Improving Tracking of High-GHG Finance in the Power Sector

December 2020

CLIMATE POLICY INITIATIVE

Supported by
Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety

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ACKNOWLEDGMENTS

The authors wish to thank the following for their helpful comments in alphabetical order by affiliated organization: Sarah Zugel (BMU), Valeria Ehrenheim (Carbon Tracker Initiative), and Padraig Oliver (UNFCCC). We are grateful to Global Energy Monitor and the Global Development Policy Center, Boston University, for sharing valuable data contained in the report. Finally, the authors would like to thank and acknowledge contributions from Barbara Buchner, Elysha Davila, Caroline Dreyer, Angela Falconer, Julia Janicki, Federico Mazza, Valerio Micale, Chavi Meattle, Alice Moi, and Vikram Widge for advice, internal review, and editing; Morgan Richmond for support on data cleaning and analysis; and Josh Wheeling for graphic design.
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SECTOR

Power sector

REGION

Global

KEYWORDS

Fossil fuels, Private finance, Public finance, Green Finance, Tracking, Taxonomy, Disclosure, Paris Agreement, Alignment

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1. KEY FINDINGS

This report explores available methods and data for tracking financial flows to high greenhouse gas emissions ('high-emissions') assets and activities and assesses the standard of information required to draw conclusions about the climate impact of such investments. For the purpose of this report, we define high-emissions finance as primary investment in assets and activities with a material (direct and indirect) contribution to global greenhouse gas (GHG) emissions. It draws on project-level datasets to describe, in granular detail, financing sources, instruments, destinations, and technology uses for high-emissions power plant projects during 2017 and 2018.

This exercise shows how high-emissions finance tracking can help us understand global progress towards decarbonization targets, and what steps are needed to deepen that analysis. Our findings include:

- Despite momentum among private and public financial decision-makers to define and promote sustainable activities, far less progress has been made in identifying and restricting investment that is harmful to climate goals.
- We were able to track new project finance commitments to fossil fuel power generation of over USD 40 billion in 2017 and 2018. These flows represented approximately one-third of the investment into fossil fuel power generation taking place worldwide over the same years.
- Export credit agencies, state-owned banks, and commercial banks provided particularly large financial flows to fossil fuel power plants (USD 9.2 billion, 5.1 billion, and 13.1 billion per year, respectively).
- Granular data are not available for financing of new assets through the balance sheets of private and public corporations, limiting the coverage of high-emissions financial flows that can be tracked accurately. The contribution of financial actors is therefore underestimated to the extent they are making corporate loans to or other forms of investment in utilities building and extending fossil fuel assets.
- National regulators and policymakers should enforce mandatory disclosure of capital expenditures into new high-emissions assets and activities. In conjunction, they should define thresholds for unacceptable levels of emissions, to serve as a working guide for investors to identify and avoid the most harmful assets – and the companies building and operating them.[1]

1 In line with CPI's Global Landscape of Climate Finance, this paper defines "investment" as primary financial commitments into productive assets at the project level – excluding secondary transactions that involve money changing hands but no physical impact, and also research and development spending assumed to be recovered through the sale of resulting products. Financial commitments provided by certain instruments such as guarantees, insurance, government revenue support schemes and fiscal incentives, or "intermediate output" investments in manufacturing or equipment sales, are not counted due to data limitations and the potential for double-counting.

2. INTRODUCTION

The process of ensuring financial flows are consistent with the goals of the Paris Agreement, known as Paris alignment (CPI & I4CE, 2019), requires a rapid transformation of financial sector practices. While Climate Policy Initiative's Global Landscape of Climate Finance (CPI, 2019) provides an important first step to understanding progress towards international climate goals by tracking primary investment into low-carbon and climate-resilient activities, it only provides a partial picture.

Finance for new high-emissions assets and for activities which lock in carbon intensive processes raises the expected level of emissions in future years. According to IRENA (2020), by 2030, total investments of nearly USD 10 trillion should be redirected from fossil fuels and related infrastructure to low-carbon technologies. While there is no widely accepted definition of high-emissions finance, **we define it as primary investment in assets and activities with a material (direct and indirect) contribution to global GHG emissions.** Therefore, high-emissions finance should be a priority for tracking alongside climate finance in the next decade to understand where opportunities exist to redirect investment.

Detailed information is needed to understand the extent to which high-emissions financial flows should be limited. Although there are already estimates of the scale of financial flows to fossil fuel power assets, they are not provided in granular detail. In its World Energy Investment report, the International Energy Agency estimates that global expenditure on fossil fuel-based power generation reached USD 130 billion on average across 2017 and 2018 (IEA, 2019). However, these findings are only reported at very high levels of aggregation. Additional details on financial commitments are needed to identify the most harmful flows, and to promote specific actions and interventions to redirect those towards low-carbon sectors and technologies.

This paper investigates the options available to track primary finance flows to high-emissions assets and activities. By taking a similar approach used in the Global Landscape of Climate Finance, we focus on primary investment into productive assets at the project level to capture new money resulting in high-emissions intensity – excluding secondary transactions that involve money changing hands but no physical impact. These emissions-intensive activities and assets take place in key economic sectors as outlined by the scientific community, principally the Intergovernmental Panel on Climate Change.[2] Our work aims to provide greater detail than existing measurements, both on the flows themselves and the assets financed. In this paper, we focus on high-emissions power assets.

We conduct a stock take of available data on public and private climate financial flows in high-emissions power-generation assets. Adopting a similar approach used in the Global Landscape of Climate Finance, we analyze the scale, sources & intermediaries, instruments, recipients, and uses of finance to high-emissions generation assets in the power sector in 2017 and 2018.

2 Further details of the physical basis for defining high-emissions assets and activities are provided in Appendix 1.

Granular information about financial flows is the gold standard to understand opportunities to shift investment. As well as providing information about activities and assets needed to assess against taxonomies, project-level datasets are most likely to contain verifiable details on the nature of financing. That includes information about the actors providing finance, the financial instruments used, and the geographic origin of flows reveals specific opportunities to redirect investment. Such data can support advancement for specific actions to redirect flows and reduce high-emissions finance. For example, the granular information tracked in the Global Landscape of Climate Finance allow climate finance stakeholders – including market participants and policy institutions – to understand the investment opportunity represented by renewable energy assets in detail, in terms of which countries and technologies are receiving investment and which are lagging behind.

