



Landscape of Green Finance in India

Methodology and Approach
October 2020



Supported by



INTRODUCTION

The Landscape of Green Finance aims to capture annual financial flows supporting emission reduction or mitigation activities based on empirical data drawn from a wide range of primary and secondary sources. We categorized flows along their lifecycles, from public and private sources and intermediaries, through a variety of financial instruments, to recipients and the final uses of mitigation finance. For the collection, preparation and analysis of data, we adopted an operational definition of green finance and an accounting methodology in order to ensure comparability across data sets and avoid overlaps, to the extent possible.

This document serves to outline the methodology in terms of definitions, accounting scope, issues and assumptions, and coverage.

DEFINITIONS

GREEN FINANCE DEFINITION

Due to the lack of a common definition of green finance in India, the taxonomy for the study has been aligned with the findings of the 'Green Finance Taxonomy Landscape Paper' developed by CPI and cKinetics with the support of Shakti Sustainable Energy Foundation and the CPI published study 'Accelerating Green Finance in India: Definitions and Beyond' (CPI, 2020). These publications define climate, green and sustainable finance as follows:

- **Climate finance** refers to "local, national or transnational financing, drawn from public, private and alternative sources of financing, that seeks to support mitigation and adaptation actions that will address climate change."
- **Green finance** includes climate finance as well as other environmental objectives that are necessary to support sustainability, and in particular, aspects such as biodiversity and resource conservation.
- **Sustainable finance** covers a broader set of the investment universe with the aim to build an inclusive, economically, socially, and environmentally sustainable world.

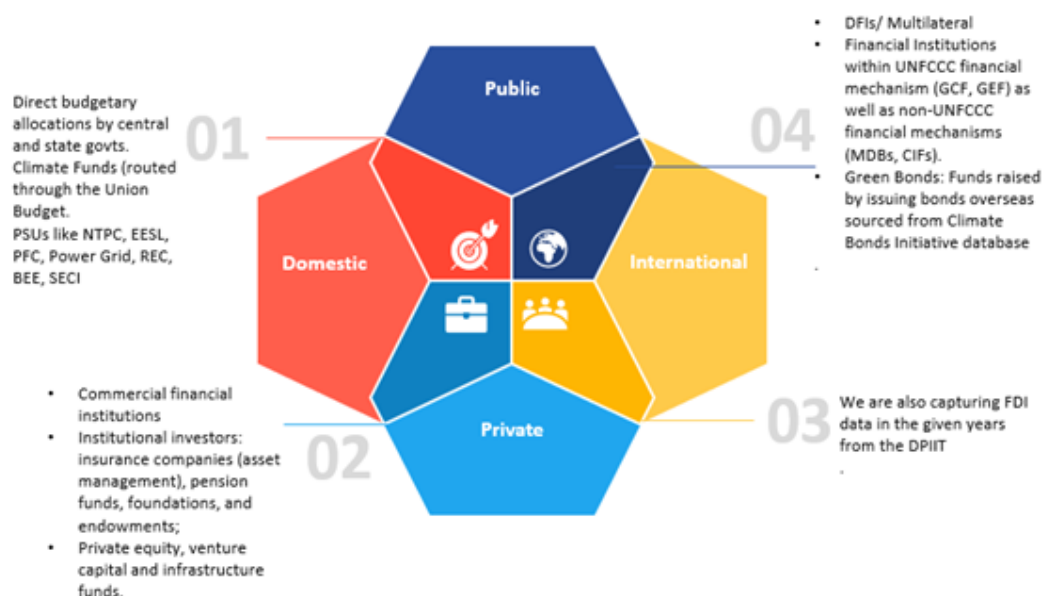
The scope of the tracking exercise undertaken in this study is confined to a subset of the green finance definition described above. This study does not map pollution abatement activities, biodiversity, agriculture, forestry and other land use (AFOLU) and adaptation finance. A detailed study of the sectors included in the paper is described in the following section.

DEFINING SOURCES AND INTERMEDIARIES

The distinction between the source of capital and the intermediaries is difficult to make in most cases, especially in cases of multiple levels of disbursements. For the purpose of this study, we considered all funds moving out of the Indian exchequer as the source of public funds.

We classify DFI flows as: multilateral, where public finance institutions have multiple countries as shareholders and finance flows internationally; bilateral, where there is single country ownership of the public finance institution and finance flows to India; national, where there is Indian ownership of the public finance institution and finance is directed domestically.

Within the private side of money, we consider Corporate actors (Project level equity and Balance sheet financing), project developers (Project debt and equity and Balance sheet financing), households and commercial institutions as the primary source of funds.



DEFINING DISBURSEMENT

For the study, the disbursement are defined as the actual capital flows from the source/ Intermediary to the recipient. The finance can flow through the recipient via public, private or public/private channels.

