



Landscape of Green Finance in India

Approach and Methodology

August 2022



CLIMATE
POLICY
INITIATIVE

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1. Introduction

Climate finance is required for investments in climate mitigation and adaptation.

A careful estimation of the possible sources of finance is a prerequisite for encouraging investments in this sector. A systematic assessment of green investment can help evaluate whether India is on track in achieving its targets under Nationally Determined Contributions (NDCs), while the measurement of financial flows can help identify the right stakeholders for the same. Such assessment can provide insights to policy makers and regulators, enabling them to better promote climate mitigation and adaptation; It can inform domestic and international private investors of the trends in India's climate action; and it can serve as a tool—under the Katowice climate package and enhanced transparency framework— to track India's progress in achieving its climate targets. Lastly, it can also serve as a basis for cross-sectoral, inter-governmental, and Government-donor discussions on resource mobilization for climate action.

The Landscape of Green Finance in India aims to capture annual financial flows supporting emissions reduction or mitigation activities based on empirical data drawn from a wide range of primary and secondary sources. In this study we have categorized financial flows along their lifecycles— from public and private sources and intermediaries, through a variety of financial instruments, to sectors and sub-sectors of mitigation finance. To collect and prepare a comprehensive database, and for the subsequent analysis of data, we have adopted an operational definition of green finance. Also, to avoid overlaps and ensure comparability across datasets to the extent possible, we have developed a detailed methodology to identify climate-relevant financial transactions.

This document, therefore, serves to outline the approach and methodology of the study in terms of key definitions, accounting scope, data gaps and limitations, issues and assumptions, as well as the breadth and depth of sectoral coverage.

2. Definition

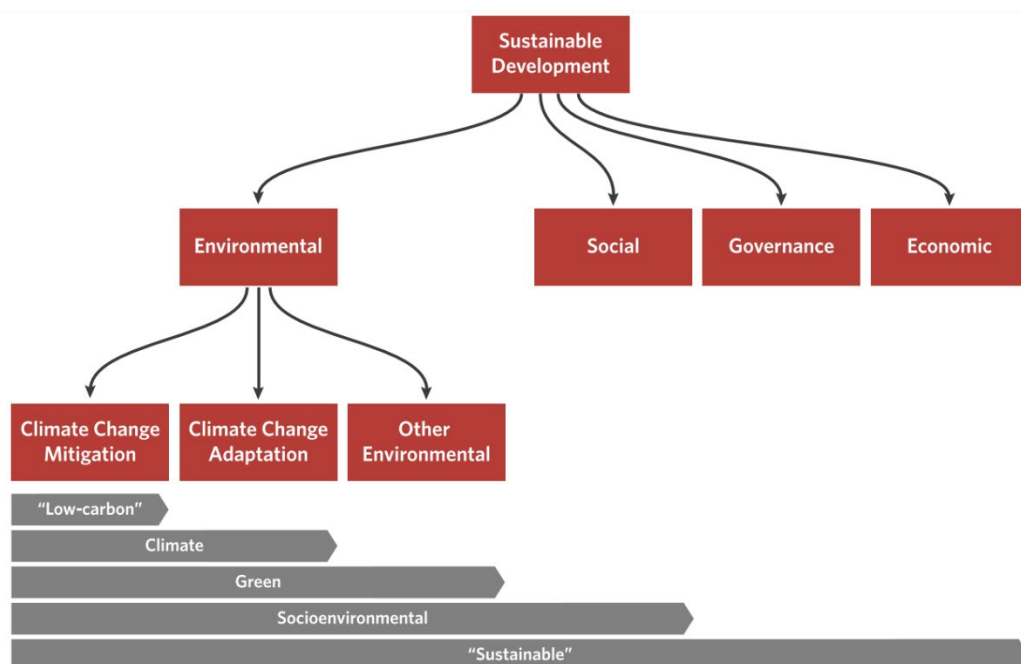
2.1 Defining green finance

In the absence of a clear definition, attribution of the term 'green finance' is likely to be subjective and may trigger dissonance if actions are seen to be unaligned with climate mitigation, adaptation and pollution control. Not knowing what constitutes 'green' restricts proper tracking of capital flows into green sectors, which in turn causes inaccuracies in the assessment of capital flows and inadequacy of investments needed to meet India's NDC targets.

Therefore, for the purpose of this study, we have aligned our taxonomy with the findings of CPI and cKinetics' [Building a Consensus on the Definition of Green Finance](#) conducted with the support of Shakti Sustainable Energy Foundation, and [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, aiming to build an inclusive, economically, socially, and environmentally sustainable world.

Figure 1: Difference between Sustainable, Green, and Climate Finance



Source: UNEP Enquiry, 2016

In the [Global Landscape of Climate Finance 2021](#), CPI has used a definition aligned with the United Nations Framework Convention on Climate Change Standing Committee on Finance, which states: 'Climate finance aims at reducing emissions, and enhancing sinks of greenhouse gases and aims at reducing vulnerability of, and maintaining and increasing the resilience of, human and ecological systems to negative climate change impacts.' Broadly, green investment flows are often defined by their intervention areas related to GHG mitigation—such as renewable energy, energy efficiency, electric vehicles, etc.—, and investments in adaptation—such as water, forests, preserving eco systems, and built infrastructure.