High-emissions intensity of new investment makes it more likely that countries will not achieve decarbonization pathways and puts more assets at risk of becoming stranded. Yet, a small fraction of high-emissions finance might serve the low-carbon transition, depending on certain conditions. Each country has a different pathway along the low-carbon transition, and the harm caused by new high-emissions investment depends on the role of a given technology in each context. Some technologies and activities with high-GHG emissions still feature in stringent climate scenarios (IPCC, 2018). These appear, for example, in sectors where alternative low-emissions technologies do not yet exist or have not yet reached market readiness, such as in the case of industrial processes for steel and cement. As such, not all high-emissions investments are automatically inconsistent with climate goals. Rather, a separate analysis is required to translate their contribution to climate pathways and warming potential to determine compatibility with Paris goals. Our objective is therefore to gather data on high-emissions finance to understand broader climate related finance flows. That, in turn, will permit further analysis of impact of investment by particular groups of actors, across an entire end-sector, on national and international decarbonization pathways. The results of that analysis are elaborated in the linked paper 'Paris Misaligned: An Assessment of Global Power Sector Investment.'

2.1 OUTLINE

This paper has four parts:

1. We examine progress among leading taxonomies and classification systems for identifying high-emissions investments. We also review previous estimates of high-emissions finance in the power sector.
2. We map available datasets at the global level to show what information is available that allows for the detailed analysis of flows from specific sources and to particular assets.
3. We compare our processed database of project-level financial commitments to high-emissions power plants to aggregate estimates to indicate coverage and data gaps.
4. We conclude with recommendations to improve the understanding of the large portion of global high-emissions investment that is not tracked at the level of specific sources.

3. EXISTING APPROACHES TO TRACKING HIGH-EMISSIONS FINANCE

3.1 TAXONOMIES AND DATA REQUIREMENTS

The financial community currently employs a wide range of standards and definitions to identify what counts as high-emissions finance. The content and application of these benchmarks varies according to their purpose – for example, institutions screening their own investments have different needs to regulators trying to classify activities across the whole economy.

To understand the different ways information about assets and activities that generate high-GHG emissions is currently used, we surveyed prominent institutions' policies and other taxonomies, focusing on how governments, DFIs, commercial banks, and insurance companies define these activities, as well as their approaches to investing in or avoiding them.

We identified three main types of approach:

1. **Holistic classification and evaluation systems:** Could entail performance thresholds for activities that contribute to climate objectives in different sectors, or "traffic light" systems where assets are grouped based on a wide range of conditions. Currently, thresholds for activities primarily define those contributing to climate mitigation and adaptation goals.
2. **Sector- and industry-specific exclusion lists:** These isolate specific activities or entities with a certain percentage of revenue from high-emissions activities. While there are no unified and consistent methods in exclusion lists, most of the lists normally exclude new coal-fired power plants.
3. **Measuring financed emissions for target setting:** This approach is used by financial institutions to account for emissions from lending and investing in activities in the real economy (PCAF, 2020). These are voluntary disclosures by financial institutions to consistently measure financed emissions to assess climate related risks and set targets for action.

Holistic systems emphasize assets' technical characteristics as well as contextual factors relating to the sectors and political systems in which they are embedded. Table 1 outlines some examples of efforts to outline conditions for assets and activities to be consistent with climate goals. Assets and activities not classed as 'green' are not automatically misaligned with climate goals. Usually, a thick, central band of economic activity is labeled 'potentially'

compatible with temperature goals because the contribution to decarbonization depends on additional technical screening criteria. For example, Climate Bonds Initiative stipulates that for rolling stock for electrified freight rail to be 2°C compliant, fossil fuel freight must not be more than 50% of the freight transported (CBI, 2020).

Table 1: Selected holistic evaluation systems

EXAMPLE	TYPE	CLASSIFICATION DETAILS
EU Taxonomy	Regulation	Determines activities that can substantially contribute to climate change mitigation with corresponding metrics and threshold. Specific exclusions based on technical criteria, which are therefore ineligible to be treated as 'green' finance: • Activities related to dedicated storage and/or transportation of any fossil fuels • Energy generation from coal • Energy generation from gaseous or liquid fossil fuels that do not comply with energy thresholds (100gCO2e/kWh, declining to 0gCO2e/kWh by 2050)
Climate Bonds Initiative	Certification	Traffic light system: • Green – assets or projects automatically compatible with a 2-degree trajectory. This includes, for instance, most renewable energy generation technologies and their transmission infrastructure • Orange – potentially compatible with a 2-degree trajectory, depending on whether additional, more specific technical criteria are met, for example, fossil fuel-based generation facilities without carbon capture and storage (CCS) • Red – incompatible with a 2-degree trajectory. Most coal or oil fueled power generation is included in the list, except for those with CCS that capture 100% of GHG emissions • Grey – further work required to determine stoplight color. Most gas powered generation facilities are included in this category
Equator Principles	Voluntary principles	Case-by-case project categorization: • Category A – Projects with potential significant adverse environmental and social risks and/or impacts that are diverse, irreversible or unprecedented • Category B – Projects with potential limited adverse environmental and social risks and/or impacts that are few in number, generally site-specific, largely reversible and readily addressed through mitigation measures • Category C – Projects with minimal or no adverse environmental and social risks and/or impacts • The categorization also takes into account national law, regulations, and permits on environmental and social issues for countries in OECD and in World Bank High Income Country list.

Sources: *CBI, 2020; EU TEG, 2020a; Equator Principles, 2020*

However, across most systems produced to date, precise thresholds have only been set for climate-positive investment, while relatively little attention has been devoted to the dirty side. Clear thresholds for activities harmful to climate goals are much less developed than low-carbon or 'green' thresholds and criteria. For instance, the European Union's Taxonomy for Sustainable Activities ('EU Taxonomy') encourages reporting on activities that meet its screening criteria and those on a trajectory towards meeting them (Natixis, 2020). Meanwhile, it uses the concept of 'significant harm to environmental objectives' to refer to activities that contravene one of the goals (including climate change mitigation), but no specific thresholds for this category yet exist.

Despite the absence of benchmarks, high-emissions finance tracking should cover technical information about new assets and provide insight into local context in order to shed light on the progress (or hindrance) of decarbonization efforts.

