



A GREEN INVESTMENT ARCHITECTURE FOR INDIA

**BUILDING A BRIDGE
FOR GLOBAL CAPITAL**

Annapurna Mitra
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MacArthur
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Attribution: Annapurna Mitra, Tanushree Chandra, Nandini Sarma, Ria Kasliwal, “A Green Investment Architecture for India: Building a Bridge for Global Capital,” June 2020, Observer Research Foundation.

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This report was prepared with support from the John D and Catherine T MacArthur Foundation. Key insights were built with the help of academic and research inputs from Shri. Jayant Sinha, Dr. Samir Saran and Mr. Mihir Swarup Sharma. Special thanks to Rahil Shaikh for support in designing the graphs. The recommendations and the views expressed herein are, however, those of the researchers and do not reflect the formal position of the Foundation.

Design and Layout: simijaisondesigns

Cover design: Simi Jaison

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ISBN: 978-93-90159-02-4

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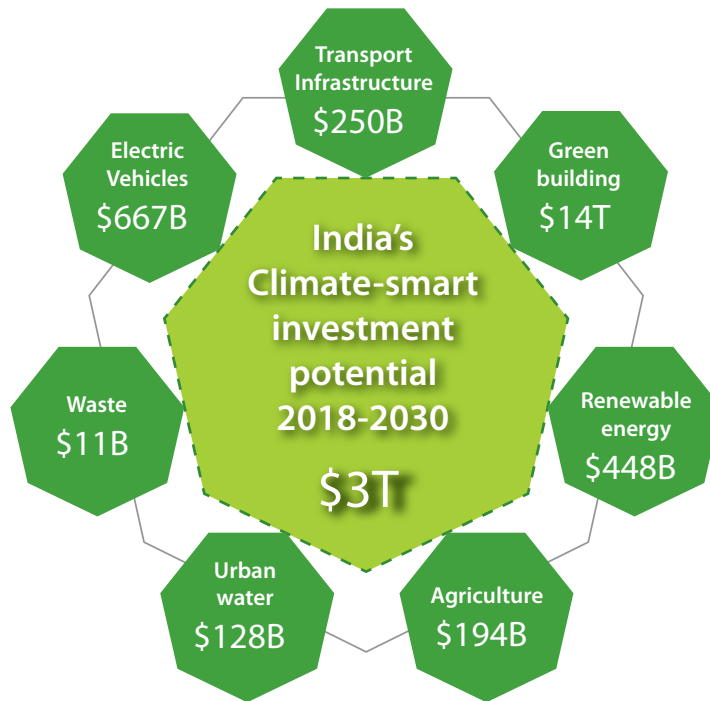
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Introduction

The Indian government estimates that the country needs to spend 7-8 percent of its GDP on green infrastructure each year,¹ an annual investment of US\$200 billion up to 2030. The International Finance Corporation (IFC) estimates for climate-smart investment are even higher, at US\$3.1 trillion up to 2030, which implies an annual investment of US\$300 billion.²

FIGURE 1: India's climate investment potential up to 2030

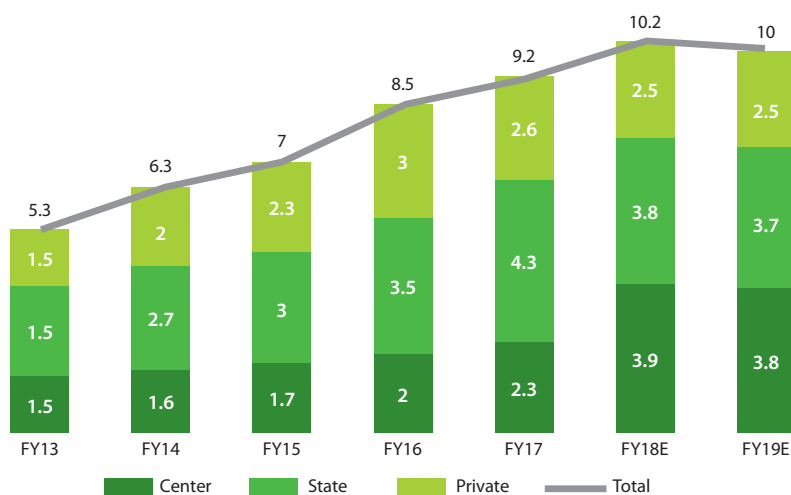


Source: International Finance Corporation

Currently, infrastructure investments in India average around US\$100-110 billion annually,³ far below what is required. While the government has released a US\$1.4-trillion infrastructure pipeline for the next five years, there is no specific focus on green infrastructure other than renewable energy.⁴ The pipeline depends on significant participation from the private sector. It is expected to contribute around 22 percent of the projects (with the state and central governments contributing 39 percent each), and to finance the entire investment in renewable energy (around US\$120 billion) over the next five years.

To build the infrastructure India needs over the next decade and ensure that it is environmentally sustainable and climate change resilient, the private sector's contribution will need to increase and include foreign capital. Domestic financial

FIGURE 2: Infrastructure investment in India since 2013



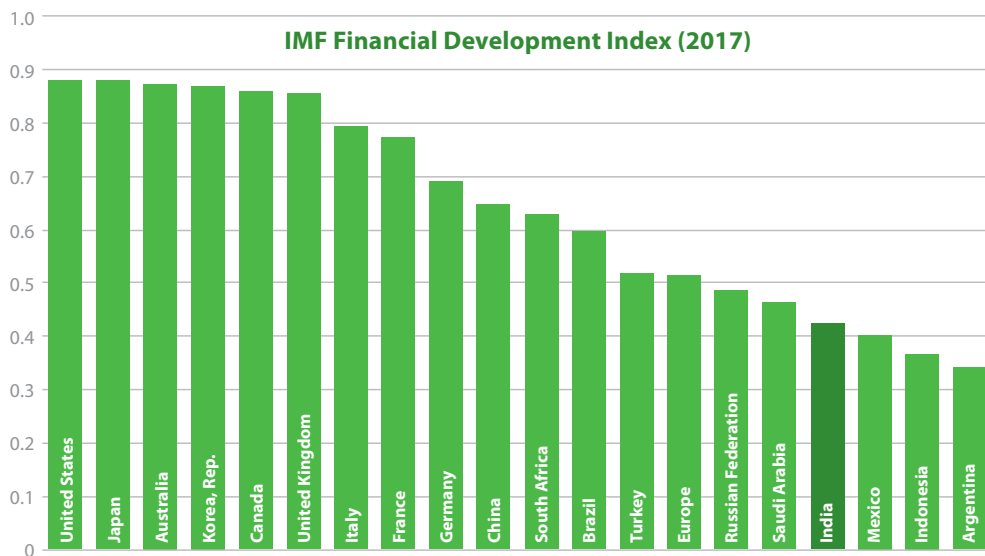
Source: National Infrastructure Pipeline

markets and institutions, which have so far been important sources of finance, are currently in crisis, with the bank and non-bank financial sector holding a large proportion of non-performing assets and low levels of liquidity. Also, infrastructure projects that have long gestation periods, uncertain yields in the first few years of investment, and unclear exit strategies are inherently challenging to finance for deposit-taking institutions. In India, however, the financial markets are relatively undeveloped compared to the G20 economies, and the domestic pool of institutional investment is small (see Figures 2 and 3).

While the foreign capital pool is large and well-suited to financing infrastructure investment, accessing this finance is complicated. The World Bank found that in the 2011-17 period, institutional investors had not financed a single infrastructure project in South Asia,⁵ primarily because investing in emerging market infrastructure is perceived as high risk. Research from the Asian Development Bank shows that the share of infrastructure bonds rated AA and above is about 52 percent in Europe but only about 16 percent in Asia.⁶ This raises the cost of finance, particularly for pension and insurance funds, which have high capital adequacy requirements, against such investments. Other challenges to institutional investors in emerging-market infrastructure include the lack of a pipeline of bankable projects, foreign exchange risks, perceived political risks, uncertain yields and a lack of information about the sector.

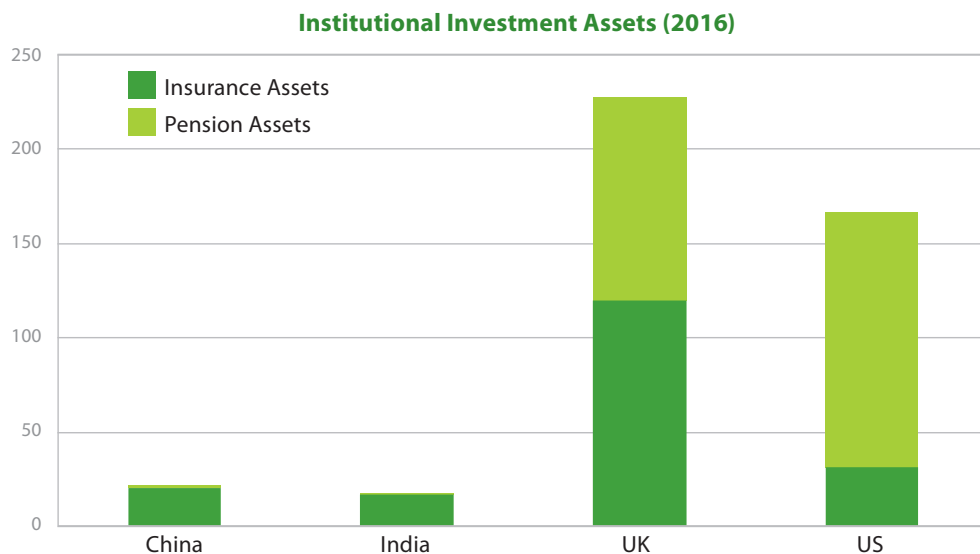
Project risk needs to be mitigated to facilitate the entry of foreign institutional investors into India’s infrastructure sector. Public funds can play a catalytic role in

FIGURE 3: India's financial markets and institutions are less developed than the G20 average...



Source: IMF Financial Development Index database

FIGURE 4: ...while the pool of institutional investment available is comparatively small



Source: World Bank Global Financial Development Database.
*Data for India is from 2014

achieving this by making the initial investment, absorbing most of the risk and accepting lower rates of return. Once the project shows signs of profitability, commercial investors can enter and get higher rates of return.

As countries move to mitigate the economic impact of the COVID-19 pandemic, there may soon be an increase in cross-border capital flows. Currently, the major economies are facing a sharp slowdown in growth, massive unemployment and the largest financial market crash in decades. While the current focus is on improving healthcare, providing a social safety net, and developing medication, tests and a vaccine, a global stimulus will be launched over the next few months to mitigate the economic impacts. The G20 has already announced a combined US\$5 trillion fiscal expansion.⁷ Major central banks, including the US Federal Reserve and the European Central Bank, have started large-scale asset purchase programmes designed to flood financial markets with liquidity.

As developed economy interest rates approach the zero-lower bound, experience suggests this money will soon be searching for yield, including in the emerging markets. While India saw large inflows of foreign capital after the 2008 global financial crisis, these investments were predominantly confined to debt and equity markets and reversed rapidly when global economic conditions turned volatile. India must find an avenue to direct this funding toward long-term infrastructure investment.

The pandemic is also changing the way financial risks are measured. March 2020 had the fastest pace of rating downgrades since 2002,⁸ with more expected in the weeks ahead. As risk profiles are re-assessed, exogenous events are likely to be given larger weights. This could lead to climate risks being considered more seriously in financial portfolios. Financial regulators across the world have stated that climate-related risks are under-priced^{9,10} and have been pointing to recent extreme climate events as a wake-up call. Despite this, the shift to green finance has not reached the pace required to avoid catastrophic climate change. The Covid-19 crisis could bring such systemic risks front and centre, providing the impetus needed to re-evaluate financial models and, consequently, greater support for green investment.