Owing to multiple terminologies, and a lack of global or national common consensus regarding the definition of green finance, we have confined the scope of our tracking exercise to a subset of the green finance definition mentioned 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 this paper is described in the following section.

Figure 2: Defining green finance: A sectoral taxonomy



**Note: For adaptation sector finance, this year, we have briefly touched upon some activities like disaster monitoring and emergency response system, flood and cyclone mitigation, and drought management. These investments, however, have not been included in the total tracked green finance for FY 2019 and FY 2020.*

2.2 Defining sources and intermediaries

In most cases, making a distinction between the source of capital and the intermediaries is difficult, especially when there are multiple levels of disbursements. In this study, we have considered all funds moving out of the Indian Exchequer (Union and State Government), and Public Sector Undertakings (PSUs) as the source of domestic public funds. Also, we have classified Development Finance Institution (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 domestically directed.

For private sources of finance, we have considered corporate actors (Project-level equity and Balance sheet financing); project developers (Project debt and equity and Balance sheet financing); households and commercial finance institutions (banks, NBFCs etc.) as the primary source of funds.

Figure 3: Sources of Green Finance

DOMESTIC	PUBLIC
<ul style="list-style-type: none"> • Direct budgetary allocations by central and state govt. • Climate Funds (routed through the Union Budget PSUs like NTPC, EESL, PFC, Power Grid, REC, BEE, SECI. 	<ul style="list-style-type: none"> • DFIs/ Multilateral • Financial Institutions within UNFCCC financial mechanism (GCF, GEF) as well as non-UNFCCC financial mechanisms (MDBS, CIFs). • Green Bonds: Funds raised by issuing bonds overseas sourced from the Climate Bonds Initiative database
PRIVATE	INTERNATIONAL
<ul style="list-style-type: none"> • Commercial financial institutions • Institutional Investors: insurance companies (asset management), pension funds, foundations, and endowments • Private equity, Venture capital, and infrastructure funds 	<ul style="list-style-type: none"> • We are also capturing FDI data in the given years from the DPIIT

2.3 Defining public and private

We have defined **Public** as Government-owned/administered institutions such as bilateral or multilateral development finance institutions; climate funds; national and State government departments; line ministries; municipalities; Central and State public sector undertakings, etc.

We have defined **Private** as institutions not owned by the Government— such as commercial financial institutions, privately-owned Special Purpose Vehicles, non-governmental organizations, independent domestic and international institutional investors, households, corporations, etc.

Table 1: Classification of Sources of Finance into Public and Private

Entity	Suggested Classification
Climate Funds	Public
Commercial financial institutions (providers of private debt capital like commercial and investment banks)	Private
Corporate actors (non-energy corporations)	Private
Government Budgets	Public
Households	Private
Institutional investors (insurance companies, pension funds, foundations, and endowments)	Private
NGOs, Philanthropic Institutions	Private
Private equity, venture capital, infrastructure funds	Private
Project developers (entities designing, commissioning, operating, and maintaining emissions reduction projects)	Private
Central and State Public Sector Undertakings	Public
Public Financial Institutions - Bilateral	Public
Public Financial Institutions - Multilateral	Public
Public Financial Institutions - National	Public

Financing has been labelled **Domestic** where funds flow from the account of Government of India (both at national and sub-national tiers); or if they are raised by public and/or private entities (including residential, commercial, and institutional) within the territorial jurisdiction of India. Any fund-raised outside India by issuing bonds, through external commercial borrowings, foreign equity or by using any other financial instrument like concessional debt and grants, are classified as **International** financing.

2.4 Defining disbursement and end use

For the purpose of this study, we have defined disbursement as the actual finance flows from sources and intermediaries to the end-recipient/s. Sources of finance include Union and State Government Budgets, Public Sector Undertakings, private and State-owned Commercial Financial Institutions, Foreign Direct Investment, Corporations, Bilateral and Multilateral Development Finance Institutions, Residential, Commercial, and Institutional investors, and Philanthropy.

Finance flows can occur through public and private channels via a variety of financial instruments. These instruments include Balance sheet financing (Debt portion); Balance sheet financing (Equity portion); Government Budgetary Expenditure; Grant; Low-cost project debt; Project-level equity; and Project-level market rate debt.

End use of these funds is defined by the type of activities being financed. This includes mitigation activities in clean energy, energy efficiency, and clean transportation sectors. We have further disaggregated each of these sectoral investments into a number of sub-sectors:

Table 2: Disaggregation of Investments into Sectors and Sub-sectors

Clean Energy	Biofuel Biogas Energy Biomass and Waste Clean Coal Technologies Energy Storage Hydel Energy Renewable Energy - Multiple Renovation and Modernization (R&M) of Thermal Power Technologies Research and Development Rooftop Solar PV Solar PV Solar Thermal Wind – Onshore
Energy Efficiency	Energy Conservation Energy-efficient Appliances Energy-efficient Equipment Green Buildings Green Energy Corridor Process Efficiency Research and Development Smart Grids Transmission and Distribution
Clean Transportation	Bicycle Sharing

