Evaluating the impact of British International Investment's Infrastructure Portfolio

Final Synthesis Report

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Date: December 2025

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Acronyms and abbreviations

AI	artificial intelligence
AWID	Africa Water Infrastructure Development
BESS	battery energy storage systems
BII	British International Investment
BOLD	Black Ownership and Leadership for Development
C&I	commercial and industrial
CCGT	combined cycle gas turbine
CI2	Climate Investor Two
CSP	concentrated solar power
DFCD	Dutch Fund for Climate and Development
DFI	development finance institution
DI	development impact
DRC	Democratic Republic of the Congo
EDFI	European Development Financial Institution
e-mobility	electric mobility
ESG	environmental, social and governance
FCDO	Foreign, Commonwealth & Development Office
FPEL	Fourth Partner Energy
FTTH	fibre to the home
GDP	gross domestic product
GHG	greenhouse gas
HFO	heavy fuel oil
I&C	infrastructure and climate
ICT	information and communications technology
IDA	international development association
IPP	independent power producer
ISP	internet service provider
km	kilometre
KPI	key performance indicator
KWh	kilowatt hour
Liquid	Liquid Intelligent Technologies
m^3	cubic metre(s)
Metro	Metro-area Ethernet
MFA	multifactor authentication
MNO	mobile network operator
MW	megawatt

MWh	megawatt hour
ND-GAIN	Notre Dame Global Adaptation Initiative
OCGT	open cycle gas turbine
ODA	official development assistance
OECD	Organisation for Economic Co-operation and Development
OPIM	Operation Principles for Impact Management
PSI	productivity, sustainability and inclusivity
PURE	productive use of renewable energy
PV	photovoltaic
SARA	Sustainable Asia Renewable Assets
SDG	Sustainable Development Goal
T&D	transmission and distribution
tCO_2e	tonnes of carbon dioxide equivalent
TURF	The Urban Resilience Fund
UN	United Nations
USAID	United States Agency for International Development
WASH	water, sanitation and hygiene

Foreword

Regular, longer-term evaluations of British International Investment's (BII's) impact are critical to help FCDO and BII better understand how, and in what contexts, BII's investments deliver tangible, sustainable development impact on people, businesses, sectors and overall economies.

I am pleased to introduce this report, presenting combined findings of a portfolio-wide evaluation and subsequent in-depth studies on BII Infrastructure portfolio, published as part of the wider FCDO-BII Evaluation and Learning Programme.

Infrastructure is vital to facilitate trade, economic growth and job creation in the UK and internationally. BII's investments have an important role in laying the foundations for decarbonised and resilient economies, to remove major constraints to growth such as poor electricity and connectivity, and to address infrastructure financing gaps in development markets.

This timely final synthesis compiles a valuable set of evidence and recommendations to help inform the direction of BII's approach to infrastructure across BII's next 5-year strategy period. It is encouraging to note the evaluators findings that BII's infrastructure portfolio is: addressing critical gaps in emerging markets; mobilising private capital to support essential infrastructure that drives inclusive economic growth and productivity; and assuming risk that many other Development Finance Institutions (DFIs) cannot. The FCDO is proud that BII is a leader amongst DFIs in investing in the riskiest places with the highest development needs.

This final synthesis makes a number of important recommendations for how BII can work to improve impact in its approach to investing in infrastructure, build on systems-based approaches and monitor and evaluate sustainable and inclusive impact. The FCDO will work with BII to reflect the questions raised in the report's findings in the future approach to evaluations.

I wish to thank the independent evaluators at ITAD and Steward Redqueen for their work, and to colleagues who sit on the FCDO-BII Evaluation and Learning Steering Group who have provided valuable guidance on the direction of this work.

Professor Dennis Novy

Chief Economist and Director of Analysis, Foreign, Commonwealth & Development Office (FCDO)

Executive summary

Purpose and scope of the evaluation

This evaluation was commissioned by the UK's Foreign, Commonwealth & Development Office (FCDO) to support both accountability and learning. Its core aim is to assess the development impact of British International Investment's (BII's) infrastructure investments, examining not only what has been achieved but also how BII's actions and instruments contribute to these outcomes. The evaluation places particular emphasis on understanding investing for impact: that is, how BII's investment choices, practices and tools (such as the impact score and technical assistance) influence the quality and depth of infrastructure-related development outcomes. The evaluation does not seek to assess broader market-level or strategic factors influencing BII's infrastructure investment approach, except where these are directly relevant to observed development outcomes. The work is intended to support reflection and learning within BII and to provide evidence that can inform future strategy, impact management and evaluation approaches.

Headline conclusions

BII's infrastructure portfolio targets critical gaps in emerging markets, where access to finance is limited and bankable projects are scarce. Through a mix of financial instruments, investment strategies and partnerships, BII assumes risks that many other development finance institutions (DFIs) cannot, mobilising private capital while supporting essential infrastructure that drives economic growth, productivity and inclusion.

This synthesis draws on a comprehensive review of BII's infrastructure portfolio, five in-depth studies, and interviews with a broad cross-section of BII staff. It is important to acknowledge that this evaluation is necessarily constrained by the relatively small number of in-depth assessments conducted across a large and diverse portfolio; although it incorporates evidence generated by BII, it cannot capture the full breadth of BII's ongoing monitoring at the individual deal level. The conclusions and recommendations presented here should therefore be understood within this context; they are informed by a broad body of evidence and supported by the evaluators' experience in development finance and private sector engagement.

The standout conclusion is that BII's expanded 2022 mandate, encompassing both development and climate objectives, has revealed genuine trade-offs. Although these goals can align, they often diverge. The evaluation highlights the need for a differentiated approach, which prioritises development impact in frontier markets (alpha and beta countries), where infrastructure needs are most urgent, and focuses on climate objectives in more mature markets (gamma and delta countries), which are better positioned to support low-carbon transitions. Frontier economies must grow to build resilience against climate risks, whereas advanced markets offer the greatest opportunity to mitigate emissions. Attempting to achieve both outcomes through a single strategy is unlikely to succeed – a challenge encapsulated by the Tinbergen rule, which emphasises the necessity of one policy instrument per policy goal.

BII's infrastructure portfolio

As of end-2024, infrastructure investments accounted for $3.3 billion (36%) of BII's total $9.2 billion portfolio. Since 2007, BII has committed $6.9 billion to 202 infrastructure investments, with a median investment size of $15 million and an average of $34.3 million. From 2012 onwards, BII transitioned from a fund-of-funds model to growing its direct equity and debt infrastructure portfolio, with 61% of infrastructure investments made through equity. The power sector dominates, comprising $3.3 billion (59%) of the infrastructure portfolio, followed by telecoms ($1.03 billion) and transport ($491 million). Within power, independent power production makes up one-third of the overall infrastructure portfolio. BII has also invested significantly in platforms and partnerships, totalling around $1.7 billion, including ventures such as Globeleq, Gridworks and Ayana. Geographically, 72% of commitments since 2012 have been in Africa and 28% in Asia.

BII's infrastructure and climate (I&C) strategy

BII's I&C strategy has evolved over the course of the evaluation period. BII's first I&C strategy (2017–21) set out an ambition to create jobs and remove major constraints to growth, such as poor electricity and connectivity, allowing businesses to be more productive and competitive. The 2022–26 strategy builds on this, aiming to: (i) support the energy transition through utility-scale renewable energy generation; (ii) expand access to energy via decentralised solutions such as minigrids and home solar in underserved areas; (iii) strengthen electricity systems through improved transmission and distribution (T&D) networks; (iv) improve connectivity and competitiveness through investments in ports, transport and logistics infrastructure; (v) build climate resilience and inclusive services through water, sanitation and hygiene (WASH) services; (vi) provide access to urban I&C technology; and (vii) increase connectivity and productivity through information and communications technology (ICT). The 2022–26 strategy also broadens BII's previous focus on Africa and South Asia, to include Southeast Asia and other official development assistance (ODA)-eligible countries, while focusing on BII's role in mobilising private capital.

In the 2022–26 strategy, BII replaced the development impact (DI) grid with a new impact score, which evaluates each investment across three pillars: productivity, sustainability, and inclusivity. BII now scores each prospective investment against these categories and conducts follow-on scoring every two years (or every year for platforms) over the investment's lifetime, using the same key performance indicators (KPIs) as the *ex ante* assessment. The impact score is designed to recognise and incentivise investments that are likely to contribute most to BII's three strategic impact objectives. It also complements detailed assessments in investments' impact dashboards by providing a quantitative metric that can be aggregated and used to monitor and analyse strategic impact performance across the portfolio.

Evaluation methodology

The evaluation was delivered in two phases:

- Phase 1 involved a portfolio-wide review and evidence synthesis which covered all BII's infrastructure commitments made between 3 December 2007 and 30 August 2020. This review mapped the portfolio against impact pathways and highlighted areas where BII could strengthen its evidence base. This review was subsequently updated with new data to 31 December 2024.
- Phase 2 collected additional evidence through five in-depth studies, chosen for their relevance to BII's portfolio and strategic priorities; they covered independent power producers (IPPs), rural electrification (including renewable minigrid), broadband fibre access, port infrastructure, and commercial and industrial (C&I) renewable energy. Each study combined qualitative and quantitative methods, drawing on a mix of stakeholder interviews, secondary data analysis and targeted primary research.

Summary of findings from the five in-depth studies conducted during the evaluation

Economic and climate impacts of IPP investments[1]. This study assesses how investments in utility-scale IPPs across six African countries contribute to gross domestic product (GDP) (through outage reduction and power cost efficiency) and greenhouse gas (GHG) emissions mitigation. By analysing 38 country/technology combinations, the study finds that identical investments can yield very different outcomes, depending on national power system dynamics. Although renewable power is well suited to avoid GHG emissions across all countries (albeit to different extents), its limited ability to avoid outages in countries such as Kenya causes it to have limited economic impact. In contrast, in South Africa outages are so prevalent that cheap solar power helps reduce them and thereby increases GDP. Solar with battery is even more effective to increase reliability, but the higher cost makes it much less cost-effective on a per

[1] BII (2025) Development and Climate Impact of Power Investments across Africa

dollar basis, especially when compared with cheap firm power solutions (e.g. open cycle gas turbine). Transmission investments, such as in Western Kenya, emerge as highly impactful per dollar, both in terms of GDP and GHG avoidance impact, by relieving local grid bottlenecks and reallocating existing generation more efficiently.

Impact of rural electrification[2]. This study evaluates the livelihood impact of BII's investment in Virunga Energies, which operates a hydroelectric minigrid in North Kivu, Democratic Republic of the Congo (DRC). The investment is found to be effective in opening access to populations previously underserved by electricity; this is confirmed through analysis of satellite data. It has exceeded its original target, achieving 25,856 new connections against an initial target of 10,000–12,000. The study finds that access to electricity is associated with improved household asset wealth: for households connected for the first time, asset wealth has increased from the 79th to the 86th percentile between 2017 and 2021 (based on synthetic control analysis of geospatial asset data).

Impact of broadband fibre access[3]. This study examines the livelihood impact of BII's investment in Liquid Intelligent Technologies (Liquid), a backbone fibre infrastructure provider, focusing on DRC. The objective of the study was to understand whether expanded broadband access leads to improved connectivity and living standards for surrounding communities. The study finds that in connected areas, standards of living improved more than in unconnected areas: after four years of being connected, average spending in connected regions went up by $1.25 per day versus $0.30 in the unconnected areas, although the result is not yet statistically robust and therefore, causality cannot be inferred.

Impact of port expansion[4]. This study investigates the economic effects of BII's investment in the expansion of Berbera Port, Somaliland, delivered through a joint venture with DP World. The objective was to use available secondary data and information from the investee to assess improvements in port capacity, trade flows and wider economic benefits in Somaliland and eastern Ethiopia. Using a modelling approach based on industry benchmarks, the investment is found to have produced significant transport cost reductions for users – estimated at $8.4 million overall and $6.9 million for new port users in 2024. The investment is also contributing significantly to the economy of Somaliland. In 2024, the upgraded port and its surrounding ecosystem, including DP World Berbera's operations, local supply chains and the linked Berbera Economic Zone, are estimated to support a total of around 2,490 jobs and $45.1 million in local value addition. When adjusted for the proportion of container traffic (around 37%) that is considered additional since 2017, and would not have materialised without the expansion of the port, these figures for 2024 are 921 jobs created and $16.7 million in additional value added.

Impact of C&I renewable power[5]. This study evaluates BII's investment in Fourth Partner Energy (FPEL), a provider of renewable energy solutions to C&I clients in India. The objective is to understand why firms adopt C&I solar and to evaluate the resulting development and environmental impacts. The study finds that firms are adopting C&I solar solutions primarily to meet sustainability goals and on cost grounds rather than to improve supply reliability. Drawing on a modelling-based approach, the study finds that switching to cleaner and cheaper electricity results in GHG avoidance for FPEL clients of approximately 3.23 million tonnes of carbon dioxide equivalent (tCO_2e) per year and (based on average cost savings of 30%) results in a 3% increase in output, equivalent to $344 million in additional value added annually.

Assessment of implementation against BII's strategic priorities

Productive impact

Infrastructure is foundational to building viable private sector economies, with all developing countries prioritising it in development plans. BII scores an investment's potential to raise productivity in an

[2] BII (2025) Evaluating the Impact of a Hydroelectric Power Investment in the Democratic Republic of the Congo

[3] BII (2025) Evaluating the impact of BII's investment in broadband fibre infrastructure in DRC

[4] BII (2025) Evaluating the impact of BII's investment in ports in Somaliland

[5] BII (2025) How does BII's investment in C&I power impact India's energy transition and create economic value? Insights from FPEL

economy through its productive score, which is based on four elements: (i) relative degree of need; (ii) intensity; (iii) economic enablers; and (iv) potential to catalyse markets.

Relative degree of need

BII scores countries based on their relative degree of need, using a granular approach across infrastructure subsectors. Example indicators include access to power, and access to basic drinking water.

The portfolio review analysed BII's targeting to relative degree of need in 2020, prior to the introduction of the impact score and this needs-based approach. It grouped countries and investments by quintile based on indicators of need and found that BII targeted investments especially well in the power and telecom subsectors but made relatively more transport investments in countries where the need was less. This analysis suggested that the use of country-based scores can mask large variations, especially in larger countries, and that a more fine-grained assessment of need may be necessary to improve targeting in certain sectors.

Phase 2 in-depth studies support this view. In many subsectors, such as large-scale independent power production, ports, power transmission, and internet backbone or data centres, a country-level or subsector-level assessment is likely to suffice. However, for other areas, including minigrids, home solar, and mobile towers, **we recommend BII apply a more fine-grained assessment of relative need where feasible**. BII may now conduct such analyses at a deal level on a case-by-case basis, but this was outside the scope of this evaluation. We also recommend that in the telecoms subsector **BII continue to take a differentiated approach, investing in backbone internet coverage in the few regions where it is still insufficient** (for example, in the Horn of Africa), in order to improve productive use of communications infrastructure, but that BII continue the shift towards improving utilisation of existing infrastructure and improving market structures elsewhere.

Intensity

BII measures how efficiently investments deliver impact relative to benchmarks, using default scores where no benchmarks exist.

Phase 2 studies found that it is feasible to model GDP and job creation impacts for IPPs, transmission and ports largely from secondary sources, using a variety of techniques. For example for IPP investments, GDP impact per million dollars invested was modelled for all country/technology combinations, and it was found that GDP impact per million dollars invested varies widely by technology and country.

BII can be more specific about the intensity of impact across similar investments such as IPPs, and **we recommend that BII measure the intensity of economic and climate impact delivery across comparable infrastructure investments by considering investment costs**. Such comparisons are less relevant in the case of large infrastructure investments such as ports, given the limited number and unique nature of such investments across the portfolio. In terms of comparing GHG avoidance across investments, BII already measures this for IPP and electric mobility (e-mobility) investments.

Economic enablers

Economic enablers are productive inputs that are required by other firms. Improving the quality or reducing the price of these inputs enables growth of companies. This is especially true for infrastructure investments. BII awards economic enabling points to investments in grid power generation, transmission and C&I, except in markets where reliable electricity is already widely available at a low cost; in these cases, BII's DI thesis will typically focus more on decarbonisation.

Phase 2 findings highlight how the economic enabling effect of different power generation technologies varies by country and technology type. Dispatchable technologies such as gas and geothermal tend to have a stronger enabling effect on economic activity than non-dispatchable sources such as solar or wind without backup. Integrating renewables into national grids also involves higher costs up front, posing financing challenges in lower-income contexts.

C&I power solutions can enable firms to reduce energy costs and increase output, particularly where they are cheaper than grid electricity. Their relevance and impact depend on both the type of C&I solution and the broader context in which they are deployed.

As shown in the in-depth study of renewable C&I power in India, off-site solutions, such as open access solar and wind, can scale rapidly and provide significant generation capacity when there is a reliable national grid, strong energy demand and a supportive regulatory environment. These solutions not only offer economic benefits through increased output but also support the transition to green energy. In contrast, in settings where grid reliability is lower (such as in Nigeria), on-site solutions such as rooftop solar can enhance energy security by providing a more stable power supply.

Targeted investments in off-grid power solutions, such as renewable minigrids, are particularly effective in underserved or remote areas. These investments have been shown to improve electricity access and enhance household living standards, for example through increased asset ownership.

Overall, the greatest opportunities for BII to achieve economic enabling impact lie in alpha and beta countries, where infrastructure gaps are widest and private capital is least available. In these markets, BII can play a catalytic role by addressing deep market constraints and unlocking broader socioeconomic transformation. **We therefore recommend that BII prioritise economic development in frontier (alpha and beta) markets while continuing to prioritise climate mitigation in more mature emerging (gamma and delta) markets.** To do this, we further **recommend that BII develop high-level plans for a select number of regions** on how to increase availability and reliability of power supply (generation and transmission) while minimising GHG emissions.

Potential to catalyse markets

BII identifies five pathways to catalyse markets: demonstration effects, market infrastructure development, policy and regulatory engagement, capacity building, and promoting innovation.

The portfolio review highlighted BII's platform development strategy (e.g. DP World collaboration) and its willingness to invest early in project development as critical to catalysing markets, especially where bankable projects are scarce. BII's ability to take investment risks avoided by others helps initiate projects that attract further investment.

BII's approach has continued to evolve. BII's Catalyst Strategies support high-risk, early-stage opportunities to crowd in private capital, and in the 2022–26 strategy these have expanded to include thematic strategies such as Gridworks, Energy Access and Efficiency, and Greenovate. BII Plus, launched in 2018, has evolved from supplementary support to a core component, providing pre-investment readiness, post-investment value addition, capacity building, and field-building initiatives such as 2X Global. Finally, the Kinetic Portfolio, introduced in 2021, complements the Growth and Catalyst Portfolios with higher risk tolerance and concessional capital; it has three facilities which target climate innovation, mobilisation of private capital and investments in low-income African countries.

Phase 2 studies support the conclusion that one of the most important contributions to market catalysation by BII is its platform investment strategy. Alongside the equity stakes that BII takes in these platforms, the different pools of capital that BII can deploy add to its ability to make catalytic investments. **Although hard currency debt has historically provided better return profiles, we recommend that BII continue its equity investment in platforms.** In sub-Saharan Africa, platforms help address the scarcity of bankable projects – often a bigger constraint in these markets than capital. In Asia, platforms serve to mobilise commercial capital by originating greenfield infrastructure that can be transferred to investors seeking long-term exposure without assuming development risk.

Sustainable DI

The 2022–26 strategy has seen a significant shift in focus to climate-smart objectives, with BII aiming for at least 30% of all new commitments (by value) qualifying as climate finance investments. BII's sustainable score aims to incentivise investments that contribute towards the transition to net zero and climate-resilient economies.

The portfolio review highlighted that annual climate finance allocations within the infrastructure portfolio have been well above the 30% target every year since 2019. Most of this climate finance is in the power subsector, especially IPPs and C&I power, where GHG emissions avoidance is most quantifiable. The bulk of BII's climate finance goes towards mitigation (the net zero transition), with much less going to adaptation (climate-resilient economies).

Climate mitigation and net zero transition

Phase 2 studies show that the emissions avoidance potential of renewable energy investments depends on both the technology used and the country context. Avoided emissions increase with the number of hours for which renewable plants displace fossil fuel-based generation and with the carbon intensity of the fossil sources being replaced. This means that technologies with high availability (e.g. geothermal, concentrated solar power (CSP) with storage) can achieve the greatest emissions reductions, particularly in countries where fossil fuels are a major source of baseload power.

The cost-effectiveness of emissions avoidance also depends on capital costs. For example, although CSP may avoid more emissions per megawatt (MW) installed than solar photovoltaic (PV), its much higher cost – often five times more expensive – means it delivers only around one-third as much avoided emissions per dollar invested.

There is a trade-off between short-term emissions efficiency and long-term innovation. BII's catalytic role may justify investment in emerging or unproven technologies, such as battery energy storage systems (BESS) in South Africa, even if they do not offer the lowest emissions reduction per dollar today. By supporting early deployment, BII can help drive cost reductions and create future system-wide benefits.

C&I solar is found to be an important enabler of the green transition, especially when targeted at firms that would otherwise rely on high-emissions grid power. However, its effectiveness at scale depends on several factors: a supportive regulatory environment, access to finance and reliable grid infrastructure to integrate and balance supply.

BII's expansion into Southeast Asia opens a large universe for meaningful decarbonisation, which places renewed emphasis on capital efficiency, catalytic effect and private capital mobilisation.

We recommend that **emissions avoided per million dollars continues to be a key indicator in BII's sustainable impact score**. This indicator will help BII allocate capital towards countries where decarbonisation potential is largest. We also recommend that **BII continue, and if possible increase, investment in T&D and C&I to support the green transition in suitable contexts** – particularly in parts of South and Southeast Asia – while recognising that the model may be less applicable in African markets, where grid stability is lower and capital availability more constrained.

Climate adaptation and resilience

Investing in adaptation is inherently more difficult than mitigation, because its benefits are long-term and hard to quantify. Many adaptation interventions, especially in infrastructure, tend to be led by the public sector, with more limited involvement by the private sector. To gain an indication of how well its capital is targeted to the most climate-vulnerable countries, BII maps its investments against country vulnerability and adaptation readiness.

The portfolio review highlighted that most (63%) of BII's disbursed capital went to countries that are most vulnerable to, and least ready to manage, the effects of climate change. The three largest countries in BII's portfolio – India, South Africa and Egypt – have lower vulnerability and/or slightly better readiness but still require significant finance to adapt.

Nevertheless, identifying bankable adaptation-focused investment opportunities is not straightforward. One area of opportunity for BII is in expanding the use of infrastructure services, such as its ongoing focus on handset financing, because this can have an important role in increasing access to information from climate information and early warning systems. In addition, a greater focus on WASH is likely to play a key role in increasing the adaptation portfolio, and this is an area that BII has identified as a strategic priority in its 2022–26 strategy. Up to now, DFIs (including BII) have found it difficult to identify, develop and commercialise investments in this space. However, BII has recently drawn on its platform model to launch the Africa Water Infrastructure Development (AWID) platform.

Although we recognise the difficulty of making private sector infrastructure investments in climate adaptation, **we recommend that BII increase the share of its infrastructure climate finance that goes to adaptation**. BII should continue to deploy capital to the most vulnerable and least ready countries and on deals elsewhere that catalyse or mobilise finance from the private sector into investments which have a focus on adaptation.

Inclusive DI

Infrastructure investments have the potential to contribute meaningfully to inclusive development, but their impact is often indirect. BII's inclusive score is determined by the extent to which an investment (i) reaches low-income populations, (ii) targets poor and fragile countries, and (iii) supports gender and diversity objectives.

Reach to low-income populations and poor and fragile countries

The portfolio review found that BII's infrastructure investments most commonly contribute to inclusive impact by expanding access to affordable and reliable services, such as electricity, at scale. However, it also noted that the evidence for the depth of inclusive impact was often limited. In response, the review recommended that BII adopt a more intentional, data-driven approach to identifying and enhancing its impact on low-income populations.

Under the 2022–26 strategy, BII introduced an inclusion score into its impact score framework, which now explicitly considers the extent to which investments reach people living on less than $6.85 per day. Measuring this type of reach is especially challenging in infrastructure, where investments are often many steps removed from the end users. In cases where direct measurement is not feasible, BII applies a default score based on the income level of the country.

Phase 2 studies highlight that inclusive impact is easier to assess, and evidence is easier to obtain, when there is a clearer line of sight to end users. For example, the in-depth study of a hydroelectric minigrid investment in Eastern DRC used geospatial data to estimate how many lower-income households were served, offering a model for future evaluations.

We recommend that BII continue to look for opportunities to improve infrastructure access to underserved communities. This goes beyond providing hard infrastructure and includes, for example, handsets for internet access, e-mobility bikes and scooters for productive use, and solar water pumps for crop irrigation.

Gender and diversity

Gender and diversity also remain difficult areas to assess in large-scale infrastructure investments. BII now systematically screens all investments against the 2X gender lens framework and BII's own Black Ownership and Leadership for Development (BOLD) framework, applied where regionally relevant. A 25% target has been set for 2X-qualified investments at the portfolio level under the 2022–26 strategy. However, structural barriers in infrastructure – a male-dominated sector – limit the contribution the portfolio can make to this target.

Given the difficulty of demonstrating reach to female end users in large infrastructure projects (such as utility-scale power or ports), BII's gender focus has shifted towards leadership and employment within investee companies. This includes encouraging greater female participation in management and operations, even where this falls short of formal 2X thresholds.

The BOLD framework, although used in internal scoring, has proven harder to apply portfolio-wide, owing to BII's partnerships with large (often global) sponsors in the infrastructure portfolio. Nonetheless, opportunities remain to target more inclusive local players, such as H1 in South Africa, where both gender and racial diversity in leadership are present.