In anticipation of the greater focus on green investment and the global financial markets being flush with funds, India must create an institutional structure to attract this capital to its infrastructure sector. India has already had some success with renewable energy. In the public sector, the Solar Energy Corporation of India (SECI) has used direct investment in land acquisition and a payment security mechanism to encourage private power developers to set up solar parks. The Indian and UK governments have jointly set up the Green Growth Equity Fund (GGEF) to

encourage the UK financial sector to invest in India. Tata CleanTech Capital Limited (TCCL), India's first 'green bank', is a private non-bank financial company set up with support from the IFC, and has mobilised US\$700 million from an initial investment of US\$130 million.

To fulfil the need for investment in infrastructure sectors other than energy, such institutions must expand, find new financial instruments and create a pipeline of viable projects. As the mandate for environmental, social and governance investment has expanded worldwide, there is likely to be a large pool of finance available, provided there is an institutional and regulatory structure to make these projects attractive to investors. Technical capacity building will also be required to ensure that investments are structured to fit green norms.

This report proposes the establishment of an Indian 'green investment bank' that will use public funds to generate private finance for green infrastructure investment, considering the quantum of finance needed and the specific needs of an economy transitioning to environmental sustainability while maintaining high growth rates. This requires projects to be economically viable to compete with incumbent technologies and be scaled up across the country. Additionally, the areas covered, such as energy and transport systems, will require the creation of new markets and the participation of several stakeholders. To get many actors to buy in, these will have to be profitable.

While the government's ability to provide a stable stream of seed capital and mitigate credit risk could help in the initial years, the initial funding could also be provided/supplemented by multilateral institutions and philanthropists. Strict limits should be imposed on the government's level of control over day-to-day activities and choice of investment to ensure that decisions are taken in line with the institution's mandate and are free from political interference. The bank and government should, however, coordinate on regulatory and fiscal policies. For the bank to succeed in shifting the economy to a low-carbon path, finance will need to be complemented with other policies, such as carbon emissions standards or new technology subsidies.



Institutional Architecture for Green Infrastructure Investment

India has several initiatives that mobilise green infrastructure investment and have been effective in helping the country meet its ambitious renewable energy targets over the last few years.

The National Clean Energy Fund (NCEF), set up in 2010, was the first such government-funded organisation. Several other government agencies followed, including non-bank financial companies, public sector enterprises, and an equity fund for infrastructure investment (See Table 2). The Kerala and Tamil Nadu governments have also used the equity fund structure. The private TCCL, India's first green investment bank, was set up in 2011. While its initial equity was much smaller than those of the public sector enterprises, it has been the most successful in mobilising additional capital.

National public sector initiatives

National Clean Environment Fund

The NCEF, or Clean Environment Fund, was constituted in 2010 out of the cess on coal produced/imported to finance and promote clean energy initiatives and fund research in the area. It was later expanded to include clean environment initiatives. The NCEF has funded the building of a Green Energy Corridor that integrates renewables into the transmission grid, the expansion of solar power, and the Green India Mission for afforestation.

However, the fund has not been used efficiently. From 2010-11 to 2017-18, a total of INR 86,440.21 crore (US\$11.24 billion) was collected as coal cess, but only INR 29,645.29 crore (US\$3.85 billion) was transferred to the NCEF. Just about half of this has been used, indicating a lack of viable projects.

Indian Renewable Energy Development Agency Limited

The Indian Renewable Energy Development Agency (IREDA) was established as a non-banking financial institution in 1987 under the energy ministry. It promotes, develops and extends financial assistance for projects related to new and renewable sources of energy. During 2018-19, IREDA disbursed loans worth INR 93.8 billion (US\$1.2 billion), while its assets totalled INR 200 billion (US\$2.6 billion). IREDA's resource base stood at INR 213 billion (US\$2.8 billion) during the year, financed through a mix of international assistance, domestic borrowing, equity capital and reserves. IREDA has actively raised money using green bonds, issuing INR 8.6 billion (US\$113 million) through taxable green bonds in the domestic market and INR 1.5 billion (US\$19.5 million) raised via subordinated taxable bonds. It also raised US\$300

Table 1: NCEF funding, 2010-18

Year	Coal Cess Collected	Amount Transferred to NCEF	Amounts financed from NCEF for projects
2010-11	1,066.46	0.00	0.00
2011-12	2,579.55	1,066.46	220.75
2012-13	3,053.19	1,500.00	246.43
2013-14	3,471.98	1,650.00	1,218.78
2014-15	5,393.46	4,700.00	2,087.99
2015-16	12,675.60	5,123.09	5,234.80
2016-17	28,500.00	6,902.74	6,902.74
2017-18	29,700.00	8,703.00	-
Total	86,440.21	29,645.29	15,911.49

All numbers in INR crore

Source: Ministry of Environment, Forest & Climate Change. Performance of the National Action Plan on Climate Change Committee on estimates (2018-2019) Thirtieth Report

million through a green masala bond issue on the London Stock Exchange.

IREDA is also working to develop the bond market for renewable energy projects in India by supporting bond issuance through a credit enhancement guarantee scheme.¹¹ By providing partial credit guarantees, IREDA aims to enhance the credit rating of bonds for renewable energy projects, thereby improving their marketability and liquidity, and attracting lower-cost and longer-term funding for project developers.

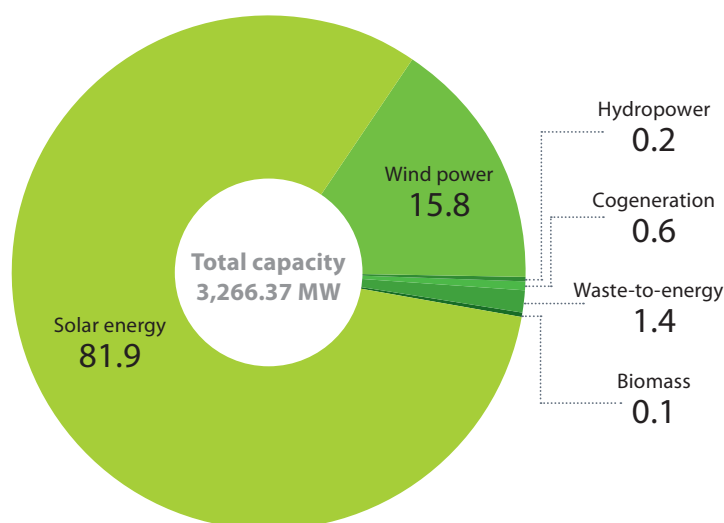
The IREDA green window for green energy finance was announced in December 2019,¹² with the government proposing to allocate approximately US\$20 million and leverage US\$80 million from other agencies to establish a US\$100-million facility. The green window will support underserved clean energy markets and the scaling up of new clean energy technologies.

Energy Efficiency Services Limited

Energy Efficiency Services Limited (EESL) was established in 2009 as a joint venture between four of the power ministry's public sector undertakings.ⁱ As an implementing arm of the Bureau of Energy Efficiency under the ministry, EESL pursues large-scale energy efficiency-focused investments by providing project design, implementation and monitoring services.

i NTPC Limited, Powergrid Corporation of India Limited, Power Finance Corporation, and Rural Electrification Corporation

FIGURE 5: Capacity sanctioned by IREDA across sectors



Source: Capacity sanctioned by IREDA across sectors

EESL's most significant success has been in the distribution of LED light bulbs, tube lights and energy-efficient fans, and installing LED street lighting. It also has programmes focused on electric vehicle (EV) charging infrastructure, smart meters, decentralised solar plants and industrial energy efficiency. EESL invests in and implements projects and retains operational responsibility through service-level agreements over the project's course. Its pay-as-you-save model avoids any upfront capital investment by the consumer. EESL's entire investment is recovered through monetised energy savings over a scheduled project period. During 2018-19, EESL's net profit was INR 951 million (US\$12 million), and the projects executed during this period saved over 50 billion kWh of energy per year, and avoided peak demand of over 10,000 MW and cut over 39 million tonnes of CO₂ emissions.

EESL also runs projects in foreign countries like Saudi Arabia and Canada focused on energy storage, distribution of LED light bulbs and industrial energy efficiency. It has a UK-based subsidiary, EESL EnergyPro Assets Limited, that works on energy efficiency improvements in the education and leisure sectors.

Solar Energy Corporation of India

The SECI was set up in 2011 as the energy ministry's administrative arm and was tasked with handling solar energy auctions and distributing subsidies.

It was converted into a for-profit enterprise in 2014, and now acts as a power trader, purchasing solar energy from developers and selling it to distribution companies

(discoms) at a small premium. As discoms are financially stressed and often delay payments to developers, having the SECI as the counter-party acts as a safety-net. Research suggests that developers are willing to accept a 5 percent reduction in tariffs if the SECI guarantees payments.¹³

The SECI also provides support for the development of solar parks by acquiring land, equipping it with transmission infrastructure and leasing it to developers. Park owners charge solar developers a one-time down payment and annual recurring costs per megawatt. It also provides a payment security mechanism, ensuring continuous payment to the power developers even in the discom defaults.

National Investment and Infrastructure Fund

The National Investment and Infrastructure Fund (NIIF) was established in 2015 to address the long-term financing needs of India's infrastructure sector, with a proposed corpus of US\$6 billion. The government has a 49 percent stake in NIIF, which is used to mobilise domestic and global capital. NIIF has successfully raised funds from several investors, including the Australian pension fund, the UK government and Asian Infrastructure Investment Bank. It has three investment sub-funds—Master Fund, the Fund of Funds and the Strategic Investments Fund. NIIF also collaborates with the government at a policy level and provides inputs on developing India's infrastructure pipeline.

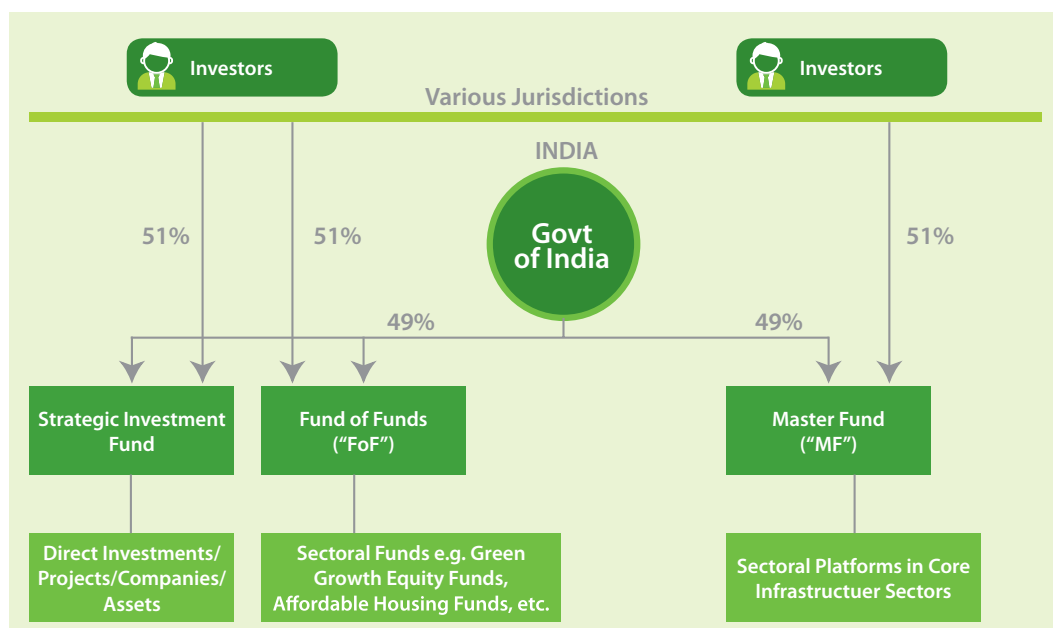
The GEEF, promoted jointly by the UK and India (through NIIF), aims to bring global private institutional investors to finance India's green infrastructure.¹⁴ The NIIF and the UK government anchored the GGEF with a capital commitment of £120 million (US\$145 million) each. It is structured as a commercial private equity vehicle that aims to leverage this public capital to raise an additional £260 million (US\$315 million) from private investors. The capital will be used to invest in India's renewable energy, energy distribution/transmission, clean transportation, and water treatment and management sectors. While EverSource Capital independently manages the investment committee, an advisory committee that includes government representatives provides strategic oversight. So far, two investments have been made in the renewable energy sector, totalling about £100 million (US\$121 million).