	Dedicated Freight Corridor Electric Vehicles Electronic Trolley Bus Mass Rapid Transit System (MRTS) Public Transportation Research and Development
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2.5 Defining sectoral coverage

We have aligned sectoral view and taxonomy with the findings of *Building a Consensus on the Definition of Green Finance* developed by CPI and cKinetics with the support of Shakti Sustainable Energy Foundation. Accordingly, we have classified the tracked green finance investments into the following sectors:

Table 3: Sectoral Coverage of the Landscape of Green Finance

Clean Energy
<ul style="list-style-type: none"> ▪ Wind - Construction and operation of the facility ▪ Solar/Rooftop Solar PV - Construction and operation of solar power plant ▪ Solar Thermal - Construction and operation of systems like solar water heater, solar heating system, solar cooling system ▪ Hydro - Construction and operation of the facility ▪ Tidal - Construction and operation of the facility ▪ Geothermal - Construction and operation of the facility ▪ Biomass Energy/Biogas - Construction and operation of the facility ▪ Clean Coal Technologies - Investment in Ultra supercritical and Supercritical technologies that are High-efficiency, Low-emission (HELE) ▪ Research and Development for renewable energy equipment - R&D for creation of new and improved RE products and technologies
Energy Efficiency
<ul style="list-style-type: none"> ▪ Smart Grids - Setting up of smart grid infrastructure (will support both conventional and renewable power) ▪ Green Energy Corridors - Setting up transmission and distribution network ▪ Renovation & Modernization of thermal Power technologies - Renovation, modernization and Life Extension of old coal power stations ▪ Process efficiency due to employment of products, services and technologies that are considered energy efficient - Specific plants where these energy efficiency measures are employed in manufacturing, and asset operations ▪ Green Buildings - Structure as well as application of processes that are green, sustainable and resource-efficient throughout the lifecycle of the building from design, construction, operation and maintenance, renovation etc. ▪ Renovation, upgradation, and modernization of existing building stock - Performance upgrades of existing building stock only (including commercial and residential buildings)

- Research and Development for energy efficiency products - R&D for creation of new and improved EE products and technologies
- Manufacturing of energy-efficient appliances - Manufacturer of the product/technology and its key components. Examples can be seen in lighting appliances, building materials, fans, motors, transformers, pumps, compressors, consumer durables like air conditioners, ceiling fans, washing machines etc, that comply with certain Standards and Labels.

Clean Transportation

- Low-emission Vehicles - Ownership of the asset. Examples of low-emission public transport include urban rail transit, Bus and Mass Rapid Transit systems, Electric vehicles (trains, trams, buses). Examples of private and freight vehicles include cars, buses, other vehicles.
- Charging Infrastructure (Public and Private) - While home and work can be considered private investments, parking and BEV charging investments can be considered public.

2.6 Defining financial instruments

We have captured grants, low-cost (including concessional) and market-term debt, project-level equity, and balance sheet financing (i.e., a direct debt or equity investment by a company or financial institution making a gearing ratio assumption of 70:30 for debt and equity). While we acknowledge the importance of risk management instruments like guarantees and insurance, and have included them in our consolidated database, we have, nevertheless, excluded them from the total tracked green finance coverage at this stage. This is primarily due to the difficulty in tracking disbursement of funds from the guarantor/ insurer. Furthermore, we have not covered transactions through any instrument designed to cover full or partial financial losses arising out of a non-repayment of debt in this phase of the study. The following table lists the various financial instruments used in our analysis:

Table 4: List of Financial Instruments Used in the Study

Data Source	Source Instrument	Study Instrument
Union and State Government Budget	<ul style="list-style-type: none"> ▪ Grants-in-Aid ▪ Inter-Account Transfer ▪ Internal and Extra Budgetary Resources ▪ Investments ▪ Loans and Advances ▪ Other Expenditure ▪ Project Expenditure ▪ Subsidies 	<ul style="list-style-type: none"> ▪ Government Budgetary Expenditure

BloombergNEF and IJ Global	<ul style="list-style-type: none"> ▪ Balance Sheet Financing ▪ Term Loan 	<ul style="list-style-type: none"> ▪ Balance sheet financing (Debt portion) ▪ Balance sheet financing (Equity portion) ▪ Low-cost project debt ▪ Project-level equity ▪ Project-level market rate debt
OECD CRS	<ul style="list-style-type: none"> ▪ Official Development Assistance (ODA) ▪ Other Official Flows (OOF) ▪ Private Development Finance 	<ul style="list-style-type: none"> ▪ Grant ▪ Low-cost project debt ▪ Project-level equity
Foreign Direct Investment	<ul style="list-style-type: none"> ▪ Project Equity 	<ul style="list-style-type: none"> ▪ Balance sheet financing (Equity portion)
PSU Annual Financial Statements	<ul style="list-style-type: none"> ▪ Balance Sheet Financing ▪ Project Debt ▪ Administrative Expenditure 	<ul style="list-style-type: none"> ▪ Balance sheet financing (Equity portion) ▪ Grant ▪ Low-cost project debt ▪ Unknown
Vahan Dashboard	<ul style="list-style-type: none"> ▪ Balance Sheet Financing 	<ul style="list-style-type: none"> ▪ Balance sheet financing (Equity portion) ▪ Balance sheet financing (Debt portion)
Green Building Data collected through primary research	<ul style="list-style-type: none"> ▪ Balance Sheet Financing ▪ Debt ▪ Equity 	<ul style="list-style-type: none"> ▪ Balance sheet financing (Equity portion) ▪ Balance sheet financing (Debt portion)
Data collected under the Right to Information Act, 2005	<ul style="list-style-type: none"> ▪ Balance Sheet Financing ▪ Debt ▪ Equity 	<ul style="list-style-type: none"> ▪ Balance sheet financing (Equity portion) ▪ Balance sheet financing (Debt portion)