We recommend that BII continue to look for opportunities to maximise gender and diversity impact where it can across the infrastructure portfolio. This is likely to include supporting existing initiatives by investees (such as initiatives to enhance female participation), looking for opportunities to 'nudge' investments in the right direction (especially where BII has leverage through its platform investment strategy), leveraging the work of BII Plus (such as through the new Gender & Diversity Advisory Programme), and deploying new levers such as impact-linked finance.

Impact trade-offs

BII must navigate trade-offs between financial returns, economic productivity and climate mitigation. Evaluating the balance between GDP impact and emissions avoidance is especially complex in power generation. In low-income countries with unreliable grids, investing in firm capacity[6] is often prioritised to support growth, even if it means higher emissions in the short term. Conversely, investments in renewable energy offer more straightforward emissions savings in countries such as India and Southeast Asia, where financing is easier to obtain. BII manages these tensions partly by allocating higher risk and concessional capital through its Catalyst and Kinetic windows.

We recommend that BII continue to emphasise economic development in alpha and beta markets, while focusing climate finance in gamma and delta markets where emissions reductions per dollar invested are highest. Given the challenges of targeting in many infrastructure subsectors, BII should continue to systematically look for opportunities to achieve inclusive impact, and should ensure that investments are delivering long-term benefits to underserved populations. To navigate impact trade-offs and to maximise impact additionality, we recommend that BII leverage the strong position it has obtained in debt and project finance through innovative structures that mobilise other (commercial) sources of capital. Building on the results of the IPP study, we also recommend that BII consider adopting a shadow carbon price for its infrastructure investments, starting with its grid-scale and C&I power projects.

Impact measurement

BII's current approach to impact measurement in infrastructure focuses primarily on *ex ante* assessments and self-reported data. There is limited follow-up on realised (*ex post*) impacts, including evaluative studies that assess 'what works and why'. This limits BII's ability to learn from its investments, particularly in areas with evidence gaps or where productivity, sustainability and inclusivity scores lack sufficient granularity.

In relation to impact measurement, we recommend that BII: (i) measure the intensity of economic and climate impact delivery of investments across comparable infrastructure investments, including measuring emissions avoided per million dollars as a key indicator in BII's sustainable impact score; (ii) more regularly assess the reach and impact it is having for underserved and low-income populations where these can be inferred; and (iii) adopt a systems-based rather than deal-based perspective where appropriate, supported by a portfolio-wide strategy for applying cost-effective methods.[7]

Summary of recommendations

In relation to investment strategy, we recommend that BII:

1. Strategically allocate its scarce capital to maximise global impact: prioritising economic development in frontier (alpha and beta) markets through locally relevant infrastructure investments, while continuing to focus climate mitigation efforts in more mature emerging (gamma and delta) markets where emissions reductions per dollar invested are most impactful.
2. Continue, and if possible increase, investment in transmission and C&I to support the green transition.

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[6] This refers to 'traditional' power generation technologies that provide firm power (power that is consistently available and dispatchable); this includes coal, natural gas, nuclear, and large hydroelectric plants. These are considered 'firm' because they can be relied upon to generate electricity on demand, regardless of weather conditions or time of day.

[7] A full list of recommendations is provided in this report in Section 5.

3. Develop high-level plans for a select number of countries/regions on how to increase availability and reliability of power supply (both generation and transmission) while minimising GHG emissions.
4. For its Impact Score, BII should use a more granular assessment of relative degree of need, at the infrastructure subsector and country level where appropriate.
5. Increase the share of its infrastructure climate finance that goes to adaptation.
6. Continue its equity investment in platforms.
7. Build on its strong position in debt and project finance by continuing to focus on where these can be most additional. In Asia this means supporting the green transition by financing innovative sectors and mobilising commercial capital in mainstream sectors through mezzanine and subordinated finance. In Africa this means increasing deal flow in a range of infrastructure sectors using blended finance.
8. Improve productive use of communications infrastructure by investing in backbone internet coverage in the few regions (mostly in Central Africa and the Horn of Africa) where it is currently insufficient, but continue the shift towards improving utilisation of existing infrastructure and improving market structures where it can.
9. Continue to look for opportunities that aim to improve access to infrastructure for underserved communities.
10. Continue to look for opportunities to maximise gender and diversity impact where it can.

In relation to impact measurement, we recommend that BII:

11. Measure the intensity of economic and climate impact delivery of investments across comparable infrastructure investments within the portfolio by measuring key impact variables relative to project investment costs.
12. More regularly assess the reach and impact it is having for underserved and low-income populations where these can be inferred, especially where there is a link to the end user. This may include the collection and analysis of geospatial data.
13. Adopt a systems-based rather than deal-based perspective where appropriate, supported by a portfolio-wide strategy for applying cost-effective methods, for example using a modelled approach where appropriate.

1. Introduction

1.1. Rationale for the infrastructure evaluation

This evaluation was commissioned by the UK's Foreign, Commonwealth & Development Office (FCDO) and undertaken by Itad and Steward Redqueen, in conjunction with our delivery partners. Its primary aim is to generate learning on the development impact (DI) of British International Investment's (BII's) infrastructure investments, with a particular focus on what has been achieved and how BII contributes to those outcomes. The emphasis is deliberately on evaluating investing for impact – that is, the ways in which BII's activities support more impactful infrastructure outcomes through its investment choices, practices, and use of tools such as the impact score and technical assistance. The evaluation does not seek to assess broader market-level or strategic factors influencing BII's infrastructure investment approach, except where these are directly relevant to observed development outcomes. The work is intended to support reflection and learning within BII and to provide evidence that can inform future strategy, impact management and evaluation approaches.

1.2. Methodology

The evaluation was conducted in two phases between 2021 and 2025.

Phase 1, completed in early 2022, combined a portfolio-wide review of BII's infrastructure investments with a broader synthesis of external evidence on infrastructure and development. The portfolio review covered all BII infrastructure investments committed between 3 December 2007 and 30 August 2020, spanning power, transport, information and communications technology (ICT), and water. It analysed patterns in investment allocations, subsectoral focus and geographical reach, and assessed the relevance and potential for impact across the portfolio, drawing on internal data, documentation, and interviews with BII staff. In parallel, the evidence review examined published research and evaluation findings on the DI of infrastructure investment in emerging and frontier markets. Together, these two strands helped to identify key gaps in the evidence base, particularly around the causal mechanisms linking investments to outcomes and ultimate impacts.

Phase 2 built on these findings through a set of five in-depth studies, designed to explore how BII's infrastructure investments contribute to DI in practice. These studies were developed to address key evidence gaps identified in Phase 1, particularly around intermediate outcomes and the mechanisms through which impact occurs. The studies focused on selected investments across different infrastructure subsectors and geographies, chosen for their relevance to BII's portfolio and strategic priorities. Each study combined qualitative and quantitative methods, drawing on a mix of stakeholder interviews, secondary data analysis, and targeted primary research. The findings from Phase 2 are synthesised around BII's impact framework – covering the dimensions of productivity, sustainability and inclusivity (PSI) – and provide insights into both impact results and the effectiveness of BII's approach to managing for impact.

This final synthesis report presents a synthesis of evidence from Phases 1 and 2. It draws on the findings of the earlier evaluation work and incorporates additional document review, analysis of updated BII portfolio data,[8] and interviews with BII's investment and DI teams, to understand key trends and institutional developments.

1.3. BII's overall strategy

During the period of analysis (2012–24), BII published three strategic frameworks, describing its investment priorities over five years to achieve development outcomes. The 2012–16 strategy focused on supporting job creation in Africa and South Asia. This was succeeded by the 2017–21 strategy, which built on BII's progress since 2012 and focused on investing to transform economies, businesses and lives in Africa and South Asia. The 2022–26 strategy is BII's most recent strategic framework, which is guiding BII's

[8] The portfolio reflects all available data up to year end 2024.

current investment decisions. Because of the greater focus on climate, the investment universe was expanded to include Southeast Asia. The 2022-26 strategy focuses on three impact objectives: productive development, sustainable development, and inclusive development.

Figure 1. Evolution of BII's investment strategy and infrastructure sector strategy

2012-2016	2017-2021	2022-2026
Investing to create jobs and make a difference to people's lives in some of the world's poorest places	Investing to transform economies, businesses and lives in Africa and South Asia	Investing to achieve productive, sustainable and inclusive development
Strategic objective(s): focus on investing to support the building of businesses in order to create jobs in Africa and South Asia, using different instruments (debt and direct equity) as well as continuing in funds.	**Strategic objective(s):** focus on investing to (1) support the business growth and economic stability that enables countries to leave poverty behind, and to (2) make a financial return, and reinvest to improve the lives of millions of people in Africa and South Asia	**Strategic objective(s):** focus on investing to: (1) raise productivity to support a decent standard of living for all; (2) reduce emissions, protect the environment and adapt to the changing climate; and (3) share the benefits of higher productivity and sustainability with poorer and marginalised populations.
Infrastructure strategy	Infrastructure strategy	Infrastructure strategy
No sector-specific strategies	A focus on: (i) the power and transmission subsectors, with a preference for renewables where they make sense from a cost and grid perspective; (ii) exploring transport and oil and gas in relation to power and industrial development; (iii) continued lending to telecoms infra to improve connectivity for the power.	A focus on: (i) utility-scale power investments in renewables; (ii) transmission and distribution; (iii) household and business power solutions; (iv) growing investments in ports, transport and logistics; (v) access to water, sanitation and hygiene, urban infrastructure and climate technology.
Impact framework: DI grid	Impact framework: DI grid	Impact framework: Impact score

The evolution of BII's objectives across the three strategic frameworks highlights BII's efforts towards achieving more targeted impact by responding to protracted and emerging development issues. With the intent of increasing the DI of its investments, BII pivoted its investment strategy in 2012 to target poorer and fragile economies of Africa and South Asia, where the world's poorest people live.[9] Building from the foundation of the 2012–16 strategy, the 2017–21 strategy continued to target Africa and South Asia as well as continuing the focus on job creation.[10]

To improve on the previous strategy in achieving impact, in 2017 BII introduced sector-specific strategies to intensify its approach in investing in sectors that have a high propensity to create jobs. BII also introduced women's economic empowerment and climate change as target areas of investments, in line with Sustainable Development Goals (SDGs) 4 and 13 respectively, in the 2017–21 strategy. In its 2022–26

[9] BII (2012) BII Annual Review.

[10] BII (2017) Strategic Framework 2017-2022.

technical strategy, BII aligned its investments to achieve three strategic impact objectives: productive, sustainable and inclusive development.[11]

Sustainable DI is now at the core of BII's investment decisions. Under the 2022–26 technical strategy, BII intends to grow its investments in climate finance to at least 30% of total new commitments by value. BII published a climate change strategy (see Section 4.2) which highlights how BII will combat climate change through its investments.

Through the 2022–26 technical strategy, BII intends to achieve inclusive DI by prioritising investments that reach low-income groups, women, and black-owned and -led businesses in Africa. Gender finance has been one of BII's priorities influencing investment decisions since its first Gender Equality Position Statement and its co-founding of the 2X Challenge in 2018.[12] The 2022–26 strategy re-emphasises the importance of investing to empower women economically, and, unlike the previous strategy, sets a target of 25% of new commitments on a cumulative basis to be directed towards gender finance (as defined by the 2X Criteria).[13] The 2022–26 strategy also includes a new priority area for diversity finance: investing to increase the representation of black owners and leaders in our sub-Saharan Africa portfolio, per BII's Black Ownership and Leadership for Development (BOLD) framework.[14]

In terms of geographical focus, the 2022–26 technical strategy takes a more segmented approach to inform its market presence and offer. This includes: mature markets (India and South Africa); powerhouses (Nigeria, Egypt, Pakistan, Kenya, Bangladesh and Ethiopia); continuing emphasis on the poorest and most fragile; and a new commitment to expand into new geographies, including the Indo-Pacific region (climate finance) and official development assistance (ODA)-eligible countries in the Caribbean.

In addition to being guided by BII's five-year strategy, BII's investments are categorised into three portfolios: Growth, Catalyst and Kinetic. Within the Growth Portfolio, BII's investment teams inject long-term capital into businesses that have the potential to achieve sustainable growth while making a positive environmental, social and economic impact.[15] Within the Catalyst Portfolio, BII invests to support nascent markets in fragile economies and build more inclusive and sustainable economies.[16] Catalyst investments take on higher risk (with BII setting a loss tolerance of 30%) to enhance the DI of fragile economies and communities. These investments make up 10% of BII's portfolio, and growth investments make up 90%. Under the 2022–26 strategy, BII committed to increasing its Catalyst Portfolio to 10%–15% of its total portfolio by value by 2026.[17] BII's recently introduced Kinetic Portfolio is designed to enable it to pursue concessional investment strategies. It complements the Growth and Catalyst Portfolios and the BII Plus technical assistance capabilities, with a higher risk tolerance than the Growth and Catalyst investment strategies. Through the Kinetic Portfolio, BII can use concessional capital in different ways, from closing the 'viability gap' on projects to providing flexible debt products.

1.4. BII's infrastructure & climate (I&C) strategy

The 2017–22 strategic framework set out an ambition to create jobs and remove major constraints to growth, such as poor electricity and connectivity, allowing businesses to be more productive and competitive. It focused primarily on expanding power generation, with a preference for renewables where they made sense from a cost and grid perspective, and excluding coal-fired thermal power plants. Beyond

[11] BII (n.d.) Productive, Sustainable and Inclusive Investment: 2022–26 Technical Strategy. https://assets.bii.co.uk/wp-content/uploads/2022/01/06170001/2022-2026-Technical-Strategy-2.pdf

[12] CDC (2018) Advancing Women's Economic Improvement: May 2018: Gender Equality Position Statement. https://assets.cdcgroup.com/wp-content/uploads/2018/07/11143751/Gender-Position-Statement.pdf

[13] BII (n.d.) Productive, Sustainable and Inclusive Investment: 2022–26 Technical Strategy. https://assets.bii.co.uk/wp-content/uploads/2022/01/06170001/2022-2026-Technical-Strategy-2.pdf; 2X Challenge (2024) '2X Criteria'. https://www.2xchallenge.org/2xcriteria

[14] BII (n.d.) Gender and Diversity Finance Position Statement: Investing for Inclusion: 2022–26 Strategy Period. https://assets.bii.co.uk/wp-content/uploads/2022/02/02182247/Gender-and-Diversity-Finance-Position-Statement-2022-26-1.pdf

[15] BII (2025) 'Growth'. https://www.bii.co.uk/en/about/our-company/investment-portfolios/growth/#

[16] BII (2025) 'Catalyst'. https://www.bii.co.uk/en/about/our-company/investment-portfolios/catalyst/

[17] BII (2022) Productive, Sustainable and Inclusive Investment: 2022 – 26 Technical Strategy. https://assets.bii.co.uk/wp-content/uploads/2022/01/06170001/2022-2026-Technical-Strategy-2.pdf

increasing generation capacity, it also focused on the transmission and distribution (T&D) of electricity to improve access for businesses and households. Finally, it included an intention to look at investments in two other types of critical infrastructure which are major economic enablers in sub-Saharan Africa and South Asia; transport, and oil & gas – although the latter was superseded by BII's climate strategy and fossil fuel policy (2020), which resulted in a shift away from investments in this area. The strategy also highlighted a commitment to continue developing telecoms infrastructure to improve connectivity for the poor.

In the power subsector, the strategy emphasised investments in generation and transmission, with a preference for renewables where they make sense from a cost and grid perspective, and a commitment not to invest in coal-fired plants. It aimed to invest in least-cost power, while always evaluating the potential climate impact, to increase electricity supply in the most challenged countries.

The 2022–26 technical strategy places greater emphasis on achieving climate goals through infrastructure investments. Its key areas of focus are clean power and energy systems, sustainable transport and logistics, and climate-resilient urban infrastructure and utilities. A key shift in the strategy is to provide climate finance in the Indo-Pacific region, specifically in the larger economies of the Philippines, Indonesia and the Mekong region, with a particular emphasis on green, renewable infrastructure.

The 2022–26 technical strategy provides a more detailed investment strategy in infrastructure, covering a larger number of subsectors, with plans to:

- support the energy transition through utility-scale renewable energy generation (e.g. solar, wind, geothermal, hydrogen)
- expand access to energy through decentralised solutions (e.g. minigrids, home solar) to expand access in underserved areas
- strengthen electricity systems through T&D networks to improve reliability and reduce costs
- improve connectivity and competitiveness through ports, transport and logistics infrastructure to facilitate trade and improve competitiveness
- build climate resilience and inclusive services through water, sanitation and hygiene (WASH) services
- provide access to urban I&C technology and increase connectivity and productivity through ICT.

The 2022–26 technical strategy differentiates BII's investment strategy from other development finance institutions (DFIs) in terms of its risk appetite and its ability to offer patient capital. It aims to achieve this by continuing to offer equity to platform companies and to other developers through both direct equity and fund investments.[18] Examples of platform companies include Globeleq and Gridworks in the energy sector and DP World in the transport (ports) sector. The intention is that BII will support these third parties to build teams with the capabilities and financial resources needed to progress opportunities through the development life cycle. In addition, BII's tolerance to risk enables it to provide developers with long-term debt financing, which is in short supply in all countries it invests in; this includes the poorest and most fragile countries and includes more mature economies such as India, especially with regard to more innovative, climate-smart investments.

The 2022–26 technical strategy also emphasises BII's role in mobilising private capital into infrastructure investments. The strategy highlights that much of the infrastructure in advanced economies has originated from the public sector. In many parts of Africa and Asia, however, governments are constrained by limited borrowing capacity and relatively low tax revenue, much of which is needed for other commitments such as healthcare and education. In this context, privately owned and operated infrastructure is a necessity,

[18] BII defines a platform as 'an enterprise set up with the purpose of developing multiple new assets and/or managing multiple existing assets. The assets may be on the balance sheet of the platform or structured as separate entities that the platform company participates in, alongside others.'

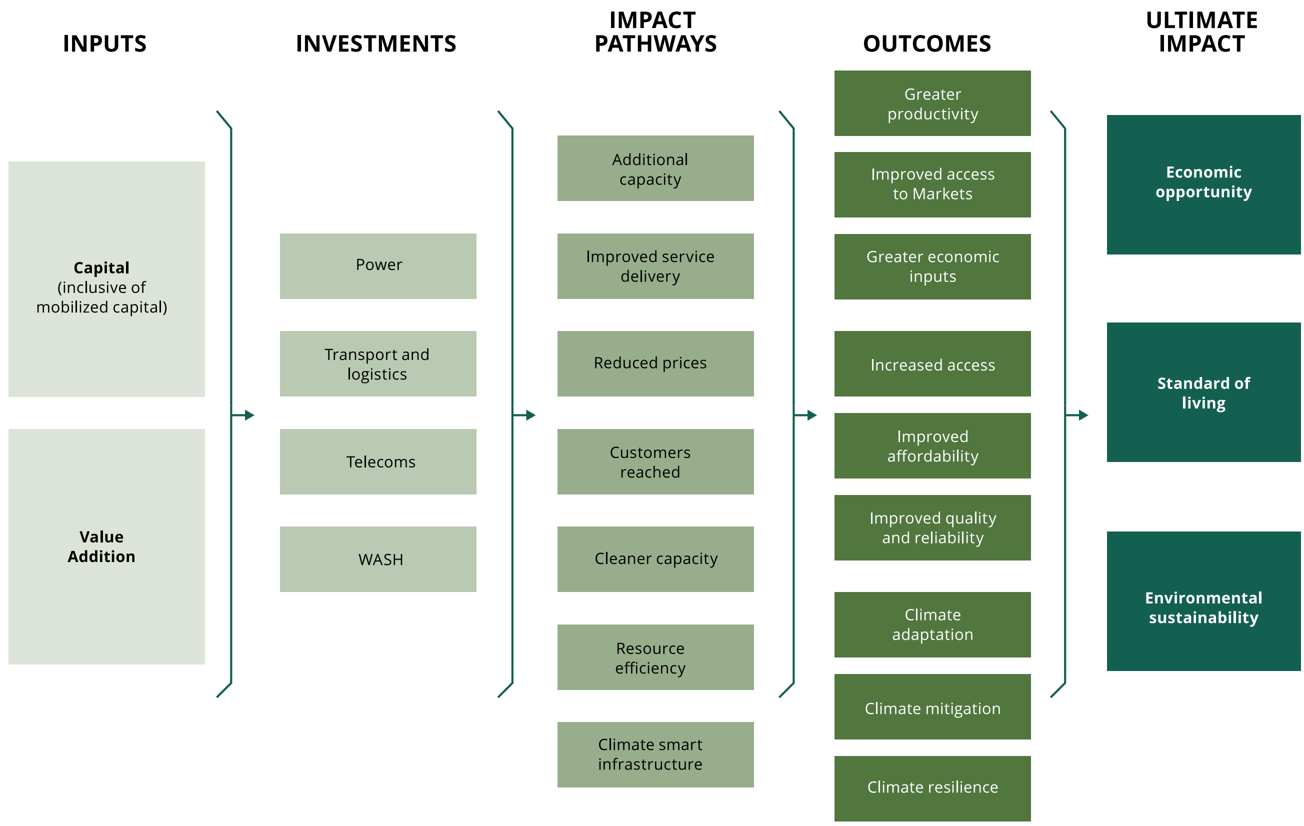
but DFIs such as BII have a vital role to play in supporting the difficult process of developing infrastructure opportunities into bankable projects that meet the risk–return expectations of private sector investors.

1.5. BII's DI approach and relevance to infrastructure investments

1.5.1. DI framework

After the introduction of sector-specific strategies in 2017, BII began developing sector-specific impact frameworks. The framework for infrastructure can be seen in Figure 2. The framework shows how BII capital and value addition in four infrastructure investment subsectors (minus ICT) achieves impact via seven impact pathways, and how this translates into outcomes and ultimate impacts.[19]

Figure 2. BII impact framework for infrastructure



1.5.2. Impact score

From 2012 to 2021, BII used the DI grid to score and screen investments. The DI grid scored investments along two dimensions: the difficulty of making investments in a country, and the propensity of sectors to create employment (the latter was a core objective of the 2012–16 strategy period, as described above). At the start of the current strategy period in January 2022, BII replaced the DI grid score with the impact score (ranging from –1 to 10), which consists of three pillars:

- **Productivity** (score varies from 0 to 4): reflects how efficiently an investment addresses the core developmental needs.

[19] Kim, R. *et al.* (2022) Final Report: Evaluating the Impact of British International Investment's Infrastructure Portfolio. https://assets.publishing.service.gov.uk/media/623b3cb98fa8f540f6c2322c/BII_Infrastructure_-_Formal_Evaluation_Report_-_Final_Report_230322.pdf

- **Sustainability** (score varies from –1 to 4): reflects the extent to which an investment will contribute to the transition to net zero and climate-resiliency. A negative score would be given if an investment involves 50% or more fossil fuels.
- **Inclusivity** (score varies from 0 to 4): reflects the extent to which investments are (i) reaching low-income populations or poor and fragile economies and (ii) contributing to gender and diversity (as defined by 2X and BOLD frameworks).

BII scores each (prospective) investment based on its impact thesis along the subcategories of the three pillars. The score is reviewed every two years (and the platforms are reviewed every year) over the lifetime of the investment, based on the same key performance indicators (KPIs) as the *ex ante* assessment. This allows tracking of how well the investment performs against the original impact thesis. Section 4 describes in detail the many aspects of the impact framework from an infrastructure perspective.

2. Description of BII's I&C portfolio

This section provides an overview of BII's I&C portfolio and the trends and strategy that helped shape it from January 2012 up to December 2024 in the current 2022–26 strategy period. We analyse the portfolio in terms of commitments where we can, because it most clearly expresses strategic intent. However, we use disbursements to describe the evolution of the portfolio in terms of infrastructure subsectors to include funds' underlying investments, which are unknown at time of commitment.

2.1. Evolution and composition of the I&C portfolio

As of end-2024, infrastructure investments made up 36% of BII's $9.2 outstanding billion portfolio, i.e. $3.3 billion.[20,21] This synthesis report not only covers BII's active portfolio but also includes exited investments. Although the focus is on the post-2012 period, Figure 3 depicts the time evolution of the cumulative $6,938 million committed to 202 infrastructure investments made since 2007,[22] and also shows the different strategic periods. The median investment of $15.0 million is much smaller than the average investment of $34.3 million because the underlying investments of funds are much smaller. Having previously been a fund-of-fund investor, in 2012 BII started to grow its direct equity and debt infrastructure portfolio. The emphasis on the direct portfolio continued until the end of the second strategic period in 2022, after which disbursements slowed and the portfolio stabilised. Some 61% of all infrastructure investments were in the form of equity, either direct or through an infrastructure-focused fund. This is in line with BII's overall portfolio and is roughly double that of the portfolios of peer DFIs.[23]

Figure 3. Cumulative growth of BII's infrastructure portfolio since 2007 (commitments)

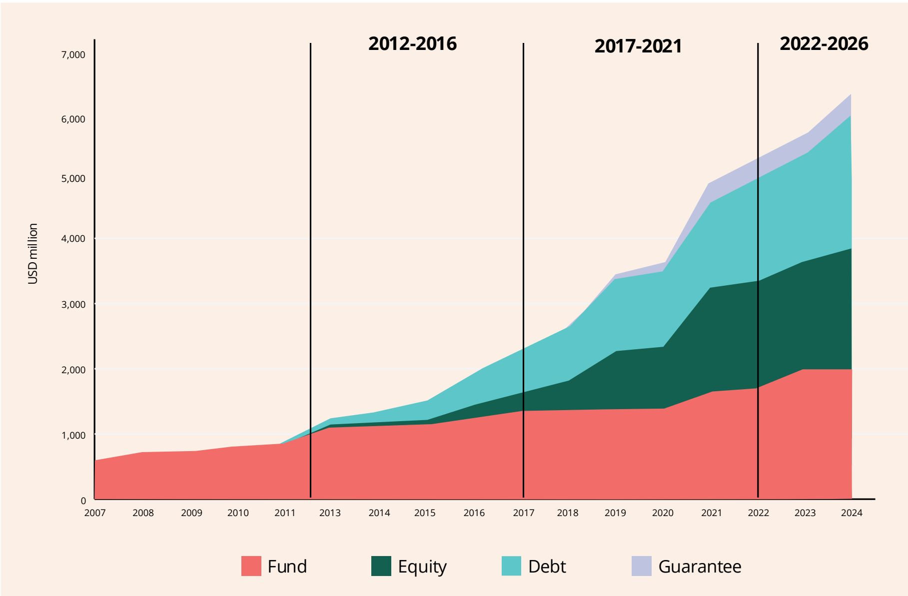


Figure 4 provides an overview of the $5,556 million of infrastructure commitments made since 2012 along different dimensions. The inner circle shows that the power sector is by far the largest ($3,305 million), followed by telecoms ($1,028 million) and transport ($491 million). Despite BII's ambition to grow its

[20] BII's Annual Report 2023 reports $2.7 million for infrastructure, to which $594 million of outstanding ICT investments have been added. 2024 accounts were not available at time of writing.

