semi-structured interviews.	PIDG employees, investee firms, infrastructure investors,	Micro
		6b. To what extent are PIDG investments additional in a non-financial sense?	<u>Additional indicators:</u> Qualitative evidence that infrastructure beneficiaries would not have received access without project	Semi-structured interviews; FGDs	Local beneficiaries, investee firms, co-investors, CBOs, business organisations	Micro
	1. To what extent are PIDG facilities, individually and collectively, appropriately designed to	7a. Have PIDG companies been well designed to address the key constraints to infrastructure development in target countries?	<u>Additional indicators:</u> Qualitative evidence of contribution of each PIDG facility.	Semi-structured interviews	PIDG employees, investee firms, infrastructure investors, regulatory bodies and government, beneficiary firms	Micro
		7b. Given potential changes to needs and constraints in the future, to what extent do PIDG companies need to adjust?	<u>Additional indicators:</u> Evidence of trends in needs and future challenges in PIDG contexts	Review of secondary research Semi-structured interviews	Socioeconomic and political research in PIDG contexts PIDG employees; market experts, DFIs/MDBs	Micro

	achieve their objectives?	7c. How has the shift to 'One PIDG' affected companies' effectiveness, and how can it support this in the future?	<u>Additional indicators:</u> Qualitative evidence of synergies between PIDG companies. Qualitative evidence of opportunities and challenges for future collaboration between PIDG companies.	Semi-structured interviews	PIDG employees; market experts, DFIs/MDBs	Micro
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Annex 5: PIDG ToC



Annex 6: Coding framework

Annex 7: Sample evaluation interview guides

Project-level stakeholders

Interview logistics

- ~1 hour
- Online – Microsoft Teams or Zoom
- Questions sent in advance
- Discussions treated confidentially in line with GDPR guidelines
- Interview inputs fed into overall analysis

General question areas (for all cases and interviewees, but tailored to their role/perspective)

- Case for project relative to alternatives (need) and activities of other institutions (gap)
- Project objectives and barriers to realizing these
- Additionality/overall contribution of PIDG relative to other factors
- Additionality/contribution of specific PIDG inputs in shaping project relative to other factors
- Contribution of PIDG to specific outputs, outcomes and impacts relative to other factors
- Sustainability of project results and contribution of PIDG in this regard

Case specific question areas (again, tailored to role/perspective of different interviewees)⁸²

1. Ninh Thuan Solar Power
 - Value/additionality of early-stage equity
 - Value/additionality of credit enhancement mechanism
 - Value/additionality of PIDG input to PPA modification
 - Value/additionality of project development with Sunseap
 - PIDG role in mobilising equity and debt
 - Demonstration effects created (or expected to be) and PIDG’s role relative to other factors
2. Coc San Hydro Power Project
 - Rationale for reviving project (e.g. value of objectives and business case strength)
 - Value/additionality of equity investment
 - Value/additionality of PIDG inputs to project restructure
 - Value/additionality of PIDG inputs to completion of project development
 - Value/additionality of PIDG inputs on World Bank environmental standards
 - PIDG role in mobilising debt financing
 - Demonstration effects created (or expected to be) and PIDG’s role relative to other factors
3. Ho Chi Minh Infrastructure Investment
 - Rationale for road construction in context of larger national network & local development in HCMC and Mekong Delta
 - Value/additionality of GuarantCo guarantee for bond issuance (overall)
 - Value/additionality of GuarantCo inputs to structure and implementation of issuance
 - PIDG role in identifying and attracting target investors (long-term domestic)
 - Value of attracting this type of investor for local capital market development

⁸² We will be looking at results/impacts separately for each case. The aim of the interviews is therefore to gather evidence on PIDG’s contribution to these impacts relative to other factors, rather than focus on the impacts themselves.

- Demonstration effects created (or expected to be) and PIDG’s role relative to other factors

TLMT businesses beneficiaries

I. General business context and current situation

1. Could you please provide and describe about investment (vốn đầu tư)? personnel, i.e. male and female differences of key people at the company; male and female differences of workers?
2. In term of your company (group)’s businesses’/cooperatives activities, what products is your company producing/how many members do you currently have?
3. What is the general situation of this product in Vietnam and the Mekong Delta, especially in the Mekong Delta? (in terms of output, trade value, market; export turnover value)
4. Could you please list the difficulties in accessing the market? Of the difficulties you listed, what are the difficulties related to road transport? Are there markets you would like to access more?

II. Potential benefits of the highway project

5. How does your company ship/transport to the market? How often? Where do the products go? Could you estimate the cost?
6. (Introducing/describing the Trung Luong- My Thuan), have you heard about the project? What benefits does your company benefit from this project?
7. How do you think the project will contribute to the development of the Mekong Delta in the general and your company in the specific? Especially the barriers to accessing the markets in Ho Chi Minh City and widens markets in Vietnam/other countries? In particular related to gender and social inclusion
8. Does your company plan to grow/develop in size, business and market as shipping/transportation issues tend to get better?
9. What else do you think the project would benefit to your company’s businesses? Please explain?



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