Private sector initiatives

Tata Cleantech Capital Limited

TCCL was created in 2011 as a joint venture between Tata Capital Limited, a subsidiary of TATA Sons Limited, and the IFC.¹⁵ It offers commercial loans to cleantech sectors

FIGURE 6: Structure of NIIF



Source: NIIF case-study by the Global Infrastructure Hub.

such as wind and solar energy, solar rooftop, small hydro energy, off-grid solar, waste management, water management, and energy efficiency. TCCL has also been active in resource efficiency sectors, such as roads and power transmission. Besides its lending activity, it provides technical and financial advisory services.

TCCL has raised finance from international and domestic investors like development finance institutions, multilateral banks, pension funds and wealth funds. With a total investment of US\$700 million, it has supported projects totalling US\$4.86 billion. As of March 2019, TCCL provided funding to more than 150 cleantech projects and is the only Indian institution to be part of the 'Green Bank Network'.

Sub-national initiatives

Tamil Nadu Infrastructure Fund

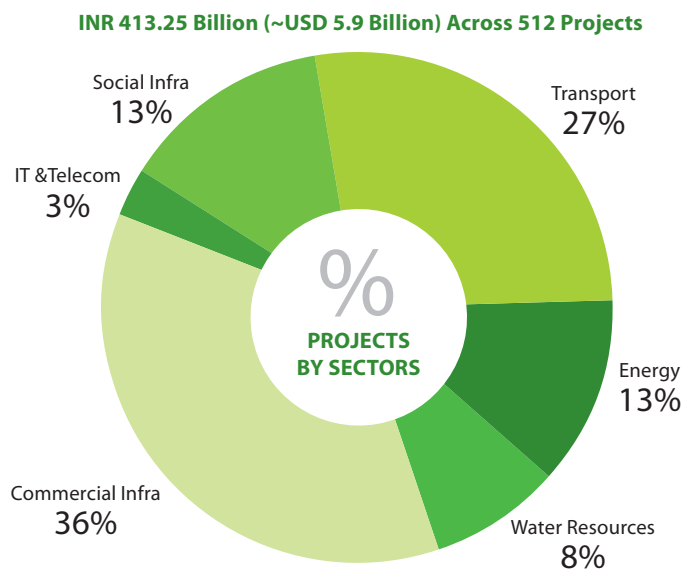
The Tamil Nadu Infrastructure Fund (TNIF), founded in 2015, is a targeted US\$1 billion investment fund with the goal of mobilising and deploying non-public domestic and international capital into infrastructure projects within the state. It is managed independently by the Tamil Nadu Infrastructure Fund Management Corporation and operates at an arms-length from the state government. The state government currently holds a 49 percent stake, which is expected to be diluted further.

The TNIF's key objectives include encouraging private sector investment and successfully implementing public-private partnerships in developing, funding and completing critical infrastructure projects.

Kerala Infrastructure Investment Fund

The Kerala Infrastructure Investment Fund (KIIF) was set up in 1999 as an autonomous body to finance infrastructure development in the state. KIIF's role was substantially amended in 2016, and it now raises debt for critical infrastructure development against future receivables from the state government. Revenues from the fuel cess and motor vehicle tax are earmarked for the KIIF, and the state government provides funds to meet any shortfalls in debt service requirements. As of December 2018, the government has transferred about US\$350 million as seed capital to the KIIF, which has been used to raise US\$830 million. Funds are raised through bank loans and debt, including a masala bond issuance on the London and Singapore stock exchanges last year. While the KIIF is not committed to financing only green infrastructure, it has undertaken many projects that meet these requirements, including sustainable roads and flood resilient cities.⁶

FIGURE 7: Sectoral distribution of KIIF funding



Source: KIIF Annual Report

TABLE 2: Overview of institutions financing green infrastructure in India

	IREDA		Tata Cleantech Capital Ltd	SECI
Type	Green window	Non-bank financial company	Green investment bank	PSE
Year of Inception	Announced in Dec. 2019	1987	2011	2011
Sponsors	Indian government	Indian government	Tata Sons Ltd and IFC	Indian government
Funding	US\$20 million	Indian government, masala bonds, funding from multilateral development banks	From Tata Capital and IFC, equity of US\$130 million	Draws on the budget of MNRE
Sectors	Renewable energy	Renewable energy	Renewable energy and green infrastructure	Solar energy
Instruments		Loans, credit guarantees	Loans, technical and financial advisory	Direct investment, financial intermediation, payment guarantee
Finance Mobilisation	Aim to leverage US\$80 million		US\$700 million	
Emissions Reduced			8.4MtoeCO ₂ annually	

Source: Authors' own, based on data from official sources

	EESL	NIIF	GGEF	NCEF
	PSE	Equity Fund	Equity fund (part of NIIF)	National climate fund
	2009	2015	2017	2010
	Indian government	Indian government	Indian + UK governments	Indian government
		US\$3 billion	£240 million (US\$290 million)	Funded out of coal cess revenue, INR 30,000 crore (US\$3.9 billion) to date
	Energy efficiency	Infrastructure	Green infrastructure, so far renewable energy	Renewable energy and infrastructure
	Direct investment	Equity finance	Equity finance	Grants
		Aim to leverage US\$3 billion	Aim to leverage £260 million (US\$314 million)	
	39 MtoeCO ₂ annually			



Exploring Global Green Investment Funds

Several green investment banks/funds have successfully blended public and private finance to build green infrastructure, including the UK's Green Investment Group (GIG), the Malaysian Green Technology and Climate Change Centre (MGTC) and the Connecticut Green Bank (CGB). These institutions have been able to attract private finance, achieve commercial returns on 'green investments' and perform successfully across sectors. The GIG and the CGB have transitioned from public-funded to largely independent institutions, while the public-funded MGTC has successfully leveraged private investment from many sources.

An examination of the organisational structure, financial resources, projects and performance of the GIG, MGTC and CGB will help highlight issues relevant to India—investing in green technology to ensure economic growth and development, building a sustainable sub-national institution, and creating a financially profitable institution while facilitating green growth.

Overview

Originally called the Green Investment Bank, the GIG was established in October 2012 after the UK incorporated the Climate Change Act of 2008.¹⁷ In the late 2000s, the UK government had estimated that it would need additional green infrastructure investment of around £330 billion (US\$399 billion) till 2020 to meet its climate obligations.ⁱⁱ The GIG was created "to provide financial solutions to accelerate private sector investment in the UK's transition to a green economy."¹⁸ It didn't just aim to achieve a significant green impact but also worked towards making financial returns, aspiring to attain a 'double bottom line'. Thus, it provided finance on fully commercial terms while ensuring that the projects undertaken created a substantial green impact. The Macquarie Group acquired the bank in 2016 for £1.6 billion (US\$1.9 billion), with the government retaining a £132 million (US\$160 million) stake in assets.

The launch of the National Green Technology Policy in 2009 was a watershed moment in Malaysia's climate finance landscape, leading to the establishment of GreenTech Malaysia in 2010, which was renamed MGTC in 2020. MGTC aims to deploy green technology as an engine of socio-economic growth and sustainable development while achieving commercial success. By 2018, its efforts resulted in 34,662.68 MW/year energy conservation, 532.89 MWh of renewable energy generation and green investments worth RM 7.05 billion (US\$1.67 billion).¹⁹

ii The UK government's key 2020 commitments were to reduce GHG emissions by 34 percent from its 1990 levels, to increase proportion of renewable energy to 15 percent, to reduce biodegradable waste to landfill by 65 percent as compared to its 1995 levels.

The CGB, launched in 2011, evolved from the Connecticut Clean Energy Fund and the Clean Energy Finance and Investment Authority. It was funded through public revenues, mainly a surcharge on Connecticut ratepayers' utility bills and proceeds from the Regional Greenhouse Gas Initiative.²⁰ Since its inception, for every US\$1 of public investment, it has attracted about US\$6 of private investment.²¹ The CGB and its private investment partners have deployed over US\$1.6 billion for clean energy projects across the state.

Organisational Structure and Financial Resources

Green Investment Group

The GIG was established as a public limited company with the UK government as its sole sponsor. The investment was managed through the government and the Department for Business, Innovation and Skills (BIS). It was allotted initial public funding of £3 billion (US\$3.6 billion) to invest in green projects from 2012-2015, with a further allocation of £800 million to support additional investments in green projects in 2015-16. Although a government entity, the GIG was set up as a separate institutional unit with full operational independence. It became a private limited company on acquisition by the Macquarie Group, its new sole sponsor.

The capital committed in the GIG's inception, pre-acquisition and post-acquisition phases (See Table 3) has been used to leverage private funds.

TABLE 3: Capital committed since GIG's inception

	Inception ⁱⁱⁱ 2012-13 to 2014-15	Pre-Acquisition 2015-16 to 2016-17	Post-Acquisition ^{iv} 2017-18 to current
Capital Committed	£0.7-0.8 billion	£0.45 billion	£0.6-0.75 billion

Source: Annual Reports 2012-13 to 2016-17 and Progress Report 2018 to 2019.

Malaysian Green Technology and Climate Change Centre

MGTC is under the purview of the Ministry of Energy, Science, Technology, Environment and Climate Change, and is charged with introducing programmes and incentives to advocate the use of green technology in Malaysia's key economic

iii The inception period does not include year 2012-13, because the targets weren't available for that year.

iv Data available only for 2017-18

sectors. As of 2018, it had 27 individual members, 13 corporate members and 30 honorary members. MGTC is funded by the government, with finances allocated to its flagship Green Technology Financing Scheme (GTFS) and other key initiatives.