[21] According to the EDFI Comparative Analysis 2022, the infrastructure exposure of the aggregate portfolio of all European development financial institutions (EDFIs) is 26% (i.e. approximately $13 billion). The exposure of FMO is 31%, that of DEG is 21% and that of Proparco is 23%.

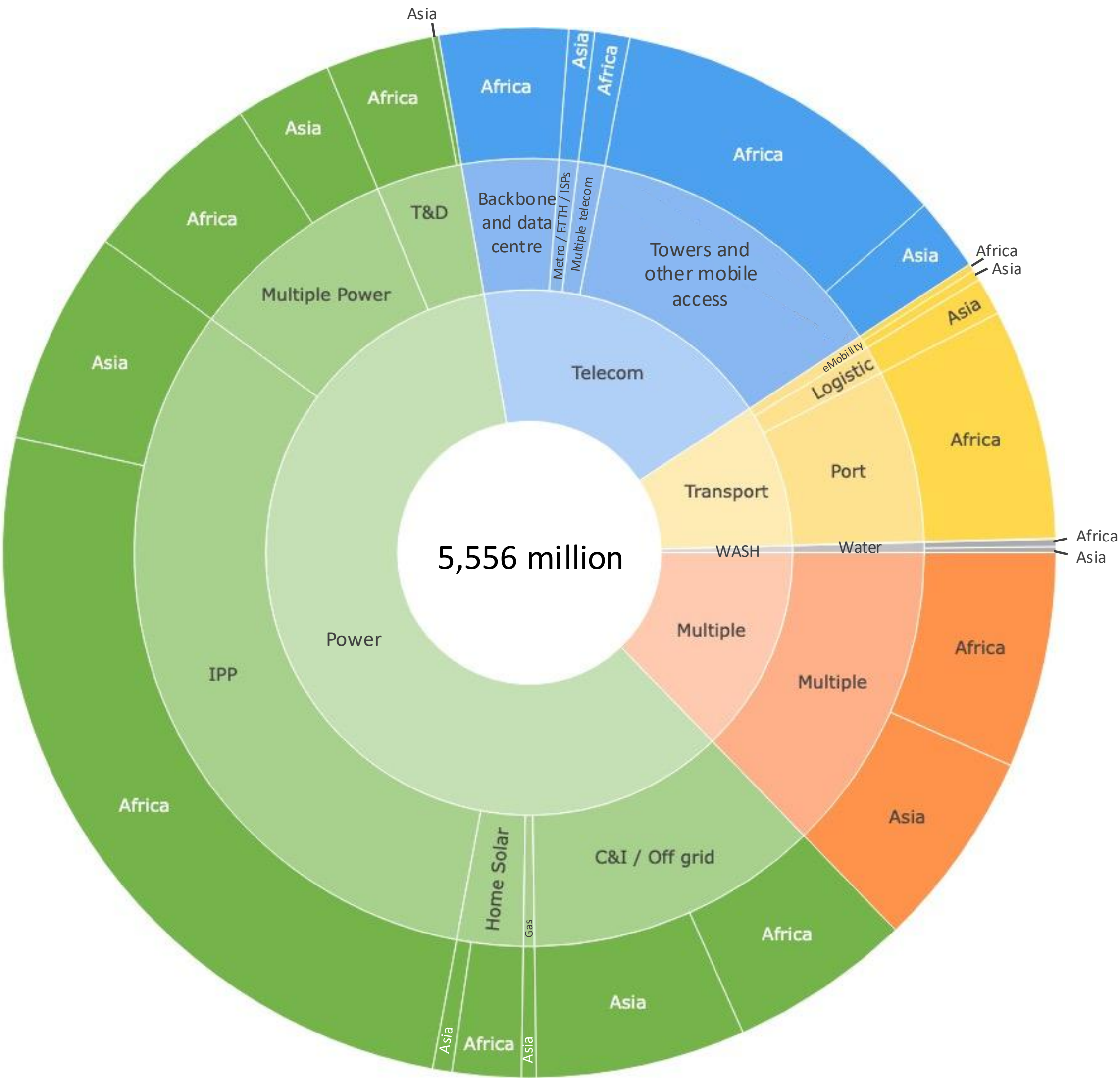
[22] Infrastructure assets held by generalist funds are not included in the analysis presented.

[23] For example, equity (including quasi equity) investments make up about 37% of all investments for DEG and 35% of all investments for FMO. Only Finnfund, IFU, Norfund and Sifem have comparable equity exposure (EDFI Comparative Analysis 2022). No infrastructure data is available.

WASH investments, so far it has been able to invest only $23 million, owing to the limited private sector opportunities in this traditionally public sector.

Within the power sector, independent power production is the largest subsector, constituting one-third of BII's infra portfolio. BII made past investment in gas power plants, but new commitments are all in renewable power. Other large subsectors are commercial & industrial (C&I) power and off-grid power, towers & mobile access, internet backbone and data centres, and ports. In each of these sectors, BII has made considerable equity investments in platforms or partnerships, which make up some $1.7 billion of BII's infrastructure portfolio.

Figure 4. BII's infrastructure investments made from 2012 to end-2024 in terms of sectors, subsectors and geography[24] (commitments)



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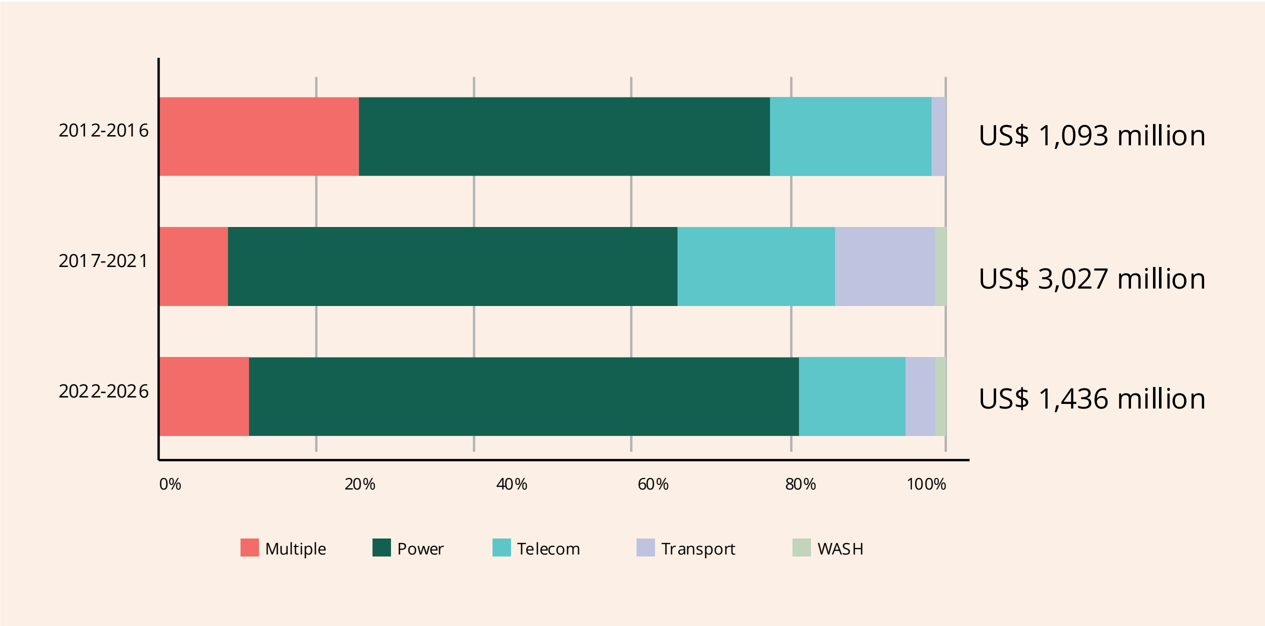
[24] Note that the WASH sector is in grey.

The commitments made during the three strategy periods (see Figure 5) are similar in terms of sector composition, although the 2022–26 period is only two-fifths complete and thus is smaller in aggregate. The increase in transport commitments during the 2017–21 period is because of the joint venture with DP World to develop ports across Africa. This points to a unique characteristic of BII's infrastructure strategy: its investment in platforms and/or joint ventures, which gives it more strategic leverage. In the sections below on the various sectors, these platforms are described in more detail; 72% of infrastructure commitments have been in Africa and 28% in Asia.

Figure 5. Commitments per infrastructure sector during the three strategy periods (2012 to end-2024)

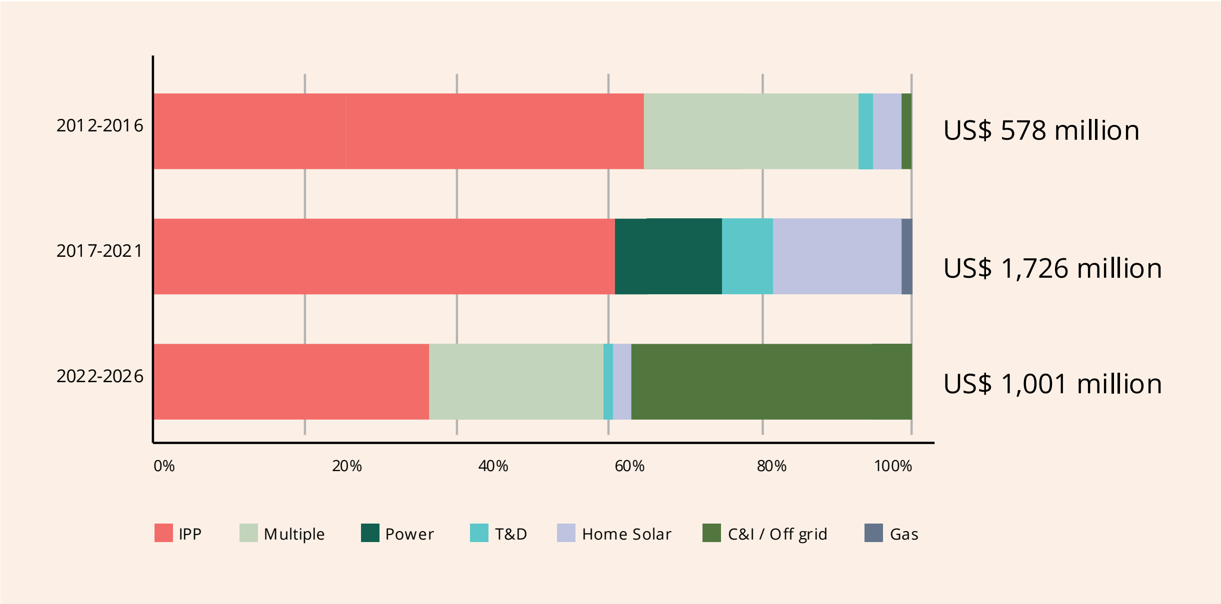


2.2. Power sector

With $3,305 million, investments in the power sector constitute 59% of BII's infrastructure portfolio. The independent power producer (IPP) subsector comprises 54% of all power investments, and thus makes up 32% of all infrastructure investments. C&I/off-grid power investments are the next biggest segment, followed by home solar.

Diversity of the power portfolio has increased over time. Whereas the focus in the 2012–16 strategy period was on IPPs, during the second strategy period C&I power and home solar became more important. From 2022 onwards, investments in midstream gas have been abandoned, after adoption of the BII Fossil Fuels policy in 2020. New sectors such as electric mobility (e-mobility) and energy and, in the future, energy efficiency, energy trading and green hydrogen increase diversity of the portfolio. Within the IPP sector, battery energy storage systems (BESS) is a new segment in which BII aims to be increasingly active, having made three investments so far (Kenhardt in South Africa; Cuamba in Mozambique; and Energrid in India, which invests in stand-alone BESS in addition to transmission).

Figure 6. Commitments per power subsector during the three strategy periods (2012 to end-2024)



Geographically, 71% of power commitments went to Africa and 29% to Asia. More than $750 million (23% of power investments) has been invested in power platforms, i.e. companies that develop and build projects:

- **Globeleq:** in 2015, BII and Norfund bought a power project developer, which it had founded in 2002 and since then had owned indirectly through the Actis Infrastructure Fund. Envisioned as a pan-African power project developer, Globeleq has geared more towards an emphasis on southern/eastern Africa. BII's committed equity stands at $270 million.
- **The Africa Power Platform:** BII partnered with The Aga Khan Foundation for Economic Development to set up the platform in 2016. Because of its deep local connections, the platform was not expected to become very large, but rather to develop projects in some of the most difficult areas. BII committed $73 million in equity capital.
- **Ayana:** BII launched Ayana, a utility-scale renewable energy platform, in 2018 because it could not enter in other platforms (for commercial, business integrity and strategic alignment reasons). The platform's pipeline developed much faster than expected, and after a little over a year BII gave up its majority position to leverage a larger pool of finance to realise the pipeline. BII's original equity investment was $233 million. BII exited Ayana in 2025, when the enterprise value of the platform was $2.3 billion.
- **Gridworks Development Partners:** in 2019 BII established Gridworks as a dedicated platform for development and investment in Africa's electricity networks. The platform invests in T&D and C&I, both on- and off-grid, and minigrids. BII's equity commitment was $300 million.[25]
- **Energrid:** in November 2024 BII announced its participation in Energrid, a partnership with IndiGrid and Norfund. The platform will bid for and develop greenfield transmission projects and stand-alone BESS in India. Like the other two partners, BII invested around $100 million in equity capital, which allows the raising of an additional $1 billion of debt capital that can be provided by Indian banks. The intention is that Energrid develops greenfield transmission projects and then sells them to long-term investors, who look for steady yields but do not want to be exposed to a riskier project development phase.

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[25] BII (2019) 'CDC launches new company, Gridworks, to invest in electricity networks across Africa'. https://www.bii.co.uk/en/news-insight/news/cdc-launches-new-company-gridworks-to-invest-in-electricity-networks-across-africa/

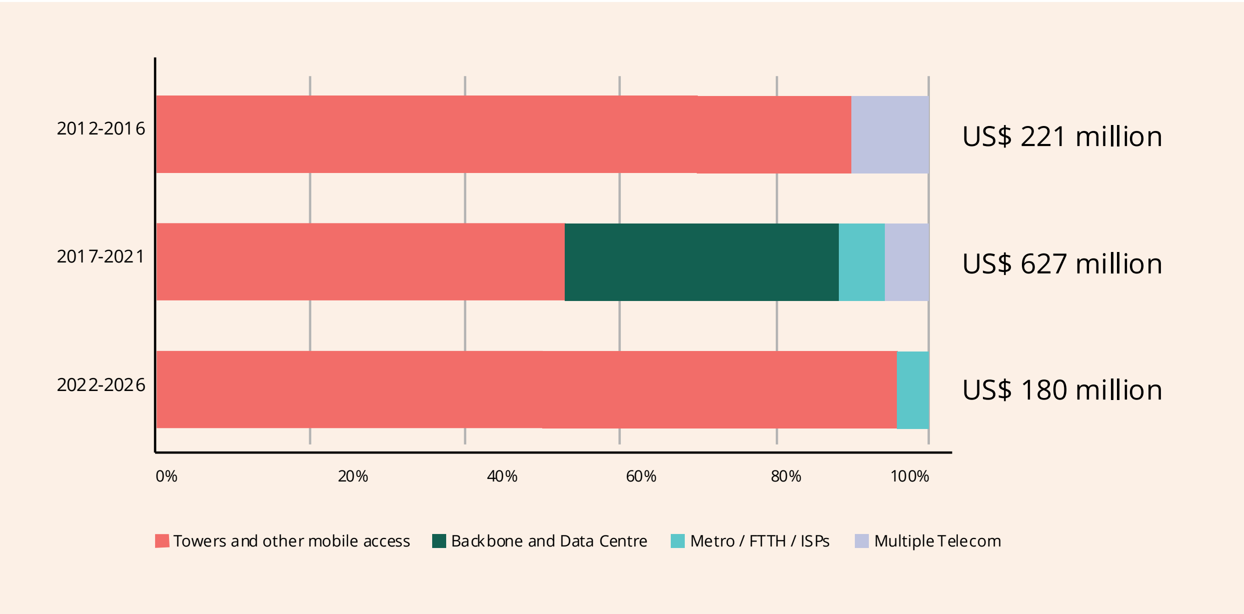
2.3. Telecoms

Of the $1,028 million in investments made since 2012, towers and mobile access constitutes roughly two-thirds. Internet backbone and data centre investments have increased significantly in the 2017–21 strategy period, largely owing to the investment in Liquid Intelligent Technologies (Liquid). About 50% of the telecoms portfolio consists of two major investments:

- **Liquid:** In 2018, BII made a $180 million equity investment in Liquid to accelerate its expansion along the Cape-to-Cairo route and further into central and western Africa, with the objective to improve access to affordable and quality connectivity in Africa. In 2020 BII made a follow-on $40 million investment to support Liquid's data centre expansion.
- **Global Partnership for Ethiopia:** In 2021, BII committed $298 million to a consortium that also includes Safaricom, Vodafone, Vodacom and Sumitomo. The consortium won a mobile network licence in Ethiopia – the largest country in which telecom services had not yet been privatised – to bring better and more affordable access to digital services.

Figure 7 shows that the portfolio has shifted back towards towers and mobile access, after the Liquid investment in the 2017–21 strategy period, which focused on the internet backbone. In the mobile access segment, BII is pursuing new business models, such as services that allow mobile network operators (MNOs) to directly share infrastructure to reduce the capital intensity of the sector and that provide financing for handsets, the affordability of which is a bottleneck in many countries.

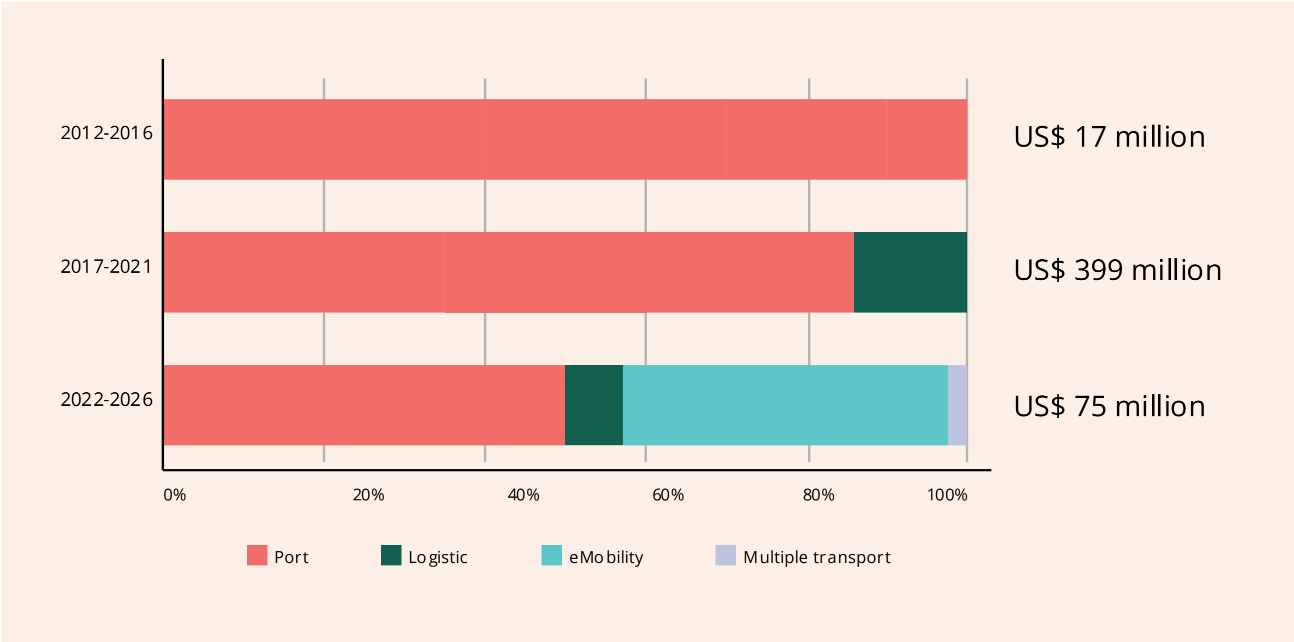
Figure 7. Commitments per telecom subsector during the three strategy periods (2012 to end-2024)



2.4. Transport & logistics

Transport & logistics is the third-biggest but fastest-growing part of the infrastructure portfolio. Port investments comprise 80% of the transport & logistics portfolio. After some commodity port investments before 2019, BII moved its focus to container ports through a 2021 participation in Gateway Africa, a joint venture with DP World, covering investments initially in ports in Somaliland, Egypt, Senegal and, most recently, the Democratic Republic of the Congo (DRC). Most of the post-2022 road investments are in e-mobility. Logistics grew rapidly in the 2017–21 strategy period, owing to the large Ecom Express investment in India. All four investments in airports have been made through funds, and BII's intention is to focus future airport investments on the least developed (alpha and beta) countries.

Figure 8. Commitments per transport & logistics subsector during the three strategy periods (2012 to end-2024)



2.5. WASH

Despite its strategic intention to invest more in the WASH sector, BII has made only two direct and two fund investments since 2019, for a total of $23 million. In 2019 BII invested in Roserve Enviro, a wastewater management firm in India, and in 2022 BII and Metito Utilities Limited set up the Africa Water Infrastructure Development (AWID) platform. AWID aims to develop and operate greenfield water and sanitation projects across Africa. The platform currently operates two assets: one in Egypt that supplies 22,000 cubic metres (m^3) of water per day to more than 60 hotels, and a water treatment facility in Rwanda that supplies 40,000 m^3 of water per day to domestic and C&I customers.

Globally, the share of the private sector in water supply and wastewater treatment is extremely limited (1%).[26] Given the large investments required, especially in view of climate adaptation, it is estimated that some two-thirds of the world's population would benefit from private sector interventions; thus it is rational for BII to maintain its aspiration to become more active in the WASH sector.

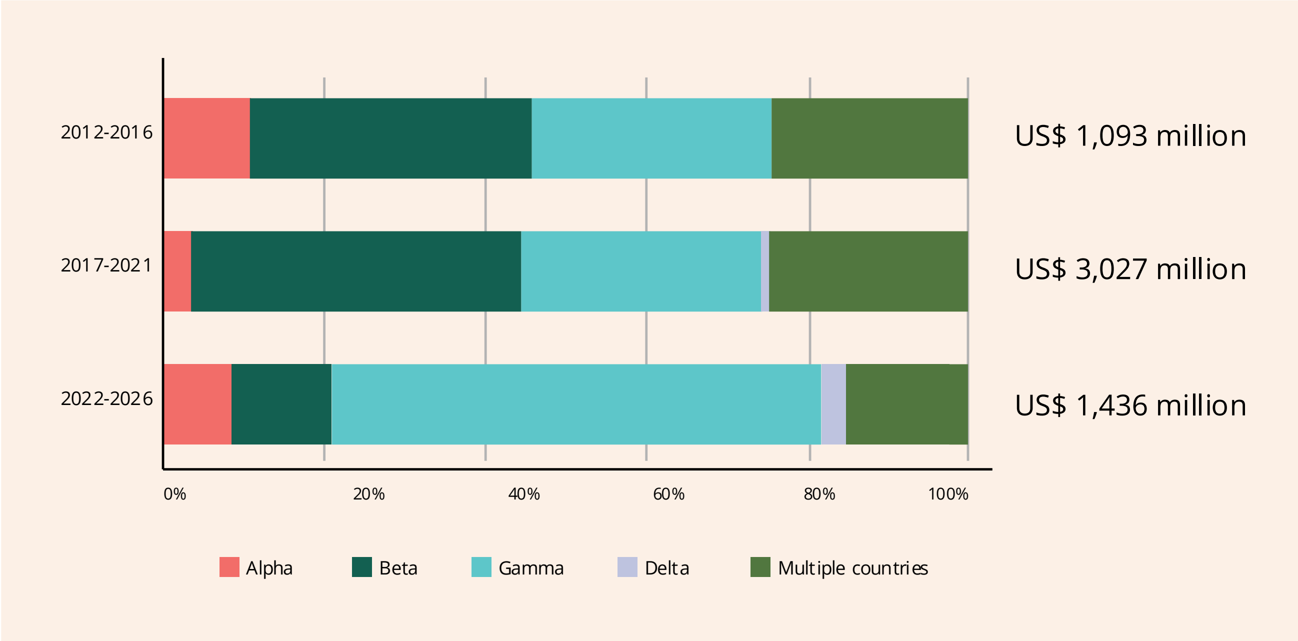
2.6. Country

From an inclusion perspective, BII has grouped all countries in its investment universe into four categories, based on poverty gap, gross domestic product (GDP) per capita, and the Organisation for Economic Co-operation and Development (OECD) fragility score.[27] Alpha countries are the poorest and/or most fragile, and delta countries are the least poor and/or most stable. In general, the relative degree of need for infrastructure investments is highest for alpha countries and lowest for delta countries. Figure 9 shows that halfway through the 2022–26 strategy period, BII commitments to alpha and beta countries have decreased on a relative basis, because of a focus on supporting the net zero transition in highly emitting countries in India and Southeast Asia.