DEFINING END-USE

End-use is defined as the type of activities being financed. Since this study only captures mitigation related activities, the uses include activities such as power generation, energy efficiency and power transmission, sustainable transportation, and green buildings.

CPI analysts endeavour to identify eligible green finance flows through a set of general principles discussed further below. It should be noted that CPI relies on publicly available and voluntarily disclosed data for the scope of this study.

SECTORAL COVERAGE

The sectoral view and the taxonomy was aligned with the finding of the ‘Green Finance taxonomy landscape paper’ prepared by CPI and cKinetics with the support of Shakti Foundation.

Table: Sectoral scope of the landscape

Power Generation
1) Wind - Construction and operation of the facility
2) Solar - Rooftop, utility, utility scale concentrated solar power; Thermal application
3) Hydro and Tidal - Construction and operation of the facility
4) Geothermal - Construction and operation of the facility

5) Biomass Energy - Construction and operation of the facility
Energy Efficiency and Power Transmission
1) Process efficiency due to employment of products, services and technologies that are considered energy efficient
2) Renovation & Modernization (R&M) of thermal power technologies
3) Green built infrastructure - new green establishments, renovation, upgrade and modernization of existing building stock
4) Smart Grid projects implemented under the National Smart Grid Mission
5) Green energy corridor projects
Sustainable Transportation
1) Vehicles - Examples of low emission private transport including two, three and four wheelers, and public transportation such as electric buses
2) Charging Infrastructure (public and private) - While, home & work can be considered private investments, parking and BEV charging investments can be considered public.

FINANCIAL INSTRUMENTS

The Landscape captures:-

Instruments	Definitions
Grants	Transfers made in cash for which no repayment is required
Loans	A debt evidenced by a note which specifies, in particular, the principal amount, interest rate, and date of repayment
1)of which low-cost	Loans extended at terms preferable to those prevailing on the market. This category can also include concessional and ODA loans i.e. loans extended on terms substantially more generous than market loans. The concessionality can be achieved either through interest rates below those prevailing on the market or longer maturity or grace periods, or a combination of those. Concessional loans typically have long grace periods. According to the OECD, the 'grant element' of ODA loans is of at least 25%.
2)of which market rate	Loans extended at regular market conditions
Equity	A stock or any other security representing an ownership interest; Secondary market transactions (e.g., re-selling of stakes) are not tracked because they do not represent new money targeting climate-specific outcomes, but rather money changing hands.

While we acknowledge the importance of risk management instruments and include them in our consolidated database, these instruments are excluded from the green finance coverage at this stage. . The deployment of guarantees are case specific in particular circumstances, They are also excluded due to the difficulty of tracking disbursement of outflow from the guarantor. Additionally, any any financial instrument designed to cover full or partial financial losses arising out of a non-repayment are not covered in this phase.

		Source	Source Instrument	Landscape Instrument	
Domestic	Public	Government Budgets	Budgetary Grants-in-aid	Budgetary expenditure	
			Budgetary and Recurring expenses		
		State and Union Government loans (concessional and Market Rate)	Debt		
			State or Central Equity	Equity	
	PSU Annual Financial Statements	Project debt/Downstream grants	Debt/Grants		
		Balance Sheet financing	Equity		
		Administrative expenditure	Unknown		
	Private	BNEF	Balance sheet financing	Equity	
			Project debt	Debt	
		Electric vehicles sales	Unknown	Debt	
International	Public	OECD	Other Official Flows (OOF)	Grants	
			Official Development Assistance (ODA)	Debt/Grants	
	Private	FDI	Project Equity	Equity	
			Philanthropy	Grants	Grants

DATA COLLECTION AND SCOPE OF ACCOUNTING

Following an extensive data scoping exercise, datasets are intensively cleaned and processed. Where financing flows are detailed at the project level, data are checked manually for the consistency of information about actors, geographies, instruments and sectors. Inconsistencies and data gaps are corrected, wherever possible through supplementary desk research

	Source	Source Instrument	Landscape Instrument
Domestic	Public	Central Government Budgets (FY 2016-18)	Aggregated
		Relevant Ministries Budget (FY 2016-18)	
		Relevant PSUs Annual Reports (FY 2016-18)	
		CERC, SERC (2018)	
	Private	BNEF (2018)	Project-level
		CES (2018)	Aggregated (EV sales and retail prices)
		GRIHA (2018)	Project-level
		LEED (2018)	
		IFC (2018)	
		BTI (2019)	Aggregated (total rooftop capacity added)
Mercom (2018)	Aggregated (average rooftop installation costs)		

Internationa-	Public	OECD (2018)	Project-level
	Private	DPIIT (2018)	Project-level
		OECD (2018)	

ACCOUNTING BY SOURCE

DATA SOURCE - UNION AND STATE BUDGETS

In this phase of the study, all funds moving out of the Indian exchequer were classified as a source of domestic public funds. Accordingly, the Budget (Actuals) of the following central ministries and all the states and union territories of India¹ were studied and data corresponding to the relevant project codes collected.