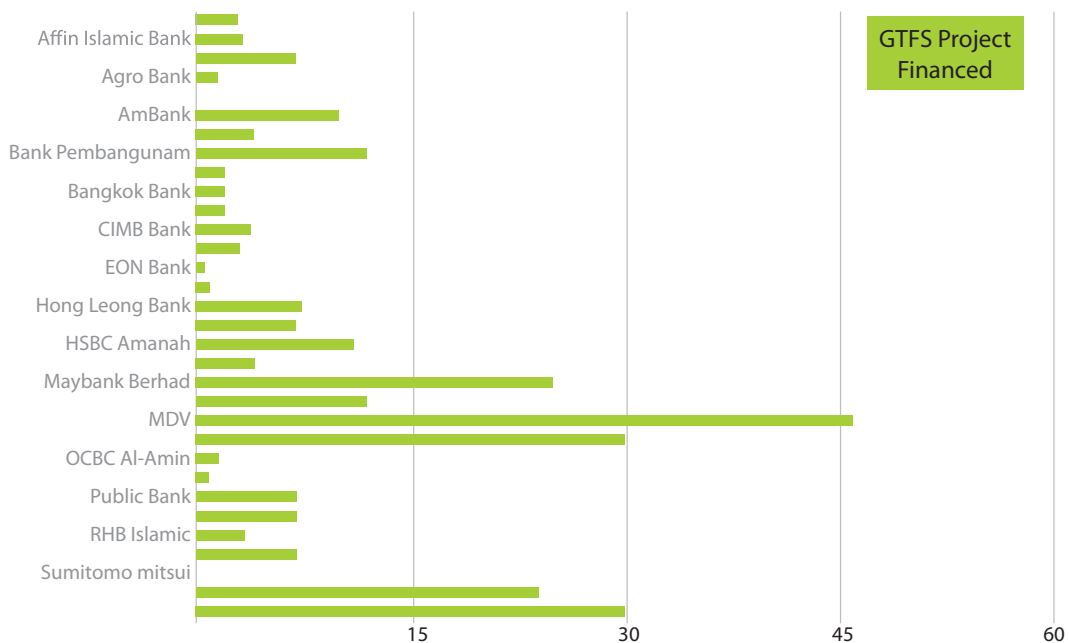
The GTFS was allocated RM1.5 billion (US\$355 million) in 2010. Initially set to last through 2015, it was first extended through 2017 and then again to 2022. The extension included approval of an addition RM 5 billion (US\$1.2 billion), on top of the RM 3.5 billion (US\$814 million) already approved.²²

The GTFS has also been instrumental in encouraging private financial institutions to invest in green ventures. With an increasing number of entrepreneurs venturing into the green technology sector, GTFS will continue to be an important enabler by bridging financing gaps and empowering emerging green businesses in the country.

Connecticut Green Bank

The CGB is a quasi-public agency governed by a board of directors, comprising 11 voting and two non-voting members. Senior board members, including the

FIGURE 8: 28 Financial Institutions that have participated in the GTFS

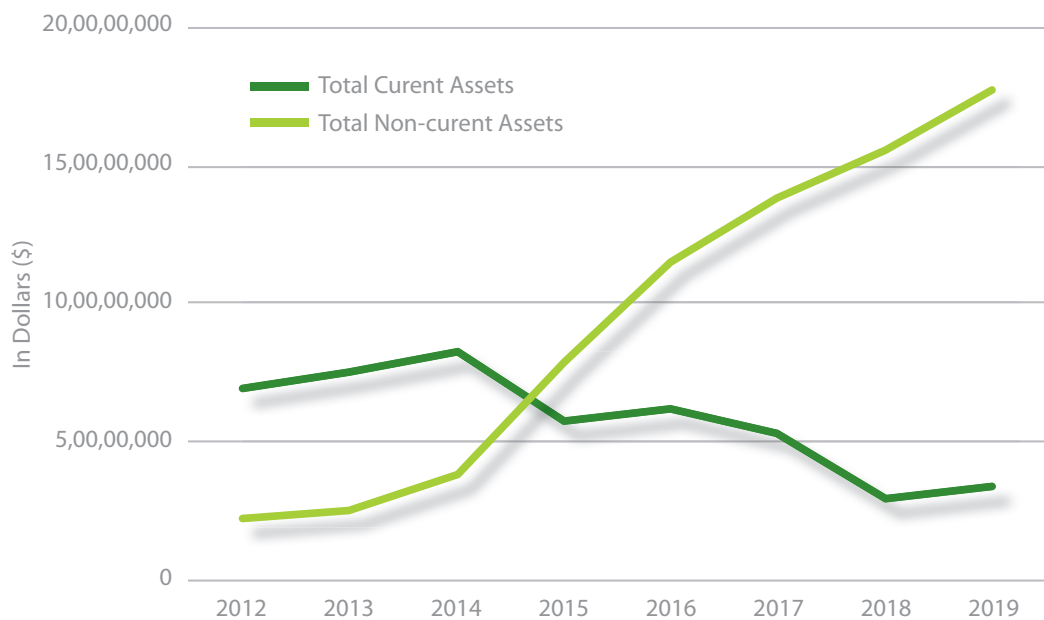


Source: https://www.gtfs.my/Financial_Institution

chairperson, are political appointees, while the sitting members of the board elect the others. The CGB is funded by several state and ratepayer sources, including the Regional Greenhouse Gas Emission Allowance Proceeds, Special Capital Reserve Fund and Connecticut State Treasurer's Office.

Among its goals is to leverage the limited public resources to scale-up and mobilise private capital investment. The CGB has evolved its financing model from relying on subsidies and grants to becoming investment dependent (See Figure 9).

FIGURE 9: Change in asset quality

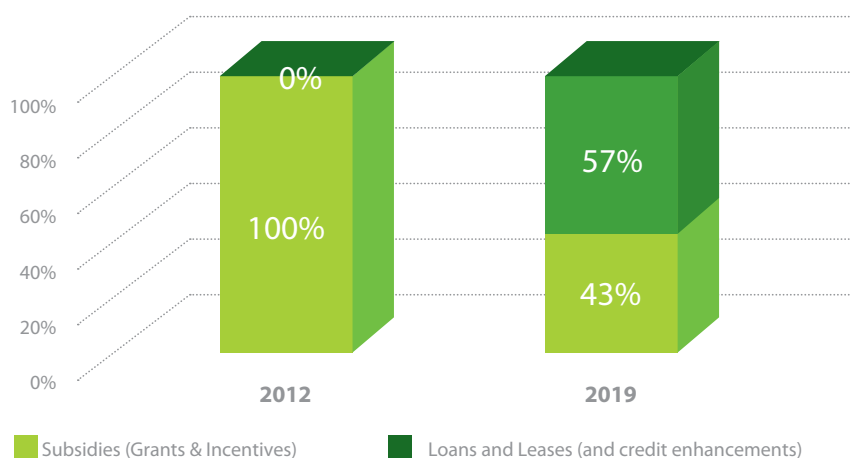


The non-current assets refer to the CGB's long-term investments.

Data Source: Comprehensive Annual Financial Report (Fiscal Year ended June 30, 2019)

The CGB's sources of funding have changed substantially since its inception (See Figure 10).

FIGURE 10: CGB's financing model



Source: *Comprehensive Annual Financial Report (Fiscal Year ended June 30, 2019)*

While the provision for public revenue streams, which had no capital costs, allowed the CGB to fund projects that had high initial costs and provide credit guarantees, budget cuts threatened the bank's existence.²³ The CGB functioned under a 'zero-based budget,' such that all funds received were used for its operations. Since the capital cost under an entirely publicly funded zero-based budget was zero, the CGB could charge very low-interest rates.²⁴ The reduction in public funding forced the CGB to rely more on private funding and projects with higher rates of return. The bank is now considering ways to transition to a sustainable model, insulated from budgetary risks.²⁵ One way is to agree to a 'sunset provision' with the government, under which the CGB would stop using public funding within a specific number of years in exchange for a guarantee of funding stability until then.

Mandate

Green Investment Group

The UK government enacted the Enterprise and Regulatory Reform Legislation in 2013 to help attain its international climate commitments. The law defined green purposes for the GIG to work towards—reduction in greenhouse gas emissions, the advancement of efficiency in the use of natural resources, protection or

enhancement of the natural environment and biodiversity, and promotion of environmental sustainability.

Of these, three were quantifiable:

TABLE 4: The Green Metrics Used to Measure Green Purposes

Green Purposes	Green Metrics
Reduction of Greenhouse Gas Emissions	GHG emissions avoided (tCO ₂ e ^v) Renewable Energy Generated (TWh ^{vi})
Advancement of Efficiency in the Use of Natural Resources	Materials consumption avoided through materials recycling (t ^{vii})
Protection or Enhancement of the Natural Environment	Waste to landfill avoided (t)

Source: Annual Reports 2012-13

After its acquisition, the GIG's mandate was expanded to include six new focus areas: development capital, investing beyond subsidy, partnership platforms, geographical expansion, market transformation, and new technologies. To ensure the green purposes were followed, before the GIG's privatisation, the government made the provision of a 'special share' held by a company limited by guarantee called Green Purposes Company Limited. Operated and owned by independent trustees, it has the power to approve or veto any amendments to the green purposes.

Malaysian Green Technology and Climate Change Centre

MGTC has been mandated to propel the Malaysian economy on a low carbon trajectory, focusing on key areas such as climate mitigation, adaptation and resilience. The MGTC primarily leverages three pillars—green incentives, green promotion and investment and green capacity building. Additionally, it also focuses on data collection and reporting, policy analysis and awareness building initiatives.

Connecticut Green Bank

The CGB has four goals: attract private investment for green finance; leverage limited public funds to attract private investment; develop policies and strategies

v carbon dioxide emissions in tonnes

vi terawatt hour

vii tonnes

that help increase the demand and lower the cost of clean energy; and support low-to-moderate income sections of society to have access to affordable, green buildings.

The CGB also aims at reducing greenhouse gas emissions and creating green jobs.

Sectors

Green Investment Group

Initially, at least 80 percent of the GIG's investments were meant to target the priority sectors (offshore wind, waste recycling and waste-to-energy, and non-domestic energy efficiency) and up to 20 percent to fund projects in other permitted sectors (biomass power, carbon capture and storage, marine energy, and renewable heat). The GIG also proposed supporting the UK Green Deal.

Post-acquisition, the investment sectors were expanded to include hydro power and onshore wind.

TABLE 5: Sectoral Allocation of funding

Sectors	Inception	Pre-Acquisition	Post-Acquisition
Off-shore Wind	16% to 48%	46% to 60%	% not available
Waste and Bioenergy	29% to 41%	23% to 34%	% not available
Domestic Energy Efficiency	14% to 23%	11% to 14%	% not available
On-shore renewables	8%	6%	% not available

Source: Annual Reports 2012-13 to 2016-17 and Progress Report 2018 to 2019.

Malaysian Green Technology and Climate Change Centre

MGTC's work is carried out through the GTFS and six key initiatives:

- 1 Green Investment Tax Incentives, which works with GTFS on financing projects in the renewables sector
- 2 Government Green Procurement, which integrates environmental considerations into government-based procurements

- 3 Low Carbon Cities Framework (LCCF), which provides local authorities with a roadmap to pursue low-carbon development at the city level, with a focus on transport, infrastructure, buildings and environment. MGTC assists the local authorities in implementing the frameworks
- 4 Low Carbon Mobility, under which the MGTC is trying to increase the number of EV charging stations across Malaysia
- 5 MyHIJAU Mark & Directory, which promotes the sourcing and purchasing of green products and services in Malaysia
- 6 Energy Management Gold Standard (EMGS), a certification system delivered under the ASEAN Energy Management Scheme (AEMAS) based on excellence in energy management

Connecticut Green Bank

The CGB mainly invests in renewable energy and energy efficiency projects that offer green energy solutions to home, building and multifamily property owners, residential and commercial contractors, towns and cities, and even capital providers. The CGB takes a 'technology agnostic' approach and lets the market do the allocation. The maximum number of projects and the total megawatt generated have been approved under the photovoltaic (PV) technology (See Table 6).

