Paris Misaligned: An Assessment of Global Power Sector Investment

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CLIMATE POLICY INITIATIVE

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ABOUT CPI

CPI is an analysis and advisory organization with deep expertise in finance and policy. Our mission is to help governments, businesses, and financial institutions drive economic growth while addressing climate change. CPI has six offices around the world in Brazil, India, Indonesia, Kenya, the United Kingdom, and the United States.

SECTOR

Power, Transport

REGION

Global

KEYWORDS

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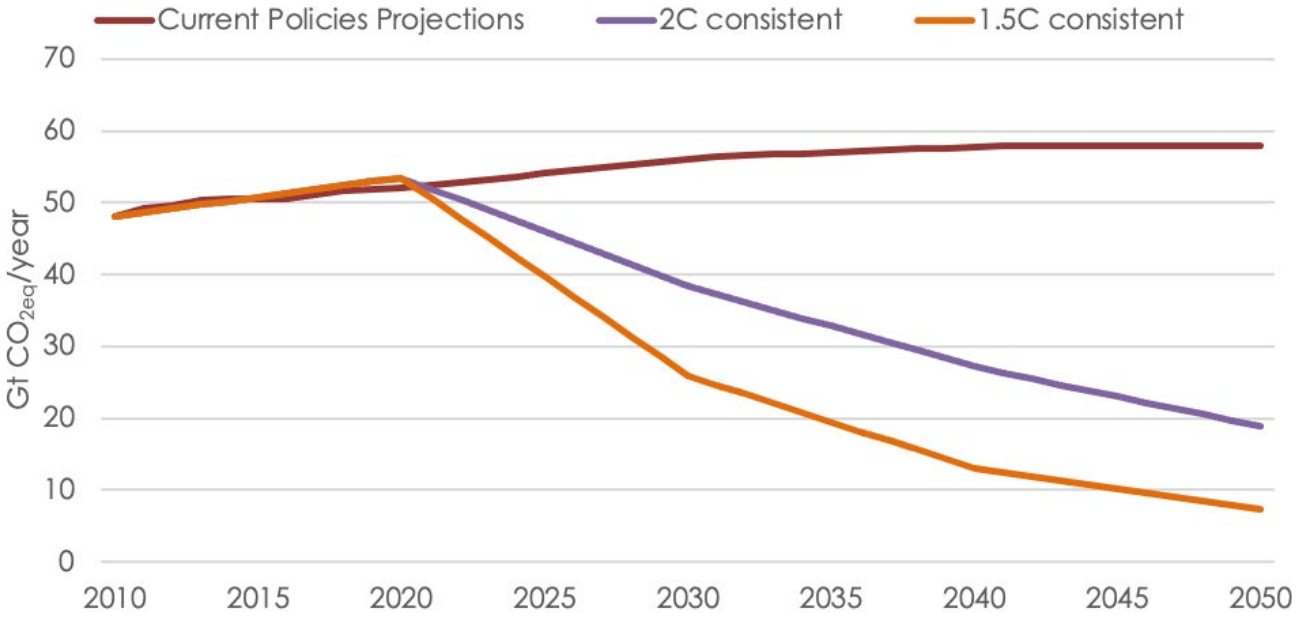
1. INTRODUCTION

To avoid the catastrophic effects of a >2°C rise in global mean temperature, more ambitious efforts are required. Investment in low-carbon, climate-resilient technology must be deployed at scale, while investment in activities generating higher carbon emissions and harming adaptation efforts should be phased out as quickly as possible. Global greenhouse gas (GHG) emissions must be cut 7% per year between now and 2030 to limit warming to 1.5°C. In such a scenario, global GHG emissions in 2030 would be as low as 26 GtCO2eq, less than half of 2020 levels, as seen in Figure 1.

Figure 1: Emissions reduction pathways required to limit global temperature rise to 1.5 ˚C



Source: *CAT, 2020*

Article 2.1c of the Paris Agreement calls for finance flows "[to be made] consistent with a pathway towards low greenhouse gas emissions and climate-resilient development." To meet this challenge, all financial actors (financial institutions and corporations) must align their practices, investments, and portfolios with climate goals, mitigate risks related to climate change, and seize opportunities for growth through climate-smart investment.