3. Data collection and scope of accounting

Following an extensive data scoping exercise, we have cleaned the datasets and removed any possible double counting. Where finance flows are detailed at the project level, we have checked the data manually for consistency of information about sources, geographies, instruments and sectors. Wherever possible, we have corrected data gaps and inconsistencies through supplementary research and engagement with our review group of experts. For each of the data sources referred to in this study, the level of data granularity is indicated in the following table:

Category	Source	Data Source	Level of Granularity
Domestic	Public	Government Budgets	Aggregated (Disaggregated by states/UTs and sectors)
		PSU Annual Reports	Aggregated (Project-level in some cases)
		CERC/SERC Tariff Orders	Aggregated
	Private	BloombergNEF	Project-level
		IJ Global	Project-level
		Green Buildings	Project-level
		Electric Vehicles	OEM/Vehicle category-level
		Energy-efficient Appliances	Appliance category-level
		Process Efficiency	PAT Scheme cycle-wise
		Bridge to India	Aggregated/Rooftop Solar Capacity Installed
International	Public	OECD CRS (ODA & OOF)	Project-level
	Private	DPIIT, Ministry of Commerce and Industry (FDI Data)	Project-level
		OECD CRS (Philanthropy)	Project-level

Figure 8: Level of Data Granularity

3.1 Accounting by data source

3.1.1 Union and State government Budgets

In this study, we have classified all funds moving out of the Indian Exchequer (Central and State government Treasury) as source of domestic public funds.

Accordingly, we have analyzed the Annual Financial Budget of the following Central ministries and all the States and Union Territories of India¹ and collected data corresponding to the relevant project codes. Furthermore, instead of 'Budget Estimates' or 'Revised Estimates', we analyzed the 'Actuals' for both the financial years being considered for this study (2018-19 and 2019-20).

We referred to the detailed demand for grants of the following line ministries in the Union Budget 2018-19 and 2019-20 (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/>)
6. Ministry of Agriculture (<https://agricoop.nic.in/en>)
7. Ministry of Jal Shakti (<http://jalshakti-dowr.gov.in/>)
8. Ministry of Home Affairs (<https://www.mha.gov.in/>)

We have carried out the analysis of Annual Budgets of all the 28 States and 8 Union Territories of India. The State of Jammu and Kashmir was reorganized into Union Territory of Jammu and Kashmir and Union Territory of Ladakh vide [The Jammu and Kashmir Reorganization Act, 2019](#). The Union Territory of Dadra and Nagar Haveli and the Union Territory of Daman and Diu were merged to form the Union Territory of Dadra and Nagar Haveli and Daman and Diu vide [The Dadra and Nagar Haveli and Daman and Diu \(Merger of Union Territories\) Act, 2019](#).

The State Budgets included the following:

01. Andhra Pradesh	13. Kerala	25. Telangana
02. Arunachal Pradesh	14. Madhya Pradesh	26. Tripura
03. Assam	15. Maharashtra	27. Uttar Pradesh
04. Bihar	16. Manipur	28. Uttarakhand
05. Chhattisgarh	17. Meghalaya	29. West Bengal
06. Goa	18. Mizoram	30. Andaman & Nicobar Islands
07. Gujarat	19. Nagaland	31. Chandigarh
08. Haryana	20. Odisha	32. Dadra & Nagar Haveli
09. Himachal Pradesh	21. Punjab	33. Daman and Diu
10. Jammu and Kashmir	22. Rajasthan	34. Delhi
11. Jharkhand	23. Sikkim	35. Lakshadweep Islands
12. Karnataka	24. Tamil Nadu	36. Puducherry

¹ 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>)

From each of the State Budget statements, we have identified the following project codes and included the corresponding outlays in our tracked green finance (climate change mitigation related activities)²:

- 2045 Other Taxes and Duties on Commodities and Services
- 2053 District Administration
- 2216 Housing
- 2217 Urban Development
- 2401 Crop Husbandry
- 2402 Soil and Water Conservation
- 2501 Special Programmes for Rural Development
- 2552 North Eastern Areas
- 2801 Power
- 2810 New and Renewable Energy
- 3055 Road Transport
- 3075 Other Transport Services
- 3425 Other Scientific Research
- 3435 Ecology and Environment
- 4217 Capital Outlay on Urban Development
- 4552 Capital Outlay on NEA
- 4702 Capital Outlay on Minor Irrigation
- 4801 Capital Outlay on Power Projects
- 4810 Capital Outlay on New and Renewable Energy
- 5055 Capital Outlay on Road Transport
- 5075 Capital Outlay on Other Transport Services
- 6217 Loans for Urban Development
- 6801 Loans for Power Projects
- 7055 Loans for Road Transport

The total transfer of financial resources from the Union to the States consists 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 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 the amount collected from cess, surcharge and taxes of Union Territories, and an amount equivalent to the cost of

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>)

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>)

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 Grant⁵, 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; Government Budgetary grants; guarantees; viability gap funding; capacity development and technical assistance; etc.