Union Budget 2016-17 and 2017-18 (Actuals)

1. Ministry of New and Renewable Energy (<https://mnre.gov.in/>)
2. Ministry of Environment, Forests and Climate Change (<https://moef.gov.in/>)
3. Ministry of Power (<https://powermin.nic.in/>)
4. Ministry of Heavy Industries and Public Enterprises (<https://dhi.nic.in/>)
5. Ministry of Housing and Urban Affairs (<http://mohua.gov.in/>)

From the Budget statements, the following project codes were identified²:

- 2810 - New and Renewable Energy
- 4810 - Capital Outlay on New and Renewable Energy
- 6217 - Loans for Urban Development
- 4217 - Capital Outlay on Urban Development
- 5075 - Capital Outlay on Other Transport Services
- 6801 - Loans for Power Projects
- 3435 - Ecology and Environment
- 2216 - Housing
- 3075 - Other Transport Services
- 4059 - Capital Outlay on Public Works

The total transfer of financial resources from the Union to the States consist of those determined by the Finance Commission in its recommendations (which include states' share in Central taxes and other Grants) and the Plan and Non-Plan Grants (which include the funds for

¹ In the years 2016-18, India was geographically divided in 29 states and 7 union territories. In 2019, the state of Jammu and Kashmir was bifurcated into two union territories - Union Territory of Jammu and Kashmir, and Union Territory of Ladakh vide The Jammu and Kashmir Reorganisation Act, 2019 of the Government of India (<http://egazette.nic.in/WriteReadData/2019/210407.pdf>)

² List of Major and Minor Heads of Account of Union and States, Controller General of Accounts, Department of Expenditure, Ministry of Finance (<http://cga.nic.in/DownloadPDF.aspx?filenameid=1537>)

Centrally Sponsored Schemes). It is to be noted here that the government did away with Plan and Non-Plan Classification of government expenditure from fiscal 2017-18³.

The constitutionally determined transfers from the Union to the State government are explained as follows:

1. At present, the sharable/divisible pool of Central tax revenue comprises the total revenue collected from central taxes less amount collected from cess, surcharge and taxes of Union Territories, and an amount equivalent to the cost of collection of central taxes. The 14th Finance Commission recommended⁴ a transfer of 42 per cent of sharable/divisible pool of central tax revenue to states with regard to vertical distribution. In recommending horizontal distribution, it used broad parameters of population as per 1971 census (17.5 per cent weight), demographic changes in population since 1971 (10 per cent weight), area under forest cover (7.5 per cent weight), area (15 per cent weight), and income distance (50 per cent weight).
2. The “Post-Devolution Revenue Deficit Grants”, determined by the 14th Finance Commission prior to the formulation of Union and State budgets, was awarded to states as per their projected fiscal positions.
3. The third component, “Local Bodies Grant” is determined under Article 275 (1) of the Constitution and consists of grants to both urban and rural local bodies.

In addition to this, the Centre determines the grants to the States as a part of fund allocation for Centrally Sponsored Schemes. In most of the cases, the Union government and the states fund these schemes at a 60:40 ratio. In some cases, the funding ratio could be 80:20. In the case of north-eastern states, 90 per cent of the funds come from the central government. These funds are disbursed through central and state nodal agencies under different government schemes/projects. The financial instruments deployed are central and state subsidies, project-level debt and equity, budgetary grants, guarantees, viability gap funding, capacity development and technical assistance, etc.

DATA SOURCE -OECD

The international public green finance flows covered in this study are limited to the primary capital flows directed from bilateral and multilateral public actors towards the direct and indirect mitigation efforts in India. To determine what constitutes climate-related investment by the international public actors, we rely on the methodology provided by the members of the OECD’s Development Assistance Committee (DAC), Rio Markers⁶ for Climate and

³ Plan – Non Plan Classification To Be Done Away from Fiscal 2017-18, Press Information Bureau, Govt. of India, February 29, 2016 (<https://pib.gov.in/newsite/PrintRelease.aspx?relid=136996>)

⁴ 14th Finance Commission (FFC) Report Tabled in Parliament, Press Information Bureau, Govt. of India, February 24, 2015 (<https://pib.gov.in/newsite/printrelease.aspx?relid=115810>)

⁵ Post-Devolution Revenue Deficit Grant is a grant given to states under the “Distribution of Revenues” Order to help them deal with their burgeoning revenue deficit.