Technical thresholds are best understood in the energy system, and in the power sector in particular. The EU Taxonomy sets a screening criterion for a 'substantial contribution to climate change mitigation' of (technology-agnostic) emissions intensity threshold of 100g tCO2e/kWh. By comparison, the Taxonomy's treatment of the agriculture sector notes a lack of deep datasets on emissions produced by different agricultural practices, which prohibits setting best performance benchmarks. Therefore, the Taxonomy's screening criteria do not contain absolute thresholds for investments in sustainable agriculture (EU TEG, 2020b).

Since power sector assets can be measured in terms of intensity per unit of output, they are amenable to developing thresholds for 'dirty' assets. In turn, thresholds are applied according to local context. Therefore, transactions tagged against specific countries are more useful than those referring to regions

3.2 ESTIMATES OF POWER SECTOR FINANCE

There is currently a gap in terms of tracking global financial flows to high-emissions power assets comprehensively across actors and at a granular level of detail. Previous analyses give a sense of the full picture of high-emissions power finance at multiple levels of the economic system. There are three main types:

1. International Energy Agency (IEA) estimates have the broadest coverage: it measured expenditure on global fossil fuel-based power assets worth USD 130 billion on average across 2017 and 2018 (IEA, 2019). However, the IEA only provides aggregate data: investments are only broken down into world regions geographically and into broad fuel types (coal, oil, and gas), and no specific institutions or institution categories are indicated as the sources of finance. Furthermore, although the comparison can be illustrative, the nature of flows is not the same as the commitments measured in climate finance tracking (CPI, 2019). IEA estimates measure expenditures on assets under construction or refurbishment. In order to compare flows of new commitments made in a given year to high-emissions assets to those made to new low-carbon assets, data on new commitments – for example, new loan contracts, rather than the release of promised funds to projects – are a preferable point of comparison.

2. Tracking initiatives which go further in terms of identifying the sources of primary finance for new assets nonetheless tend to have restricted scope. For instance, an analysis by Oil Change International (2020) of new finance for energy assets focuses on public

institutions in G20 countries and multilateral development banks (MDBs). While public actors' role as catalysts in the global economy means this is an important focus, finance from private actors must be included if we want to understand overall progress towards decarbonization goals.

3. Finally, further research examines secondary flows at the level of financial markets, such as bank loans to fossil fuel corporations (RAN et al., 2020) or changes in ownership of financial assets (such as bonds and equity shares in companies) derived from fossil fuel infrastructure and revenues (InfluenceMap, 2018). While valuable evidence for understanding the wider financial system, these findings do not provide insights into changes in primary investment in new high-GHG assets or activities.

To complement these studies, we draw on available project-level datasets to examine flows across their life cycle at a more granular level. Table 2 shows our approach in comparison with previous work.

Table 2: Comparison of high-emissions power sector investment estimates

SOURCE	METHOD	COVERAGE		ANNUAL FINANCIAL FLOWS 2017/18 (USD)
		INSTRUMENTS AND/ OR INSTITUTIONS	SECTOR	
CPI	Consolidating transactions in available project-level datasets; Cleaning and processing to characterize financial flows by their life cycle	**Project finance commitments for new projects**, including debt, equity, and grants, from public and private actors	Power plants: new or replacement of old assets, or supporting activities	41 billion
IEA	Surveys with industry, asset and project-level datasets; Investment modelling tool allocates annual capital spending corresponding to assets under construction, spreading capital outlays over years from financial close to completion	Total capital **expenditure** on all projects under construction **balance-sheet and project finance**	Power plants: new or replacement of old assets	130 billion
Rainforest Action Network, Banktrack et al.	Lending and underwriting transactions (both corporate and project finance) to fossil fuel companies; Weighted based on proportion of borrower's operations in relevant sector.	Commercial banks' loans to corporations	Fossil fuel supply, expansion and wider infrastructure; Coal power generation	650 billion (all fossil fuels); 31 billion (coal power)
Oil Change International	Shift the Subsidies database compiled from available public-sector data sources and project-level datasets	Grants, loans and equity from G20 country development finance institutions and export credit agencies, plus multilateral development banks	Fossil fuel supply, power plants (aggregated)	25 billion

Sources: *IEA (2019), RAN et al. (2019), Oil Change International (2020)*

Power generation is the sector most likely to offer high quality granular data on finance and carbon intensity per unit of output. This analysis therefore uses the power sector as a test case, but with the longer term objective in mind of working towards targets and performance indicators for the alignment with Paris goals of all financial flows in polluting sectors, such as transport and buildings. Further work is needed to expand this methodology to adaptation and other mitigation sectors where criteria refer to essential practices or best-in-class technologies.

4. DATASETS ON GLOBAL FINANCE FOR HIGH-EMISSIONS POWER GENERATION – FEATURES AND COVERAGE

4.1 TRANSACTIONS AND TECHNOLOGIES

We construct a picture of global financial flows using a range of different datasets containing investments into non-renewable power sector assets financed through project finance arrangements.

Each dataset provides a focus on different actors and geographies. The commercial infrastructure finance dataset IJGlobal and the freely available World Bank PPI dataset provide project deals involving a mix of private and public actors. Further datasets on public finance compiled by research institutions (including Global Energy Monitor and the Global Development Policy Center at Boston University) highlight additional loan contracts from DFIs. Table 1 shows the composition of our final high-emissions database.

Table 3: Available project or activity-level datasets

Priority	Source	Coverage			Proportion of tracked finance
		Type of transaction	Geography	Technology	
1	Private Participation in Infrastructure (World Bank)	Public projects with private entity assuming operational risk	Low- and middle-income countries	Coal, diesel, natural gas, waste, cogeneration	34%
2	IJGlobal	Infrastructure project finance deals	All	Coal, oil, gas, cogeneration	50%
3	Global Coal Public Finance Tracker (Global Energy Monitor)	Coal projects receiving foreign support from a major G20 public finance institution	International	Coal	8%
4	China Global Energy Finance (Boston University)	Loan contracts from China Development Bank and Export-Import Bank of China	International, from China	Coal, oil, gas	7%
5	OECD Creditor Reporting System	Development Assistance flows from governments, agencies, and public finance institutions reported at activity level	International, to ODA* recipient countries	Coal, oil, gas, waste	2%

*Official Development Assistance

Sources: *World Bank (2020), IJGlobal (2020), Global Energy Monitor (2020), Gallagher (2019), OECD 2020)*

4.2 SCOPE OF OUR ANALYSIS

In building the dataset, we screened the projects carefully to include only those that add new generating capacity or extend the lifetime of existing high-emission assets. We apply the same principles as in CPI's Global Landscape of Climate Finance (CPI, 2019), including a series of rules to avoid double counting financial commitments that contribute to final tangible assets. These principles are covered in greater detail in Appendix 2.