3.1.2 Organization for Economic Co-operation and Development (OECD) creditor reporting system

In this study, the international public green finance flows covered are limited to the primary capital flows directed from bilateral and multilateral development finance institutions towards the direct and indirect mitigation efforts in India. To determine what constitutes climate-related investment by international public actors, we have referred to the methodology provided by the members of the OECD's Development Assistance Committee (DAC), Rio Markers⁶ for Climate. The relevant dataset is publicly available through the Creditor Reporting System (CRS) database⁷.

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. Accessible at: http://www.oecd.org/dac/environmentdevelopment/Revised%20climate%20marker%20handbook_FINAL.pdf

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

We have tracked the Official Development Assistance (ODA), Other Official Flows (OOF) and Philanthropic investments through the bilateral and multilateral climate-related development finance, and gross disbursements reported to OECD-DAC-CRS system for 2018 and 2019. The data is available for the calendar year starting from January and ending in December. In our study, however, we have made use of the Indian financial year that starts in April and ends in March. Since the OECD data is not disaggregated by month, we have made an exception and considered the data as is for our analysis. In other words, we have not adjusted the data for financial year accounting.

OECS CRS includes reporting from bilateral and multilateral development finance institutions, government agencies, and philanthropies. 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 sub-sectors have been assigned based on the project description. We have identified all the relevant transactions and mapped them with corresponding sectors and sub-sectors. To avoid duplicity (double counting) with other sources of finance, we have omitted all the transactions where the Government or a PSU like IREDA is a beneficiary of the funds.

3.1.3 Bloomberg New Energy Finance (BNEF) and IJ Global Databases

BNEF and IJ Global provide project-wise transaction-level data. However, in most cases, the transaction value is not captured. In this study, we have used a proxy methodology to estimate them, based on the capacity addition (MW) for a given project. We have used the sector-wise capital cost norm per MW as suggested by State-wise Electricity Regulatory Commissions (SERC) tariff orders across States in India.

The gearing ratio is the ratio of a project's long-term debt to the total capital invested. Wherever given, we have directly used the gearing ratio to calculate the transaction value and break it down into the corresponding debt and equity components. In all other cases, we have assumed a debt-to-equity ratio of 70:30 to compute the project transaction value.

FOREIGN DIRECT INVESTMENT

The Department for Promotion of Industry and Internal Trade⁸ (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 made by non-resident entity/person resident outside India, in the capital of an Indian company under Schedule 1 of Foreign Exchange Management⁹. (Transfer or Issue of Security by a Person Resident Outside India) Regulations, 2000). In the renewable energy sector, FDI up to 100 per cent is permitted under the Automatic Route and prior Government approval is not required.

A Foreign business entity can enter India via a number of routes, subject to general conditions mentioned in FDI Policy¹⁰:

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, we have accessed the annual data published by DPIIT on sector-wise Foreign Direct Investment in India. We have operated with the assumption that 100 per cent of the FDI inflow in the two years was eventually disbursed to the relevant projects within this time period.

3.1.4 Public sector undertakings

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 Government and partly by one or more State Government/s. 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 and energy-efficient technologies; and development of infrastructure for clean transportation, through a range of policy and financial instruments. Though these entities often act as the medium or channel of delivery for external and domestic funds, in order to eliminate any double

8 The Department for Promotion of Industry and Internal Trade (DPIIT), formerly the 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/>)

9 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)

10 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>)

counting, we have placed PSUs as a source of funds and not as an intermediary in the value chain.

In this study, we have considered the investments undertaken by the following PSUs in the fiscal 2018-19 and 2019-20 for analysis, since they form the most significant part of the energy sector:

- **Bureau of Energy Efficiency (BEE)** - The Govt. of India set up 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 in accelerated and sustained adoption of energy efficiency in all sectors. (<https://beeindia.gov.in/>)
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- **Coal India Limited (CIL)** - 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 coal production in India. CIL undertakes research and explores possibilities of setting-up coal-based Methanol plants as part of its initiative towards development of Clean Coal Technology and alternative uses of coal.. (<http://beta.coalindia.in/>)
- **Energy Efficiency Services Limited (EESL)** - 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-subsidized energy-efficiency portfolio across sectors like lighting, buildings, e-mobility, smart metering and agriculture. (<https://eeslindia.org/>)
- **Indian Renewable Energy Development Agency (IREDA)** – 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 related to new and renewable sources of energy and energy efficiency/conservation with the motto: 'ENERGY FOR EVER'. (<https://www.ireda.in/>)
- **National Hydro Electric Power Corporation Private Limited (NHPC)** – NHPC Limited is the largest organization for hydropower development in India. Its objective is: 'To Plan, promote and organize an integrated and efficient development of power in all its aspects through Conventional and Non-conventional Sources in India and Abroad, including planning, investigation, research, design and preparation of preliminary, feasibility and definite project reports, construction, generation, operation and maintenance of power stations and projects,

transmission, distribution, trading and sale of power generated at Stations in accordance with the national economic policy and objectives laid down by the Central Government from time to time and release of water and other needs to the State Govt. as per the agreed parameters. (<http://www.nhpcindia.com/home.aspx>)