⁶ Organization for Economic Co-operation and Development (OECD) 2016. “OECD DAC Rio Markers for Climate: Handbook” Paris, OECD. At http://www.oecd.org/dac/environmentdevelopment/Revised%20climate%20marker%20handbook_FINAL.pdf

relevant data is publicly available through the Creditor Reporting System (CRS) database⁷. The Official Development Assistance (ODA), Other Official Flows (OOF) and Philanthropic investments are tracked through bilateral and multilateral climate-related development finance, gross disbursements reported to OECD- DAC- CRS system for 2016 to 2018 and adjusted for the financial year accounting. It includes reporting from DFI, MDBs and government agencies. The finance is qualified by marking 'Principal' or 'Significant' mitigation objective and is counted fully or partially towards mitigation finance for relevant sectors and sub-sectors as per the scope of the study. The sectors included in the data are General Environment Protection, Energy generation, renewable sources, Energy distribution, Energy Policy and Transport & Storage. The relevant subsectors were assigned based on the project description. To avoid overlapping with other sources of funds, the transactions where PSUs like NTPC, PTC, IREDA etc. are funding/debt/equity providers are omitted.

DATA SOURCE -BLOOMBERG NEW ENERGY FINANCE (BNEF) RENEWABLE ENERGY AND ASSET FINANCE DATABASES⁸

As BNEF doesn't provide project-wise transaction values, the study has used a proxy methodology to estimate them based on the capacity addition (MW) and sector-wise capital cost norm per MW as suggested by state-wise electricity regulatory commissions (SERC) tariff orders across the states in India. For FY 2017-18, Central Electricity Regulation Commission (CERC)⁹ provides capital cost norms for Solar PV, Solar Thermal, Wind, Small Hydro and other emerging renewable energy technologies. Due to unavailability of project specific data, we assume the cost norms to be the same as FY 2016-17 for the above technologies. The gearing ratio is the ratio of a project's long-term debt to the total capital invested. Wherever given it's directly used to calculate the transaction value, in projects where either debt, equity or both components are known. For such projects, the gearing ratio is used to calculate the debt and equity components from the transaction value which is indirectly calculated from the abovementioned CERC/SERC norms.

DATA SOURCE - FOREIGN DIRECT INVESTMENT

The Department for Promotion of Industry and Internal Trade¹⁰ (DPIIT), Ministry of Commerce and Industry, Government of India formulates Foreign Direct Investment (FDI) policy and promotion, approval and facilitation in the country. It defines FDI as investment by non-resident entity/person resident outside India in the capital of an Indian company under Schedule 1 of Foreign Exchange Management¹¹. (Transfer or Issue of Security by a Person

7 Organisation for Economic Co-operation and Development (OECD). 2018. "Climate Related Development Finance at the activity level". Paris: OECD's Development Assistance Committee (DAC). At: <http://www.oecd.org/dac/stats/climatechange.htm>

8 Organisation for Economic Co-operation and Development (OECD). 2018. "Climate Related Development Finance at the activity level". Paris: OECD's Development Assistance Committee (DAC). At: <http://www.oecd.org/dac/stats/climatechange.htm>

9 CERC (2018), Determination of levelized generic tariff for FY 2016-17 under Regulation 8 of the Central Electricity Regulatory Commission (Terms and Conditions for Tariff determination from Renewable Energy Sources) Regulations, 2012., New Delhi

10 The Department for Promotion of Industry and Internal Trade (DPIIT), formerly Department of Industrial Policy and Promotion (DIPP) is a central government department under the Ministry of Commerce and Industry, Govt. of India (<https://dipp.gov.in/>)

11 Foreign Exchange Management (Transfer or Issue of Security by a Person Resident Outside India) Regulations, 2000, Reserve Bank of India (https://www.rbi.org.in/Scripts/BS_FemaNotifications.aspx?Id=174)

Resident Outside India) Regulations, 2000). In the renewable energy sector, FDI up to 100% is permitted under the Automatic Route and no prior government approval is required.

A Foreign business entity can enter India via a number of routes, subject to general conditions mentioned in FDI Policy¹²:

1. As an Indian Company:
 - By setting up a wholly owned subsidiary
 - Joint Venture with an Indian entity/person
2. Operate as a foreign company and be registered with the Registrar of Companies, Ministry of Corporate Affairs

In this study, the annual data published by DPIIT on sector-wise foreign direct investment in India was accessed. An application under the Right to Information Act, 2005 was filed to this effect on January 30, 2020. Accordingly, the data for the fiscal years 2016-17 and 2017-18 for the renewable energy sector was collected and analyzed. We operate with the assumption that 100 per cent of the FDI inflow in the two years was eventually disbursed into relevant projects, though we do understand that this may not always be the case and may slightly overestimate the findings.

DATA SOURCE - PUBLIC SECTOR UNDERTAKING

Public Sector Undertakings (PSUs) are government-owned corporations in which majority (51 per cent or more) of the paid-up share capital is held by central government or by any state government or partly by the central governments and partly by one or more state governments. They play a pivotal role in creating a positive outlook necessary to promote investment in, demand for and supply of renewable energy, adoption of sustainable technologies and energy-efficient, and development of infrastructure for clean transportation through a range of policy and financial instruments. These entities often act as the medium or channel of delivery for external and domestic funds, but in order to eliminate any double counting, we placed PSUs as a source of funds and not an intermediary.