While stress testing for physical climate risks is becoming an essential component of prudential risk management (L&G, 2019, Mitchell et al., 2020), physical risk is not the only type of climate threat facing companies. Negative climate impacts associated with the provision of finance to carbon-intensive activities are increasingly exposing firms and investors to transition and litigation risks as well. Investing for a scenario compatible with temperature increases below 2˚C is both a fiduciary and business imperative, necessary to avoid the destruction of physical, human, and natural capital. In addition to mitigating downside risk, climate-smart investment strategies can also help investors capitalize on growth opportunities in new low-carbon technologies and sectors (Mercer, 2019).

These market incentives are increasingly driving investors to track the impacts of their real asset investments[1], including GHG emissions, to understand whether their activity is compatible with international climate goals (Kessler et al., 2019). This push for impact measurement and reporting will require organizations to create and apply new information, tools, and strategies to measure not only exposure to climate risks, but also the extent to which their investments are consistent with Paris temperature goals, or "Paris-aligned" (in a narrow interpretation of the term). A number of initiatives have emerged to promote new impact tracking approaches and assist institutions in applying these approaches to their own portfolios. Examples include the Partnership for Carbon Accounting Financials (PCAF, 2020), to measure emissions funded by financial institutions; the Paris Agreement Capital Transition Assessment (PACTA; 2 Degrees Investing, 2020), to assess alignment of equity and fixed income portfolios; and the UNEP Finance Initiative's Corporate Impact Analysis Tool, to provide a 'holistic analysis' of company-wide impacts (UNEP FI, 2020a).

This paper breaks new ground for assessments of Paris alignment, complementing existing approaches by examining the alignment of the most recent investment decisions rather than focusing exclusively on existing asset stocks. Such decisions directly drive deployment of new assets that will operate for decades to come alongside existing, "locked-in" assets. Further development of this new-investment alignment approach is key to understanding the evolution of financing practices in response to climate objectives.

Our findings hold important practical implications for public and private actors, with the potential to shape policy and investment decision-making processes. A growing body of research focuses on evaluating the alignment between the current energy mix and the decarbonization milestones required for countries and regions to limit global temperatures, including the potential for new and existing dirty power plants to become stranded assets as the transition speeds up (e.g. Bodnar et al., 2020; Carbon Tracker Initiative, 2018; Pfeiffer et al., 2018.). However, new approaches like ours are required to analyze how Paris alignment goals and the overall decarbonization challenge are integrated into due diligence processes used to evaluate new investment opportunities.

Chapter 2 of this paper applies a new science-based method – introduced in CPI's analytical paper "*A Proposed Method for Measuring Paris Alignment of New Investment*" – to assess the alignment of new power sector generation investment with different temperature scenarios, including trajectories compatible with the Paris Agreement. While previous approaches have focused on assessing how existing assets and portfolios fit into broad taxonomies of activity or project type, our approach evaluates the alignment of new investment based on asset-level transaction data, breaking out new power sector finance broken out by geography, actor type, and technology type, enabling granular assessments of Paris alignment (see Box 1 for a more detailed overview of the method). We have applied this methodology to:

- **The power sector, which accounts for about one third of global emissions (IPCC, 2018; ClimateWatch, 2020), and for which high-quality data are available.** Asset-level transaction data are available for almost all renewable investment and 23% of fossil

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.

fuel investments in 2018[2]. Further, full decarbonization of the power sector by 2050 is a crucial component of both the 1.5˚C and 2˚C IPCC scenarios (IPCC, 2019).