Figure 9. Infrastructure commitments per country category during the three strategy periods (2012 to end-2024)

[26] Water Finance & Management (2021) 'The Financing Gap: Re-examining the Role of Private Financing & P3s' estimates that of the $275 billion annual capital expenditure, 1% comes from private finance. https://waterfm.com/water-infrastructure-financing-gap-widening-p3s/

[27] Annex A of BII (n.d.) Impact Score: 2022-26 Strategy Period. https://assets.bii.co.uk/wp-content/uploads/2022/02/24121022/British-International-Investment-Impact-Score-2022-26.pdf

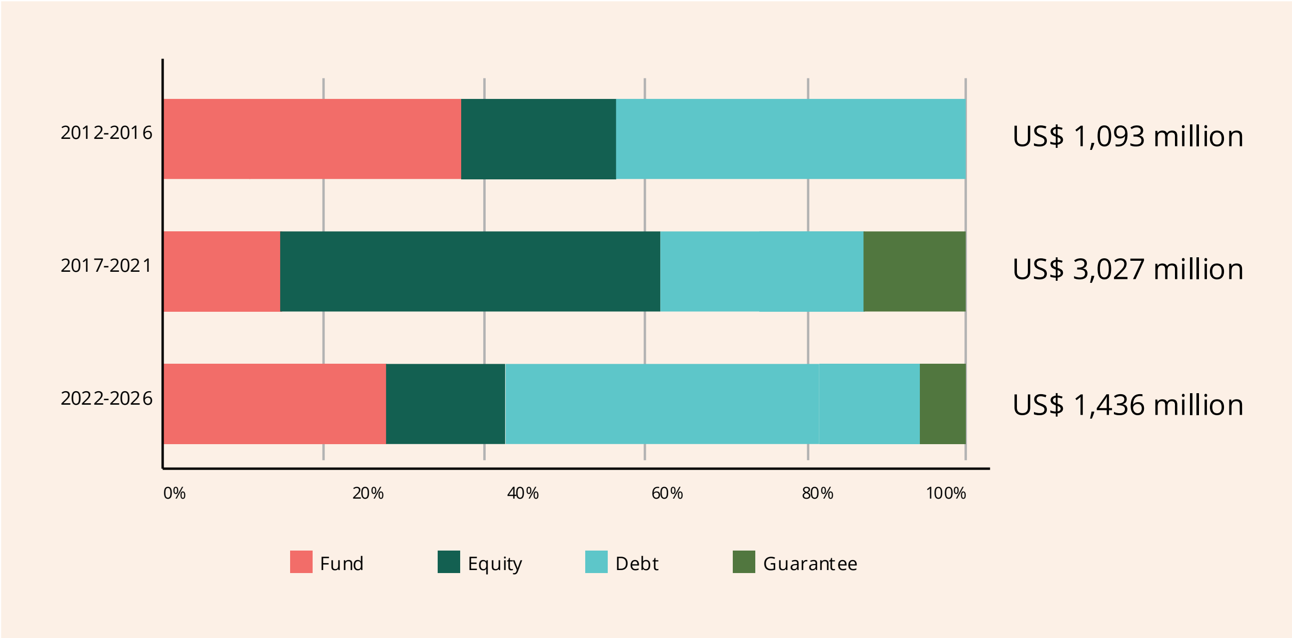


2.7. Financial instruments

Since BII became a direct rather than a pure fund-of-fund investor in 2012, its direct equity and debt commitments have consistently been above 60%. In the 2022–26 strategy period, debt has become more important. An important driver for this is the greater emphasis on climate finance, which translates into more debt financing in gamma and delta countries because of the large deal pipeline for green investments and the higher cost up front of renewable power, which is typically financed with debt. A second driver is that debt allows BII to reach its disbursement targets and achieve scale faster than through equity investments. For example, BII's project finance has grown considerably since the slow 2020–22 period, during which governments postponed investment decisions, owing to the pandemic. A third driver is that BII has deployed more structured credit and mezzanine finance,[28] especially in India, where this product was not commercially available. This type of financing enables BII to pursue deals and develop nascent infrastructure sectors without taking too much equity risk and while getting attractive returns. Lastly, in 2021 BII had made many equity commitments, which were balanced over the subsequent years.

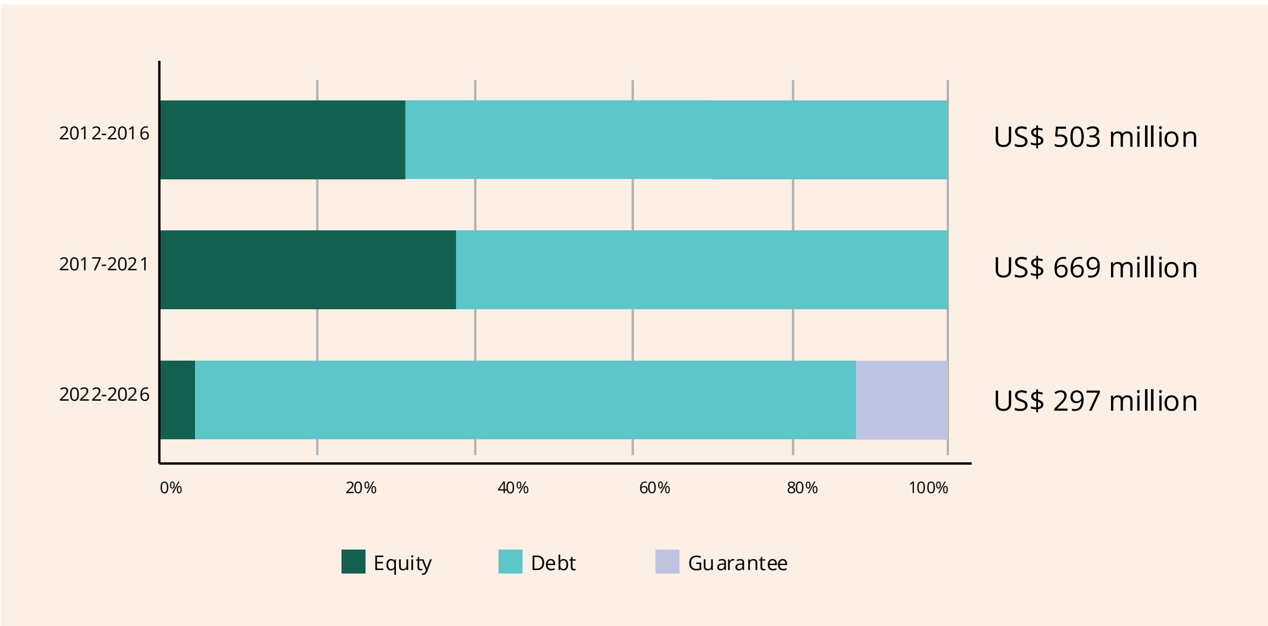
[28] Mezzanine finance is a hybrid of debt and equity (e.g. debt with equity instruments or warrants), often used for expansion rather than early-stage financing. Mezzanine finance can provide better commercial (risk-adjusted) returns.

Figure 10. Infrastructure commitments per financial instrument during the three strategy periods (2012 to end-2024)



Equity financing is especially important in the earlier parts of infrastructure project development. In general, in the riskiest alpha and beta countries the scarcity of new projects is even greater than the capital needed to finance them. Continued equity investment in alpha and beta countries is therefore important. However, Figure 11 shows that (direct and fund) equity commitments to alpha and beta countries are substantially smaller in the current strategy period. This reflects the difficulty of equity investing in these countries and reflects BII's ambition to do more project and mezzanine investments for better risk-adjusted returns.

Figure 11. Infrastructure commitments per financial instrument in alpha and beta countries during the three strategy periods (2012 to end-2024)



From an economic development and climate impact perspective, there are differences between debt and equity. Through equity, BII has a lever to influence strategy towards its impact focus, as is illustrated by the platform investments mentioned in Sections 2.2–2.5. But strategy development is often a nebulous process, and with BII typically being a minority shareholder, attribution of impact to BII cannot always be clearly articulated. Equity also enables the mobilisation of debt capital[29] and thus provides an impact 'multiplier'. Debt is needed to scale projects and can allow a clearer use of proceeds, but BII's additionality is less clear because it is often in a more competitive market, except in the alpha and beta countries, where substitutes for DFI capital are few.

2.8. Capital pools

BII deploys three distinct capital pools with different risk appetites:

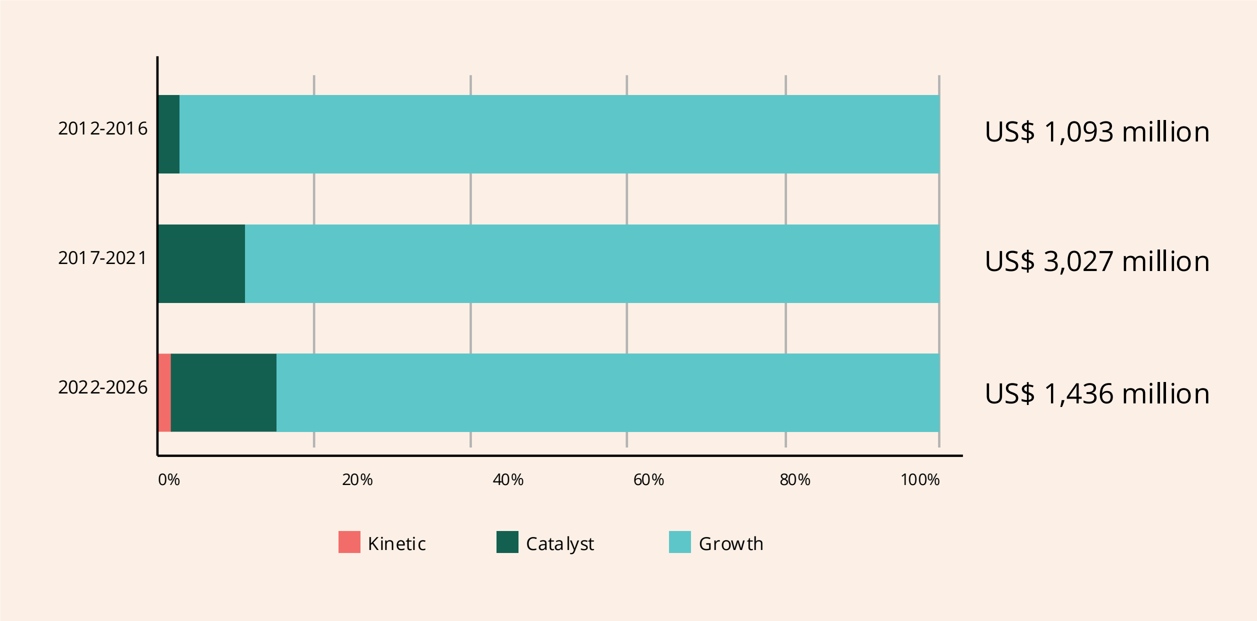
- **Growth:** constituting close to 90% of infrastructure commitments by value, these investments inject long-term capital into business to achieve sustainable growth.
- **Catalyst:** to explore and scale a broad range of investments addressing persistent market failures and/or delivering enhanced DI. The three strategies in infrastructure are Gridworks (see Section 2.2), Energy Access and Efficiency (covering off-grid clean energy access and resource efficiency) and Greenovate (concessional debt for high-impact infra projects to overcome financing constraints).
- **Kinetic:** provides concessional and blended finance. There are currently three facilities: Climate Innovation Facility (£240 million), African Resilience Investment facility (£50 million, focused on low-income countries), and a mobilisation facility (£100 million) which aims to unlock private capital into climate and sustainability-focused investments.

Catalyst is more tolerant of risk with respect to country, sector, technology and business models, although not all at the same time. Kinetic can assume several of these risks as well as financial instrument risk, such as more junior debt and local currency financing. Through Catalyst and Kinetic, BII can invest in deals few other (DFI) investors can participate in. Examples include the financing of project developers in new areas (e.g. green hydrogen) or funding projects that are not yet commercially viable (e.g. battery storage). It is hoped that, over time, investee companies will 'graduate' to BII's Growth Portfolio, although stand-alone deals are possible too.

Both Catalyst and Kinetic signal BII's clearer perception of and higher appetite for risk compared to those of its peers. Figure 12 shows the growth of Catalyst during the 2017–21 strategy period and the start of Kinetic in 2022. This illustrates the increase of higher-risk instruments and investments in BII's infrastructure portfolio, which is positive from an impact perspective.

[29] A debt/equity ratio of 70/30 means that $1.00 equity can leverage an additional $2.33 in debt and thus $3.33 of total capital.

Figure 12. Infrastructure commitments per capital pool during the three strategy periods (2012 to end-2024)



2.9. Climate and gender finance

For the current strategy period, BII adopted a climate change target of 30% of climate finance commitments. Climate finance covers both mitigation and adaptation/resilience. Because of its nature, most of BII's climate finance will be in infrastructure investments. Figure 13 shows that in each year since 2019, infrastructure investments qualifying as climate finance have been substantially above the 30% target. Total climate finance from 2019 to 2024 is 61% of total infrastructure commitments. Given that it accounts for roughly one-third of BII's commitments, the infrastructure portfolio alone is responsible for reaching more than half of the 30% BII-wide climate finance target.

Figure 13. Infrastructure commitments that qualify as climate finance from 2019 to end-2024

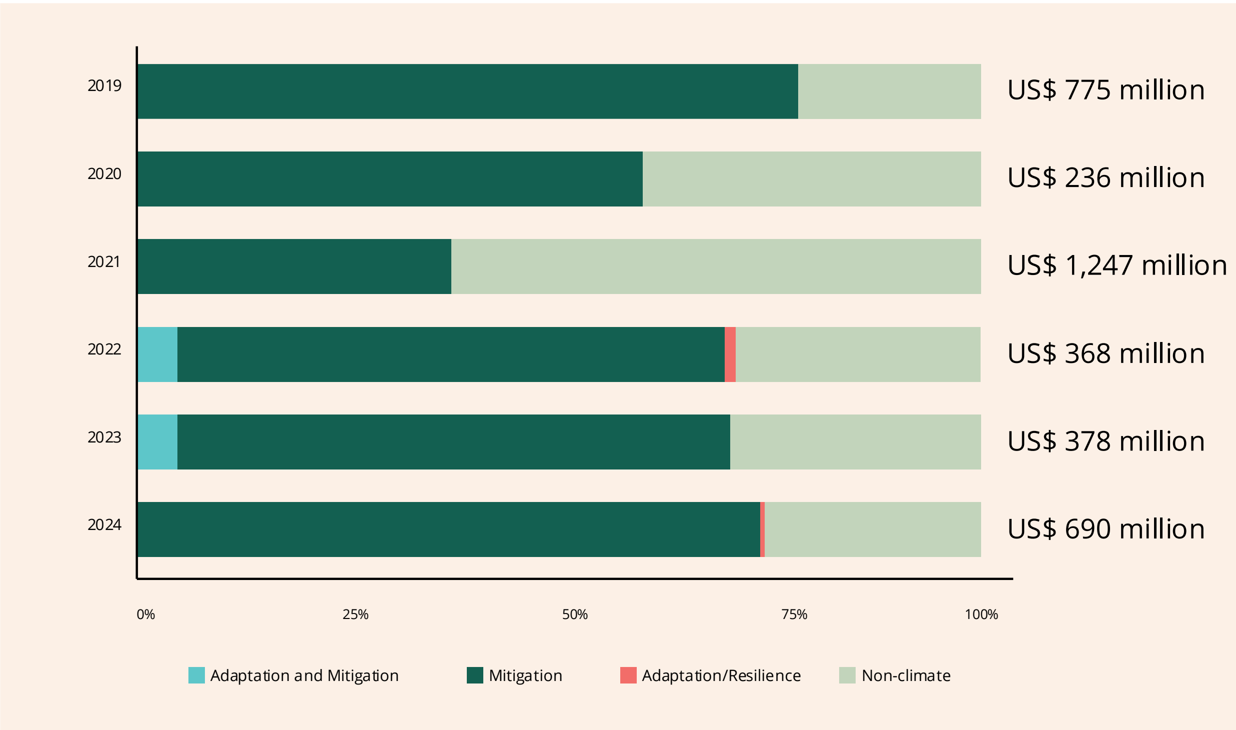
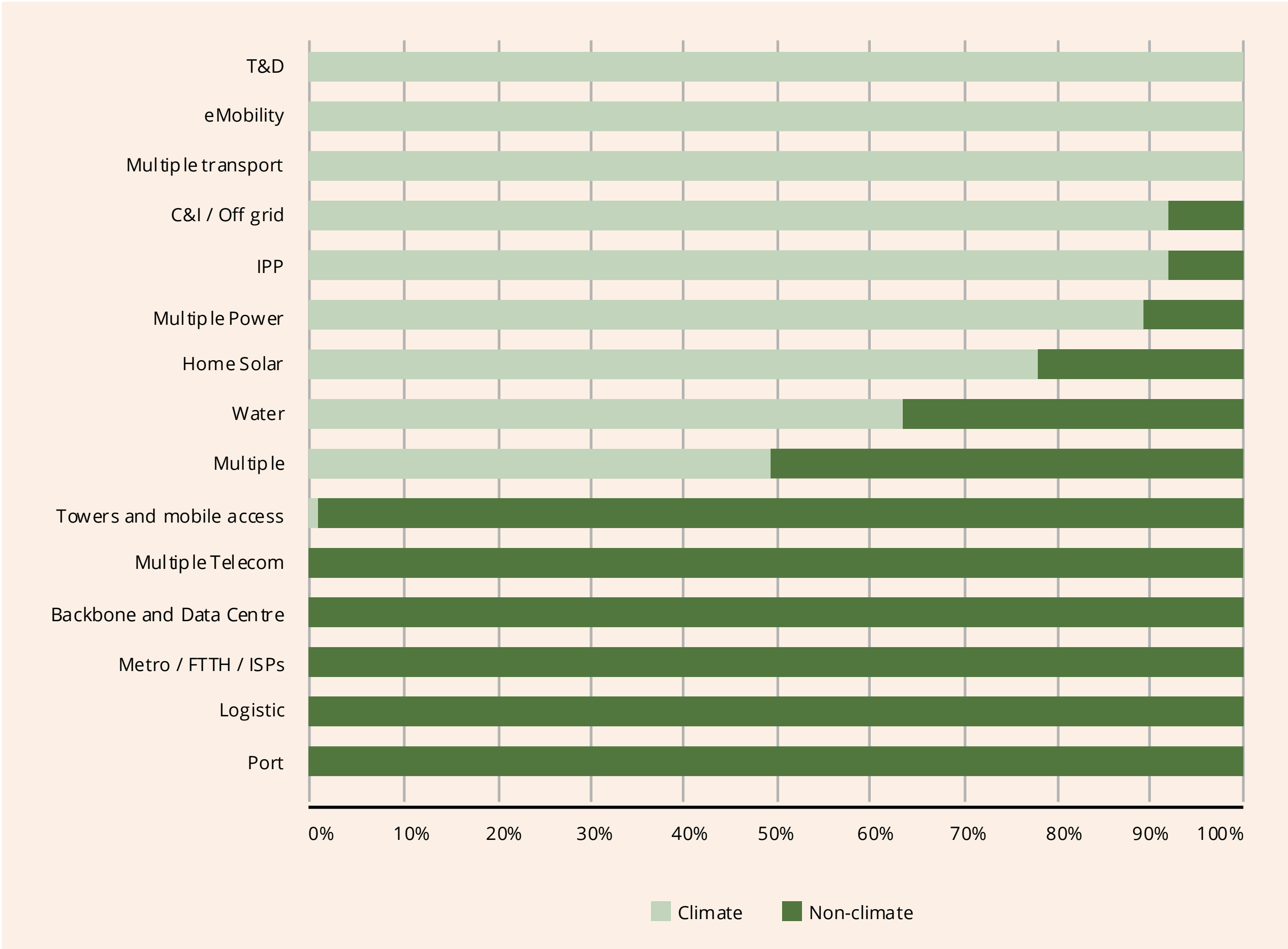


Figure 14 shows that, unsurprisingly, most of the committed climate finance is in the power subsectors, notably IPP and C&I, where the (avoidance of) greenhouse gas (GHG) emissions is most easily quantified.

Figure 14. Climate finance committed to subsectors from 2019 to end-2024

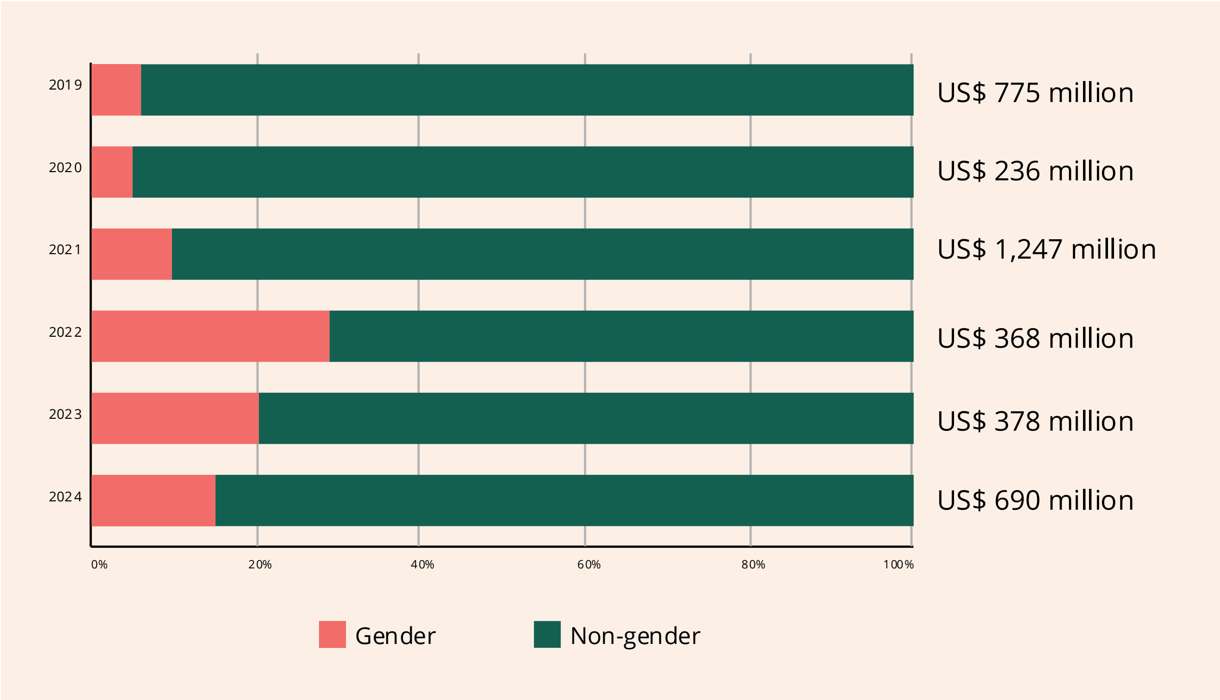


BII uses the Common Principles for Climate Mitigation Finance Tracking;[30] however, the 'climate finance' label qualifies an input and not a climate outcome. In Section 4.2 we will revisit this issue to see in which infrastructure subsectors BII could also address more outcome-based measures and in which ones that would be harder.

During the 2017–21 strategy period, BII emphasised its role in contributing to SDG 5 on gender equality, and inclusive finance became one of the three pillars of the impact score introduced in 2022 (see Section 1.5.2). A 25% BII-wide target was set for new commitments during 2022–26 to classify as gender finance according to the 2X Challenge criteria, which cover female entrepreneurship and ownership, leadership and employment (among others which are less relevant for infrastructure investments; see Section 4.3 for further discussion). In general, investments in infrastructure are much harder to direct in a gender-focused way; Figure 15 shows, unsurprisingly, that gender lens commitments in infrastructure are lower than BII's target, although it is increasing. Over 2022–24 (after the BII-wide target for gender finance was set), gender finance grew to 17% of total infrastructure commitments. Where BII relies greatly on infrastructure investments to hit its overall climate financing targets, it depends more on other sectors to reach its gender target.