In this study, the investments undertaken by the following PSUs in the fiscal 2016-17 and 2017-18 were considered for analysis as they form the most significant part of the power sector which constitutes 90% of the tracked investments:

- Bureau of Energy Efficiency¹³ (BEE)
- Coal India Limited¹⁴ (CIL)

¹² Consolidated FDI Policy, Effective from August 28, 2017, DPIIT, Ministry of Commerce and Industry, Govt. of India (<https://dipp.gov.in/policies-rules-and-acts/policies/foreign-direct-investment-policy>)

¹³ The Govt. of India set up Bureau of Energy Efficiency (BEE), in 2002 under the provisions of the Energy Conservation Act, 2001. The mission of BEE is to assist in developing policies and strategies with a thrust on self-regulation and market principles, within the overall framework of the Energy Conservation Act, 2001 with the primary objective of reducing energy intensity of the Indian economy. This will be achieved with active participation of all stakeholders, resulting into accelerated and sustained adoption of energy efficiency in all sectors. (<https://beeindia.gov.in/>)

¹⁴ Coal India Limited (CIL) is the state-owned coal mining and refinery company headquartered in Kolkata, West Bengal, India. It is the largest coal-producing company in the world and a Maharatna PSU. The company contributes to around 83 per cent of the coal production in India. In pursuance to initiatives towards development of Clean Coal Technology and alternate use of coal, CIL is undertaking research and exploring the possibilities for setting-up a coal-based Methanol plants. (<http://beta.coalindia.in/>)

- Energy Efficiency Services Limited¹⁵ (EESL)
- Indian Renewable Energy Development Agency¹⁶ (IREDA)
- National Thermal Power Corporation (NTPC)¹⁷ Limited
- Power Finance Corporation¹⁸ (PFC) Limited
- Power Grid Corporation of India Limited¹⁹
- Power Trading Corporation of India²⁰ (PTC) Limited
- Rural Electrification Corporation²¹ (REC) Limited
- Solar Energy Corporation of India²² (SECI)

The consolidated financial statements – Balance Sheet, Profit and Loss Account and Cash Flow Statement for the years 2016-17 and 2017-18 were studied to identify investments undertaken by these PSUs in the power generation and energy efficiency sectors. The power generation investments were further divided into solar, wind, hydro, other renewable energy sources like tidal, biomass etc., and policy support and research. Similarly, the energy efficiency investments were divided into retrofits, renovation and maintenance, and policy support and research. All administrative expenditure like acquisition of property, plant

15 Energy Efficiency Services Limited (EESL) is promoted by the Ministry of Power, Govt. of India as a Joint Venture of four reputed public-sector undertakings - NTPC Limited, Power Finance Corporation Limited., REC Limited, and POWERGRID Corporation of India Limited. It is a Super-Energy Service Company (ESCO), which enables consumers, industries and governments to effectively manage their energy needs through energy efficient technologies. It is implementing the world's largest non-subsidised energy efficiency portfolio across sectors like lighting, buildings, e-mobility, smart metering and agriculture. (<https://eeslindia.org/>)

16 Indian Renewable Energy Development Agency Limited (IREDA) is a Mini Ratna (Category - I) Govt. of India Enterprise under the administrative control of Ministry of New and Renewable Energy (MNRE). It is a Public Limited Government Company established as a Non-Banking Financial Institution in 1987 engaged in promoting, developing and extending financial assistance for setting up projects relating to new and renewable sources of energy and energy efficiency/conservation with the motto: "ENERGY FOR EVER". (<https://www.ireda.in/>)

17 NTPC Limited is India's largest energy conglomerate, promoted by the Govt. of India, that became a Maharatna company in May 2010. It has established itself as the dominant power major with presence in the entire value chain of the power generation business. From fossil fuels it has forayed into generating electricity via hydro, nuclear and renewable energy sources. To strengthen its core business, the corporation has diversified into the fields of consultancy, power trading, training of power professionals, rural electrification, ash utilisation and coal mining as well. (<https://www.ntpc.co.in/>)

18 Incorporated on July 16th, 1986, Power Finance Corporation Ltd. is a Schedule-A Navratna CPSE, and is a leading Non-Banking Financial Corporation in the Country. It is designated as a "Nodal Agency" for development of Integrated Power Development Scheme (IPDS), Ultra Mega Power Projects (UMPPs) and "Bid Process Coordinator" for Independent Transmission Projects (ITPs). (<https://www.pfcindia.com/>)