TABLE 6: Energy (MW) generated across different projects

Technology	2012	2013	2014	2015	2016	2017	2018	2019	Total	%
Photovoltaic	1.9	8	20.4	55.6	65.1	49	57.5	72.5	330	92%
Fuel Cell	0.0	14.8	0.0	0.0	0.0	0.0	0.0	0.0	14.8	4.3%
Wind	0	0	0	5	0	0	0	0	5	1.4%
Others	0	0.7	3	1.8	1	1	0	0.8	8.3	2.3%
Total	1.9	23.5	23.4	62.4	66.1	50	57.5	73.3	358.2	100%

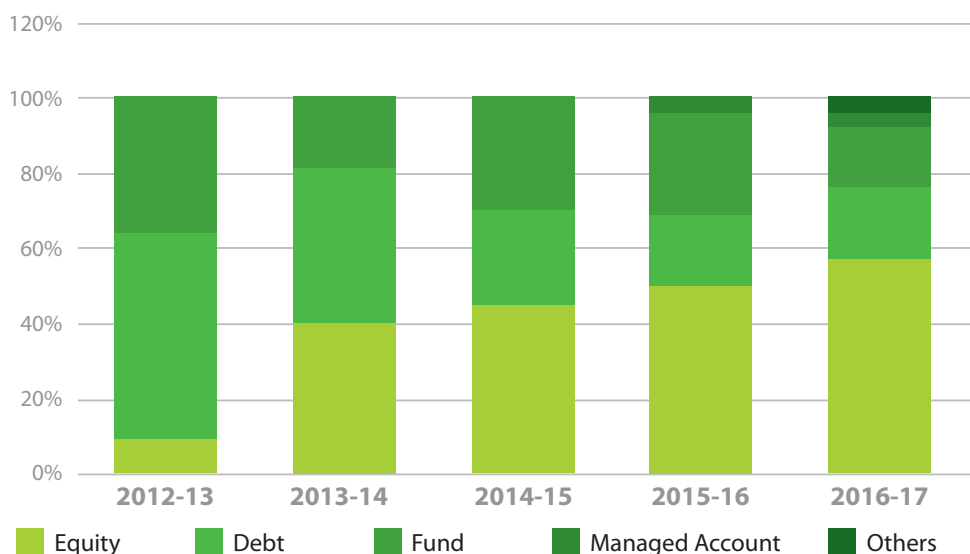
Source: Comprehensive Annual Financial Report (Fiscal Year ended June 30, 2019)

Financial Instruments

Green Investment Group

The GIG's principal financial instruments are refinancing, equity finance, direct investment for construction, debt instruments, funds and managed accounts (see Figure 11).

FIGURE 11: Percentage of capital committed to each financial instrument



Source: Annual Reports 2012-13 to 2016-17 and Progress Report 2018 to 2019.

Investment in equity has increased every year, while the use of debt instruments has fallen. Use of funds and managed accounts have been consistent. Data for the post-acquisition period (2017-19) is not available.

Malaysian Green Technology and Climate Change Centre

MGTC has used a variety of financial instruments and partnerships to further its goals. The GTFS, which aims to reduce barriers to investment in technology, uses a combination of interest subsidies, government guarantees and capacity building through training programmes.

Other instruments like tax incentives and subsidies, green procurement and standards for green products, and energy efficiency promote the development and uptake of green technologies. These include green investment tax allowances (GITA) for the purchase of green technology equipment and assets, and green income tax exemption (GITE) for green technology service providers.

Connecticut Green Bank

The financing options offered by the CGB ranges from simple direct loans to more complex structures where it provides an upfront payment to residential solar

projects in exchange for the lifetime stream of solar renewable energy credits from the system. Loans are given through three primary channels—the Residential Solar Investment Programme (RSIP), loan loss reserve credit enhancements, and direct loans and leases. Loan loss reserves are used as a risk reduction mechanism to support the direct lending of a private entity.

Major Projects and Partnerships

Green Investment Group

The GIG works with other investors to fund green infrastructure projects. By the end of FY 2014-15, it had worked with over 70 co-investors, such as GE Energy Financial Services and Lightsource BP, to drive investment in the UK's green economy.

TABLE 7: Major GIG projects

Name of the Project	Co-Investor	Capital Committed	Total Transaction Size	Product Used	Sector
Westermost Rough	Marubeni Corporation	£241 million	£881 million	Equity	Offshore Wind
Drax Biomass Conversion Project	Prudential and M&G UK Companies Financing Fund	£50 million	£990 million	Debt	Bioenergy
Crianlarich hydro project	KKR and Strathclyde Pension Fund	£150 million	£300 million	-	Community-scale renewables
North Yorkshire waste treatment plant	-	£33.4 million	£319.4 million	-	Waste
Kent County Council streetlighting project	-	£10.2	£40.8	-	Energy Efficiency
The Green Deal Finance Company	-	£125 million	-	Debt	Green Deal

Source: Annual Reports 2012-13 to 2016-17 and Progress Report 2018 to 2019.

It is currently partnering with multiple investors to build a sustainable development pipeline, which now sits at over 20GW and has projects in foreign countries²⁶

The GIC's green investments in India

The Green Investment Group and the UK government entered a joint venture to form UK Climate Investments (UKCI) to establish green projects in India and Africa, with the UKCI's capital mobilising additional private investment to promote greener growth in developing economies.

In June 2018, the UKCI provided £5 million in equity funding for solar developer Lightsource BP to commission a solar farm in Maharashtra. Lightsource's expertise would bring management and project development skills to India while adding to the country's capacity. The project is estimated to generate 50MW capacity in India, while reducing 81kt CO₂ emissions per year.

The UKCI helped in seeding the first renewable energy 'yieldco' in the Indian market in August 2018. With a 40-percent equity stake in the project, it has partnered with the Finnish energy company Fortum and the Finnish investment services firm Elite Alfred Berg Group to establish solar assets that are estimated to generate 185MW worth of capacity while reducing up to 330kt CO₂e emissions per year from India

In April 2019, the UKCI committed £30 million to partner with CleanMax Solar to build new ground-mounted and rooftop solar energy generation projects to enable commercial and industrial clients to access clean and cheaper electricity.

The UKCI and its co-investors have also announced a £1.2-million investment in the Bhadla solar farm to establish robotic waterless cleaning technology. The use of this technology in a water-stressed region will enable smooth operations while ensuring water availability to local communities and farmers.

*By aggregating renewable energy projects, yieldcos generate predictable cash flows that are attractive to institutional investors while allowing developers to recycle their capital and address new renewable energy project development opportunities.

Malaysian Green Technology and Climate Change Centre

MGTC has partnered with several private and public sector actors to implement its projects, some of which are:

- Collaboration with Deutsche Gesellschaft für Internationale Zusammenarbeit to execute training in measuring, reporting and verification for sustainable transport in Malaysia.
- Collaboration with PLUS Malaysia Berhad to chart the PLUS Green Roadmap 2018-2022, and to oversee the installation and commissioning of PLUS' Solar PV System project at Persada PLUS and Machap Rest & Service Area (Northbound) on the North-South Expressway.
- Partnering with ASEAN Centre for Energy to expand the scope of Energy Manager Training Course and EMGS in Malaysia, in line with the AEMAS certification.
- Partnering with PETRONAS Dagangan Berhad to install 66 EV charging stations. As of end-2018, 61 stations were installed along major highways of peninsular Malaysia.
- Partnering with BMW Malaysia to serve the electric mobility needs of BMW EV users across the nation.

MGTC's Green Energy Office

As MGTC works across several sectors, its office has been designed to showcase the importance and benefits of green technology implementation and green infrastructure. The building, located in Bandar Baru Bangi, Selangor, is designed to showcase energy efficiency and renewable energy. It was developed in 2007 and receives more than 10,000 local and international visitors per year.

Key facts:

1. Building energy index of between 20-30 kWh/m²/year, compared to 220-300 kWh/m²/year for a typical office building in Malaysia, meaning electricity bill ~ RM5,000/mth
2. Savings of almost 500,000 kWh per year (at least RM 200,000 per annum)
3. Avoided 360 tonnes per year of carbon emissions

Connecticut Green Bank

To meet Connecticut's clean energy goals, the CGB deploys capital across three programmes: residential; commercial, industrial and institutional; and infrastructure. Through these programmes, the CGB aims to provide longer-term loans for energy efficiency upgrades or renewable energy installations.

TABLE 8: Total Investments since inception

Programme	CGB Investment	Private Investment	Leverage Ratio*
Solar Lease Project	US\$37,554,932	US\$111,364,160	4
C-Pace	US\$49,282,431	US\$109,248,738	3.2
RSIP	US\$129,310,933	US\$923,572,465	8.1
Smart-E Loan	US\$6,225,629	US\$68,059,188	11.9
Multifamily Project Types and Investment	US\$8,529,545	US\$119,614,578	15
Low Income Solar Lease Project	US\$22,536,000	US\$48,351,057	3.1
CT Solar Loan	US\$459,674	US\$8,599,469	19.7
SBEA (Small Business Energy Advantage)	US\$4,486,648	US\$43,194,557	10.6

Data Source: Comprehensive Annual Financial Report (Fiscal Year ended June 30, 2019)

** Leverage ratio is the extent to which public capital drives private investment. It is calculated by dividing the total investment by that of the total public investment (green bank investment). A higher leverage ratio shows a larger proportion of private investment in the programmes.*

The smart e-loan programme, which offers residential loans to make energy efficiency and clean energy improvements, uses a loan loss reserve to encourage local lenders to offer below-market interest rates. In 2019, the CGB investments were reduced to zero except for operating and administrative expenses.

CT Solar Loan, a US\$5-million pilot public-private partnership between the CGB and Sungage Financial, was the first crowd-funded solar loan programme aimed at enabling citizens to own solar PV systems at low rates through long-term financing. In 2016, it graduated to a US\$100-million partnership between Sungage Financial and Digital Federal Credit Union, which provides solar loans in Connecticut and three other states with no resources from the CGB.

The RSIP programme supports the installation of solar PV systems in residential homes through direct incentives, with a goal of supporting 30 MW of PV installations by 2022. The incentive is provided per KW produced. The RSIP programme costs are also recovered by aggregating and monetising the solar home renewable energy credits earned for solar energy generated by systems whose owners received RSIP incentives.

Performance

Green Investment Group

As per the double bottom approach, the GIG needs to ensure it achieves the green purpose targets and performs well financially.

Green performance

The green metrics determine how the green purposes laid down in the GIG's mandate are faring.

TABLE 9: Performance against green metrics

Green Metrics/Phase	Inception	Pre-Acquisition	Post-Acquisition*
GHG Emissions Reduction	6.43 million tCO ₂ e	14 million tCO ₂ e	7.6 million tCO ₂ e ^{viii}
Renewable electricity generated	12,267 GWh	29,034 GWh	51,547 GWh
Energy Demand Reduced	36,781 MWh	1,32,544 MWh	> 78,445 MWh ^{ix}
Materials Recycled	43,367 tonnes	3,45,795 tonnes	5,04,956 tonnes
Waste to landfill avoided	36,026 tonnes	5,26,790 tonnes	14,29,358 tonnes

* Figures in the post-acquisition phase measure global impact since the GIG began undertaking projects in other countries.

Source: Annual Reports 2012-13 to 2016-17 and Progress Report 2018 to 2019.

The GIG has performed exceptionally in every period, showcasing a higher commitment to the achievement of its green purposes.

viii Approximate figure: Data not available for 2018-19

ix Approximate figure: Data not available for 2018-19

Financial performance

Three different metrics measured the GIG's financial performance: capital committed, mobilisation ratio and rate of return.