- **National Thermal Power Corporation (NTPC) Limited** – NTPC Ltd. 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. Not restricting itself to fossil fuels, NTPC has forayed into generating electricity via hydro, nuclear and renewable energy sources. To strengthen its core business, the Corporation has diversified into consultancy, power trading, training of power professionals, rural electrification, ash utilization and coal mining as well. (<https://www.ntpc.co.in/>)
- **NLC India Limited (NLC)** – Formerly Neyveli Lignite Corporation Limited, NLC is a Government corporation in the fossil fuel mining sector in India, as well as in thermal power generation, under the ownership of Ministry of Coal, Government of India. Lately, it has diversified into renewable energy production and installed 1,404 MW solar power plant to produce electricity from photovoltaic (PV) cells and 51 MW electricity from windmills. (https://www.nlcindia.in/new_website/index.htm)
- **Power Finance Corporation (PFC) Limited** – Incorporated on July 16, 1986, PFC 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/>)
- **Rural Electrification Corporation (REC) Limited** – REC Limited is a public Infrastructure Finance Company in India's power sector. It is a Navratna PSU that 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, and Private Power Developers. (<https://www.recindia.nic.in/>)
- **Satluj Jal Vidyut Nigam Limited (SJVN)** – SJVN Limited, a Mini Ratna, Category-I and Schedule 'A' CPSE under the administrative control of Ministry of Power, Govt. of India, was incorporated on May 24, 1988, as a joint venture of the Government of India (GOI) and the Government of Himachal Pradesh (GOHP). SJVN aims to be a 5,000 MW company by 2023, 12,000 MW company by 2030 and 25000 MW company by 2040. Presently, total portfolio of SJVN is 16,433 MW, out of which 2,016.5 MW is under operation, 3,301 MW is under construction, 426 MW is under pre-construction and 10,689 MW is in the Survey and Investigation stage. (<https://sjvn.nic.in/>)

- **Solar Energy Corporation of India (SECI)** – SECI is a CPSU under the administrative control of 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; grid-connected solar rooftop scheme; along with a host of other specialized schemes such as defense 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/>)

For both the years, we have studied the consolidated financial statements – Balance Sheet, Profit and Loss Account, and Cash Flow Statement— to identify investments undertaken by these PSUs in clean energy, energy efficiency, and clean transportation sectors. It may be noted that we have collectively classified all administrative expenditure such as acquisition of property, plant and equipment, salaries and allowances, and other overheads investments through 'Unknown' financial instrument in our representation of tracked investments in the Sankey diagram. We have not included any non-cash expense like depreciation, amortization, stock-based compensation, provision for bad debts etc. in our analysis.

3.2 Accounting by sectors

3.2.1 Electric vehicles

We have prepared a detailed database of different Original Equipment Manufacturers (OEMs) by accessing data for registration of electric vehicles from Vahan dashboard¹¹. This dashboard is owned by the Ministry of Road Transport and Highways (MoRTH), Government of India. Our database includes the list of OEMs for all segments of battery-operated electric vehicles (BEVs), 2-Wheelers, 3-Wheelers Auto, Golf Carts, Passenger 4-Wheeler vehicles, Light Commercial Vehicles, and Buses. We have calculated the private investment in the clean transportation sector by identifying the average ex-showroom price of the vehicles and multiplying that with the segment-wise annual sales for both the years (XXXX-XX).

For 2018-20, we did not come across particular investments in battery storage and supporting industries and have, therefore, assumed that the market price of the end product subsumes all the intermediary investments in the vehicle value chain. Apart from that, we have captured any other Budgetary outlay made by the Government, or DFI fund flows into these sectors.

¹¹ Vahan Dashboard. Accessible at: <https://vahan.parivahan.gov.in/vahan4dashboard/>

In terms of the financial instrument used for deployment of funds, we have considered that 30 per cent of these investments are Balance Sheet Financed (Equity Component) and 70 per cent of the investments are Balance Sheet Financed (Debt Component). The public demand incentives through Faster Adoption and Manufacturing of Electric and Hybrid Vehicles (FAME) scheme¹² have been included as grants to avoid double counting of public finance through the value chain of the sales of electric vehicles in India¹³.

3.2.2 Green built infrastructure

A green building is one that, in its design, construction and/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 private residential dwellings and multifamily residential buildings.