19 Power Grid Corporation of India Limited (POWERGRID) is Govt. of India owned Maharatna company and engaged mainly in transmission of power. It has been working towards the expansion and strengthening of the grid network, to ensure transmission availability and robustness of the grid for better integration of renewable energy into the network through the Smart Grids and Green Energy Corridor projects. It is working to enable real time monitoring and control of power system as well as help in reduction of AT&C losses, demand response and demand side management, power quality management, outage management, smart home energy system etc. (<https://www.powergridindia.com/>)

20 PTC India Ltd. (PTC), the leading provider of power trading solutions in India, was established in the year 1999 as a Government of India initiated Public-Private Partnership, whose primary focus is to develop a commercially vibrant power market in the country. It is a pioneer in starting a power market in India and undertakes trading activities which include long term trading of power generated from large power projects as well as short term trading arising as a result of supply and demand mismatches, which inevitably arise in various regions of the country. (<https://www.ptcindia.com/>)

21 Rural Electrification Corporation (REC) Limited, is a public Infrastructure Finance Company in India's power sector. It is a Navratna PSU and finances and promotes rural electrification projects across India. The company provides loans to Central/ State Sector Power Utilities in the country, State Electricity Boards, Rural Electric Cooperatives, NGOs and Private Power Developers. (<https://www.recindia.nic.in/>)

22 Solar Energy Corporation of India Ltd (SECI) is a CPSU under the administrative control of the Ministry of New and Renewable Energy (MNRE). The company is responsible for implementation of a number of schemes of MNRE, major ones being the VGF schemes for large-scale grid-connected projects under JNNSM, solar park scheme and grid-connected solar rooftop scheme, along with a host of other specialised schemes such as defence scheme, canal-top scheme, Indo-Pak border scheme etc. In addition, SECI has ventured into solar project development on turnkey basis for several PSUs. The company also has a power trading license and is active in this domain through trading of solar power from projects set up under the schemes being implemented by it. (<https://seci.co.in/>)

and equipment, salaries and allowances, and other overheads was collectively classified as “other investments”. For disbursement of funds, the financial instruments considered were debt, equity, and grants. Any other flow was classified as investment undertaken through “unknown” financial instrument. Further, all non-cash expenses like depreciation, amortization, stock-based compensation, provision for bad debts etc. were discarded.

ACCOUNTING BY SECTORS

ELECTRIC VEHICLES

The data for the electric vehicle unit sales market share and investment analysis of public and private entities for FY 2016- 18 was acquired from Customized Energy Solutions India Private Limited. This database included primary research from CES network and secondary data collection on all segments of battery-operated electric vehicles (BEVs), 2-Wheelers, 3-Wheelers Auto, Passenger 4-Wheeler vehicles, Light Commercial Vehicles and Buses. The private investment in the sector was calculated by identifying the average retail price of the commercially available vehicles combined with the segment-wise annual sales for both the years²³. The instrument of deployment for private investments is assumed to be debt financing. The public demand incentives through FAME I²⁴ scheme were included as grants to avoid double counting of public finance through the value chain of the sales of the electric vehicles in India²⁵. In this phase, we did not include particular investments into, storage and supporting industries as the years in question did not witness significant flows owing to the nascency of the sector.

GREEN BUILT INFRASTRUCTURE

A green building is one that, in its design, construction or operation uses less water, improves energy efficiency, conserves natural resources, recycles waste and provides healthier spaces for occupants, as compared to a conventional building. These buildings can be commercial like offices, malls, hotels, retail establishments, educational institution buildings, hospitals, etc., or residential private dwellings and multifamily residential buildings. The development of a green building includes application of processes that are sustainable and resource- efficient throughout lifecycle of the building: from design, construction, operation and maintenance, renovation etc. It also includes performance upgrades of existing building stock through energy conservation retrofits, appliance or equipment upgrades, and use of alternative construction materials.

The following institutions provide rating and certification to green buildings²⁶ in India:

23 We acknowledge that in 2016-18, the electric vehicles industry was in the nascent stage. Therefore, there are severe data limitations as well as methodological and definitional issues related to the project/activity level investment. The current methodology can lead to overestimation but, when data is tracked consistently, attempt was to standardize data collection process for investments in (i) Demand Creation, (ii) Technology Platform, (iii) Pilot Project and (iv) Charging Infrastructure.

24 FAME (Faster Adoption and Manufacturing of Electric and Hybrid Vehicles) India Scheme is a part of the National Electric Mobility Mission Plan under the Department of Heavy Industries, Ministry of Heavy Industries and Public Enterprises, Government of India.

25 In alignment with the OECD (2013), finance qualifies as public if carried out by central, state or local governments and their agencies at their own risk and responsibility.