The vast majority of investment tracked is in new coal-fired, gas-fired, and oil-fired power plants and any expansions using these technologies (Table 4). The aggregate totals for finance and installed capacity also include cogeneration plants where there is clear evidence the assets are fired using fossil fuels. We exclude any cogeneration from biomass, waste-to-energy plant, and power sector efficiency measures. This is to avoid counting investment that may be included as climate-compatible in most taxonomies.

We took note of some technologies which may lock in some power sector emissions but also may improve the carbon intensity of the power sector vis-à-vis conventional fossil fuels. For example, some generating fuels and technologies are likely to produce lower emissions than generation using coal, oil, and gas (combined-cycle or combustion turbines). Although the datasets covering 2017 and 2018 did not contain any, plants fired using fossil fuels but with active carbon-capture and storage technology to reduce their emissions also present a challenge to accurately estimate future emissions. We also acknowledge that the emissions intensity of plants fired with a given fuel type may vary greatly across different countries.

Projects or measures to improve efficiency of the electricity grid overall, thereby benefiting plants of all types, are expected to reduce emissions in the short-term. However, rebound effects may also lock in further emissions in the long run. This can occur by improving fossil fuel plants' competitiveness, leading to an increase in utilization rates and possibly prolonging assets' operational lifetime. Assessing these measures' overall impact is methodologically complex.

As such, the following technologies are excluded from the numbers we report, with a view to revisit them in the future:

1. Plants fired by waste incineration and cogeneration from biomass (combined heat and power).[3]
2. Power sector efficiency technologies. These can include plant-level measures or refurbishments aimed at increasing energy efficiency in transmission or generation, and programs with funds allocated to transmission and distribution upgrades with benefits to the whole full electricity system in a recipient country.

3 However, we include data we gathered on all types of plants in the analysis in the linked paper 'Paris Misaligned', where capturing the 'grey' zone between the most and least carbon-intensive technologies is important to understand overall power sector alignment with Paris goals.

Table 4: Types of project identified

FINANCE FOR HIGH-EMISSIONS GENERATING CAPACITY	FINANCE FOR POWER SECTOR EFFICIENCY
Included New power plants that are: • coal-fired • oil-fired • gas-fired and expansions of plants using these technologies **Excluded** New power plants that are: • waste-to-energy • cogeneration from biomass and expansions of plants using these technologies	**Excluded** • Energy efficiency renovations to all kinds of fossil plants. These investments are also excluded from climate finance tracking and represent a (contested) form of 'transition finance.' • Programs with funds allocated to transmission and distribution with benefits to full electricity system.

4.3 TRACKED FINANCIAL FLOWS

We tracked financial commitments to high-emissions power plant projects worth USD 40.8 billion on average across 2017/18. These commitments therefore represent less than one-third of the value of capital outlays on fossil fuel power assets in the same years by the IEA's measurement, implying significant data gaps (accounting for an estimated USD 89 billion in expenditure provided by unknown sources). The investments we tracked provided on average 37.2 GW of new generating capacity per year.

4.3.1 ACTOR TYPE

Public institutions provided a majority of the financial commitments tracked in the dataset, contributing USD 21.7 billion a year. Private investors accounted for USD 19 billion, just under half of the commitments tracked. The small remainder (0.3%) of flows tracked were from unknown institutions.

Table 5 exhibits the contribution of different actor types as sources and intermediaries of these financial flows as well as our estimation of untracked high-emissions finance. Our classification follows definitions outlined in the methodology behind the Global Landscape of Climate Finance (CPI, 2019), updated this year to more accurately identify public lending agencies and to highlight state ownership of many organizations operating on a commercial basis, both financial and non-financial (CPI, 2020).

Table 5: High-emissions power sector finance and capacity installations supported by different institution categories

ACTOR TYPE		FINANCIAL COMMITMENTS (USD BN/YEAR)	NEW INSTALLED CAPACITY ATTRIBUTED (GW/YEAR)
Public	Export credit agencies	9.2	5.5
Public	State-owned financial institutions	5.1	2.5
Public	National DFIs	3.2	3.5
Public	Multilateral DFIs	1.4	1.8
Public	State-owned enterprises	1.4	1.5
Public	Bilateral DFIs	1.1	1.2
Public	Governments	0.1	0.1
Private	Commercial financial institutions	13.1	15.8
Private	Corporations	4.6	3.8
Private	Funds	0.7	0.7
Private	Institutional investors	0.6	0.6
Unknown	Unknown (estimated)	89.0	79.5

The data reveal significant commitments made by public financial institutions. Far out in front were export credit agencies, providing on average USD 9 billion per year, accounting for 22% of tracked finance. These institutions aim to lend to activities that support their home country's commercial interests abroad. State-owned banks were also significant providers. A small number of development finance institutions (DFIs)[4] provided over a quarter of the public finance total, accounting for 6.6 GW of new capacity.

Private financial institutions were also providing significant financial flows to fossil fuel power generation. Commercial banks provided over two-thirds of total private financial commitments during the period, corresponding to 15.8 GW of installed capacity per year on average. Financial institutions have in the past been attracted to power plant project financing due to the expectation of long-term stable returns and familiar debt structures.

However, a growing understanding of stranded asset risk could be causing declining investment among entities with more commercial mandates. Reporting biennial averages helps smooth anomalies in the data, but obscures year-on-year changes. Total finance in 2017 was USD 53 billion, which fell by almost half to USD 29 billion in 2018. Decreases took place across most categories of institutions, except for National and Multilateral DFIs, as well as state-owned enterprises (SOEs).

4.3.2 POWER PLANT TYPE

The dominant fuels used for new high-emissions power plants covered in our datasets are coal and gas. Coal-fired generation received an annual average of USD 23 billion in 2017/18, or 57% of total tracked finance, paying for 14.9 GW of new capacity. Gas-fired generation received USD 15.0 billion, or 37% of the total. Oil-fired and dual-fuel generation each

4 Development finance institutions are publicly owned banks or agencies with specific mandates to help secure development mandates in their country of ownership (National DFIs), in countries abroad (Bilateral DFIs), or across multiple countries globally or within a certain region (Multilateral DFI).

represented under 5% of the total (together receiving USD 2.7 billion and 3.6 GW of new capacity per year on average).