TABLE 10: Performance against financial targets

	Inception ^x		Pre-Acquisition		Post-Acquisition ^{xi}	
	T*	P	T	P	T	P
Capital Committed	£0.8-1 billion	£0.6-0.75 billion	£0.7-0.9 billion	£0.7-0.8 billion	NA	£0.45 billion
Mobilisation Ratio	2.5:1 ratio	2.8:1 to 3:1 ratio	2.5:1 ratio	0.6:1 to 3:1 ratio ^{xii}	NA	2.5:1 ratio
Rate of Return	3.5%	8% to 9%	NA	9.8% to 10.3%	NA	-

*T=target, P=performance.

Source: Annual Reports 2012-13 to 2016-17 and Progress Report 2018 to 2019.

Its performance exceeded the targets in most cases, but the non-specification of targets in the post-acquisition phase makes it difficult to compare. The capital committed saw an improvement over the first period but fell significantly in the last. The mobilisation ratio and rate of return were similar.

There are other measures—cumulative figures for the total projects funded, income generated and post-tax profits—that give a fuller view of the GIG's financial performance.

Table 11: Other indicators of financial performance

Metric/Phase	Inception	Pre-Acquisition	Post-Acquisition
Funded Projects	55	54	More than 11 ^{xiii}
Income Generated	£51.7 million	£155.6 million	-
Post Tax Profits	Loss of £11.6 million	£28.7 million	More than £217 million ^{xiv}

Source: Annual Reports 2012-13 to 2016-17 and Progress Report 2018 to 2019.

x The inception period does not include year 2012-13, because the targets were not available for that year.

xi Data available only for 2017-18

xii As per own calculation: [(Capital Mobilised – Capital Committed)/Capital Committed]

xiii The Annual report for 2017-18 did not clarify the exact number of projects funded.

xiv Only reported figure was for 2017-18.

Despite the limited data, the post-tax profit appears to have performed exceptionally after the acquisition. The projects funded grew every year, and income generated and profit post-tax rose every year.

Malaysian Green Technology and Climate Change

GTFS

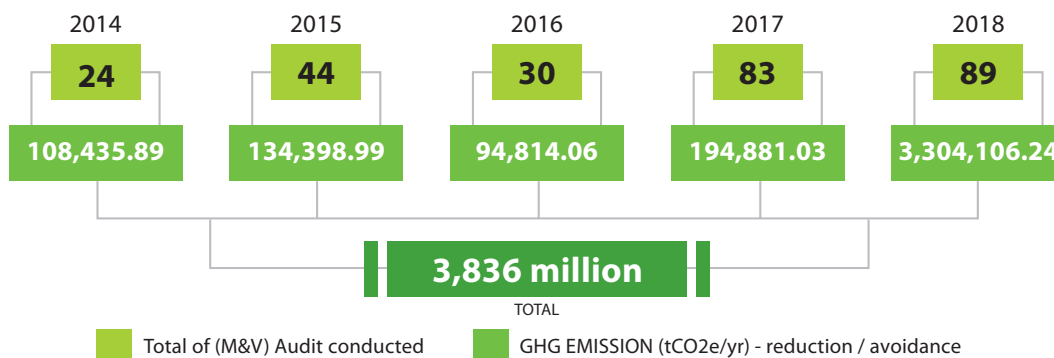
As of October 2017, the GTFS has successfully approved 315 projects, mostly in the renewable energy sector, at a total cost of about US\$1.7 billion. Loans worth US\$829 million were approved under the scheme. The projects are expected to contribute to the avoidance of over 3.7 million tonnes of CO₂ equivalent every year and create more than 5,200 green jobs.²⁷

Table 12: GTFS impact assessment

No. of funded projects	315
Cost of projects	US\$1.7 billion
Amount of loan approved	US\$829 million
Estimated GHG impact	3.7 million tonnes of CO ₂ e
No. of fin institutions engaged	28

Source: <https://greenbanknetwork.org/malaysia-green-technology-corporation/>

FIGURE 12: Yearly GHG emission reduction as per the M&V audit programme



Source: Malaysia Green Technology and Climate Change Centre Annual Report, 2018

Green Investment Tax Incentives (GITA/GITE)

In 2018, 175 renewable energy and 55 energy efficiency projects were approved, attracting investment of RM 3 billion (US\$711 million) and RM139.1 million (US\$33 million) respectively. About 95.4 percent of the renewable energy GITA investors were local.²⁸

TABLE 13: Environmental Impact of GITA approved projects in 2018

GHG Emission Reduction	393,269 tCO₂e/year (equivalent to 137170 tonnes of waste recycled instead of landfilled)
Energy Saving	556,345 MWh/Year
Cost Saving	87,294,366 RM/year or \$2074716/year

Source: GreenTech Malaysia Annual Report, 2018

LCCF

As of 2018, 52 local authorities are participating in the LCCF initiative; five have succeeded in cutting their overall carbon emissions by 9,363.25 tCO₂/year.²⁹

FIGURE 13: Indirect Economic Benefits of the LCCF

City	Local Authority	Sector	Activity	Results
Seberang Perai	Majlis Perbandaran Seberang Perai	Energy	<ul style="list-style-type: none"> Installation of 60 kWp rooftop Solar PV Replacement of all indoor lights to LED 	Total Investment: RM315,000 Estimated Annual Savings: RM37,000
Hang Tuah Jaya	Majlis Perbandaran Hang Tuah Jaya	Energy	<ul style="list-style-type: none"> Energy Efficiency campaign @ 14 buildings in Hang Tuah Jaya Low Carbon Workshops & Capacity Building Low Carbon Competition 	Total Investment: RM1,780,000 Total Estimated Annual Savings @ 14 buildings: RM660,000
Subang Jaya	Majlis Perbandaran Subang Jaya	Energy	<ul style="list-style-type: none"> Upgrading to a Green Data Centre Replacement of all indoor lights to T5 HVAC upgrade to Variable Speed Chiller 	Total Investment: RM1,750,000 Estimated Annual Savings: RM330,000

Source: <https://www.greentechmalaysia.my/our-services/low-carbon-cities-framework/>

Low Carbon Mobility

As of 2018, a total of 132,307 charging hours and 47,502 charging sessions were recorded, a 51 percent growth from 2017.³⁰ MGTC has also been focused on bringing EV charging stations to more Malaysian homes through ChargeEV, with 250 charging stations installed as of December 2018.³¹

MyHIJAU Mark & Directory

The green technology master plan includes targets for the number of registered green products and services under the MyHIJAU Mark: 5000 by 2020, 7500 by 2025, and 10,000 by 2030. In 2018, MGTC managed to get a total of 3,142 green products and services registered with the MyHIJAU Mark, 136 percent more than in 2017.³²

EMGS

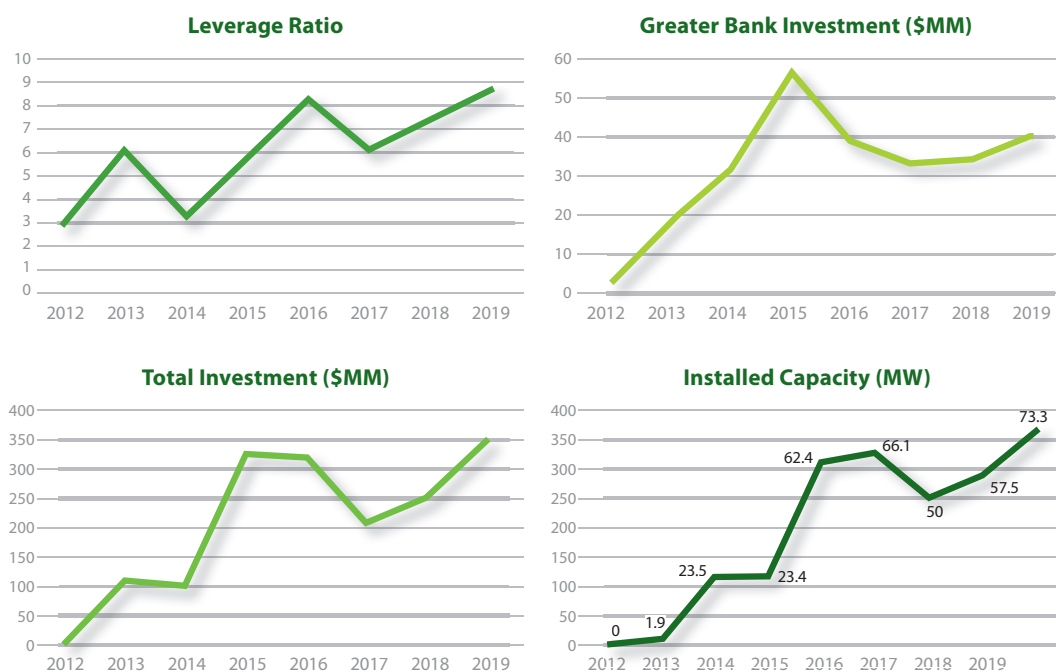
To date, the EMGS programme has helped mitigate 54kt CO₂e annually compared to the respective energy baselines and has saved RM 34 million (US\$7.8 million) each year.³³ Since the MGTC was appointed the EMGS certification body in 2016, 200 assessments have been conducted, 170 of which have been certified.

Connecticut Green Bank

Since its inception, the CGB has attracted US\$8.7 of private investment for every US\$1 it puts in. The CGB and its private investment partners have raised over US\$1.6 billion for clean energy projects across the state.³⁴

The leverage ratio in the CGB's investments has increased over the years because of the rise in private-sector investments. Also, the percentage of grants as a source of funding declined to 43 percent in 2019 (See Figure 14).

FIGURE 14: Green and financial performance



Authors' own using data from the Comprehensive Annual Financial Report (Fiscal Year ended June 30, 2019)

Emissions saved (or avoided)

The CGB also conducts extensive studies to calculate the emissions reduced in terms of tonnes of CO₂, pounds of nitrous oxide and sulphur dioxide, and particulate matter. Table 14 shows the CO₂ emissions reduction on an annual basis and lifetime savings.

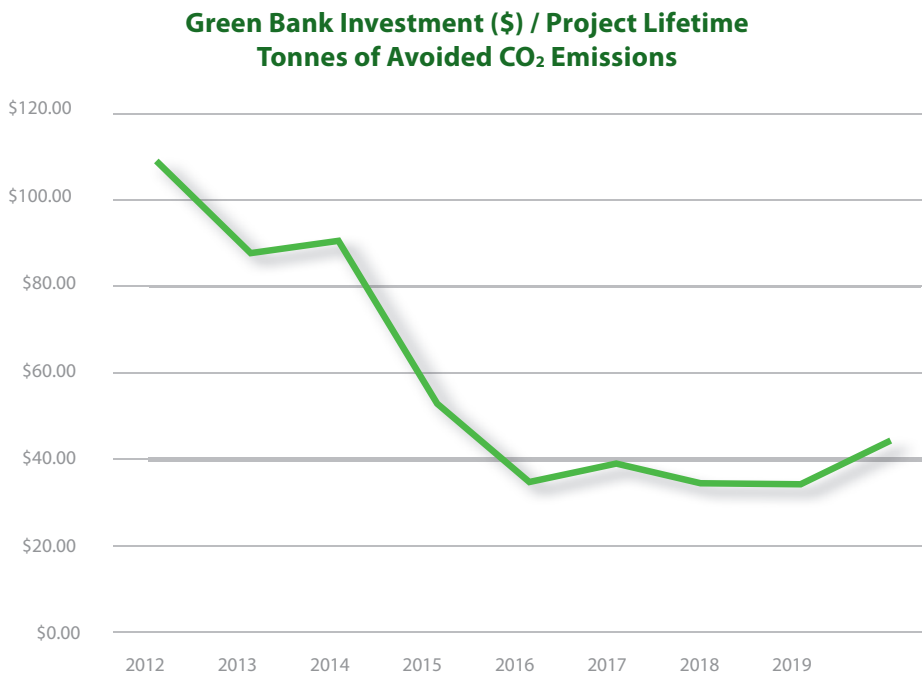
TABLE 14: CO₂ emissions avoided (tonnes)

Fiscal Year	Annual	Lifetime*
2012	1,242	31,046
2013	13,254	210,346
2014	15,714	358,049
2015	44,644	1,047,450
2016	47,831	1,129,276
2017	35,553	847,708
2018	42,576	993,233
2019	48,402	1,183,050
Total	249,217	5,800,158

Data Source: The Financial Report of 2019
 *Lifetime values are based on the aggregation of the projects' impact for one year multiplied by the useful life of the technology for each project.