26 About rating and certification agencies:

a) Green Rating for Integrated Habitat Assessment (GRIHA) is a rating tool that evaluates the environmental performance of a building holistically

1. Green Rating for Integrated Habitat Assessment (GRIHA) Council
2. Leadership in Energy and Environmental Design (LEED)
3. Excellence in Design for Greater Efficiencies (IFC-EDGE)
4. Indian Green Building Council (IGBC)

In this report, a total of 242 projects²⁷ were identified that secured rating and certification in the years 2016-18. The data for IGBC projects could not be obtained. The following assumptions were made:

1. A project that was registered but not rated/certified as on March 31, 2018 was not considered for further analysis
2. The rating/certification fee equal to 1.09% of additional cost incurred in making a building 'green' was considered for analysis²⁸
3. A currency exchange rate of 65 INR/USD was considered for calculations

New built infrastructure was subsumed under Energy Efficiency²⁹, however the sector has been discussed in detail as it represents a significant opportunity in India to scale up mitigation efforts.

SMART GRIDS

Smart Grid is an Electrical Grid with Automation, Communication and IT systems that can monitor power flows from points of generation to points of consumption (even down to appliances level) and control the power flow or curtail the load to match generation in real time or near real time. Smart Grids can be achieved by implementing efficient transmission & distribution systems, system operations, consumer integration and renewable integration. Smart grid solutions help to monitor, measure and control power flows in real time that can contribute to identification of losses and thereby appropriate technical and managerial actions can be taken to arrest the losses.

In this study, the data for smart grid projects in India was obtained from India Smart Grid Forum³⁰ (ISGF). These include the 14 Smart Grid pilot projects allocated by the Ministry of

over its entire life cycle, thereby providing a definitive standard for what constitutes a 'green building'. It was developed by The Energy and Resources Institute (TERI) and adopted as the national rating system for green buildings by the Government of India in 2007.

b) Leadership in Energy and Environmental Design (LEED) provides a framework for healthy, highly efficient, and cost-saving green buildings. LEED certification is a globally recognized symbol of sustainability achievement and leadership. Green Business Certification Inc. (GBCI) manages the certification process for all LEED rating systems in India.

c) Excellence in Design for Greater Efficiencies (EDGE), part of the International Finance Corporation (IFC), is an online platform, a green building standard and a certification system to steer construction in rapidly urbanizing economies onto a more low-carbon path. It can be used for buildings of all vintages, including new construction, existing buildings and major retrofits.

d) The Indian Green Building Council (IGBC), part of the Confederation of Indian Industry (CII), was formed in the year 2001. It offers a wide array of services which include developing new green building rating programmes, certification services and green building training programmes.

27 These include 30 projects certified by GRIHA, 209 projects certified by LEED, and 03 projects certified by IFC EDGE in the years 2016-18. The data for projects certified by IGBC could not be obtained.

28 Presentation on Green Building Norms and Cost Impact (As per GRIHA), August 05, 2017 (<https://www.grihaindia.org/grihasummit/presentations/JP-Shroff.pdf>)

29 National Smart Grid Mission (NSGM), Ministry of Power, Govt. of India (<https://www.nsgm.gov.in/en/content/smart-grid>)

30 India Smart Grid Forum (ISGF) is a Public Private Partnership initiative of Ministry of Power (MoP), Govt. of India for accelerated development

Power³¹ being implemented by various state-owned distribution utilities in the country and the operational projects (fully or partially) under the National Smart Grid Mission³² for the years 2016-18. In case of partial commissioning of a project, we analyzed the funding guidelines and included only the funds disbursed for these projects.

GREEN ENERGY CORRIDOR

For evacuation of large-scale renewable energy, Intra State Transmission System (InSTS) project was sanctioned by the Ministry in 2015-16. It is being implemented by eight renewable-rich states of Tamil Nadu, Rajasthan, Karnataka, Andhra Pradesh, Maharashtra, Gujarat, Himachal Pradesh, and Madhya Pradesh. The project is being implemented in these states by the respective State Transmission Utilities (STUs). The funding mechanism consists of 40 per cent Government of India Grant, 20 per cent state equity and 40% loan from KfW, Germany. The Central grant is disbursed in two installments to the STUs:

- 70 per cent advance on the award of contract, and
- balance 30 per cent after successful commissioning and three months of performance testing³³.

With data being available only for the KfW loans, the Government grants and the state Equity have been calculated in the proportion mentioned above. Only Intrastate Transmission Systems have been included for the purposes of the study due to limited data available on Interstate Transmissions.

In this phase, investments in Smart Grid and Green Energy Corridor were tracked under Power Transmission which is clubbed with Energy Efficiency flows due to lack of consensus on the sectoral scope.