Different technology types receive a different balance of private and public finance, driven by regional differences. Private actors provided over three-quarters of finance for gas-fired plants. By contrast, private institutions were responsible for only 27% of all tracked commitments to coal projects.[5] Coal often figures in public development lending as a viable baseload generation source for nations trying to accomplish rapid electrification and grid expansion. Growing energy demand in developing Asian countries and relatively low costs, particularly in Southeast Asia, have led countries to continue relying on coal generation to expand energy access (e.g. BNEF, 2020a). By contrast, 34% of private finance for gas flowed to projects in the United States, where natural gas prices have fallen significantly since 2008 and consequently gas is replacing coal and nuclear capacity being taken offline (BNEF, 2019).

4.3.3 GEOGRAPHIES

East Asia and Pacific received the most finance and capacity additions we tracked, at USD 15.8 billion (39%) and 20.2 GW of capacity additions. The next largest regions of destination were South Asia (19% of flows), the United States (15%), and Latin America & the Caribbean (8%). East Asia and Pacific was also by far the most significant region of origin, providing over two-thirds of tracked commitments. However, these regional characteristics reflect the coverage of institutions and types of transactions in the underlying datasets.

Tracked projects are primarily financed through commitments made across national borders: 77% of flows were international and 23% were domestic. This is unsurprising since some of our constituent data sources focus on cross-border development finance contracts provided by public institutions (especially the Global Coal Public Finance Tracker and China Global Energy Finance). By contrast, domestic finance is difficult to track comprehensively at the project level. For example, there were no projects taking place in China in any of our datasets, despite new coal plants entering construction in recent years (Shearer et al., 2019). The following section highlights how data availability on high-emissions investment varies by geographical and institutional source and examines the size of the data gaps that result.

5 Global Energy Monitor and China Global Energy Finance contain large transactions from public institutions to coal projects. Nevertheless, even if these datasets aren't counted, private actors still only accounted for 36% of tracked finance for coal-fired projects.

5. DATA GAPS

Project finance, which our granular datasets track, is used by public and private financial institutions in particular contexts. Therefore, our data do not fully capture the role of every actor type in financing high-emissions power assets. New investments recorded by the IEA but outside project-level datasets are those 'financed on the balance sheets of utilities, independent power producers, and consumers (for distributed generation)' (2019).

Granular data are not currently available for equity and debt provided through the balance sheets of utilities and other corporate entities investing in power generation. In principle, company financial statements could provide enough raw material to make assumptions as to sources of finance, by matching changes in corporate liabilities to capital expenditures. However, while this may prove fruitful for a country case study (e.g. Dobrinevski & Jachnik, 2019), at a global level this approach may require access to large amounts of confidential data. Moreover, most company filings are not transparent enough about the exact nature of capital outlays to ensure only high-emissions assets are tracked.

Therefore contributions from corporations, including SOEs, are significantly underestimated. Major commercial banks and other private investors providing corporate debt used for capital expenditure on new high-emissions assets are implicitly providing financial flows to such assets, so the role of financial institutions in promoting high-emissions investments is also understated.

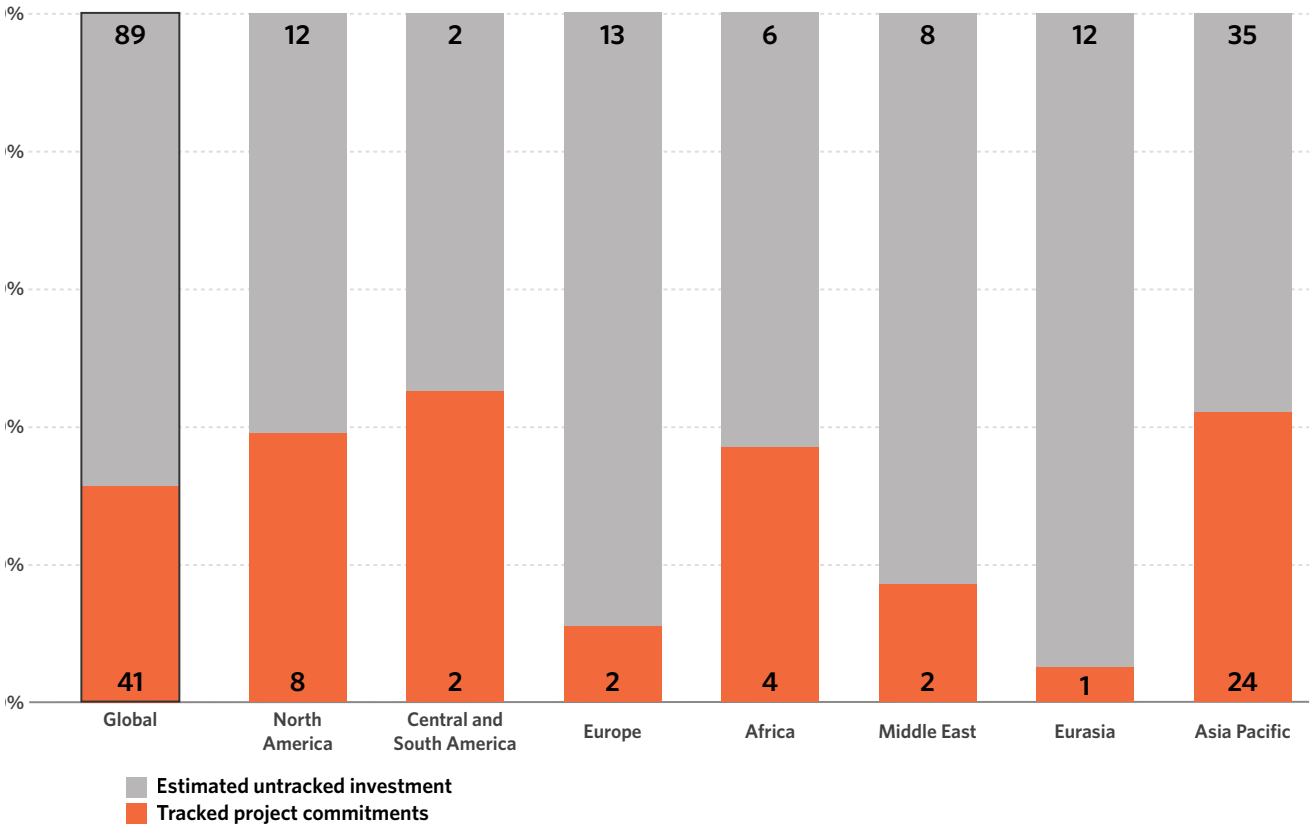
As a result, the geographical profile of flows we tracked using project-level data is also uneven in terms of regional coverage of existing projects. A comparison of total commitments in our dataset against IEA estimates for expenditures in 2018 is illustrative.