The development of a green building includes application of processes that are sustainable and resource-efficient throughout the lifecycle of the building—from design and construction to operation, maintenance, renovation etc. It also includes performance upgrade of existing building stock through energy conservation retrofits, appliance or equipment upgrades, and the use of alternative construction materials. We have collected data from the following institutions that provide ratings and green building certification to green buildings in India:

- **ASOCHAM Green and Eco-friendly Movement (GEM)** – GEM aims to address the sustainability of a given development throughout its lifecycle— from design through construction to operation. It is based upon BEE ECBC 2017 and NBC 2016. Through this initiative, it awards ratings to residential and commercial buildings such as hotels, colleges, universities, schools, factory buildings and related developments.
- **Excellence in Design for Greater Efficiencies (IFC-EDGE)** – 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

¹² 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.

¹³ 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.

buildings of all vintages, including new construction, existing buildings and major retrofits.

- **Green Rating for Integrated Habitat Assessment (GRIHA) Council** – GRIHA is a rating tool that evaluates the environmental performance of a building holistically, over its entire lifecycle, 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.
- **Indian Green Building Council (IGBC)** – 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 programs, certification services and green building training programs.
- **Leadership in Energy and Environmental Design (LEED)** – 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.
- **WELL Certification** - WELL is the leading tool for advancing health and well-being in buildings globally. Projects pursuing WELL Certification can earn points based on performance outcomes for various policy, design and operational strategies and can achieve one of four certification levels: Bronze, Silver, Gold or Platinum.

In this study, we collected the total certified green building area by each of the above rating agencies. We have not included site area that is not constructed or projects that are registered with the rating agency but have not been awarded a certification till March 31, 2020. Based on our cost assumptions, we have calculated the incremental greening cost per square meter. In terms of the financial instrument used for deployment of funds, we have considered that 25 per cent of these investments are Balance Sheet Financed (Equity Component) and 75 per cent of the investments are Balance Sheet Financed (Debt Component).

3.2.3 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 and 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, so that appropriate technical and managerial actions can be taken to arrest the losses¹⁴.

In this study, we have accessed data for smart grid projects in India from India Smart Grid Forum (ISGF). ISGF is a Public Private Partnership of Ministry of Power, Government of India for accelerated development of smart grid technologies in the Indian power sector. The mandate of ISGF is to advise the 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.

3.2.4 Energy-efficient appliances

For energy-efficient appliances, we have accessed data for the total number of mandatory and voluntary star-labelled appliances sold in India in 2018-19 and 2019-20 from the Bureau of Energy Efficiency. To compute the total finance flow corresponding to these appliances, we have considered a reference market price for each of the appliance categories, and disaggregated the same by their star ratings. For this, we have used the BEE Search and Compare portal¹⁵.

Table 5: List of Energy-efficient Appliances

Type of Appliance
<ul style="list-style-type: none">• Distribution Transformer• Frost Free Refrigerator• Stationary Storage Type Electric Water Heater• Room Air Conditioner (Fixed Speed)• Room Air Conditioner (Variable Speed)• Color Television• Direct Cool Refrigerator• Tubular Fluorescent Lamps (TFL)• LED Lamps• Ceiling Fan• Monoset Pump

¹⁴ National Smart Grid Mission (NSGM), Ministry of Power, Govt. of India (<https://www.nsgm.gov.in/en/content/smart-grid>)

¹⁵ Bureau of Energy Efficiency Search and Compare Portal. Accessible at: <https://www.beestarlabel.com/SearchCompare>

- Submersible Pump Set
- Openwell Submersible Pump Set
- Diesel Engine Driven Monoset Pumps for Agricultural Purposes
- Domestic LPG Stoves
- Computer
- Washing Machines (Semi/Top/Front Load)
- Chillers

In terms of financing, we have assumed that 25 per cent of the total investment is Balance Sheet Financed (Equity Component). In other words, there is no debt taken by the owner of the appliance to finance ownership. For the remaining 75 per cent, we have assumed that 25 per cent is Balance Sheet Financed (Equity Component) and 75 per cent is Balance Sheet Financed (Debt Component). These assumptions are consistent with the loan-to-value ratios¹⁶ used by financial institutions in India (banks and NBFCs) for electrical appliance loans.

3.2.5 Rooftop solar

Due to the non-availability of reliable and accurate data on total primary investments in rooftop installations in India, we have used the total capacity addition (in MW) as a proxy for the capital invested. For this, we have accessed data from Bridge to India for the total capacity added (CAPEX and RESCO models) in the two years. The actual installed capacity data for both CAPEX and RESCO is consistent with our assumption of the total capacity being split 70 per cent in CAPEX mode and 30 per cent in RESCO mode. Next, to compute the total finance flow corresponding to rooftop solar installation, we have used the MNRE Benchmark costs for Grid-connected Rooftop Solar Photo-voltaic systems and multiplied them with the total capacity installed.

In terms of financing structure, we have made the following key assumptions:

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

¹⁶ The loan-to-value ratio is a financial term used by lenders to express the ratio of a loan to the value of an asset purchased.

3.2.6 Process efficiency

The Perform Achieve and Trade (PAT) scheme is one of the initiatives under the National Mission for Enhanced Energy Efficiency (NMEEE), which was notified on 30 March 2012. PAT scheme is a market-based compliance mechanism to accelerate implementation of cost-effective improvements in energy efficiency in large energy-intensive industries, through certification of energy savings that could be traded. The genesis of the PAT mechanism flows out of the provision of the Energy Conservation Act, 2001 (Amended in 2010).