ROOFTOP SOLAR

Due to a non-availability of secondary data on total primary investments into rooftop installations in India, the study has used total capacity addition (in MW) as a proxy for the capital invested. Bridge to India³⁴ (BTI) and Mercom³⁵ provide primary numbers on the total

of smart grid technologies in the Indian power sector. Mandate of ISGF is to advise government on policies and programs for promotion of Smart Grids in India, work with national and international agencies in standards development and to help utilities, regulators and the Industry in technology selection, training and capacity building. (<https://indiasmartgrid.org/about-us.php>)

31 List of Smart Grid projects, India Smart Grid Knowledge Portal (<https://indiasmartgrid.org/pilot.php>)

32 National Smart Grid Mission has been established by Govt. of India vide MoP Office Memorandum dated 27.03.2015 to accelerate Smart Grid deployment in India. NSGM has been in operational since January 2016 and has its own resources, authority, functional & financial autonomy to plan and monitor implementation of the policies and programs related to Smart Grids in the country. (<https://www.nsgm.gov.in/en/nsgm>)

33 Grid Integration Division, Ministry of New and Renewable Energy, Govt. of India (September 02, 2017) <https://mnre.gov.in/img/documents/uploads/8122f64140954fb9a7e9941812dabda8.pdf>

34 India Rooftop Solar Market, 2019, Bridge to India – a leading consultancy and knowledge services provider in the Indian renewable energy market (<https://bridgetoindia.com/report/india-solar-rooftop-market-i-january-2019/>)

35 India's Top Rooftop Solar Installers in 2018, Mercom India – a leading clean energy communications and consulting firm recognized worldwide for its expertise in renewable energy (<https://mercomindia.com/india-rooftop-solar-installers-2018/>)

capacity added (CAPEX and RESCO models) in the two years. The average installation cost has been sourced from the same BTI study. Furthermore, the following assumptions were made for the purposes of calculation:

- 80% of all capex funding would be through off-taker's own equity
- 40% of all RESCO funding would be through developer's equity
- 20% of all capex and 60% of all RESCO funding would be through external debt
- Developer's equity would be combination of own funds and equity raised from international and domestic investors
- Debt capital would be combination of debt raised from domestic and international lenders

GENERAL ASSUMPTIONS AND PRINCIPLES

GREEN BONDS

The finance raised through green bond issuance is excluded to avoid double-counting issues at the end-use. The data from post-issuance reports has not been used to track the primary investments in this phase, however, due to the upsurge of the Indian green bonds market, a separate section has been included on the same.

EXCHANGE RATE AND BASE YEAR

We used a constant exchange rate of INR 65/USD³⁶.

MULTIPLIERS

Rio markers were applied to all bilateral ODA and non-export credit OOF³⁷. Rio markers apply to activities as a whole, and, in marking the full value of development finance activities, the markers considered descriptive rather than strictly quantitative but allow for an approximate quantification of development finance flows that target the Rio convention objectives. We used the same 'climate mitigation' markers to inform our calculations for the OECD data.

GEARING RATIO

The distribution of the debt-to-equity ratio in a specific year can be impacted by factors such as the credit worthiness of the borrowers involved or the quantum of collateral involved,

³⁶ Table 148: Exchange Rate of the Indian Rupee vis-a-vis the SDR, US Dollar, Pound Sterling, D. M./ Euro and Japanese Yen (Financial Year - Annual Average and end-Year Rates), Reserve Bank of India, September 15, 2017 (<https://www.rbi.org.in/scripts/PublicationsView.aspx?id=17923>)

³⁷ Annexure 18: Rio Markers, Development Assistance Committee (DAC), OECD (<https://www.oecd.org/dac/environment-development/Annex%2018.%20Rio%20markers.pdf>)

however, for the purpose of our study, we were used the gearing ratio of 0.75 to calculate our costs³⁸, as it is the weighted average for the years.

EXCLUSIONS AND INCLUSIONS

We excluded all secondary market transactions including refinancing, mergers and acquisitions, corporate debt, purchase and sale of shares to eliminate double counting.

For this phase of the study, we are including the recurring administrative and personnel expenses that accrue to various ministries, PSUs and states to implement mitigation projects. We understand that this may not be classified as directly contributing to Green, however, due to lack of a better methodology to screen such costs, we include it in this phase as indirect investments.

GROUND TRUTHING AND DOUBLE COUNTING

In the events when complete data, context, terminologies or other metadata isn't available, certain assumptions were made during analysis. The assumptions are based on the definitions and methodology outlined. They are based on industry specifications to the best extent of our knowledge. They are formulated and updated upon feedbacks from the review group of experts.

To establish credibility and maximize accuracy, CPI convened roundtables with stakeholders from relevant sectors and provided technical briefings thrice over the course of the one-year program. We have created a review group which constitutes of experts and policymakers. This group was briefed on the progress and convenes at regular intervals during the phase to review the framework and advise improvements.

³⁸ Dutt, Arjun, Lucila Arbolea, and Barath Mahadevan. 2019. Clean Energy Investment Trends: Evolving Risk Perceptions for India's Grid-Connected Renewable Energy Projects. New Delhi; Paris: Council on Energy, Environment and Water; International Energy Agency

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