However, our analysis and IEA estimates concern different types of financial flows. As emphasized in Section 3, the IEA surveys ongoing expenditures based on the capital costs of assets undergoing construction or replacement – including projects predating 2018 – which are smoothed evenly across years until the asset becomes operational. By contrast, the datasets we use measure commitments to projects which reached financial close in 2018. Therefore, the only flows which contribute to both sets of numbers are those projects which started construction in the same year. Declining fossil fuel investment globally should mean this method underestimates the coverage of commitments data. However, this trend is not homogenous across fuels: final investment decisions for coal plants declined from 2018 to 2019, while those for gas increased (IEA, 2020b).

Making the simplifying assumption that expenditures in 2017 and 2018 were approximately equal to commitments in the same years for new plants to be built in subsequent years, we find the share of global financial flows covered by project-level datasets varies across regions.

Figure 1 presents estimates of the financial flows which were untracked in each region under the IEA classification, both in terms of absolute volume of investment and as a percentage of total expenditure that took place.

Figure 1: Share and value of tracked and untracked investment to fossil fuel power generation in 2017/18, by region (USD billion, %)

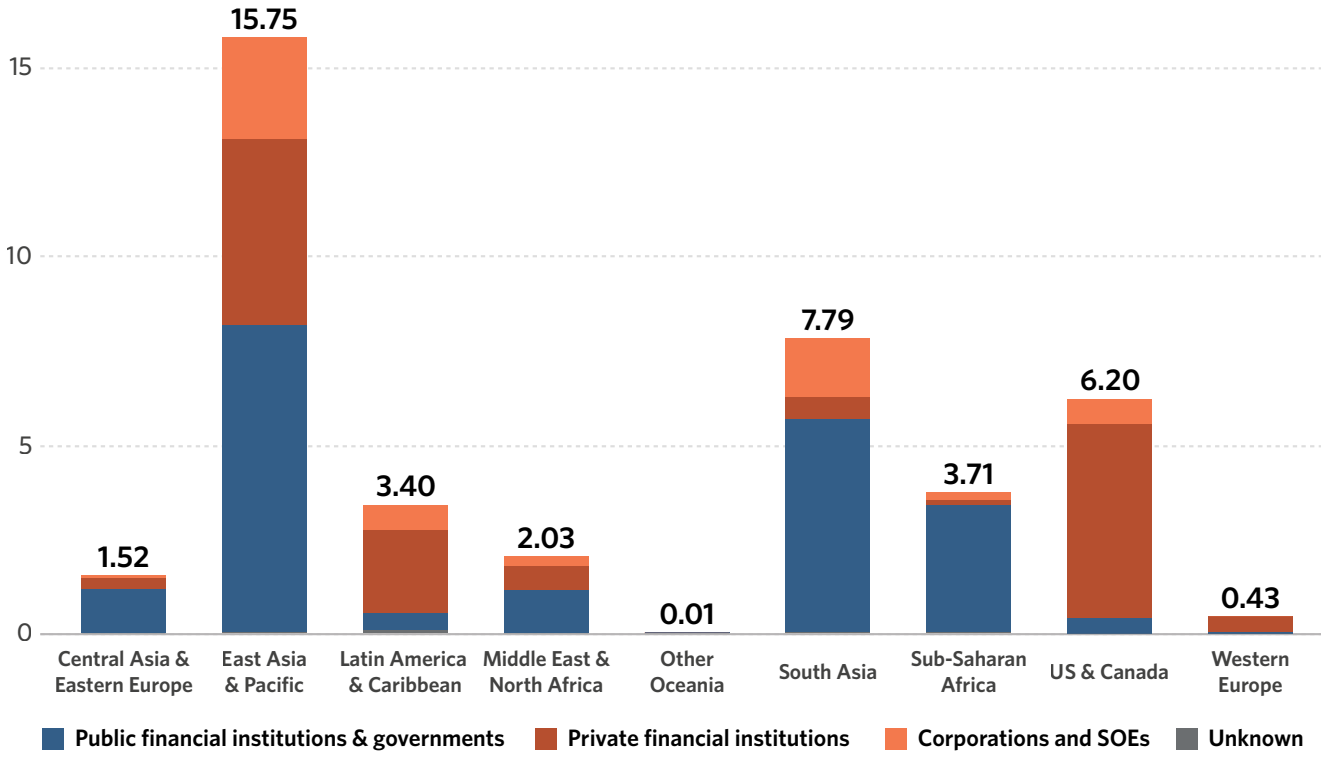


Source: *IEA, 2019; CPI calculations*

There are differences in data coverage by different regions. For example, we estimate that almost 90% of high-emissions new power investment is not tracked at the actor level in Europe, whereas in absolute terms, the amount is probably much lower than in Asia Pacific which has a relatively higher data coverage than in Europe. These regional differences emerge from the varying makeup of energy markets across national economies, and the particular shape of investment that take place and the role of certain institutions. In Europe, which has a well-developed emissions trading system, high-emissions power generation such as hard coal has been declining due to market pressures and competition from renewables (Agora Energiewende and Sandbag, 2020). However, tracking of investment data by actor type is more challenging in Europe, suggesting relatively little new investment in high-emissions power there happens through project finance, with sources preferring to invest on their balance sheets. On the other hand, new power plant in Asia Pacific can be traced through project level financing.

Figure 2 reveals the share of finance we tracked from different actor types to projects by region (using CPI's more disaggregated classification to show differences within IEA regions). It highlights the small share of tracked finance represented by non-financial businesses, which include both private corporations and state-owned enterprises.