The amount of green investment required to reduce a tonne of CO₂ emissions has declined steadily over the years, from about US\$110 in 2012 to US\$34 in 2019 (See Figure 15).

FIGURE 15: Green and financial performance



Source: Authors' own, using data from the Comprehensive Annual Financial Report (Fiscal Year ended June 30, 2019)

Jobs generated

A baseline study was conducted in 2009 and updated in 2016 to calculate the direct and indirect jobs created (job-years created per US\$1 million) through the CGB's programmes.³⁵ It showed that 5,300 direct jobs had been created in the product development, manufacturing, project development and deployment segments of the renewable energy and energy efficiency value chain. Most renewable energy jobs are split between the solar and fuel cell industries. Employment in the solar industry has grown by approximately 30 percent since 2010, becoming the largest renewables industry for jobs in Connecticut. Installation and engineering account for most jobs created in the solar sector. Similarly, manufacturing and engineering account for the bulk of positions in the fuel cell companies. In the energy efficiency market, overall employment has remained constant.

TABLE 15: RE job-years created per \$1 million capital invested per the calculator approach

Occupation	Director Job-Years Created per \$1 Million Invested	Indirect and Induced Jobs Created per \$1 Million invested	Total Job-Years Created from \$1 Million invested
Renewable Energy			
Fuel Cell			
Fuel Cell Manufacturing	4.9	6.4	11.3
Fuel Cell R&D Engineering	2.9	3.8	6.7
Solar PV			
Solar PV Installation - Residential	3.9	5.1	9.0
Solar PV Installation - Non-Residential	3.1	4.0	7.1
Renewable Thermal Technologies			
Ductless Split Heat Pump	6.7	8.7	15.4
Geothermal	6.7	8.7	15.4
Solar Thermal	5.6	7.3	12.9
Other			
Wind Installation	6.2	8.0	14.2
Hydro Installation	6.2	8.0	14.2
EV Charging Stations - Installation	3.1	4.0	7.1
Storage Installation	3.2	2.9	5.1

Source: Clean energy jobs in Connecticut, Final Report, August 10, 2016 (Navigant Reference No, 184823)

TABLE 16: Comparison of UK, Malaysia and Connecticut green banks

Basis of Distinction/ Green Investment Bank	UK GIG	MGTC	CGB
Year of Inception	2012	2010	2011
Sponsors	Earlier - Government Now - Macquarie Group	Government	Funded via a surcharge on Connecticut ratepayers' utility bills
Mandate	<ul style="list-style-type: none"> • Reduction of Greenhouse Gas Emissions • Advancement of Efficiency in the Use of Natural Resources • Protection or Enhancement of the Natural Environment • Protection or Enhancement of Biodiversity • Promotion of Environmental Sustainability 	Advocating the use of green technology in key economic sectors across the country	<ul style="list-style-type: none"> • To attract and deploy private capital investment • To leverage limited public funds • To develop and implement strategies that bring down the cost of clean energy in order to make it more accessible and affordable to consumers
Legal Structure	<p>2012-17 – Public Limited Company; mandate set by the government but investments are taken independently</p> <p>2018 onwards – Private Limited Company; to make sure that 'green purposes' are followed, a special share is held by a guarantee company, owned and operated by independent trustees which can approve/veto any change to green targets.</p>	Government agency under the Ministry of Energy, Science, Technology, Environment and Climate Change	Quasi-public corporation. Senior members of the Board of Directors are political appointees.
Initial Funding	3 Billion GBP	RM1.5 million (US\$355 million) for GTFS scheme	

Basis of Distinction/ Green Investment Bank	UK GIG	MGTC	CGB
Major Work Sectors	<ul style="list-style-type: none"> Off-shore Wind Waste and Bioenergy Domestic Energy Efficiency On-shore renewables 	<ul style="list-style-type: none"> Renewable Energy Energy Efficiency Green Data Centre Green Building Waste Management 	<ul style="list-style-type: none"> Renewable Energy Energy Efficiency
Instruments Used	<ul style="list-style-type: none"> Refinance Equity Direct Investment for construction Debt instruments Funds and Managed Accounts 	<ul style="list-style-type: none"> Interest subsidy Loan guarantee Investment Tax Allowances Tax Incentives 	<ul style="list-style-type: none"> Crowdsourcing alternative underwriting limited loan loss reserves community-based marketing - Incentive(\$ provided per Kwh produced)
Present Rate of Return	10.3% (2016-17)		
Finance Mobilization Ratio	2.5:1		8.7:1
Emissions Reduced	For 2017-18 - 7.6million tCO ₂ e	3.7 million tCO ₂ e (through the GTFS)	249,217 tons CO ₂ (since 2012)
Impact on Job Creation		5,200 green jobs every year (through the GTFS)	5,300 direct jobs

Source: Authors' own, based on data from official documents

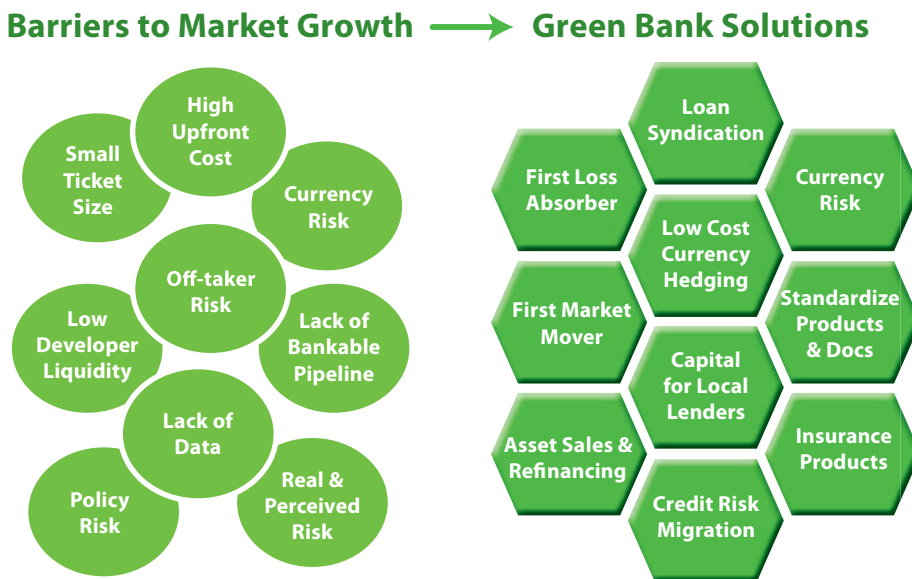
IV

An Indian Green Investment Bank: The Way Forward

India is the world's third-largest energy consumer and greenhouse gas emitter. While the government has exhibited a strong commitment to honour India's Paris pledge, placing the country on a sustainable development path requires effective and large-scale investments. The IFC estimates a US\$3.1-trillion investment up to 2030 for climate-smart infrastructure, implying an annual investment of US\$300 billion.³⁶ This financing capacity cannot be met through domestic sources; public and private foreign investment will need to be mobilised at unprecedented levels. A national green investment bank can play an instrumental role in closing the climate investment gap by spurring public and private investment in resource-efficient technologies and business models.

There are a host of factors that act as barriers to investment in green, low-carbon sectors of the economy, including the high transaction costs of energy efficiency and distributed energy projects, small average investment size, real and perceived technology risk, and regulatory uncertainty.³⁷ These barriers are particularly acute in developing countries like India and are exacerbated by currency and policy risks and a weak enabling environment. A green investment bank can address some of these barriers by employing a suite of innovative financing tools, and risk-reducing and transaction-enabling techniques. More specifically, it can introduce a range of interventions to reduce, reassign or reapportion different investment risks using mechanisms such as guarantees, insurance products, public stakes and other forms of credit enhancement.³⁸

FIGURE 16: Green bank solutions



Source: <http://coalitionforgreencapital.com/wp-content/uploads/2017/07/Green-Banks-in-Emerging-Markets.pdf>

An Indian green bank could be instrumental in redirecting capital from greenhouse gas-, fossil fuel- and natural resource-intensive industries to safer, cleaner, and more productive investments. It will also act as a useful complement to local financial institutions by providing a dedicated green focus, unleashing market forces, and deploying capital for local needs. Finally, it will fill data and information gaps, build confidence in markets for new green technologies and bring the Indian climate finance architecture quickly to the scale needed to achieve the national climate goals.

Mandate

The green bank's prerogative should be to invest in infrastructure assets and technologies that support India's transition to a green economy in sectors like renewable energy, transport infrastructure, green buildings, water management, energy efficiency and waste management. The green bank could leverage public funds to raise private investment, thereby maximising the impact of government spending. The bank's objectives should include reducing greenhouse gas emissions, in line with India's climate commitments, creating green infrastructure assets, supporting green technologies and job creation. Additionally, it should support state and local governments in setting up sub-national green banks.

Governance

The bank should be set up as a public company, operating at arms-length from the government. The bank should function as an independent entity, with the ability to make financial decisions and choose projects purely on commercial considerations without government involvement. Where the government should be involved is in formulating supportive policies for various industries, assisting the financial system in providing green financing (for instance, through priority sector lending targets), and by tracking results through an independent council or monitoring body.

The green bank should have an eminent independent investment board and an experienced management committee, consisting of financial and infrastructure sector experts. It may be possible to set up a government advisory board to ensure that the bank's activities are aligned with government policy. The advisory board could consist of officials from the finance ministry and other relevant line ministries. This will also provide an avenue for informal collaboration with the government, so that policy and regulations are well-aligned with new projects.

The bank must pursue world-class corporate governance practices, as established by other reputed financial institutions such as the Australian SuperFund, the Canadian

pension funds and the Norwegian sovereign wealth fund. Through its quarterly and annual reports and public communication channels, the bank should be able to provide a detailed picture of its operations and investments.

Audit committee

An audit committee should be established to ensure that the bank issues regular and transparent financial statements. As seen with the UK GIG and CGB, this helps build credibility and makes it easier to raise funds from the private sector.

Risk management committee

Risk management for a green investment bank is different from a traditional risk management profile. Besides physical risk, there is also transition risks, as the economy shifts to other modes of production, consumption, and energy generation.^{xv} Risk management tools may have to reflect new data, changing relationships and evolving interconnections. Traditional models based on historical trends may have to be replaced or supplemented with the development of forward-looking approaches grounded in scenario-based analyses.³⁹ A committee of experts should be formed to advise the board on risks to the bank's portfolio and ensure a smooth transition to a green economy.