The key goal of the PAT scheme is to mandate specific energy efficiency improvements for the most energy intensive industries. The scheme builds on the large variation in energy intensities of different units in almost each notified sector, ranging from amongst the best in the world to some of the most inefficient units. The scheme envisages improvements in the energy intensity of each unit covered under it. The energy intensity reduction target mandated for each unit is dependent on its current efficiency with reduction target being lower for the more efficient units and higher for the less efficient units.

In this study, we have accessed data for the investments reported by industry under different PAT cycles to improve the energy efficiency of their industrial processes. For the ongoing PAT cycles (and the ones undergoing audit process), we have made certain assumptions to calculate the total investment numbers and distributed these computed values proportionately between the years 2018-19 and 2019-20.

Table 6: Sectors Induced in Different PAT Cycles

PAT Cycle	Sectors Included	Designated Consumers
PAT Cycle I (2012-15)	Aluminium, Cement, Chlor-Alkali, Fertilizer, Iron & Steel, Pulp & Paper, Thermal Power Plant, and Textile	478
PAT Cycle II (2016-19)	Aluminium, Cement, Chlor-Alkali, Fertilizer, Iron & Steel, Pulp & Paper, Thermal Power Plant, Textile, DISCOMS, Railways, and Refineries	621
PAT Cycle III (2017-20)	Thermal Power Plants, Iron & Steel, Cement, Aluminium, Pulp & Paper, and Textile	116
PAT Cycle IV (2018-21)	Thermal Power Plants, Iron & Steel, Cement, Aluminium, Pulp & Paper, Textile, Petrochemicals, and Commercial Buildings (Hotels)	109
PAT Cycle V (2019-22)	Aluminium, Cement, Chlor-Alkali, Commercial Buildings (Hotels), Iron & Steel, Pulp & Paper, Textile, and Thermal Power Plant	110
PAT Cycle VI (2020-23)	Cement, Commercial buildings (Hotels), Iron and Steel, Petroleum Refinery, Pulp and Paper, and Textiles	135

We have assumed that 75 per cent of the tracked Process Efficiency investments are Balance Sheet Financed (Debt Component) and the remaining 25 per cent are Balance Sheet Financed (Equity Component). Based on our analysis, the years being considered for this study are covered under PAT Cycle II, PAT Cycle III, PAT Cycle IV, and PAT Cycle V.

4. General assumptions and principles

4.1 Green bonds

We have excluded finance mobilized through the issuance of green bonds to avoid double-counting at the end-use level. We have not used the data from post issuance reports to track the primary investments as it is difficult to map the use of proceeds that are outlined for specific projects with the aggregated data we have for different sectors. In other words, such a mapping exercise would require the availability of disaggregated data at the project-level. Due to lack of a common reporting structure and the use of several national and international datasets, we could not identify the exact trail of fund flow.

4.2 Exchange rate

In this study, we have used the annual average exchange rate published by the Reserve Bank of India¹⁷. For 2018-19, we have used the exchange rate of INR 69.92 /USD and for 2019-20, we have used the exchange rate of INR 70.90/USD.

4.3 Multipliers

We have applied Rio markers to the bilateral and multilateral ODA and non-export credit OOF finance flows reported by OECD¹⁸. Rio markers apply to activities as a whole, and, in marking the full value of development finance activities, the markers considered are 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. However, we have exercised careful discretion in identifying the most relevant projects from the database to avoid any over-estimation of finance flows.

¹⁷ The Reserve Bank of India is India's central bank and regulatory body and is responsible for the issue and supply of the Indian rupee and the regulation of the Indian banking system. Table 137: 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. (<https://rbidocs.rbi.org.in/rdocs/Publications/PDFs/137TF5134BCBAD2C4AF59A232862FBBB0A0A.PDF>)

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

4.4 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. In this study, however, we have used the gearing ratio of 0.70 (70 per cent debt and 30 per cent equity) to compute project transaction value wherever it is not reported in the database.

4.5 Exclusions and inclusions

We have excluded all secondary market transactions like refinancing of project assets, mergers and acquisitions, and purchase and sale of shares to eliminate double counting. In this study, we have included the administrative and personnel expenditure that accrue to various ministries, PSUs, and States to implement mitigation projects. While this may not necessarily qualify as directly contributing to 'green', it is impossible to isolate such values from the aggregated transaction data. We have, however, classified this tracked finance as funds flowing through an Unknown instrument.

5. Ground truthing and double counting

For cases where complete data, context, terminologies or other metadata is unavailable, we have made certain assumptions in our analysis. Our assumptions have been based on industry specifications to the best extent of our knowledge, and informed by multiple discussions with our review group of experts. To establish credibility and to maximize accuracy of our analysis, we have convened regular roundtables and one-to-one interactions with stakeholders from relevant sectors, and provided technical briefings thrice over the course of the one-year project.

We have constituted a Working Group of experts with representation from academia, industry, and the Government. We have briefed this group on our progress and organized regular convenings for a thorough review of our methodology. We have documented the feedback provided by each member on our data sources, analytical frameworks, and measurement methodology, and duly incorporated these inputs into our study.

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