Figure 2: Tracked finance for high-emissions power generation, by institution category and region of destination (USD billion)



Note: *'Private financial institutions' include commercial financial institutions, funds, institutional investors and other private finance institutions; 'Public finance institutions and governments' include government donors, bilateral, national and multilateral DFIs, export credit rating agencies, public funds and state-owned financial institutions.*

Important dynamics affecting the institutional-regional makeup of our data coverage include the following:

- Substantial financial commitments to projects in Sub-Saharan Africa made by DFIs and export credit agencies, and to those in Latin America made by foreign commercial banks, are well recorded at the project level and contribute to relatively good coverage of flows in those regions.
- Domestic investment by state-owned enterprises is for the most part unrecorded, creating data gaps especially in emerging economies. Perhaps most importantly, we tracked no investment flowing to projects within China. Eurasia and the Middle East, where state-owned actors play an outsized role in the energy sector, are also affected.
- Relying on project-level data underestimates high-emissions finance in high-income countries. Lower-income markets accounted for only 17% of 2018 fossil fuel investment recorded by the IEA, whereas these economies make up over half of financial flows tracked in our dataset. Many large utilities in high-income countries, especially in Europe, are likely to hold and even expand capital interests in both fossil fuel-based and renewable power generation assets on their balance sheets even as their overall business models undergo a transition away from high-emissions activities (Alova, 2020).

6. RECOMMENDATIONS: IMPROVING DISCLOSURE OF HIGH-EMISSIONS INVESTMENTS

Expanding and building on this analysis requires addressing data gaps. Currently, there is a trade-off between wide coverage and granularity in assessments of high-emissions finance. Adding to a general lack of publicly available information on commercial transactions, in the absence of mandatory reporting frameworks actors have even less incentive to disclose detailed investments in sectors associated with higher emissions (and higher climate risk). We have chosen maximally granular project data to furnish our further analysis of power sector alignment with valuable detail. However, the essential ingredients are volumes and information on the actors providing it.

Analysts and public authorities must each take steps to improve understanding and thus provide incentives to shift away from high-emissions finance. Although data gaps are substantial in the power sector, they are even more pronounced in other sectors. Creative solutions are needed to research the bigger picture of climate-aligned finance. Meanwhile, regulators can take steps to reduce the chance of misalignment and improve information about what exactly is being financed. Information linking capital expenditures to finance providers is key to improve understanding of progress towards the goals of Article 2.1c.

6.1 ESTIMATION TECHNIQUES WILL BE NEEDED TO ASSESS THE ALIGNMENT OF ALL FLOWS

Greater insight into flows from corporate actors and their financiers are needed to understand investment in a given sector across the whole economy. Investigations could start from the ownership of physical assets and links of ownership of registered companies. Company financial statements, where they are publicly available, contain information on capital expenditures (Jachnik et al., 2019; Mistura, 2019). This may offer greater detail on the type of activity being financed than sector or economy-wide statistics, but information is not standardized. The operational and capital expenditures of individual firms linked to new polluting assets can be used to make assumptions about the sources and instruments of finance.

Developing new approaches that do not rely on project-level datasets will be necessary to address high-emissions finance in non-energy sectors. Global mitigation targets cover almost all sectors and industries. Appendix 1 explores examples of activities which should be considered in tracking high-emissions financial flows in key emissions sectors. Investments in assets and activities across the breadth of the economy are not always delineated clearly as individual projects.

Bespoke methods will be needed to address each. While investments in fossil fuel supply chains are available from commercial data providers such as Rystad, Wood MacKenzie, or GlobalData, there are no providers of standardized global data on new buildings. For example, transport systems are sometimes reported in national statistics but not disaggregated into specific projects or activities, making it difficult to isolate high-emissions components such as diesel-fueled rolling stock. Agriculture, forestry, and land use is more ambiguous since asset-level criteria for 'high-emissions' activities are equivalent to a complex typology of practices across the sector. One approach is to identify companies with the most significant business interests in practices which generate high-GHG emissions (such as deforestation for industrial farming) and in effect to label all finance to and expenditure by those companies 'high-emissions' (e.g. Global Witness, 2019). However, this will fail to identify finance for specific activities enabling laggards to make significant and necessary improvements in their practices (amounting to large volumes of 'transition finance').

CPI intends to continue work to track the progress of high-emissions financial flows across more sectors over coming years. However, further research is still needed to form a typology of financial flows which harm adaptation efforts.

6.2 PUBLIC AUTHORITIES SHOULD MANDATE DISCLOSURE OF, AND SET PROVISIONAL THRESHOLDS TO DETER, HIGH-EMISSIONS INVESTMENT

Comprehensive analysis of the sources and intermediaries of high-emissions finance demands greater transparency. In particular, reporting requirements for corporations should be strengthened to require companies to disclose details on emissions linked to particular assets and activities. At a minimum, public institutions should lead by example and improve their own disclosure practices, which are often patchy (Oil Change International, 2020). This would enable better decision-making and use of scenario analysis to assess alignment with Paris.

Regulatory regimes have an essential role to play in shining a light on high-emissions finance. Since the most pronounced data gaps are among large corporations and flows of finance through their balance sheets, improving corporate disclosures is the most direct route to better coverage.

Current capital expenditures, even in industries which produce high volumes of emissions, are not covered by the recommendations of the Taskforce for Climate-Related Financial Disclosures (2020). National jurisdictions making these disclosures legally mandatory should nevertheless require a breakdown of capital expenditures by activity type, which would allow analysts to trace (or at least estimate) the link between corporate finance and specific high-emissions assets. Requiring financial institutions to report emissions which result from activities or assets which they do not own but which are impacted in their value chain (i.e. Scope 3 emissions) can act as another lever (PCAF, 2020). This would incentivize investors and banks to catalyze better corporate disclosure practices through robust, consistent engagement and lending standards.

Technical thresholds for *high-emission*s assets should be developed to fill the gap in sustainable finance taxonomies and facilitate better reporting. As our review of leading taxonomies shows, thresholds for defining harm to climate objectives are still needed to make comprehensive assessments (EU TEG, 2020b). In light of the economic crisis precipitated by COVID-19, many are calling for an 'international coordinated response supporting sustainable economic frameworks governed by harmonized criteria' (Natixis, 2020). While this is politically and methodologically challenging, and significant resources are still being devoted to implementing green taxonomies, some institutions are taking steps towards a 'common, coherent, and scientifically credible framework' to differentiate transition finance from assets with no pathway to zero-emissions (CBI, 2020b). Nevertheless, it is an essential part of the puzzle to advance actions from public and private actors towards net zero goals.