[30] Asian Development Bank (2023) Common Principles for Climate Mitigation Finance Tracking: Version 4. https://www.eib.org/files/documents/mdb_idfc_mitigation_common_principles_en.pdf

Figure 15. Infrastructure commitments that qualify as gender finance as defined by 2X from 2019 to end-2024



2.10. PSI score

Figure 16. Average PSI scores by infrastructure subsector

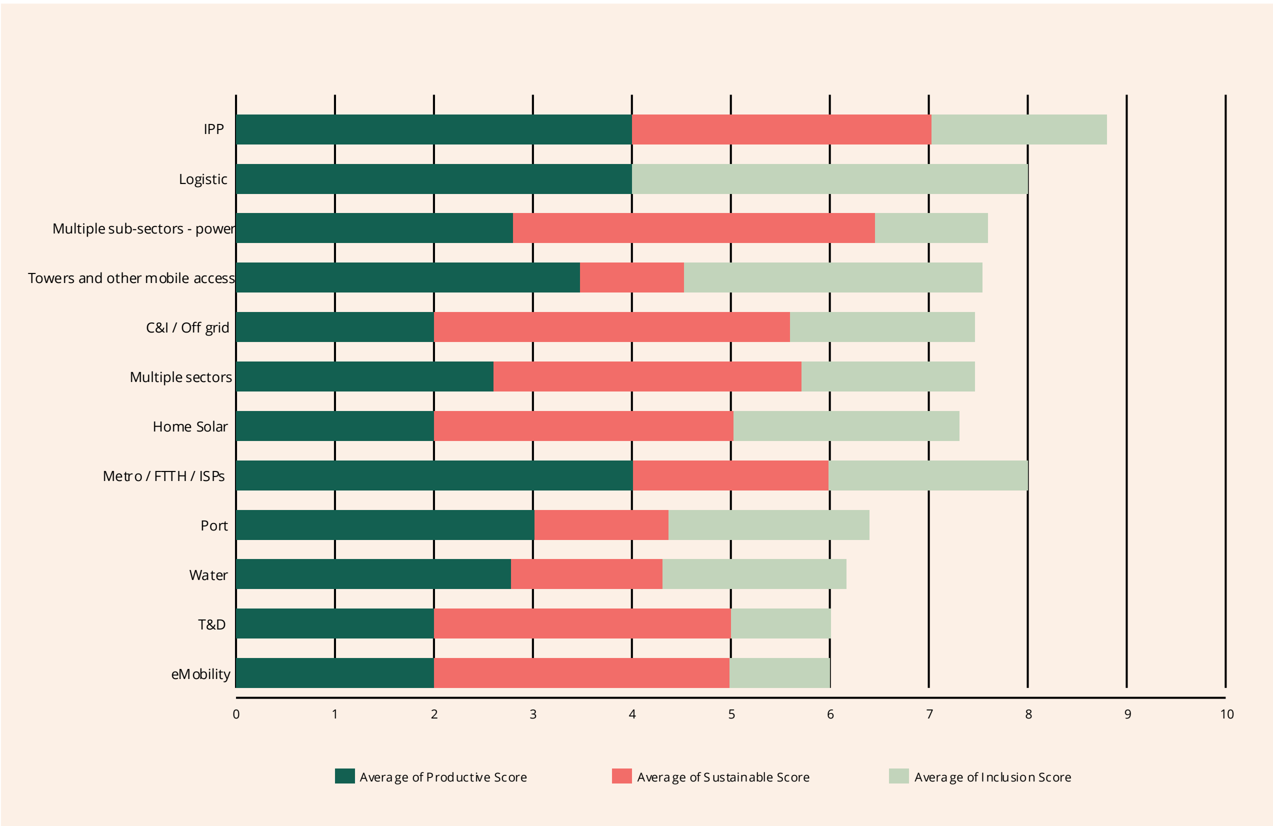


Figure 16 shows the average PSI scores by infrastructure subsector for the investments that were made since the introduction of the PSI score in 2022. This means that there is a limited number of commitments here, and the average scores of some sectors may not be representative. Nevertheless, because in Section 4 we assess the infrastructure portfolio against these PSI criteria in more detail, it is useful to have some visual information available.

IPPs, Metro-area ethernet (Metro)/Fibre to the home (FTTH)/Internet Service Providers (ISPs) and Logistics each receive the maximum (4) on the productive score. In terms of sustainability (essentially GHG mitigation), three sectors (towers & mobile access, port and water) receive relatively lower scores. Mobile access and home solar are sectors with a line of sight to the end customer and score relatively higher on inclusivity, whereas sectors such as e-mobility and T&D score lower.

3. Description of new evidence collection

3.1. Prioritisation of in-depth studies

The starting point for additional evidence collection as part of this evaluation is the detailed portfolio and evidence reviews conducted in Phase 1 of the evaluation. Together, these reviews (i) analysed the composition of BII's infrastructure portfolio and its achievement of DI results, (ii) assessed relevant external evidence that links increased or improved infrastructure capacity to the same DI aims, and (iii) synthesised and compared findings from these two assessments.

This work was used to prioritise additional data collection in Phase 2 through a series of five in-depth studies. In terms of BII's infrastructure impact framework (Figure 2), a key focus was on collecting additional evidence against the 'outcomes' category and understanding in more detail the relationships between impact pathways and relevant outcomes to establish a causal impact evidence chain. The in-depth studies were prioritised based on: (i) portfolio coverage or generalisability of findings across BII's portfolio (focusing in particular on power, transport, ICT and telecoms); (ii) importance for BII's overall strategy or impact, and demand for additional evidence; and (iii) evaluability, or feasibility to produce robust evidence, including the opportunity to develop new methods that allow for repeating and scaling impact assessments.

3.2. Description of in-depth studies undertaken in Phase 2

Phase 2 consisted of five in-depth studies, which are summarised as follows:

1. **Economic and climate impact of power investments across six African countries[31].** IPP investments constitute 34% of BII's infrastructure commitments. This study consisted of six country-level studies, which quantified the GDP, GHG emissions and employment impacts of additional generation capacity through reduction of outages and/or cheaper power generation and the change of GHG impact of the entire power system. A comparison of results by generation technology (and transmission, in the case of Kenya) was made to support BII in determining which technologies generate the greatest development and climate impact in different country systems.
2. **How does access to green energy transform rural communities? Insights from Virunga Energies[32].** This study identified the impact (as expressed in terms of changes in average household asset wealth) of rural minigrid hydro electrification, using BII's investment in Virunga Energies (North Kivu, DRC) as a case study.
3. **Impact of broadband fibre access[33].** This study sought to understand the impact (as expressed in terms of changes in average household wealth and spending) of faster and more reliable internet access through the expansion of backbone fibre, using BII's investment in Liquid (DRC) as a case study.
4. **Impact of investments in container ports[34].** Using BII's investment (in partnership with DP World) in Berbera Port (Somaliland) as a case study, this study tracks the impact of the expansion of the port in terms of: (i) physical changes in terms of port capacity, port movements, trade flows and the geographic area served by the port; and (ii) an estimate of direct and indirect economic impacts in the port's 'competitive hinterland'[35] (in Somaliland and eastern Ethiopia).

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[31] BII (2025) Development and Climate Impact of Power Investments across Africa

[32] BII (2025) Evaluating the Impact of a Hydroelectric Power Investment in the Democratic Republic of the Congo

[33] BII (2025) Evaluating the impact of BII's investment in broadband fibre infrastructure in DRC

[34] BII (2025) Evaluating the impact of BII's investment in ports in Somaliland

[35] The region it is able to serve cost-competitively as compared with other ports in the region.

5. **Impact of C&I investments[36].** This study uses BII's investment in Fourth Partner Energy (FPEL) in India as a case study to understand the reasons why businesses opt to supplement grid power with energy sourced from C&I solutions and the impacts that this has on GHG emissions avoided and increased production at the level of the firm. This study is complementary to study 1, given that it focuses more at the level of businesses rather than on the grid as a whole.

3.3. Overview of methods used in in-depth studies

Evaluating the impact of infrastructure projects is challenging. Unlike small-scale interventions, these projects are rarely implemented randomly and often involve complex impact pathways and long chains of causality. Counterfactuals can be difficult to establish, data is often sparse or incomplete, and obtaining primary data is resource-intensive. These obstacles make traditional approaches to impact evaluation both expensive and difficult to scale.

To address these challenges, the Phase 2 in-depth studies applied three tailored designs, each suited to different types of investments and impact questions (see Annex I. Summary of methods used in in-depth studies and applicability across the portfolio for full details):

- A **modelled counterfactual design**, such as that used in study 1 on the economic and climatic impact of investments in IPP, can be used both *ex ante* and *ex post* to establish estimates of impact for investments that produce impact at a 'systemic' level and where observations on the actual use of the asset are not possible, and especially where it is not possible to separate treatment areas from non-treatment areas.
- A **synthetic counterfactual design**, such as that used in studies 2 and 3 on the impact of rural electrification and broadband fibre access, can be used *ex post* to compare treated and untreated areas. The approach used in these studies made use of satellite data and machine learning-based algorithms to establish robust estimates on net changes in asset wealth over time and offers a quicker and cost-effective method to isolate DI than traditional designs, which rely on primary data collection on the ground. As explored further in Annex I, while powerful, these methods do have limitations around the extent to which results can be disaggregated by population groups (e.g. by gender) and their ability to unpack the detailed, often interlinked pathways through which change occurs. On their own, they capture aggregate changes in living standards rather than the 'how' and 'who' behind them – but they remain a robust, relatively fast, and cost-effective way to assess the reach and impact of investments on low-income populations.
- An **interrupted time series design**, such as that used in studies 4 and 5 on the impact of container port expansion and C&I power applications, can be applied *ex post*, and this is especially relevant where it is possible to collect data among investment stakeholders but where robust counterfactuals cannot easily be constructed.

The relevance of each design across BII's portfolio and practical experience developed through the studies in terms of what can and cannot be measured in practice are covered in greater detail in Annex I. Summary of methods used in in-depth studies and applicability across the portfolio.

3.4. Contribution to evidence base

In this section we briefly summarise the ways in which the five studies undertaken during Phase 2 contribute to BII's evidence base.

3.4.1. IPP study

The evidence review conducted in Phase 1 identified three areas to focus on in terms of enhancing BII's understanding of the connection between investments in utility-scale energy generation and downstream

[36] BII (2025) How does BII's investment in C&I power impact India's energy transition and create economic value? Insights from FPEL

impacts for end users. These were: (i) the impact of increased generation capacity on power outages (frequency and duration) and subsequently on firm productivity and output; (ii) the impact on the cost of power production and the extent to which this feeds through in changes of commercial and retail end user power tariffs; and (iii) understanding the nexus of DI, climate neutrality and optimal power investments under different circumstances.

In this context, the Phase 2 in-depth study of IPP investments sought to better understand how different types of IPP investments generate DI depending on the existing structure of the power supply sector and the demand patterns and requirements of the private sector. It sought to quantify trade-offs between expected investment return, DI and (mitigation of) GHG emissions, as well as to identify 'just net zero scenarios' and 'investment roadmaps' that optimise development and climate impact under different supply/demand conditions and private sector needs.

The study established a model of the power sector in six different countries,[37] capturing the time-varying interplay of power supply and demand. By matching hourly (merit order) supply and demand throughout the year, the evaluation team calculated estimates of (i) the electric energy lost due to outages (in megawatt hours (MWh)), (ii) the weighted average generation cost per kilowatt hour (kWh) generated, and (iii) the weighted average GHG emissions per kWh of energy produced. By inserting additional capacity of different generation technologies, the marginal impact on these three variables was inferred. The model was extended in two areas: (i) analysis of transmission and the impact of relieving associated bottlenecks in Kenya; and (ii) the inclusion of BESS, using data from BII's Kenhardt investment in South Africa.[38] The study also calculated GDP and GHG impact per million dollars, which enabled the evaluation team to analyse the climate–development nexus of different technologies from an investor's perspective.

The study extends the evidence base and understanding of the impacts and trade-offs in terms of investing in utility-scale power generation in several ways:

- **Identical power interventions in different countries can have rather different GDP and GHG impacts.** The economic impact of adding generation capacity depends largely on its ability to reduce outages, as opposed to its ability to reduce the price consumers pay for power. For example, open cycle gas turbine (OCGT) in South Africa comes out as the investment with the highest economic impact, despite it having the highest costs of operation. For GHG emissions, the impact depends on the timing of outages and the emissions of the last power plant in the merit order.
- **Cheap, easily dispatchable power is highly impactful, especially in countries where outages occur frequently.** Ensuring that the power is dispatchable (and resolves outages) is key. For example, affordable solar photovoltaic (PV) capacity in South Africa is one of the most effective interventions, but in Kenya it is constrained owing to outages, most of which occur after sunset. As such, thermal power plants – heavy fuel oil (HFO), OCGT, and combined cycle gas turbine (CCGT) – are much more effective in reducing outages after dark, although it is important to consider climate-friendly dispatchable solutions, such as the conversion of HFO plants to OCGT, or cost-effective hybrid solutions such as solar/battery or solar/gas.
- **There are trade-offs between reliability, cost and GHG emissions of different power technologies, and the optimal choice depends on the carbon price and the power system dynamics of each country.** As such, investors should consider using a shadow carbon price to systematically compare the climate and development impacts of different types of power investments across different geographies. Certain technologies break with the traditional trade-off between climate and development impacts; for example, geothermal is efficient at reducing both outages and GHG emissions, but only a few locations have the right conditions for it. Adding battery storage to a

[37] The six countries are Côte d'Ivoire, Kenya, Mozambique, Senegal, South Africa and Zambia.

[38] Unlike other generation technologies, adding a BESS to the IPP model requires construction of a charging/discharging model that optimises power delivery given the existing supply and demand system within physical constraints (battery size, maximum power evacuation to grid, etc.).

solar PV plant also decreases both power outages and GHG emissions, yet high capital costs may still be a constraining factor for certain projects.

- **Transmission plays an important role in overcoming local supply and demand imbalances.** It was shown that the economic impact of transmission to alleviate power shortages in Western Kenya was the most effective on a per dollar basis. It should be noted, however, that transmission investments are much less standardised that IPPs and depend not only on the capacity of the line but also, critically, on terrain and distance.
- **Given the heightened volatility in (hydro) power supply availability across Africa, diversification of power systems and greater reliance on regional power pools to effectively manage fluctuations are important.** Power systems must be able to cope with increased volatility in power supply availability. For example, climate change-induced droughts may greatly decrease the availability of hydropower, whereas reliance on fossil fuel imports may create fuel shortages because of geopolitical factors or other supply chain constraints. In addition, investments in transmission can offer a more cost-effective solution to reducing outages and driving environmental and socioeconomic impact, as compared to investments in power generation.

The study methodology has several limitations that should be considered when interpreting its findings and that could be reflected in the study model in future. Notably, it does not include the role of T&D investments or regional interconnectors, nor does it explore demand-side management or broader system improvements. It also does not reflect future dynamics, such as transition risk or the risk of stranded assets, fossil fuel dependency, price volatility for oil and gas importing countries, or long-term planning required to meet rising electricity demand. Additionally, it does not account for improvements in cost competitiveness, social benefits of renewable technologies and energy storage systems, or Paris-aligned country pathways to net zero emissions.

3.4.2. Rural electrification study

The evidence review conducted in Phase 1 suggested that minigrid solutions are effective in reaching new customers and therefore in increasing access to electricity. However, it identified very limited evidence which links investments in minigrids to improved standards of living for end users, especially underserved communities away from urban areas. In this context, the minigrid study sought to test whether investments in new infrastructure in a rural location resulted in improved access to electricity and whether access to electricity translated into improved standards of living (as defined by increasing household asset wealth).

To do this, the study adopted an innovative approach that combined recent advancements in synthetic control impact evaluation design with the latest developments in artificial intelligence (AI)-derived geospatial datasets. The study was designed in this way to test whether it was feasible to develop a robust understanding of impact through an approach which is 'non-invasive' for the investee, can be used in harder-to-reach locations (including fragile and conflict-affected areas), and can be replicated and scaled in a relatively low-cost way by BII (in comparison with 'traditional' methodologies).

The study expands the evidence base and understanding of the impact of investments in minigrid solutions in several ways:

- **Minigrids are effective in reaching new customers and opening access to electricity.** Connection data revealed that the Virunga Energies minigrid achieved 25,856 new connections from 2017 to 2022, against an initial target (for the first phase of the investment) of 10,000–12,000. Analysis of night-time light data indicates that a high proportion of these customers previously had either no access or very limited access to electricity. The communities served by the minigrid include rural and poorer populations (as expressed by their average asset wealth).
- **Minigrids are effective in improving living standards, especially for communities that previously did not have access to electricity.** Analysis of asset wealth data reveals a net increase in asset wealth for households that have been connected to the electricity grid, with this impact being strongest among households who previously had either no access to electricity or very poor

access (as identified through analysis of satellite night-time light data). Households which had accessed electricity for the first time experienced a significant growth in their asset wealth since connection, moving them from the 79th to the 86th percentile between 2017 and 2021 (as set against the distribution of asset wealth for all households in the region).

- **Minigrid solutions have an important role to play in the BII portfolio, and BII should continue making such investments, especially in rural and underserved locations.** Evidence collected through the study suggests that minigrids are especially effective in improving access to energy and in improving livelihoods, including in harder-to-reach locations. In contrast to many other investments in infrastructure (including IPPs), these investments also establish a direct line of sight to end users, and as such it is more feasible to establish the pro-poor impact of these investments. Nevertheless, although this study demonstrates impact, the evidence base for these types of investments is still small, and the time horizon over which data on impact was analysed in this case was relatively short (four years, given the date of connection); as such, BII should consider repeating this study, both with this investment over a longer time horizon and with other similar investments in the portfolio.

3.4.3. Broadband fibre access study

The evidence uncovered in Phase 1 of the evaluation showed a strong positive impact of broadband penetration on productivity and weak evidence of improved quality and reliability on firm productivity. This evidence was amalgamated into a 'strawman' evidence rule that a 1% increase of broadband penetration generates a GDP increase in the range of between 0.13% and 0.7%. At the same time, the evidence review revealed that there is very limited evidence on how additional broadband backbone infrastructure increases penetration and/or productivity for firms in the catchment area. Two studies identified through the review suggested that a doubling of average internet speed is associated with a 0.3% increase of GDP in OECD countries; another study suggested that fast internet infrastructure may have the greatest employment-creating potential in Africa through new firm entry and increasing productivity.

Again using AI-derived geospatial datasets, the synthetic control method and data from Liquid Intelligent Technologies on the location of their infrastructure in DRC, the study sought to answer two questions: (i) which regions have become connected to the broadband fibre line; and (ii) the extent to which households in the connected regions experienced improvements in living standards as a result. It was found that:

- **Liquid's broadband fibre cable is providing an estimated 2.5 million internet users with access to faster and more reliable internet.** This number only reflects the population that got 'accidentally' connected because of their proximity to the fibre cable, which was intended to connect the two largest cities Kinshasa and Lubumbashi.
- **Although well below the US$4.20 lower-middle income threshold of the World Bank, the studied population live in urban areas and are wealthier than most of the DRC's population.** The population's average spending per capita in 2020 of US$3.38 (in 2021 PPP terms), although higher than 91% of the DRC's population, was well below the US$4.20 and US$8.30[39] per day per capita that the World Bank defines as the lower-middle income and upper-middle income thresholds, and close to the international poverty line of US$3.00.
- **Four years after the arrival of faster internet, average spending increased by US$1.25** in the connected areas, which is US$0.95 more than the US$0.30 spending increase of the synthetic control counterfactual. **These results, however encouraging, are not sufficiently statistically robust yet to claim strong causal inference**
- **The study shows the important role that broadband fibre investments can have in underserved countries** like DRC. It also points to the **importance of the 'last mile' through which people access**

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[39] These thresholds are in terms of 2021 PPP spending. In terms of 2017 PPP spending, they correspond to US$3.65 and US$6.85.

the internet. This involves MNOs providing towers with high bandwidth mobile antennas and the financing of internet capable handsets, which are now seen as the single greatest barrier that keep people offline.

3.4.4. Berbera Port expansion study

The in-depth study into the expansion of Berbera Port examined the economic impacts of this investment. The investment (through a partnership with DP World) aims to strengthen trade infrastructure and regional connectivity in the Horn of Africa by upgrading the port's container terminal, introducing modern handling systems, and improving links with Ethiopia via the Berbera Corridor. The study focused on understanding whether these infrastructure improvements are being translated into tangible economic benefits for Somaliland and regions in Ethiopia which fall within an expanded competitive hinterland of the port. Particular attention is placed on cost savings, employment, and value addition for the local economy.

The analysis combined quantitative modelling (including through a 'transport cost model' which draws on industry-accepted benchmarks),[40] with primary data provided by the investee and secondary sources. It drew on port operational data, payroll and employment data, information on customs duties and tax records, official business registration figures, and structured interviews with the investee, government sources and the private sector, including several port users.

The study found that the upgrading of the port has significantly enhanced its handling capacity and cargo systems, leading to substantial growth in container traffic and notable improvements in operational efficiency. These improvements have generated significant reductions in transportation costs for importers and exporters, driven largely by increased vessel sizes and faster turnaround times. Estimated cost savings for new port users reached $6.9 million in 2024. The upgraded port is also contributing significantly to the Somaliland economy. In 2024, the upgraded port and its surrounding ecosystem, including DP World Berbera's operations, local supply chains and the linked Berbera Economic Zone, are estimated to support a total of around 2,490 jobs and $45.1 million in local value addition. When adjusted for the proportion of container traffic (around 37%) that is considered additional since 2017, and would not have materialised without the expansion of the port, these figures for 2024 are 921 jobs created and $16.7 million in additional value added.

3.4.5. C&I study

This study explores the impact of BII's investment in FPEL, a leading provider of renewable energy solutions for C&I clients in India. The evidence review in Phase 1 identified C&I as strategically important but under-evidenced in terms of its impacts. The aim is to assess how BII's capital and non-financial support has contributed to FPEL's growth, and what this reveals about the broader role of C&I in supporting India's energy transition. The analysis draws on investment documentation, secondary data, and interviews with BII and FPEL representatives. Direct engagement with FPEL's clients was not possible, however, so secondary data was used to explore firm-level drivers of demand for C&I and potential impacts on productivity and environmental objectives.

Preliminary findings suggest that the primary motivation for firms to adopt C&I solar solutions in India is not improved reliability of electricity supply but alignment with firm-level sustainability goals. This was consistently cited in publicly available client statements and case studies. A secondary driver is the potential for operational cost savings, with evidence pointing to power cost reductions of 30%–50% for some firms. These savings can lead to modest increases in output or profits, depending on the firm context (which were modelled through the study, although no baseline information was available). The environmental benefits of C&I are also measurable, with GHG emissions avoided through displacement of grid-based power. India's relatively favourable regulatory environment and increasingly reliable transmission infrastructure, together with the capital available from sources including DFIs such as BII, have supported the expansion of C&I solutions such as those offered by FPEL. A stable grid network has

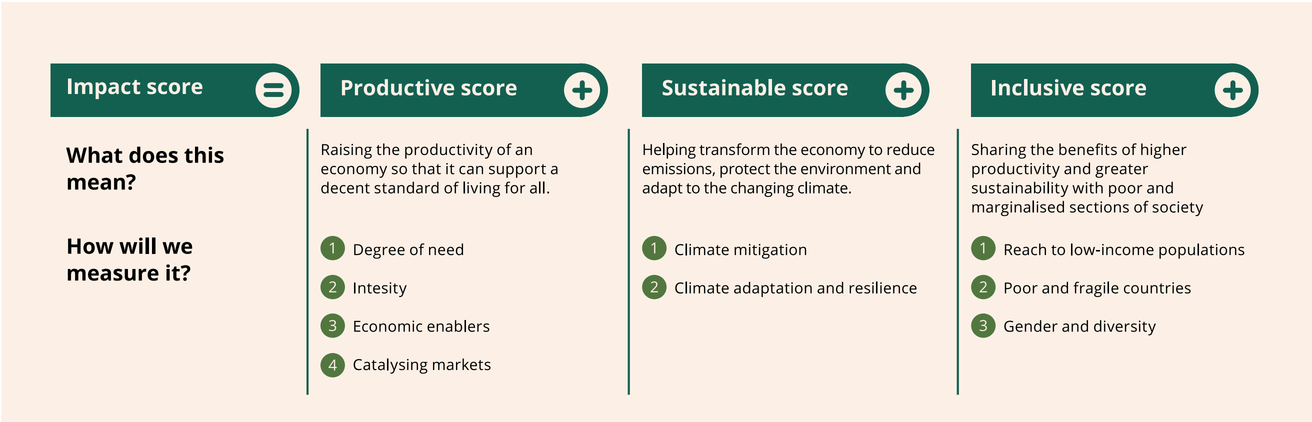
[40] Where secondary data was not available, the study made use of industry benchmarks for impacts, such as job creation in supply chain-linked industries and GHG emissions avoided owing to increased efficiency of port operations.

enabled the recent growth in off-site solar solutions, which have dramatically increased FPEL's scale of generation. These features make C&I a promising model for accelerating the green transition (for specific businesses) in contexts with a reliable grid and commercial demand.

4. Assessment of implementation against BII's strategic impact priorities

BII's approach to impact management is grounded in the Operation Principles for Impact Management (OPIM), of which BII is a founding signatory. BII's impact framework shapes how it assesses the expected impact of each investment and how impact is monitored and managed after investment, which is summarised in each investment's impact dashboard. BII has used different tools for assessing and managing its impact on a portfolio basis, which is one of the principles of the OPIM. From 2012 to 2022, BII used the DI grid to score investments along two dimensions: (i) the difficulty of investing in a country; and (ii) a sector's propensity to create employment. At the start of the 2022–26 strategy period, BII replaced the DI grid with the impact score, which now consists of three pillars, aligned with BII's strategic impact priorities in the 2022–26 strategy: (i) **productivity** (0 to 4); (ii) **sustainability** (–1 to 4); and (iii) **inclusivity** (0 to 4). Scores for each pillar are applied to each prospective investment and are reviewed biennially over the investment's lifetime, with performance tracked against the original impact thesis according to a series of KPIs. Figure 17 provides an overview of each of the elements contained in each pillar. These determine the total impact score awarded for each investment.

Figure 17. BII impact score[41]



The impact score is designed to recognise and incentivise investments that are likely to contribute most to BII's three strategic impact objectives. It also complements detailed assessments in investments' impact dashboards by providing a quantitative metric that can be aggregated and used to monitor and analyse strategic impact performance across the portfolio.

In this section, we assess implementation against these three strategic impact priorities, highlighting BII's approach to scoring investments against drawing on relevant findings from the Phase 1 report and the in-depth studies undertaken in Phase 2 of this evaluation. We discuss recent changes that BII has introduced in these areas and identify implications for investment strategy and impact management.