Financial resources

The bank could either be set up using seed funding from the government budget (like the UK GIG and NIIF) or be assured of continued government funding every year through earmarked revenue streams from some taxes (like the CGB). Another option, given fiscal constraints in the aftermath of the COVID-19 crisis would be to use seed funding from multilateral and development finance institutions or from classic impact investors such as philanthropists. In both cases, the funds could be used to leverage additional investment from the private sector.

Using seed funding is useful in ensuring the bank's financial stability but also pressurises the management to invest the funds rapidly, which may be difficult in situations where a pipeline of projects do not exist. This, in turn, could force investment in sectors that are already somewhat developed and can raise capital directly from the private sector.

xv Transition risk is the potential for loss resulting from a shift toward a lower-carbon economy as policy, consumer sentiment and technological innovations impact the value of certain assets and liabilities.

Having an assured continued funding ensures a stream of zero-cost capital that can be deployed in industries that have high initial costs, which will allow for grants for technical assistance and capacity building if required. However, budget cuts could potentially jeopardise the activities of the bank, and an agreement would need to be worked out with the government to ensure revenue stability. A 'sunset provision' could be considered, under which the bank aims at becoming financially self-sufficient within a fixed number of years.

Institutional structure

The green bank could comprise two core funds—National Green Fund and State Green Fund. Along the lines of the NIIF, the sub-funds could be established as Alternative Investment Funds with the Securities and Exchange Board of India. These funds would further be structured into various asset categories: growth equity; mezzanine and project debt; seed funding; and technical assistance grants.

National Green Fund

The chief objective of the National Green Fund would be to catalyse green finance on a large and economically viable scale to develop sustainable growth patterns. The focus would be on financing national-level projects that reduce greenhouse gas emissions, advance efficient resource use, protect biodiversity and promote environmental sustainability. The fund would also collaborate with a wide range of investors and institutions to drive investment into India's green economy. For instance, the fund would make investments in e-mobility ventures, like the MGC's low carbon mobility flagship project.

State Green Fund

Provincial governments may be keen to implement green financing concepts but not possess the requisite technical know-how, institutional capacity, or funding to accomplish this. The State Green Fund will address this gap by investing in green infrastructure projects at the state and municipal level by supporting local bodies in building affordable green housing, cities in low-carbon transport and states in setting up industrial parks with waste management facilities. States could be asked to prepare preliminary project reports and bid for funding from the green bank. Alternatively, the green fund could announce a project, and states could compete to have it located in their jurisdiction.

As the green bank gains expertise, it could support the states and local bodies in setting up their own green banks, along the lines of those in Kerala and Tamil

Nadu. Additionally, it could help sub-sovereign entities to raise funds through domestic and international markets. Kerala recently issued masala bonds on the London Stock Exchange, and other states could do the same. The green bank's technical assistance division could help train municipal bodies to prepare financial statements to improve their credit rating when issuing bonds. It could also support states in accessing capital from international finance institutions and the Green Climate Fund.

The technical assistance division could also ensure that information is shared between state and local bodies and facilitate a regular exchange of ideas. This is especially relevant in India, where project implementation often goes awry due to a poor understanding of ground realities. Sharing of best practices—and failures—could help ensure successes are replicated widely and implemented efficiently.

Tech Innovation Fund

The green bank could also have a Tech Innovation Fund to finance green technology pilots throughout the country. Acting as a subset of the core funds, the tech fund would promote scaled-up financing for demonstration, deployment, and transfer of low-carbon technologies. By generating public and private investment, the fund would play an important role in accelerating the diffusion and transfer of technologies with significant potential for long-term greenhouse gas emissions savings. It would also help in establishing market-based mechanisms to respond to climate change.

Financial instruments

The bank should explore a range of innovative financial instruments to encourage private investment in projects. While generating private finance for large projects, it should also aim to make funds available to households that are economically vulnerable and do not have access to the financial system. Thus, the bank will need to strike a balance between maximising financial returns on some instruments to subsidise concessional lending on others. The bank could also consider assigning private asset managers to handle investments in a 'fund of funds.' Some instruments that have been used successfully in India and abroad include:

Debt products: The most used investment instrument by green investment banks, debt products include direct lending, co-lending through public-private partnerships, and providing credit enhancements for projects that support positive climate outcomes. They aim at bridging financing gaps and empowering emerging green businesses in the country.

Equity: This would take the form of seed capital investment to promote green ventures and technologies. The bank could provide a minimal initial investment to spur private investment and raise capital. Investment by the green bank would act as a risk mitigant for private investors and build greater confidence among them regarding the venture.

Mezzanine capital: Mezzanine financing is a hybrid of debt and equity financing and is a high-risk instrument. It gives the lender the right to convert to an equity interest in the company in case of default. The UK GIG and CGB have mentioned mezzanine financing as a permitted investment tool. Borrowers generally prefer mezzanine debt because the interest is tax-deductible.

Bonds: The green bank could issue bonds through a public or private sale to finance its initial capitalisation. The UK GIG and CGB have used bonds widely.

Loan warehousing: Energy efficiency and distributed energy projects generally have a high transaction cost that act as an investment barrier. This barrier can be addressed by employing the loan warehousing instrument. Loan warehousing is an aggregation technique whereby small-scale projects are bundled together to reduce transaction costs and facilitate investment. For instance, the CGB combined solar leases from many small residential projects to attract private investors through its Solar Lease II programme.

Securitisation: Securitisation is the process of taking small-scale or illiquid assets (such as cash flows from power purchase agreements or wind farm leases) and transforming them into tradable, standardised assets.

Guarantees: The green bank could provide guarantees on investments to mitigate perceived or actual risks, thereby increasing the attractiveness of the investment. For instance, MGTC provides guarantees under the GTFS to encourage private banks to finance green projects. Payment guarantees could also be used to mitigate counterparty risk, as with the SECI in India.

Refinancing: Refinancing reduces the effective maturity of a loan and allows funds to move quickly into new investments. TCCL has used refinancing successfully.

Fiscal incentives: The Indian green bank could provide tax allowances for the purchase of green technology equipment and assets and income tax exemptions for green technology service providers, much like the MGTC. The incentives could be provided in sectors such as renewable energy, green infrastructure, waste management and energy efficiency. They would be effective ways for India to

incorporate climate risk in its national fiscal framework.

Performance monitoring

Targets

India's green bank should aim for financial sustainability and green impact, to be measured by the quantum of private finance catalysed and sector-specific green goals. The targets should be set by the government advisory board in line with India's climate commitments and should be reviewed annually.

Given the size of India's infrastructure gap—about US\$200 billion annually—and the government's limited resources, ensuring that sufficient private finance is catalysed should be the priority. The GIG targeted catalysing 2.5 units of private investment for every unit of public investment. In India, the mobilisation ratio has differed across sectors. For infrastructure investment, the NIIF and GGEF have aimed at mobilising one unit of private investment for each unit of public investment. TCCL has been able to mobilise funds at a 4:1 ratio, and the IREDA 'green window' hopes to raise US\$80 million from the private sector with an initial outlay of US\$20 million. Similarly, the CGB has a leverage ratio greater than 8:1.

The Indian green bank's targets should vary across sectors. Renewable energy, for which the market is well developed, could target a higher mobilisation ratio, while newer sectors like waste management and green transport could start with lower targets. Finally, for emerging technologies, which are too risky for the private sector, the bank could provide funding through an equity stake, hedging risks across several projects.

The bank should aim for financial sustainability across all investments, ensuring that sufficient income is generated to remain solvent and to maximise the impact per rupee spent. A sectoral exposure limit could also be considered to minimize losses in case of systemic risk in any one sector.

Green targets should also differ across sectors based on their overall potential. For instance, while emissions avoided is relevant for low-carbon transport and renewable energy, waste management should focus more on the quantum of materials recycled or the reduction of waste sent to landfills. These targets should be set annually, based on the available technology and international best practice.

Monitoring and evaluation

A management information system should be set up to have uniform records for each of the bank's projects, for quick evaluation of successes and failures, to guide decision-making, and facilitate easy comparisons across states, sectors and financial instruments. The Indian government has had success in using these systems for many schemes and recently set up a dashboard for infrastructure projects built through public-private partnerships.⁴⁰ Similar software could be developed to track green bank-funded projects. Each investment should also include a set of project-specific targets and indicators against which progress can be evaluated.

Eventually, the green bank should develop a social benefits framework to measure the impacts of its projects on income distribution and quantify the effect on the ability to attain the United Nations' sustainable development goals.

V

Conclusion

Green infrastructure finance in India falls far short of the amount required, a gap that could quickly be filled by foreign institutional investors. But the international financial system is not aligned to financing infrastructure in emerging markets. On the investors' side, the climate imperative is not included in the mandate of financial institutions. Even if that changes, a lack of knowledge of investment opportunities and high perceptions of risk prevent investment in infrastructure in developing countries. In India, process and capacity limitations in infrastructure projects make it an unattractive avenue for investment. The government will need to step in and provide a pipeline of projects, and instruments to mitigate risk, to raise finance from foreign private investors.

An independent green investment bank, which uses public finance or multilateral and philanthropic support as initial seed capital to mobilise additional investment from institutional investors, is the ideal solution. Such structures have already been used effectively in the renewable energy sector, where institutions like the GGEF and the TCCL have mobilised substantial private investment using a small quantum of seed capital. Similarly, the NIIF has successfully raised finance for infrastructure investment, but climate action is not integrated into its decision-making. This model can be extended to green infrastructure, including low-carbon transport, waste management and housing. The bank can use a range of financial instruments to increase credit ratings, reduce transaction costs and guarantee a reasonable investment period to make infrastructure assets attractive to institutional investors.

The management of the bank will be independent of the government to ensure sound financial outcomes and avoid political interference. A government advisory board could be put in place to ensure the bank's lending plans are in line with public priorities. Similarly, the government can use fiscal incentives and regulations to support new technologies and create markets for the bank's projects. While stopping short of operational control, such arms-length alignment between the bank and the government will maximise the complementarities between policy, regulation, and finance, which can be coordinated to maximise impact and, crucially, mitigate private investors' concerns.

The infrastructure India builds in the next few years will determine its emissions profile for decades to come. The large amounts of finance needed to accelerate the shift from carbon-intensive infrastructure to low-carbon, resilient infrastructure can only be raised through the private sector. While investment in renewable energy has been growing, it is not enough to limit the increase in global average temperatures to below 2°C above preindustrial levels. Building an institution to unlock large flows of investment into low-carbon infrastructure will not only move India on to a low-emissions path but will also be the building blocks for a modern, competitive

economy. As the quality of infrastructure improves, the business climate benefit and productivity will increase, resulting in higher levels of economic growth and employment.

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India will need to invest more than US\$3 trillion in climate-smart infrastructure over the next decade. Domestic sources of finance are inadequate to meet this challenge, but there are large pools of patient capital in advanced economies that can be invested in Indian infrastructure. India, however, has not been able to package infrastructure as an attractive asset class. As the global economy moves to recover from the COVID-19 crisis, the monetary stimulus by the central banks in the advanced economy will lead to large capital flows seeking yields. This report proposes an institutional architecture that can act as a bridge for global capital by blending public domestic financial resources and private capital. This is based on a study of the current state of institutions financing green infrastructure in India and global best practices.



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