National or regional strategies can provide working definitions but must go beyond green and climate finance. Governments may propose assets which, in a specific context, facilitate the low-carbon transition vis-à-vis those which undermine climate goals (e.g. I4CE, 2019) when no substitute low-emission alternatives exist. Interim 'high-emissions taxonomies' of this sort would recognize the importance of contextual factors in shaping decarbonization pathways and promote debate over the proper impact of these factors. As the EU Taxonomy exemplifies, frameworks must be adaptive and open to revision as best practice and technologies evolve – whether updated according to countries' progress along decarbonization pathways or harmonized according to scientific standards.

7. APPENDIX 1: GHG EMISSIONS BY SECTOR AND ACTIVITY IN THE IPCC FIFTH ASSESSMENT REPORT

The power sector is a major contributor to greenhouse gas emissions because of the role of electricity and heat demand in other sectors. However, activities and assets producing high GHG emissions across the whole global economy are distributed among several major sectors, as the following table shows. Further work and additional methodologies will be needed for each.

SECTOR	DIRECT EMISSIONS (% OF GLOBAL TOTAL)	INDIRECT EMISSIONS VIA ELECTRICITY & HEAT DEMAND (% OF GLOBAL TOTAL)	MAIN ACTIVITIES (% CONTRIBUTION TO SECTOR TOTAL)
Energy systems	34.6	1.4	Electricity & heat production (73) Fossil fuel extraction & distribution (17) Petroleum refining (9)
AFOLU	24.0	0.9	Land use changes & Forestry (40) Enteric fermentation & manure management (30)
Industry	20.9	10.6	Ferrous & non-ferrous metals (21) Chemicals (15) Cement (13)
Transport	14.1	0.3	Road (72) Aviation (11) International & coastal shipping (9)
Buildings	6.4	12.2	Residential (68) Commercial (32)

Source: *IPCC (2014, IEA 2020a)*

Behind these aggregate global numbers lies significant variability of emissions at the country level. Furthermore, long-term emission trends vary by sector and geography. Whereas sectors like transport recorded steady GHG emission growth between 1970 and 2010, others have faced uneven variations with recent peaks (Industry, Energy). While most OECD/high income countries completed the bulk of their industrial growth prior to 1970 (and thus the growth of their industrial GHG emission), in many countries (including some of the largest global emitters) it is still ongoing. The largest increase was seen in Asia: resulting in a 40% rise in industry GHG emissions (including indirect GHG emissions) from 2005 to 2010. OECD countries recorded a 6% cut over the same period.

The IPCC 5th Assessment Report provides more details on the activities responsible for significant GHG emissions within each sector. However, when it comes to identifying specific assets responsible for the high GHG emitting activities, only value chain approaches allow for comprehensive analysis. The following list of high GHG emission activities in each IPCC sector focuses on upstream and downstream implications.

- **Energy systems:** Electricity and heat production are responsible for 72.6% of the sector's GHG emissions, and fossil fuel power plants (Coal, Gas, Oil, Combined Cycle…) are commonly accepted high-emission assets. Fossil fuel extraction and distribution and petroleum refining are the next major source activities. Any assets within these two value chains could be considered as a high-emission asset.
- **Transport:** As 94% of the transport final energy demand comes is from oil, many activities in this sector are duplicative of those from upstream fossil fuel production. Beyond direct fuel emissions, further up the value chain vehicle manufacturing and infrastructure construction enable these high GHG emitting activities (in addition to the potential GHG emissions inherent to their industrial production processes).Factories producing energy-inefficient transport vehicles can be considered high-emitting assets in the transport value chain.
- **Buildings:** Due to buildings' high electricity and heat consumption, the sector's GHG emissions are heavily determined (65% in 2010) by indirect emissions from energy sector assets. Similar to transport, the main driver of GHG emissions is the energy-efficiency level of end-use assets. Finally, some buildings may have high GHG emission construction costs because of the materials they are built from.
- **Industry:** Like buildings, the sector accounts for significant indirect GHG emissions due to high electricity and heat demand. However, direct emissions are more substantial, and some sub-sectors stand out, including ferrous and non-ferrous metals; chemicals (mainly ethylene, ammonia, nitric acid, adipic acid, caprolactam); and cement. Moreover, use of industrial products such as synthetic fertilizers entail significant downstream GHG emissions allocated to the AFOLU sector.
- **AFOLU:** Enteric fermentation is the main source of agriculture GHG emissions (32-40%), followed by manure deposited on pasture (15%), synthetic fertilizers (12%), and paddy rice cultivation (9%). These numbers reflect the industrial scale of specific sub-sectors and the intensive implementation of some agricultural practices, both causing great environmental harm. The main categories in Forestry and Land Use GHG emissions include deforestation, shifting cultivation, and industrial logging.

8. APPENDIX 2: PRINCIPLES AND METHODOLOGY FOR TRACKING HIGH-EMISSIONS FINANCIAL FLOWS

8.1 SCOPE

CPI's methodology for tracking global financial flows to climate-related activities, employed here, captures total global primary financial transactions and investment costs of new physical assets, as well as components of activities that directly contribute global emissions (CPI, 2019). Investments that fund renovations or upgrades and thereby prolong the lifetime of underlying assets are also included.

Flows capture funds committed to projects at the date of financial close where it falls in 2017 or 2018. Institutions tracked include development finance institutions (DFIs), governments and their agencies on the public side, and commercial financial institutions (banks), non-financial corporations, and investors on the private side. Finance from governments' domestic budgets are not covered. The instruments used include grants, debt issuance, and equity investment.

8.2 DATASET CLEANING AND AVOIDING DOUBLE-COUNTING

Since datasets contain some of the same projects and transactions, they were sorted into an order of priority. Projects from datasets lower in the order are removed for double counting. The order was determined by the completeness and detail of information provided in each dataset, including on asset-level metrics describing financed power plants (capacity, technology type), exact financial commitments by specific institutions, and financial instruments.

Research and investment in manufacturing for development of high-GHG assets would both be excluded on the basis of tracking only primary investment, as would revenue support mechanisms like direct subsidies to fossil-fuel-fired electricity generation facilities or below market-rate land leasing for fossil fuel exploration, since all of these flows represent double-counting with project construction costs.

Following the Global Landscape methodology, risk management instruments (such as guarantees and insurance) are excluded from the figures reported by category below, in order to avoid double counting with the insured investments.

Data were also checked manually for accuracy and consistency – for instance, desk research to fill in missing capacity information or changes to technology types. Where possible,

resources from each database were used to cross-reference transactions to build a more complete picture. To attribute capacity additions to specific sources of finance, the total capacity of each project was split pro-rata according to the proportion of the total project cost covered by each institution.

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