4.1. Productive impact

BII's productive score is driven by four elements: relative degree of need, intensity, economic enablers and potential to catalyse markets. Below we discuss each of these elements in the context of infrastructure investments.

[41] BII (n.d.) Impact Score: 2022-26 Strategy Period. https://assets.bii.co.uk/wp-content/uploads/2022/02/24121022/British-International-Investment-Impact-Score-2022-26.pdf

4.1.1. Relative degree of need

Infrastructure, more than other sectors, is foundational to a country's ability to build a viable private sector economy. All developing countries need better infrastructure, and many prioritise it in their development plans.

BII's approach: under the productivity dimension, BII scores all countries in its investment universe on their relative degree of need. Through this approach it assesses how effectively a proposed investment will address significant developmental needs, with the aim that investments are directed towards areas with substantial demand or deficiency. This provides a more granular and nuanced approach than the previous country scoring applied by BII. Table 1 provides example indicators used to assess and score relative need across various subsectors.[25]

Table 1. Example indicators for degree of need

Need	Gap assessment indicators	Source
Power access	Combined proprietary index: (1) access to electricity, (2) energy consumption per capita, and (3) proportion of electricity from a generator	United Nations (UN) SDG/International Energy Agency/World Bank
Water	Population using at least basic drinking water services	World Health Organization
Information and communications services	ICT Development Index	World Telecommunications/ ICT Indicators Database

Relevant findings from the Phase I portfolio review: the portfolio review[42] performed in Phase 1 of this evaluation considered the effectiveness with which BII targets investments across its infrastructure portfolio to relative need. Although based around an earlier approach, in which BII scored a country overall based on 14 segmented needs, the evaluation team concluded that in the power and telecom subsectors, BII targeted its investments quite well from a DI perspective. In contrast, relatively more transport investments were made in countries where the need was less (although for transport, a country-based assessment does not consider more local needs, especially in larger countries). Countries were grouped into quintiles based on their performance against each subsector indicator, and each BII infrastructure investment was subsequently allocated to a quintile. For example, the need for an IPP investment was greater the more a country suffered from outages and/or the higher the cost of power production, whereas the need for telecom investments was greater when mobile coverage and/or internet bandwidth were lower.

Relevant findings from Phase 2 in-depth studies: our in-depth studies into the expansion of rural electrification and broadband internet access in DRC support the findings of the portfolio review in Phase 1. For example, our study into the development of a new renewable energy minigrid in Eastern DRC found that BII has been able to reach a more remote, poorer and underserved population through this investment. Here the relative need for electricity access is high; household electrification rates in the Kivu region, in which the minigrid is located, are especially low and lag significantly behind the national average. In a similar vein, our study on Liquid fibre access in DRC demonstrates a high degree of need for this investment, given low broadband penetration rates in DRC. Although investments in fibre backbone will remain necessary across the world, there are ever fewer regions where broadband fibre access is entirely lacking and where the relative need for BII capital is thus largest (notably in Central Africa and the Horn of Africa) **(Recommendation 8)**. Investments in the 'last mile', such as financing capable handsets are increasingly important to enable the actual use of improved internet (**Recommendation 99**)

[42] Kim, R. *et al.* (2022) Final Report: Evaluating the Impact of British International Investment's Infrastructure Portfolio. https://assets.publishing.service.gov.uk/media/623b3cb98fa8f540f6c2322c/BII_Infrastructure_-_Formal_Evaluation_Report_-_Final_Report_230322.pdf, Section 6.3.

Our study on the expansion of Berbera Port in Somaliland provides an example of a transport investment which is being made in a region with particularly high relative need in terms of market infrastructure and access. Prior to the expansion of the port (and linked investments in roads through the Berbera Corridor project), Somaliland's limited road and port infrastructure constrained trade, with Berbera handling relatively low container volumes and lacking the facilities to attract larger shipping lines. The expansion of the port is helping to address these constraints; although the investment is at an early stage, findings from the study highlight how the port is increasingly seen as a cost-effective alternative to Djibouti Port for importers and exporters in Somaliland and in nearby regions of eastern Ethiopia, where transport costs have historically been high. These improvements are expected ultimately to enhance trade competitiveness and economic opportunities across the port's hinterland.

At the same time, the IPP study demonstrates that need is not necessarily uniform across countries and that the need for different technologies can vary substantially, indicating a requirement to understand these needs at a more granular level.

Implications for investment strategy and impact management: we understand that BII now conducts a more detailed needs assessment per infrastructure subsector and country. Although we did not evaluate the investment process, we agree on this approach and **recommend that for its impact score, BII adopt a more granular assessment of relative degree of need at the infrastructure subsector and country levels where this is appropriate (Recommendation 4).** For the impact score, we recommend splitting the power sector into IPP/transmission and power access.[43] This would be similar to how financial services are treated as three subsectors. Assessing the relative need at the country level probably suffices for subsectors such as IPP, transmission ports, power transmission, internet backbone fibre and data centres. However, for interventions in (among others) off-grid, minigrids, home solar, mobile towers and roads, a more local needs assessment is required, although we recognise that data availability is an issue and that such an assessment may best be performed during investment due diligence rather than for the impact score. A reliable needs assessment is especially important in platform/joint venture investments, where BII can exert more influence over strategy and project development.[44]

4.1.2. Intensity

BII's approach: BII captures how efficient an investment or company is in delivering impact compared to relevant benchmarks built from available data sources, including investment data and other market-level information. Default 'in line with benchmark' intensity scores are used where no suitable benchmarks are available. Intensity is considered immaterial where the investment does not result in additional impact.

Relevant findings from Phase 2 in-depth studies: for investments such as IPPs, transmission and ports, the studies undertaken in Phase 2 of this evaluation indicate that the GDP and job creation effects of investments can be inferred from modelling. In the Phase 2 in-depth study of IPP investments, for example, we compared, for all country/technology combinations, the GDP impact per million dollars invested. This indicator captures both the effect of a generation technology (determined by its place in the merit order in a country) and the investment cost (which varies widely per technology) to achieve that impact. The results are markedly different for the more than 33 different combinations (including transmission) investigated.[45] Similarly, the in-depth study of the expansion of Berbera Port applied a modelling approach that drew on data from the investee and other sources, combined with industry-accepted benchmarks and multipliers, to estimate impacts on job creation and value addition in the local economy. The model produced estimates for both direct employment at the port and indirect employment in related sectors such as logistics, transport and trade services. The approach demonstrates how relatively low-cost, replicable modelling methods can be used to quantify intensity of impact for large

[4343] For example, Uganda does not have a need for new power generation (it has a large surplus) whereas it has a great need to expand access to power

[44] In these subsectors there are opportunities for BII to target to needs at a subnational level, for example where there is inconsistent coverage within a region or geographic area, and/or to target particular categories of end user.

[45] The study showed the results by country, whereas some interventions can be valued only when taking into account the regional power pool context (e.g. Mozambique and South Africa).

infrastructure investments based on existing studies and plausible assumptions. The findings highlight that the expansion of the port is creating skilled, well-paid jobs and is having a significant impact in the Somaliland economy.

Implications for investment strategy and impact management: it seems feasible that BII can be more specific about the intensity of impact across similar investments such as IPPs, and **we recommend that BII measure the intensity of the economic impact of investments in IPPs, and possibly some other infrastructure subsectors, by considering investment costs (Recommendation 11)**. Such comparisons may be of less relevance in the case of large infrastructure investments such as ports, given the limited number and unique nature of such investments across the portfolio. In terms of comparing GHG avoidance across investments, BII already measures this for IPP and e-mobility investments.

4.1.3. Economic enablers

Relevant findings from the Phase I portfolio review: economic enablers are productive inputs that are required by other firms. Improving the quality or reducing the price of these inputs enables growth of companies; this is especially true for infrastructure investments. Possible exceptions are subsectors that focus on end users, such as home solar and e-mobility, which explains their lower productive score in Figure 16 (Section 2.10). BII awards economic enabling points to investments in grid power generation, transmission and C&I, except in markets where reliable electricity is already widely available at a low cost. In these cases, the DI thesis will typically focus more on decarbonisation efforts. This helps to explain the lower economic enabling scores for T&D, C&I and off-grid observed in the portfolio review.

Relevant findings from Phase 2 in-depth studies: in terms of investments in IPP, although we cannot infer the economic enabler score for all IPP investments,[46] it is important to note that generation technologies differ in the extent to which they enable other sectors. Economic development requires reliable power, which means that plants are turned on when required, i.e. they are 'dispatchable'. Solar and wind plants without battery or other backup systems are not dispatchable and therefore have a more limited impact on grid reliability than geothermal or gas plants, although they sometimes generate cheaper power. Solar and wind plants are undoubtedly much better from a climate-mitigating point of view (see Section 4.2); but in situations in which the power they generate is not dispatchable, their lower ability to enable economic activity must be considered. Renewable plants also come with higher costs to integrate them in existing networks. This causes the levelised full system cost of electricity[47] to be substantially higher than the levelised cost of energy related to just generation, which already is higher than, for example, open cycle combustion turbines.[48] The total cost of these integration measures increases with increasing penetration of renewable power (as a percentage of total capacity), reduced diversity of the power mix, a smaller geographic size of the grid, and reduced interconnection with other countries. Lastly, it is also important to consider that renewable power requires most capital cost to be incurred up front. Especially in alpha and beta countries, this means imposing greater financing requirements on the countries that are least able to carry them.

For minigrid investments, on the other hand, our in-depth study on the impact of rural electrification showed convincingly that these types of investment are effective in increasing household asset wealth, because of improved access to electricity. This outcome corresponds with the existing (but limited) literature, which has established a link between rural electrification and improvements in household economic well-being, including as captured by changes in their asset wealth. For example, previous research undertaken by BII into the impact of home solar solutions in Nigeria found that a significant

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[46] All IPP investments score the maximum of 4 points. This could be because of a high needs/intensity score and/or one or two additional points for catalytic score and/or an additional point for economic enabling score.

[47] For example Idel, R. (2022) Levelized Full System Costs of Electricity. *Energy* 259.

[48] EIA (2023) Cost and Performance Characteristics of New Generating Technologies, Annual Energy Outlook 2023. https://www.eia.gov/outlooks/aeo/assumptions/pdf/elec_cost_perf.pdf

majority of customers reported an improved quality of life and improved income (88% and 80% respectively).[49]

Our in-depth study into BII's investment in DP World's upgrade of Berbera Port highlights that investments in ports are key enablers of national and regional economic activity. BII's investments in container port infrastructure aim to open access to markets, reduce the time and cost of trade, and unlock economic growth. The in-depth study reveals that the upgrade of port infrastructure has increased the port's productivity and its ability to handle larger vessels, and has led to a noticeable increase in cargo throughput. As a result, Berbera Port's market share has increased vis-à-vis other ports in the region, and its competitive hinterland is expanding. The effect of these changes is to shorten transportation routes in Somaliland and Eastern Ethiopia as importers and exporters begin to choose Berbera Port, owing to its proximity and improved levels of service. The study used a logistics cost model, based on industry-standard assumptions, to quantify the impact of these changes in terms of the reduction in total cost for shipping and inland transport. These savings are expected to produce a powerful economic enabling effect by reducing the price of imports and by improving the competitiveness of exporting firms in the region.

C&I renewable power solutions can also have an economic enabling effect for firms. However, as highlighted by our in-depth study of BII's investment in C&I solar in India, this impact depends on the type of C&I solution and the broader context in which it is adopted. Off-site or open access renewable C&I applications will have an economic enabling effect where they allow firms to procure energy at a discount to national grid tariffs. However, in the case of India, the rapid expansion of these solutions in the last five years has been enabled primarily by a more reliable national grid, as well as by strong energy demand from C&I customers, access to finance, and a supportive regulatory environment.

In such a context, the study finds that firms are adopting renewable C&I solutions largely to meet environmental goals and, to a slightly lesser extent, to reduce costs; given that the grid is much more reliable than before, the enabling effect is less pronounced. This supports BII's more cautious approach to awarding economic enabling points to C&I investments in more advanced markets with a relatively stable grid infrastructure. Nevertheless, in these situations, as the India example demonstrates, open access solar and wind at scale can play an important role in the green transition by displacing carbon-intensive grid power and accelerating decarbonisation.

In contrast, on-site C&I solutions, such as rooftop solar, can be particularly impactful in contexts where grid reliability is lower. In countries such as Nigeria, firms face frequent power outages and unreliable service from the national grid. In such settings, on-site solar systems can provide a more stable and reliable source of energy, enhancing firms' energy security and enabling more consistent production.

Implications for investment strategy and impact management: the greatest opportunities for BII to unlock economic enabling impacts (those that catalyse broader productivity and growth across sectors) lie in alpha and beta countries, where infrastructure gaps are most acute and private capital is least available. In these contexts, BII can play a critical first-mover role, addressing deep market constraints and enabling wider socioeconomic transformation. **BII's investment strategy should continue to prioritise such enabling infrastructure – particularly in high-need, high-additionality markets.** For example, the in-depth study of the expansion of Berbera Port in Somaliland highlights how this investment is showing early signs of unlocking market access and promoting an increase in local economic activity in a fragile, underdeveloped region. BII is commended for also supporting the port expansion and development projects in Dakar, Senegal and Banana, DRC. The IPP study showed that the economic enabling effect per unit of capital investment of wind and solar is often less than that of geothermal and gas plants. Forgoing power investments in alpha and beta countries for climate reasons would have the consequence of reducing BII's economic enabling impact. **To that end, we recommend that BII develop high-level plans for a select number of regions on how to increase availability and reliability of power supply (generation and transmission) while minimising GHG emissions (Recommendation 3).**

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[49] CDC (2020) What Is the Impact of Solar Home Systems in Nigeria? assets.bii.co.uk/wp-content/uploads/2020/03/25194146/What-is-the-impact-of-solar-home-systems-in-Nigeria.pdf

4.1.4. Potential to catalyse markets

BII's approach: BII has identified five pathways to catalyse markets: (i) demonstration effects (investing in pioneering businesses to showcase viable models that can attract further private sector investment); (ii) market infrastructure development (supporting the development of essential market infrastructure); (iii) policy and regulatory engagement (collaborating with policymakers and regulators to create enabling environments); (iv) capacity building (providing technical assistance and support to market participants); and (v) promoting innovation (encouraging innovative solutions and business models that address market failures).

Relevant findings from the Phase I portfolio review: the potential to catalyse markets is an important potential impact of many infrastructure investments. In Phase 1 of the evaluation, we highlighted BII's potential to catalyse investment markets through its platform development strategy – such as through its collaboration with DP World – and its willingness to invest early in infrastructure project development, particularly in markets where the main constraint is not capital but the availability of bankable projects. Such platforms enable BII to expand its footprint in critical sectors such as port infrastructure, with the dual aims of deepening trade corridors and attracting further private investment. The report noted BII's ability to take on risks that other DFIs might avoid, thereby helping to initiate projects that can later attract further private and public investment. This approach is especially relevant in African infrastructure sectors, where BII's capital and engagement help shape the conditions for future market activity. In the portfolio review, we also examined BII's demonstration effect in more challenging subsectors such as T&D, where successful investments, such as Umeme in Uganda, provided models for private sector engagement in typically monopolistic or regulated segments.

BII's approach to catalysing markets has continued to evolve since the Phase 1 portfolio review was undertaken. Catalyst Strategies (initially launched in 2014) supports higher-risk, early-stage opportunities in nascent markets, with the explicit aim of crowding in private capital and shaping market norms. Catalyst makes up a small but targeted and strategic portion of the infrastructure portfolio, and its role in catalysing investments in infrastructure has expanded in the 2022–26 strategy to include thematic strategies, including Gridworks (focused on equity investments in transmission, distribution, and off-grid electricity in Africa), Energy Access and Efficiency (aimed at increasing off-grid access to clean energy and financing resource efficiency projects), and Greenovate (providing concessional debt to high-impact infrastructure projects facing first-mover disadvantages or affordability challenges).

BII Plus (launched in 2018) has also continued to evolve, transitioning from a supplementary support function to a central component of BII's investment strategy. Under the 2022–26 strategy it now provides support in pre-investment readiness and post-investment value addition. In the area of market shaping, it provides support to developing industry standards, capacity building to fund managers and other ecosystem actors, and field-building initiatives, including 2X Global. The role of BII Plus in furthering sustainability and inclusivity objectives is further discussed below.

BII recently introduced the Kinetic Portfolio to invest and manage catalytic investment strategies, which complements the Growth and Catalyst Portfolios and technical assistance provided by BII Plus. This portfolio has a higher risk tolerance than either the Growth or the Catalyst investment strategies; it can be blended with other forms of capital, and it aims to provide catalytic support in a variety of ways, from closing the 'viability gap' on projects to flexible debt products. The Kinetic Portfolio now includes three facilities, each with a distinct impact objective; (i) the Climate Innovation Facility, launched in 2021 with £240 million, supports high-risk, climate-focused technologies and business models in Africa, Asia and the Caribbean through tools such as credit enhancement, project development loans, and flexible debt, with a focus on Productive Use of Renewable Energy (PURE), agriculture and forestry, and green infrastructure; (ii) the Mobilisation Facility, announced in 2024 with £100 million, aims to crowd in private capital for climate and sustainability investments in emerging markets by supporting the development of investment products that align institutional investor needs with market opportunities; and (iii) the Africa Resilience Investment Facility, introduced in February 2025 with £50 million, seeks to catalyse growth finance for high-potential businesses in Africa's lowest-income countries, helping them become more attractive to commercial investors.

Relevant findings from Phase 2 in-depth studies: the in-depth study on Liquid provided an early indication that this investment in the backbone fibre line is already having a catalysing effect on the local market for internet services: evidence from the study suggests that existing MNOs are improving their service and the investment is also supporting the emergence of new entrants. It is hoped that these developments will flow through to impacts for customers in terms of increased reliability and reduced prices. In this context, this would be an important outcome; an initial baseline study for the investment undertaken by BII (CDC at the time) in 2020 highlighted high cost and poor reliability of internet services as key concerns for both businesses and households in DRC, with data prices being among the highest in the world relative to income. In urban Kinshasa, for example, 30% of individuals interviewed as part of the baseline study cited cost as the main limitation, with their data expenses consuming 17% of average monthly income.

The potential for investments in telecoms infrastructure to catalyse markets and to produce downstream impacts for customers is highlighted in the recent BII Insight study on the impact of its investment in Safaricom Ethiopia.[50] This study highlights that since the liberalisation of Ethiopia's telecoms markets and the increased competition brought about by BII's investment in Safaricom Ethiopia, mobile and fixed broadband prices in the country have decreased significantly, bringing Ethiopia into line with regional benchmarks. Increased competition in the market has also driven further investment in network infrastructure to improve coverage and quality of service.

Implications for investment strategy and impact management: in our view, the most important contribution to the objective of market catalysation is BII's platform investment strategy. In many emerging markets, especially in sub-Saharan Africa, the dearth of investable or bankable projects is substantially more serious than the lack of capital needed to finance them. All platforms and joint ventures listed in Sections 2.2–2.4 contribute to improving market structures, demonstrating business models, and developing human capital. For some platforms, impact can be fully or substantially attributed to BII, e.g. 100% BII-owned Gridworks and majority-owned Globeleq. In cases where attribution to BII is not as straightforward, it is evident that BII influences capital allocation decisions towards priority countries and areas. Apart from the equity stakes that BII takes in these platforms, the different pools of capital that BII can deploy (see Section 2.8) add to its ability to make catalytic investments. Although the platform strategy in India (notably Ayana) has been financially lucrative, it should be noted that the environment for investments (especially equity) in Africa is much less favourable. **Despite that (or because of it), from an impact perspective BII should continue to invest in platforms in Africa (Recommendation 6).**

4.2. Sustainable DI

BII's approach: The 2022–26 strategy has seen a significant shift in focus to climate-smart objectives, with BII aiming for at least 30% of all new commitments (by value) qualifying as climate finance investments.

Relevant findings from updated portfolio review: given that this is a relatively recent shift in focus, the original portfolio review undertaken in Phase 1 of this evaluation did not focus on this topic in significant depth. However, as the updated portfolio review in Section 2 highlights, annual climate finance allocations within the infrastructure portfolio have been well above the 30% target every year since 2019. Most of this climate finance is in the power subsector, especially IPP and C&I power, where GHG emissions avoidance is most quantifiable. BII's sustainable score aims to incentivise investments that contribute toward the transition to net zero and climate-resilient economies. Figure 13 shows that the bulk of BII's climate finance goes towards mitigation, i.e. the net zero transition, and much less to adaptation, i.e. climate-resilient economies. In this section we discuss both of these topics in turn, drawing on evidence from the in-depth studies undertaken during Phase 2 of this evaluation and highlighting implications for investment strategy and impact management.

[50] BII (2024) Impact of investment in the Ethiopian telecoms market – the story so far. https://assets.bii.co.uk/wp-content/uploads/2024/10/09105903/BII-Impact-of-investment-in-the-Ethiopian-telecoms-market_2024.pdf

4.2.1. Climate mitigation and net zero transition

In infrastructure, renewable power is the obvious example of the transition to net zero. Figure 16 (Section 2.10) shows that all non-power sectors score lower on the sustainable score. Whereas most financial institutions focus on their financed emissions, BII scores, and reports on, the intensity of impact in terms of emissions avoidance resulting from its direct renewable investments. This is based on emissions factors from the International Financial Institutions Harmonised Approach to Greenhouse Gas Accounting,[51] which considers the emissions of the plant that is displaced. Although BII does not directly report financed emissions, its sustainable impact score implicitly reflects them: investments that are high-emitting can score -1 on the 'S' (Sustainable) dimension, and low-emitting or non-climate investments tend to score 0 or 1 out of 4. In this way, BII's scoring approach disincentivises high-emission projects and favours climate-aligned ones.

Relevant findings from Phase 2 in-depth studies: the results of the Phase 2 in-depth study of IPP investments also show that emission avoidance intensity depends on renewable technology and on country. Annual avoided emissions increase with the number of hours for which renewable plants are a substitute for fossil-based plants and with the GHG intensity of the plants that are pushed out. This explains why technologies with the highest availability[52] have the greatest emissions avoidance potential, especially in countries with a lot of fossil baseload generation (e.g. South Africa and Senegal, but also India, Indonesia and Vietnam). In countries where fossil plants are mostly run as peaker plants and not as baseload (e.g. Kenya, where peaker plants run in the hours after sunset), the length of time in which renewables replace fossil plants is reduced, which constrains their avoidance potential. BII reports on avoided emissions per million dollars of book value across the portfolio, with the trend showing that this ratio is increasing, which is encouraging.

Further evidence on climate mitigation impact comes from the in-depth study of BII's investments in C&I solar in India. The study found that environmental objectives – particularly alignment with corporate environmental, social and governance (ESG) and sustainability goals – were by far the most cited motivation (rather than grid reliability) for firms to adopt both rooftop and off-site solar power solutions. The study was able to estimate avoided GHG emissions resulting from these investments by modelling power displacement from the grid, using standardised emissions factors and firm-level usage patterns. These results demonstrate the potential of C&I solar to contribute directly to decarbonisation by enabling firms to substitute fossil fuel-based grid electricity with clean energy.

Several contextual factors have enabled the rapid growth of the C&I solar segment in India in recent years. These include the development of a more mature grid and transmission infrastructure in the last decade, a favourable regulatory environment – including a recent policy allowing interstate wheeling – and growing corporate demand for clean energy. Among these, the improved reliability of India's grid has been especially important, which has made off-site solar solutions a more viable option. In turn, this has significantly expanded the potential scale of C&I solar generation beyond the limitations of rooftop installations. Enabling firms with more substantial energy needs to adopt clean energy at scale has significantly enhanced the emissions mitigation potential of C&I in India's energy mix.

Implications for investment strategy and impact management: given that avoidance potential depends on what happens at the margin, both in terms of capital and in terms of the merit curve, we think that **emissions avoided per million dollars should be a key indicator for BII's sustainable impact score (Recommendation 3)**. The Phase 2 in-depth study of IPP investments shows how the capital cost of a power plant affects GHG avoidance per dollar of investment; for example, a concentrated solar power (CSP) plant avoids more GHG per megawatt (MW) installed, but because it is five times more expensive it

[51] See International Financial Institutions Technical Working Group on Greenhouse Gas Accounting (2021) International Financial Institutions Guideline for a Harmonised Approach to Greenhouse Gas Accounting. https://unfccc.int/sites/default/files/resource/AHG-003_Guideline_on_GHG_Accounting_and_reporting_1Jun_.pdf

[52] Power plant availability refers to the percentage of time a power plant is capable of producing electricity compared to the time it is planned to operate. High availability indicates efficient performance and reliability in meeting electricity demands.

achieves only one-third of the avoidance per dollar of PV solar.[53] A CSP investment would thus tie up capital which could not be deployed elsewhere to decarbonise power generation. This, of course, is a delicate balance. Although BII's investment in Kenhardt BESS in South Africa avoids fewer GHG emissions compared to deploying the same capital in solar PV only, it also demonstrates the feasibility of this type of technology and helps drive down its cost. BII's expansion into Southeast Asia means it has opened a large universe for meaningful decarbonisation. Capital efficiency is therefore crucial, as are catalytic effect and private capital mobilisation.

The in-depth study of C&I solar in India illustrates the potential for this solution to support and accelerate the green transition in a targeted and scalable way. C&I solutions offer relatively lower risk compared to grid-scale renewables, because they are typically underpinned by guaranteed offtake agreements with private firms. They also offer opportunities to directly measure impact in terms of GHG emissions avoided. However, the study also highlights that this is not a 'one size fits all' solution. Its success in India reflects a set of enabling conditions – including regulatory stability, improved grid reliability, and access to capital – that have allowed for the development of larger-scale off-site solar solutions. BII should continue to explore C&I as a climate mitigation tool in contexts where similar conditions exist – particularly in parts of South and Southeast Asia – while recognising that the model may be less applicable in African markets, where grid stability is lower and capital availability more constrained.

[53] In fact, a counterintuitive outcome is that in Senegal, even a CCGT plant can avoid GHG. Senegal has many HFO/diesel power plants, which have a much higher GHG emission intensity than CCGT. The avoidance of these plants is driven by the cleaner CCGT technology and especially by the fact that these plants run 24/7.

4.2.2. Climate adaptation and resilience

Unlike climate mitigation, an investment's contribution to climate adaptation and resilience is much harder to determine. The evidence and impact chain from an investment to a region or country's ability to adapt is typically long and nearly always hard to quantify. Moreover, many adaptation interventions, especially in infrastructure, are made by the public sector, with limited private sector involvement.

To get some indication of how well BII targets investments to countries that are most vulnerable, we have mapped BII's investments onto the two principal indicators of the Notre Dame Global Adaptation Initiative (ND-GAIN): climate vulnerability and adaptation readiness. We hypothesise that capital deployed to countries with a higher vulnerability and lower readiness is more 'adaptation-aligned' than investments in countries with a lower vulnerability and higher readiness.

Figure 18. BII infrastructure disbursements per country, mapped against the ND-GAIN indicators as at end - Sept 2024[54]

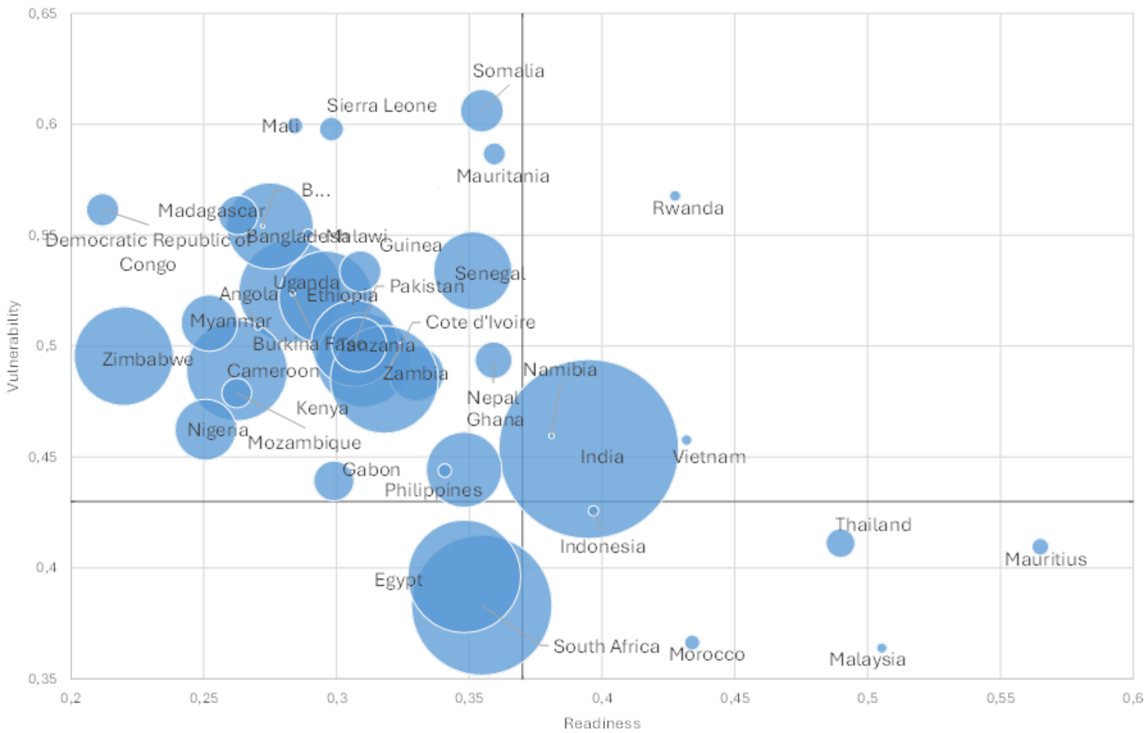

Figure 18 shows that most (63%) of BII's disbursed capital went to countries that are considered most vulnerable to, and least ready to deal with, the effects of climate change. The three largest countries in BII's portfolio – India, South Africa and Egypt – have a somewhat lower vulnerability and/or slightly better readiness, but still require ample finance to adapt.

From an adaptation perspective, BII should continue to deploy capital to the most vulnerable and least ready countries and on deals elsewhere that catalyse or mobilise finance from the private sector (Recommendation 5). The National Adaptation Plans that have been submitted by almost all developing countries[55] can be used to make sure that investments are aligned with a country's adaptation strategy and can also serve as inspiration to find adaptation-focused investment opportunities.

Although climate resilience and physical risk aspects are already considered in (hard) infrastructure investments, an important aspect of adaptation is the use of infrastructure services. BII's focus on handset financing (see Section 2.3) is a good example of enabling adaptation, because it increases access to information from climate information and early warning systems. **We recommend that BII focus more on**

[54] Axes are truncated for readability. The horizontal and vertical lines that divide the graph into four quadrants are the global median values.

[55] As at June 2025, 143 of 154 developing countries have developed a National Adaptation Plan, according to the National Adaptation Plan Global Network.

this space in future, from an adaptation perspective as well as to improve access to infrastructure for underserved populations (Recommendation 9).

BII continues to evolve its portfolio for investments in climate resilience and adaptation, although it recognises that it can be difficult to find bankable investments in this space and attractive returns. A strong recent example is BII's support to the Urban Resilience Fund (TURF), which focuses on infrastructure solutions that increase urban resilience to climate risks. TURF invests in projects such as sustainable urban mobility, flood protection, and waste and water infrastructure. In 2024 BII supported TURF's project development facility with a loan to the Nouakchott Coastal Resilience Project, which aims to protect Mauritania's capital from coastal erosion and flooding while supporting new economic activity. This integrated approach combines physical infrastructure with nature-based solutions, helping to strengthen adaptive capacity in highly exposed cities.

BII recognises the need for further adaptation-focused investments and is active in the DFI community to enhance collaboration on the topic. For example, together with several other DFIs, BII partnered with the UN Environment Programme Finance Initiative to better understand the dimensions of adaptation. The report[56] provides guidance to prioritise and scale up private investment in adaptation and resilience. BII is also exploring a shift towards more of a platform approach to develop opportunities in the adaptation space.

Further investments in the WASH sector are likely to play a key role in increasing the number of adaptation-focused investments in BII's infrastructure portfolio. This is an area that BII has identified as a strategic priority in its 2022–26 strategy. DFIs (including BII) have found it difficult to identify, develop and commercialise investments in this space. Recently, BII has drawn on its platform model to address some of these challenges and, in combination with Metito Utilities Limited, has launched a series of investments in the WASH space through the AWID platform. Launched in March 2023, this platform aims to develop climate-resilient water infrastructure, including water and wastewater treatment plants, to address water insecurity and to enhance access to sustainable, safe and reliable water services in Africa. AWID currently has two operational assets: the Kigali Bulk Water Supply Facility in Rwanda and the Sharm El Sheikh Desalination Plant in Egypt.

The WASH sector has recently been gaining additional interest from other DFIs, including FMO, DEG and Proparco, who have adopted a variety of different funding mechanisms to identify and commercialise viable investments. For instance, FMO has supported WASH-focused projects through direct equity investments and, through the Dutch Fund for Climate and Development (DFCD), through an approach which combines equity, grants and debt financing. DFCD contains a dedicated water facility which further serves as a pipeline feeder and development partner for projects that may later receive investment through Climate Fund Manager's Climate Investor Two (CI2) fund. CI2 focuses on water, sanitation, and oceans-related climate infrastructure projects through a tiered equity model blending concessional and commercial capital. Finally, DFCD also includes an origination facility which provides very early-stage support to the identification and development of projects, including technical assistance and grants for feasibility studies, environmental and social assessments, and business model development.

DEG and Proparco have also increased their commitments in the WASH sector in recent years. In 2023, for instance, the AFD Group committed €1.8 billion to water and sanitation, with Proparco contributing €274 million. Both DEG and Proparco have made a number of commitments through long-term local currency loans, either to individual businesses and business consortia or to municipalities and public-private partnerships.

[56] Adaptation & Resilience Investors Collaborative (2024) Adaptation & Resilience Impact: A measurement framework for investors. https://assets.bii.co.uk/wp-content/uploads/2024/04/16171508/Adaptation-and-Resilience-Impact_A-measurement-framework-for-investors.pdf

4.2.3. Balance between mitigation and adaptation climate finance

Many stakeholders in the development space argue that climate finance is displacing development finance because it is neither new nor additional.[57] Furthermore, most climate finance to International Development Association (IDA) countries[58] goes to mitigation and not to adaptation. Collectively, however, IDA countries are responsible for less than 1% of global emissions and much less of the cumulative emissions up to now. These countries will have to adapt to climate change long before they will feel the benefits of their climate mitigation efforts.

Implications for investment strategy and impact management: although we recognise the difficulty of making private sector infrastructure investments in climate adaptation, **we recommend that BII increase the share of its infrastructure climate finance that goes to adaptation (Recommendation 5)**.

4.3. Inclusive DI

Infrastructure investments can make important contributions to inclusive development, but these impacts are often indirect and highly dependent on project design and implementation. The inclusive score is driven by the extent to which an investment (i) reaches low-income populations, (ii) is targeted to poor and fragile countries, and (iii) meets gender and diversity objectives.

4.3.1. Reach to low-income populations and poor and fragile countries

Phase 1 of this evaluation found that BII's infrastructure portfolio makes its most significant contribution to inclusive impact by expanding access to more affordable and reliable services, such as electricity, at scale. However, it also concluded that evidence of the depth of inclusive impact was limited: affordability remained a major barrier for the poorest households, and targeting to more remote or marginalised communities was not systematic.[59] Phase 1 of this evaluation recommended that BII adopt a more deliberate and data-driven approach to identifying and deepening inclusive impact, especially for low-income populations.

Since the Phase 1 evaluation, BII has strengthened its approach through the introduction of an inclusion sub-score within its overall impact score. This inclusion score captures low-income reach by estimating the percentage of stakeholders living below $6.85/day [60](a poverty line based on consumption, measured in purchasing power parity dollars, maintained by the World Bank). However, because infrastructure investments are often far removed from their end users, measuring reach to low-income populations in this way is typically challenging. In situations where it is not feasible, BII applies default country scoring to investments, based on its alpha-to-delta country categorisation (see Section 2).

It is easier to score individual investments for their reach to low-income populations and to identify evidence of impact where there is a more direct line of sight to end users. For example in the electricity sector, a recent report by BII recommends going beyond simple data on connections to identify evidence of improved economic opportunities and resilience for low-income households and businesses in sectors such as home solar, minigrids and C&I solar.[61] This approach is also relevant to subsectors such as mobile access and e-mobility. Nevertheless, accurate assessment in these cases is still contingent on the availability of secondary datasets and investee-level data, as well as sufficient resourcing to gather new data using appropriate methodologies. Our in-depth studies of the hydroelectric minigrid in Eastern DRC

[57] CARE (2023) Seeing double: decoding the 'additionality' of climate finance. https://careclimatechange.org/wp-content/uploads/2023/09/Seeing-Double-2023_15.09.23_larger.pdf

[58] IDA (2025) 'Borrowing countries'. ida.worldbank.org/en/about/borrowing-countries. The list excludes India and South Africa, the two most coal-intensive countries in BII's universe.

[59] This finding is echoed in a recent BII study on investing for impact in the electricity sector which identifies reliability and affordability (in that order) as the principal channels through which access to power can benefit low-income populations. BII (2025) How does investing in electricity support inclusion? https://assets.bii.co.uk/wp-content/uploads/2025/02/18111604/How-does-investing-in-electricity-support-inclusion.pdf

[60] In 2021 purchasing power parity terms, this threshold is now $8.30

[61] BII (2025) How does investing in electricity support inclusion? https://assets.bii.co.uk/wp-content/uploads/2025/02/18111604/How-does-investing-in-electricity-support-inclusion.pdf

and the broadband fibre cable in Southern DRC show how a geospatial data collection method allowed for a relatively low-cost and less intrusive approach to estimating reach to a previously underserved and lower-income population, as well as the ability to isolate the impact the investment was having on household living standards. **We recommend that BII more regularly assess the reach and impact it is having for underserved and low-income populations** where these can be inferred, especially where there is a link to the end user. This may include, for example, wider collection and analysis of geospatial data. **We also recommend that BII continue to look for opportunities to improve infrastructure access to underserved communities (Recommendation 12)**. This goes beyond providing hard infrastructure and includes, among others, handsets for internet access, e-mobility bikes and scooters for productive use, and solar water pumps for crop irrigation **(Recommendation 9)**.

4.3.2. Gender and diversity

The Phase 1 evaluation provided a critical assessment of BII's approach to gender at the end of the last strategy period, concluding that although BII held strong corporate commitments in this area, these were not being systematically translated into the infrastructure portfolio's impact management processes. The report found that there was relatively little evidence on how infrastructure investments lead to specific outcomes and impacts for women.

BII's approach has since evolved and, from a gender and diversity perspective, the inclusion score now involves a systematic assessment of all investments against the 2X gender lens framework and BII's proprietary BOLD framework where regionally relevant, with eligible deals awarded one point under each framework. BII has introduced a 25% portfolio-level target for 2X-qualified investments under the 2022–26 strategy, although the infrastructure portfolio is expected to contribute less, owing to structural constraints.

As with reach to low-income populations, demonstrating reach to female consumers (which falls under the 2X 'products and services' criterion) in large infrastructure projects is challenging and risks gender-washing unless supported by robust *ex ante* evidence. As a result, there has been a more natural focus on opportunities to support gender inclusion within leadership structures and employee bases within infrastructure investments (focusing on the 2X 'leadership and employment' criterion). This is especially the case in investments in utility-scale power generation and in large-scale investments such as ports, where it is especially difficult to disaggregate reach to individual female end users. Nevertheless, targeting in this area remains challenging for structural reasons, given that employment and project leadership in the infrastructure sector are still frequently male-dominated.

In terms of BII's commitments to diversity, although there are some opportunities to target Indigenous infrastructure developers and financiers in sub-Saharan Africa (for example H1 in South Africa,[62] which is also gender-inclusive from a leadership and employment perspective), BII's BOLD framework remains challenging to apply more broadly across BII's infrastructure portfolio, given BII's typical partnerships with larger global sponsors headquartered in the global North (where there are more project developers than in BII's other markets, and also because of considerations such as target ticket sizes). As such, BII has not adopted a formal portfolio target for BOLD, although BII continues to use the framework internally as part of the impact score and impact management approach.

A residual challenge to be recognised here, however, is that investment teams are not currently incentivised, through the impact score, to spend the additional time needed to identify opportunities to maximise gender and diversity impact *ex ante* and then to work with investees to make incremental improvements over time, especially where these do not meet existing BOLD or 2X criteria (for example identifying and rewarding efforts to increase female representation in leadership, even if they are below 2X thresholds). These incremental efforts are still valuable, however, and form a key strand to the gender lens investing approach adopted by BII. Such opportunities to 'nudge' investees in the right direction are perhaps stronger in BII's platform investments.

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[62] BII (2025) 'H1 Capital (RF) Proprietary Limited'. https://www.bii.co.uk/en/our-impact/investment/h1-capital-rf-proprietary-limited-investment-03/

Across the portfolio there are examples of investees making commitments to increase gender and diversity impact over time. For example, as evidenced through the in-depth study on DP World's investment in Berbera Port,[63] DP World has its own ambitions to enhance female representation in management positions and in the workforce more broadly. For instance, across its portfolio as a whole it has adopted a graduate trainee scheme (called GROW) to tap into female talent and support greater participation of women in a traditionally male-dominated sector.

Additional 'levers' are also emerging in this space; in its 2022–26 strategy BII has committed to scoring all deals on a two-yearly basis (and more frequently for platforms and risk sharing facilities), which will provide additional evidence and incentives for investment teams to work with investees to shape gender impacts over time. BII is also experimenting with impact-linked finance, such as in the syndicated loan to Sonatel, whereby rate reductions are tied to gender KPIs (e.g. digital inclusion, female leadership);[64] and a new Gender & Diversity Advisory Programme within BII Plus, launched in 2025, will also help support pre-investment technical assistance and post-investment portfolio support. BII is also increasingly exploring ways to build enabling ecosystems, such as by fostering networks of women in leadership roles, including in the infrastructure sector.

We recommend that BII continue to look for opportunities to maximise gender and diversity impact where it can across the infrastructure portfolio (Recommendation 10). This is likely to include supporting existing initiatives by investees, looking for opportunities to nudge investments in the right direction, in particular through its platform investment strategy, leveraging the work of BII Plus and deploying new levers such as impact-linked finance.

4.4. Impact trade-offs

The three impacts of BII's infrastructure investments in its sector impact framework – economic productivity, standards of living, and GHG emissions (see Figure 2) – largely correlate with its three strategic impact objectives (PSI). The five in-depth studies conducted as part of this evaluation address these ultimate impacts differently, which makes it hard to generalise their results. Specifically, the IPP, C&I and port studies focus on GDP and employment impacts, with the IPP and C&I studies also addressing GHG emissions impact. The in-depth studies covering rural electrification and broadband fibre access address standards of living. In addition to these impact areas, BII needs to achieve a return on investment of at least 2%,[65] which is lower than a commercial risk-adjusted rate of return.

Figure 19 shows how BII navigates the trade-offs between financial returns and impact and illustrates how it could evaluate trade-offs between DI and climate impact. Although economic productivity and climate impact encompass different types of impact, we here define them as GDP and GHG impact (avoidance or emissions) respectively. Just as return on investment is a ratio, the GDP and GHG impact of an investment can also be expressed as a ratio by pro-rating them by the amount invested,[66] as was discussed in more detail in Section 4.2.[67] BII addresses the trade-off between financial return and impact using Catalyst and Kinetic, through which it is able to allocate higher-risk and concessional capital. These capital pools are growing faster than the overall portfolio, as per Figure 12.

[63] BII (2021) 'We're partnering with DP World to chart a stronger course for African trade around the world'. https://www.bii.co.uk/en/news-insight/news/were-partnering-with-dp-world-to-chart-a-stronger-course-for-african-trade-around-the-world/

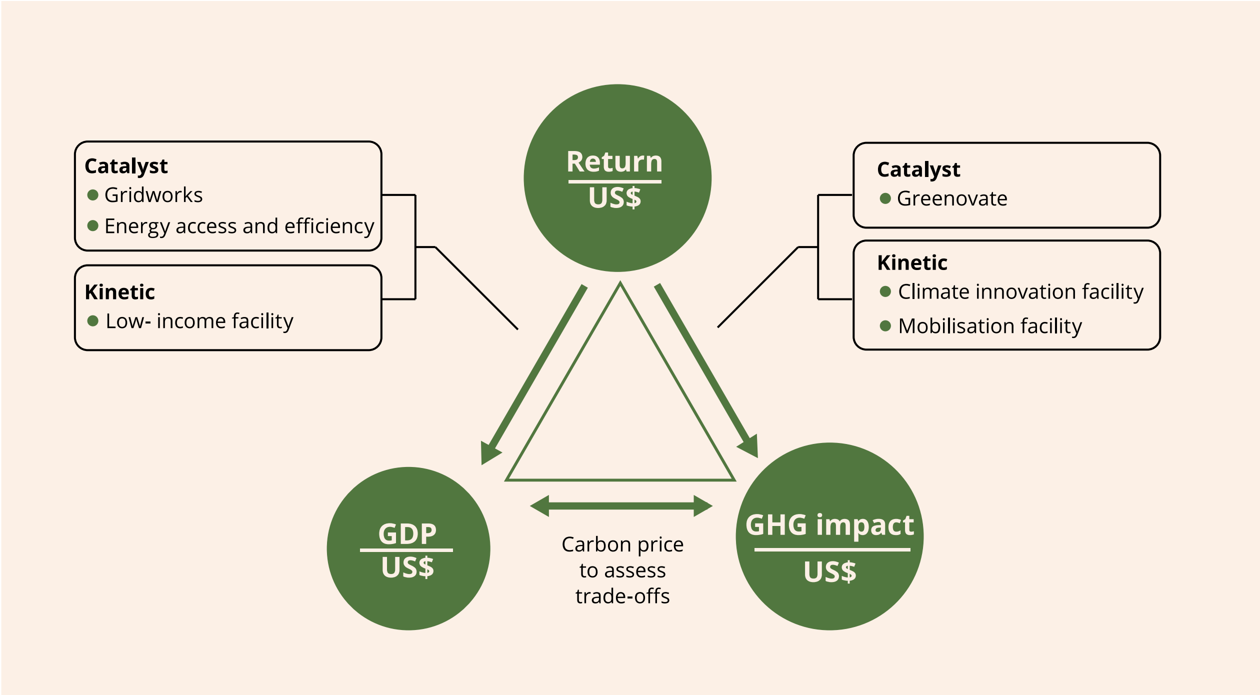
[64] BII (2025) 'Sonatel SA'. https://www.bii.co.uk/en/our-impact/investment/sonatel-sa-investment-01/

[65] CDC (n.d.) BII Investment Policy for the period from 1 January 2022 to 31 December 2026. https://assets.bii.co.uk/wp-content/uploads/2021/12/14080613/investment-policy-2022-2026.pdf

[66] If needed, corrections can be made for debt and equity capital.

[67] GHG emissions and avoidance can be monetised as a cost using a carbon price. Avoidance (i.e. scope 4 emissions) are negative emissions and thus are valued positively.

Figure 19. Trade-offs between financial return, economic development and climate mitigation[68]



The trade-off between GDP and GHG avoidance is harder to navigate, especially in infrastructure sectors other than power generation and transmission. From a development angle, one can argue that emphasising climate mitigation over economic productivity in the poorest countries compromises the development needs of the current generation for the needs of future generations.[69] The power transition is a good example, as is illustrated in the Phase 2 in-depth study of IPP investments. Although there are technologies with fewer trade-offs between GDP and GHG impact (e.g. geothermal power), many power generation investments present a clear trade-off. Building a reliable and continuously available power system using renewable sources is capital-intensive,[70] and most of the cost for renewable technologies is front-loaded, whereas access to capital is the biggest problem for poor countries.[71] In contrast, in more developed countries such as India, Indonesia and Vietnam, the power system is more reliable but very coal-intensive, making the GHG avoidance opportunity and the number of bankable projects larger as well. BII has been criticised for its investments in fossil power in Africa,[72] but it is defensible – even desirable – to emphasise economic productivity in poor countries and climate mitigation elsewhere, especially because BII works with its investees on decarbonisation and transition pathways. Moreover, it is likely that BII can increase its GHG avoidance per investment dollar by investing in renewable power options in gamma and delta countries (see Section 4.2). **We recommend therefore that BII's scarce capital should be allocated to maximise global impact by prioritising economic development in frontier (alpha and beta) countries and prioritising climate mitigation in more mature emerging (gamma and delta) countries (Recommendation 1).** This recommendation loosely applies the so-called Tinbergen rule,[73] which warns

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[68] Gridworks and the Energy access and efficiency strategies can also have an effect on GHG impact, and the climate innovation facility also has inclusivity objectives.

[69] The inverse of the Brundtland definition of sustainability: meeting the needs of the present without compromising the ability of future generations to meet their own needs.

[70] Although the investment cost in renewable technologies is now among the cheapest per MWh except for gas turbines, substantial additional investments in storage, transmission and grid balancing are required to provide more reliable or even uninterrupted power. These costs tend to increase with the share of renewable power in a country's power fleet.

[71] The imported renewable power equipment and dollar financing cost are essentially similar to the foreign dependence on imported fossil fuels for thermal power generation, albeit milder because of the absence of commodity price volatility.

[72] CarbonBrief (2024) 'How a UK government-backed company has fuelled gas power in Africa'. https://www.carbonbrief.org/how-a-uk-government-backed-company-has-fuelled-gas-power-in-africa/

[73] Named after Jan Tinbergen, the first recipient (with Ragnar Frisch) of the Nobel prize in Economics. The rule states that *n* independent policy instruments are required to successfully achieve *n* independent policy outcomes.

against trying to achieve different objectives through one intervention or policy. **In frontier markets in Africa, BII can also deploy Greenovate's concessional debt to increase the number of bankable deals, while leveraging its debt and project finance** to finance IPPs, to diversify (e.g. into C&I, green hydrogen, ports and logistics (cold chain) and WASH) and to pursue higher-risk projects in the more mature South Africa and Egypt markets **(Recommendation 7)**

In India there are many bankable projects in renewable power, and finance is increasingly available from (local) commercial sources. **BII should therefore continue to focus its efforts in India on mobilising capital into this market and/or on providing finance that is additional to what is available in the market** (such as through innovative products, or underserved segments such as transmission) **(Recommendation 1)**. The in-depth study on C&I solar in India highlights the role BII has played in mobilising capital to scale up off-site solar energy solutions, which can be seen as a success in terms of supporting the green transition through a model which is commercially viable. In Southeast Asian countries such as the Philippines, Thailand and Vietnam, commercial finance for renewable projects is increasing (although not as quickly as in India), but there is still a lack of bankable climate projects. **BII should continue to pursue platform investments which can assume development risk in Southeast Asia (Recommendation 6).** A good illustration of this is its recent commitments to Sustainable Asia Renewable Assets (SARA). In general, **BII should continue, and if possible increase, investment in transmission and C&I to support the green transition (Recommendation 2).** The commercial viability of a transmission investment does depend on the presence of credible offtakers, which depends on the quality of regulatory oversight and the financial stability of distribution companies. **The aforementioned strong position in debt and project finance could be leveraged in Asia in different ways (Recommendation 7)** – in India by supporting smaller developers and non-mainstream markets, and in Bangladesh and Pakistan to support the transition away from gas and coal. In Southeast Asia, the heterogeneous financing and commercial environment might require an opportunistic approach. For example, in the Philippines and Vietnam there is ample local capital available, which limits BII's ability to be additional, whereas in Indonesia power prices are very low, which hampers commercial viability.

To help navigate the trade-off between economic development and climate mitigation, **we recommend that BII consider using a shadow carbon price for its infrastructure investments, starting with its grid-scale and C&I power projects**. In the IPP report we used a carbon price to collapse per dollar GDP and GHG impact into one (net) GDP measure. GHG avoidance adds to the GDP effect, just as GHG emissions lower it.[74] Many DFIs use a carbon price, ranging from \$50 to \$250 per tonne of carbon dioxide equivalent (tCO_2e). The higher the price, the higher GHG emissions or avoidance are valued. Although many organisations use a single carbon price, one can argue that carbon prices in developing countries should be lower because of their limited financial capability and the prevalence of development challenges (i.e. the social cost of carbon will be lower in less developed countries); this approach is taken by the International Finance Corporation.[75] A carbon price can also be relevant for renewable projects, even though these do not emit any GHG, because different generation technologies have different effects on GDP and GHG avoidance, as was shown in the Phase 2 in-depth study of IPP investments.

Although not strictly speaking a trade-off, the fact that the PSI scores are amalgamated into a combined impact score may introduce a bias towards (renewable) power investments. This is because their impact on climate mitigation and net zero pathways can be more explicitly determined, causing power investments to have higher impact scores. This bias indeed seems to be present in Figure 16. A focus on economic development in alpha and beta countries **(Recommendation 1)** would counter this possible bias against non-power investments.

As discussed in Section 4.3, for most infra investments, BII's scoring for inclusive impact is based primarily on the score given to the country in which capital is deployed. This is because it is challenging in the majority of infrastructure sectors to target investments to particular groups, including disadvantaged populations (e-mobility, home solar and minigrid investments are notable exceptions which can be

[74] For the avoidance of doubt, renewable energy is not just neutral in carbon emissions, it can remove carbon emitting plants at the margin.

[75] Le Houérou, P. (2018) 'Carbon pricing is crucial to save planet'. https://ifc-org.medium.com/carbon-pricing-is-crucial-to-save-planet-83b41674ec2c

targeted to particular end users and/or underserved locations). As a result, in terms of meeting inclusivity objectives**, we recommend that BII maintain its objective to deploy capital in alpha and beta countries and, even more importantly, to continue to pursue platform investments in these countries that will increase the number of bankable projects.**

5. Recommendations

5.1. Implications for investment strategy

The following recommendations on investment strategy are made solely from an impact perspective and do not consider financial returns, country and instrument limits, deal flow constraints and other BII resource considerations. Because of these constraints, it is not realistic that all recommendations can be implemented, at least not in the short term. As far as we can judge, from an impact perspective no tensions exist between the recommendations.

1. **BII's scarce capital should be allocated to maximise global impact: prioritising economic development in frontier (alpha and beta) markets through locally relevant infrastructure investments, while continuing to focus climate mitigation efforts in more mature emerging (gamma and delta) markets where emissions reductions per dollar invested are most impactful.**

Although most countries have signed the Paris Agreement, BII should recognise the different development contexts and trajectories of each country and pursue a balanced portfolio in navigating the climate–development nexus (see also **Recommendation 3**).

- **In frontier markets (alpha and beta countries)** BII should prioritise economic and industrial development in the shorter term. These countries face significant hurdles in developing productive economies on intermittent renewable energy. Although renewable energy can be cheaper over the lifetime of a power project, the higher capital cost up front, for example the costs of T&D infrastructure or BESS required for renewables, coupled with limited access to commercial capital, presents a challenge. In certain instances, where no realistic alternative exists for providing more reliable/affordable energy, and in line with His Majesty's Government (HMG) and its own fossil fuel policy, BII should continue to pursue gas-fired primary power infrastructure where local economic development benefits, particularly in countries with domestic gas resources, significantly outweigh the foregone GHG mitigation. Run-of-river hydro, albeit seasonal and sensitive to climate change-induced droughts, can also play a role. Moreover, deploying capital-intensive decarbonisation solutions in countries with low emissions mitigation potential reduces BII's ability to invest where emissions reductions would be greater. It should also be recognised that BII's power and non-power investments in alpha and beta countries can yield outsized benefits (and reinforce BII's additionality and catalytic role) in terms of resilience, access and local development, given that these countries have particularly high vulnerability to climate change and have pressing unmet infrastructure needs. Because of the amalgamation of economic development and sustainable scores in the impact score, a bias may already exist towards renewable power investments over investments in other critical infrastructure such as ports and telecom.
- **In more mature emerging markets (gamma and delta countries)** BII should prioritise climate mitigation. These countries are more economically developed and industrialised than alpha and beta countries. With very few exceptions, this development has been achieved through fossil fuel-intensive power systems. This offers many opportunities to decarbonise economies and power systems, including through investments in IPPs, C&I and T&D. The potential to mobilise commercial capital for these types of investments in these countries is also considerably greater. For example, in India there are many bankable projects in renewable power, and finance is increasingly available from (local) commercial sources; BII should continue to mobilise capital by providing financing to products which are not (yet) attractive to commercial markets.

2. **BII should continue, and if possible increase, investment in transmission and C&I to support the green transition.**

One of the main findings of the IPP systems and C&I evaluations is the important role that these investments play in economic development and GHG mitigation. Transmission, within both countries and interconnectors, make power networks more resilient and better able to cope with the intermittent nature of renewable technologies. Public finance sources of most countries are grossly insufficient to support the green energy transition. BII's investment in platforms such as Gridworks and Energrid are path-breaking in this space, especially because they develop new projects in a space in which there are few investable opportunities. In frontier (alpha and beta) countries, often there is no substitute for development finance; and in more mature gamma and delta countries, BII's risk appetite allows it to assume development risks which commercial capital cannot. On-site C&I investments allow companies to speed up their individual energy transition, thereby reducing the load on broken and/or carbon-intensive power systems; but off-site C&I investments require reliable T&D networks and are thus more feasible in more mature emerging markets. A prerequisite for the commercial viability of transmission investments is that there is a credible offtaker.

3. **BII should develop high-level plans for a select number of countries/regions on how to increase availability and reliability of power supply (both generation and transmission) while minimising GHG emissions.**

The IPP study in the evaluation shows the trade-offs between economic development and climate impact change. BII's natural gas power plants guidance[76] helps evaluate whether individual projects are Paris-aligned, but it does not provide guidance on how to develop power systems to support economic development. Because power supply and demand trends change (in countries as well as in regions), a high-level road map can be valuable, especially where BII and its investees are active in new project development. Examples could be southern Africa and East Africa (including Ethiopia). In these plans, trade-offs between economic development and climate impact can be expressed in monetary terms, for example by adopting a carbon price (a monetary cost to GHGs). For example, the higher the carbon price, the higher the hurdle to invest in non-renewable power. The in-depth study of IPP investments shows that, except for South Africa, a very high carbon price would be required to make renewable energy the preferred option from a combined economic and climate impact point of view.

4. **For its Impact Score, BII should use a more granular assessment of relative degree of need, at the infrastructure subsector and country level where appropriate.**

BII's impact framework addresses a country's relative degree of need as part of the productive score. Given the great variation infrastructure subsectors and countries, a more granular assessment would be needed to appraise relative degree of need. For the impact score, we recommend splitting the power sector into IPP/transmission and power access. For interventions in (among others) off-grid, minigrids, home solar, mobile towers and roads, a more local (sub-country scale) needs assessment is desirable given the potential to target these investments to underserved populations, although we recognise that this is not always straightforward and data availability is often an issue; such an assessment may best be performed at an investment level. A reliable needs assessment is especially important in platform/joint venture investments, where BII can exert more influence over strategy and project development.

5. **BII should increase the share of infrastructure climate finance that goes to adaptation.**

Lower-income countries are both more vulnerable to the consequences of climate change and less ready to adapt to it. Alpha and beta countries in particular will face the challenges of adapting to climate change long before they feel the benefits of their climate mitigation efforts. We recognise that it is more difficult to find bankable investments and attractive returns in this space, but we also recognise some of the approaches BII is adopting, including seeking investments through platforms and joint ventures. Although infrastructure in general is a prerequisite for countries to adapt, the WASH sector, in which BII has not achieved the investment scale to which it aspires, is one of the most critical areas in climate adaptation and one in which public sources of finance are grossly insufficient. The National Adaptation Plans developed by many countries could also be useful to develop a more specific investment approach to adaptation.

[76] CDC (2020) Natural Gas Power Plants: Assessing alignment with the Paris Agreement. https://assets.bii.co.uk/wp-content/uploads/2020/12/12145227/CDC_GasGuidance_December2020.pdf

6. BII should continue its equity investment in platforms.

Hard currency debt has had much better return profiles than equity investments, especially those in Africa. We encourage BII to continue making equity investment in platforms and thereby assume development risk that commercial investors do not want to take, while also catalysing markets:

- BII's equity investments in platforms in Africa help to develop projects, which are arguably the greatest constraint on economic growth. Greenfield investments made by, among others, Globeleq, Africa Power Platform, Gridworks and DP World deliver new project developments and thereby foster economic growth.
- Through platform investments in South and Southeast Asia, such as Ayana and Energrid, BII supports the energy transition by delivering greenfield projects which can be sold on to parties that seek exposure to long-term stable returns but cannot take on development risk.

7. BII should build on its strong position in debt and project finance by continuing to focus on where these can be most additional. In Asia this means supporting the green transition by financing innovative sectors and mobilising commercial capital in mainstream sectors through mezzanine and subordinated finance. In Africa this means increasing deal flow in a range of infrastructure sectors using blended finance.

Project Finance investments by BII are currently additional, especially in frontier markets where commercial finance is limited, but there are opportunities to enhance additionality further by expanding the use of instruments such as mezzanine and subordinated tranches and blended finance, and by targeting underserved sectors and geographies. This will vary by market and reflect the varying levels of market maturity and commercial viability, financial ecosystem development, and the availability of commercial capital. In more developed emerging markets, a focus on financing innovative sectors (such as biogas, smart metering, e-mobility, renewable energy with BESS and green hydrogen) and mobilising commercial capital for mainstream climate finance, is likely to be most additional. In frontier markets, a focus on increasing the number of deals, using Greenovate (blended finance) and a continued focus on IPP projects while diversifying into C&I, green hydrogen, ports, logistics (e.g. cold chain) and WASH will be most additional.

8. To improve productive use of communications infrastructure, BII should invest in backbone coverage in the few regions (mostly in Central Africa and the Horn of Africa) where it is currently insufficient but continue its shift towards improving utilisation of existing infrastructure and improving market structures where it can.

The impact case of individual telecom and internet investments is hard to determine, which reflects the 'club good' character of the sector; but economies cannot run properly without a functioning telecoms sector. The bottleneck in telecoms is largely about moving from coverage to utilisation (e.g. tower roll-out MNOs, handset financing) (see **Recommendation 9**). BII can also play a role in improving market structures by financing new entrants or by supporting consolidation. Some markets (e.g. Ethiopia) suffer from a lack of competition, and others (e.g. Pakistan) suffer from too much competition, whereby price pressures make attracting new investment harder.

9. BII should continue to look for opportunities that aim to improve access to infrastructure for underserved communities.

The use of hard infrastructure is a necessary, if not sufficient, condition to enable people to adapt to climate change. Up to now, BII has been active in electricity access (home solar, minigrids, and electricity distribution), but in other sectors opportunities arise which would require cooperation with BII financial services, for example financing of:

- access to electricity through Gridworks and Energy and Efficiency platforms (while recognising that investors' appetite for solar home and minigrid investments has decreased in many markets)
- mobile handsets (the costs of which restrain access to internet services)

- e-mobility (e.g. electric bikes and scooters, which enable productive asset use)
- solar water pumps and cooling (allowing farmers to irrigate crops and prevent crop loss).

10. BII should continue to look for opportunities to maximise gender and diversity impact where it can across the infrastructure portfolio.

While recognising the inherent challenges of achieving impact in this space in the infrastructure sector, BII should continue to seek opportunities to maximise impact where it can. This is likely to include supporting existing initiatives by investees (such as initiatives to enhance female participation in traditionally male-dominated sectors), looking for opportunities to nudge investments in the right direction (especially where BII has leverage through its platform investment strategy), leveraging the work of BII Plus (such as through the new Gender & Diversity Advisory Programme), and deploying new levers such as impact-linked finance. BII should also continue to strengthen its processes for screening and conducting repeat *ex post* scoring of deals against inclusivity criteria, as is increasingly happening under the 2022–26 strategy. To do this credibly – and to avoid the risk of inclusion or gender 'washing' – BII should look for opportunities to improve data collection, particularly in sectors where there is a clearer line of sight to end users.

5.2. Implications for impact measurement

The measurement of impact across the BII infrastructure portfolio is primarily focused on *ex ante* assessments (as part of deal screening) as well as mainly modelled and self-reported information from investments (such as through PSI scoring). There is more limited follow-up of realised impact (*ex post*), including lesson learning through more evaluative studies of 'what works and why'. This is important from a learning perspective, such as in areas where there are evidence gaps (as noted in the Phase 1 evidence review) and where the PSI scores are insufficiently granular (see Section 4.2). The in-depth studies of Phase 2 have sought to fill some of these evidence gaps and to demonstrate what is possible within the constraints and challenges of BII's investments (including the data challenges set out in Section 3.3). The studies highlight a number of ways forward.

11. BII should measure the intensity of economic and climate impact delivery of investments across comparable infrastructure investments within the portfolio by measuring key impact variables relative to project investment costs.

This aligns with FCDO's Value for Money framework, which aims to 'maximise the impact of each pound spent to improve people's lives'. Impact variables such as GDP contribution, employment, GHG emissions/avoidance and transport cost savings can be defined across infrastructure investments that aim at productive use. This will allow measurement of the impact intensity (capital efficiency of impact) of similar investments across the portfolio as a whole and will guide value for money insights of the capital deployed. Investments with identical key impact indicators, i.e. in the same infrastructure subsector, can be compared in this way. Examples from this evaluation are:

- IPP investments (different technologies and countries) – and also C&I investments – can be compared on GDP and (avoided) GHG impact per million dollars. BII already reports on its portfolio-wide avoided emission per million dollar book value, and we recommend that BII maximise this measure. This means focusing renewable power investment in countries where most GHG emissions can be avoided at the margin. Similarly, maximising the GDP impact per million dollar implies a focus on the cheapest technologies that reduce outages the most (see also **Recommendation 1**). This would require a standardised extension of the IPP model which would allow for cost-effective application in other countries[77].

[77] BII already measure MWh produced per $ million investment for internal purposes. While this indicator correlates better with GDP impact, it does not reflect the extent to which outages are avoided.

- Minigrid investments can be compared on number of users reached and/or change in average asset wealth index – and potentially also change in spending (to be verified) – across a geographic region per million dollars.
- The port study demonstrated an approach to use available secondary data and industry-accepted benchmarks to make estimates of direct and indirect job creation, transport cost savings and GHG emissions avoided which have resulted from the upgrading of Berbera container terminal – an approach which can be compared for similar investments.

12. BII should more regularly assess the reach and impact it is having for underserved and low-income populations where these can be inferred, especially where there is a link to the end user. This may include the collection and analysis of geospatial data.

The synthetic control impact assessment methodology, combined with remote sensing technique, as demonstrated in the in-depth studies on rural electrification and broadband fibre access, can be applied *ex post* to investments where a clear treatment group can be identified. These methods use satellite data and machine learning to estimate net changes in asset wealth over time, offering a robust, relatively fast, and cost-effective way to assess changes in living standards – one of BII's core impact objectives. They are also less resource-intensive and more non-invasive than traditional impact assessments, placing minimal burden on BII staff and investees, with marginal costs decreasing as uptake increases.

While powerful, these methods (as noted in Section 3.3) measure aggregate change and currently do have limitations in terms of their ability to disaggregate results by population group (e.g. by gender) or to unpack the detailed pathways of change. Pairing them with qualitative work would help address these limitations.

13. BII should adopt a systems-based rather than a deal-based perspective where appropriate, supported by a portfolio-wide strategy for applying cost-effective methods, for example using a modelled approach where appropriate.

IPP, transmission and port investments change the behaviour of the power and transport/logistics systems at a national or regional level, depending on investment characteristics and existing system behaviour. In such cases it is more difficult to apply a synthetic control impact assessment methodology, and an approach based on a modelled counterfactual is more applicable. This was the case in the IPP and Berbera Port in-depth studies described in this report. In the IPP study, determining the contribution to GHG avoidance of an investment in power generation or transmission required an in-depth understanding of the power system in which the investment took place. We recommend that BII expand the model we developed through the Phase 2 in-depth study of IPP investments to a select number of regions (see **Recommendation 1**). It would also be worthwhile to extend the modelling approach, specifically to include regional interconnections and to include supply and demand forecasts.

Annex I. Summary of methods used in in-depth studies and applicability across the portfolio

Table 2. Shortlisted topics and investments for the in-depth studies

Topic	Sector	Relevant investments	Relevant impact framework pathway and outcomes
1. Impact of IPP capacity on the price of power and reliability and how changes to reliability affect firm productivity.	Power	Many investments in many African countries	Additional (cleaner) capacity; reduced prices; resource efficiency; cleaner capacity; productivity; reliability; climate mitigation.
2. Impact of rural electrification (through minigrid investments) on standards of living, focusing on changes for end beneficiaries.	Power	Virunga Energies SARL, DRC	Additional (cleaner) capacity; improved affordability; household asset accumulation; improved livelihoods.
3. Impact of broadband backbone investments on service delivery and onward linkages to customers reached and increased access.	ICT and telecoms	Liquid, DRC	Improved service delivery; customers reached; reduced prices; improved affordability; improved quality and reliability.
4. Impact of ports on economic variables and on emissions.	Transport	Berbera Port, Somaliland	Additional capacity; reduced prices; productivity; reliability; improved access to markets.
5. Impact of C&I renewable energy investments for businesses, including GHG mitigation.	Power	Fourth Partner Energy (FPEL), India	Additional (cleaner) capacity; reduced prices; resource efficiency; productivity; reliability; climate mitigation.

Challenges in infrastructure evaluation

Evaluating infrastructure impacts is difficult and tends to be expensive and time-consuming. The five in-depth study topics undertaken in Phase 2 were explicitly designed to respond to these challenges. Particular challenges include: non-randomisation in treatment; challenges in controlling for differences between control and treatment groups; sparse data, including incomplete datasets; and high costs associated with evaluating infrastructure impacts. These challenges are discussed in more detail below.

- **New infrastructure is not randomised in delivery.** This creates challenges in the identification of an adequate counterfactual, which can be resource-intensive and can be difficult to achieve when dealing with large and diverse treatment areas.
- **The recipients of new infrastructure may share key differences which set them apart from the surrounding untargeted populations** (such as higher underlying rates of economic growth), which complicates the use of more traditional evaluation designs (such as difference-in-difference).
- **The impact pathways from infrastructure supply to use are often long and complex**, making attribution challenging to establish, especially where it is not possible to establish a direct line of sight to the ultimate beneficiaries of new infrastructure.

- **Frequently there are data challenges to evaluating infrastructure investments.** Secondary datasets are often 'patchy'; for example, national surveys of target populations (such as household surveys of living standards) typically do not revisit the same locations across survey waves, or are repeated infrequently, or do not allow for sufficient data disaggregation (for example to explore gender impacts), making it difficult to construct repeated local-level measurements using secondary datasets. In addition, there are limitations on the data collected and made available by investees as a result of commercial sensitivities, and there are issues relating to the cost of collecting data and/or where investees are concerned about overburdening customers or where they have limited leverage to ask customers to provide data.

'Traditional' impact evaluation designs, which seek to overcome some of these challenges by closing gaps in existing datasets and establishing attribution through large on-the-ground surveys, are usually time-consuming and expensive to administer. As a result, these approaches tend to be affordable only to investment managers in limited numbers, are challenging to scale and replicate, and often do not yield results on time scales suitable to influencing investment decision-making. In addition, collecting additional primary data in this way has its own challenges in terms of accessing target groups and investees' clients. Investees (and BII) often have limited leverage to arrange interviews and data collection with target groups, given arm's-length relationships with these groups and their limited incentives to participate in research. The study designs in Phase 2 of this evaluation have been explicitly designed to offer alternatives to these traditional approaches, as discussed further in Section 3.4.

Summary of the three study designs used

With these challenges and data limitations in mind, the in-depth studies in Phase 2 were developed according to three main study design archetypes which are suitable in different situations.

1. **Modelled counterfactual:** for investments that produce impact at a systemic level and where observations on the actual use of the asset are not possible, and especially where it is not possible to separate treatment areas from non-treatment areas. This might apply, for instance, where new power generation is added to a national grid. When the model is shown to reproduce the observed behaviour of the system, one can infer impacts *ex ante* by inserting the investment into the model or *ex post* by removing it.
2. **Synthetic control counterfactual:** for investments where geographic treatment areas can be distinguished from non-treated control areas and net impacts can be isolated by comparing the two. This might apply, for instance, where a direct line of sight is possible to the users of new infrastructure. In such situations, innovative, low-cost and replicable techniques were trialled in Phase 2, such as analysis of satellite data incorporating machine learning-based algorithms.
3. **Interrupted time series:** for investments where observations on the actual use of the asset are available, either through data collected by the investee or through secondary data, but where it is not feasible to develop a robust counterfactual. This might apply, for instance, where an investment has had a nationwide impact. In such cases this approach tracks change (for as long as possible) pre- and post-investment and compares the two to assess its effects. The counterfactual scenario is the hypothetical trend that would have occurred if the intervention had not taken place.

Table 3 maps the five studies undertaken in Phase 2 of the evaluation to the three study archetypes. It illustrates which of the study archetypes are suitable for *ex ante* use and which are suitable for *ex post* use. The modelled counterfactual design used in the systems analysis study of IPP investments is suitable for *ex ante* and *ex post* use; the synthetic counterfactual and interrupted time series designs are more suitable for *ex post* use, given that they rely on real-world data observations. The table also summarises the ease with which the three designs are repeatable and scalable. The synthetic control study design used in the rural electrification and broadband fibre access in-depth studies is the most repeatable, given that this design relies to a large degree on secondary data and remote sensing. The design is therefore not especially invasive for investees (they only need to provide data on end user locations), and it can be cost-effectively scaled and replicated across the portfolio. In contrast, the interrupted time series design used in the study on container ports and (as intended) in the study of C&I applications in India is more bespoke and relies on the collection of more primary data on the ground.

Table 3. Mapping in-depth studies to study archetypes

Study archetypes	Modelled counterfactual	Synthetic counterfactual	Interrupted time series
Relevant studies	Systems analysis of IPP investments	(2) Impact of rural electrification (3) Impact of broadband fibre access	(4) Impact of investments in container ports[78] (5) Impact of C&I applications[79]
Ex ante use	✓	×	×
Ex post use	✓	✓	✓
Repeatability/ Scalability	Moderate	High	Low

What can and cannot be measured in practice

- **Interrupted time series:** where strong relationships exist and investees are able to facilitate interviews with their clients, an interrupted time series evaluation is able to explore business-level impacts in more depth. Given the typically long impact chains from infrastructure investment to end beneficiaries, as well as evaluation constraints, through this approach analysis generally focuses on business clients rather than on wider population effects. Where access to clients is not possible, interrupted time series analysis may rely on secondary data and focus on broader trends without being able to explore specific impacts for differentiated beneficiary groups. This was the case in the C&I in-depth study presented in this synthesis. While the intention had been to follow an interrupted time series design based on primary data collection in this study, impacts were ultimately modelled using secondary data sources and high-level data on electricity sales provided by the investee, rather than observed data at the level of individual clients.
- **Synthetic control with geospatial data:** in the Virunga Energies and Liquid studies, the evaluation team used machine learning-derived geospatial data to measure changes in asset accumulation (a proxy for living standards). Given that this data was available at a resolution of 2x2-kilometre (km) grid squares, this allowed analysis to focus on villages and hamlets. This resolution did not permit disaggregation of data by more specific population groups (such as poorer households or women). The study design also did not allow other relevant impacts to be captured, such as shifts in productive economic activity among households or businesses. Additional data collection – such as surveys and interviews on the ground, or alternative geospatial methods – would be needed to assess those outcomes, although this was not feasible in this evaluation, because of budget, time and security constraints. It should also be noted that the Asset Wealth Index used in this study relies in part on Demographic and Health Surveys, the funding for which has become uncertain due to recent budget cuts in United States Agency for International Development (USAID). New sources of funding or alternative data sources may or may not become available in the future, which poses some questions on the future continuity of the AWI dataset.

[78] The in-depth study on the impact of the investment in container ports uses elements of an ITS-based design alongside modelling-based approaches.

[79] Note that this was the intended study design for the in-depth study of C&I applications in India, but this study switched to include modelling of secondary sources within an ITS framework, given the challenges in accessing clients.

- **Modelled counterfactual:** the DI of an investment that adds to the capacity of an existing (nationwide) system follows from how it changes system behaviour. Because this changed behaviour is unobservable, it requires the development of a model. If the model reproduces observed system behaviour under a wide range of different conditions, it can be used to reliably analyse system behaviour for a wide range of scenarios. The changed system behaviour can subsequently be translated into short-run changes in firm and household behaviour, using stated or revealed preferences. Long-run changes are harder to predict and have received comparatively little attention in econometric literature.