- **The transport sector, with our analysis restricted to the U.S. automotive sector as a proof of concept for the methodology.** Globally, the transport sector accounts for approximately more than one-fifth of emissions (ClimateWatch, 2020), of which over two-thirds are from road transport (IPCC, 2014), and is therefore the next priority for analysis after power.[3]

Chapter 3 concludes the paper by going beyond the analysis of trends and patterns observed in recent power sector investment to explore several concrete solutions and recommendations that public institutions, private financiers, and service providers can implement to drive progress toward Paris alignment. These recommendations chapter draw on our analysis in the preceding chapter, along with an extensive review of the literature exploring incentives and levers for power sector decarbonization from the perspective of utilities and financial actors. The subsequent analysis provides a starting point to explore systemic linkages between the financial sector and the real economy that drive the observed alignment outcomes.

Our study's underlying methods, analytical findings, and corresponding recommendations are directed toward several different groups, including:

- **Public- and private-sector investors such as commercial lenders, insurance companies, development finance institutions, and international donors**, to conduct due diligence and risk assessment for their (global, regional or country-level) financing for new power sector assets according to their alignment with Paris goals.
- **Financial regulators**, to identify investments likely to become stranded in particular jurisdictions, which might inform precautionary measures to disincentivize new finance for those assets.
- **Policymakers**, to understand the extent to which future electricity demand must be met with clean power, which could help shape policies for the early retirement of fossil fuel power plants and their replacement with renewable, and the removal or repurposing of fossil fuel subsidies. Moreover, finance and business ministries can use our methodology to understand how different groups of actors and their investments are contributing to alignment or misalignment of the power sector in their country and take actions to encourage or disincentivize those finance flows.

It is important to note that the methodology used in this paper focuses on the alignment of financing for new assets and the role of locked-in emissions – both fundamental drivers of changing emissions patterns and Paris alignment progress in the real economy that are often overlooked by initiatives measuring and encouraging the alignment of existing asset portfolios.

2 CPI's "Improving Tracking of High GHG Finance in the Power Sector"

3 Expenditure on electric vehicles had surged in the second half of the last decade (CPI, 2019). However, the impact of this growing demand on emissions from the whole vehicle fleet – and correspondingly on the sector's chance of meeting Paris-aligned targets – has not been studied. We focus on the U.S., for which good sales and technical vehicle data are publicly available, to develop an analysis that could be replicated in other countries.

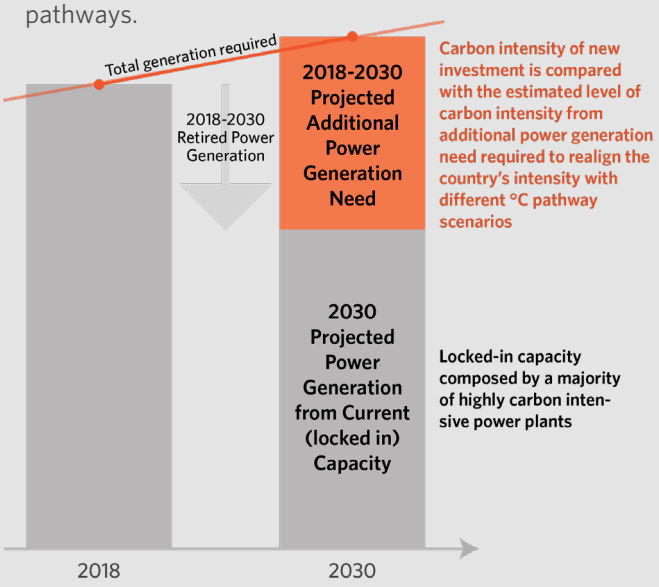
The alignment metrics and outcomes presented in this paper should be interpreted as the preliminary results of the first application of our proposed methodology. The complexity of the topic, the continuing evolution of methodologies to assess financial alignment, and several other caveats discussed in Box 1 all highlight the need for further discussion and testing of our methods. Nevertheless, our conclusions are broadly supported by existing literature on decarbonization in the power sector, as referenced throughout.

Box 1: Overview of the approach and key assumptions

The challenge – The goal of the Paris Agreement is to keep global temperature rise below 1.5 - 2ºC. This will require a collective systemic effort to achieve such goals, regarding the financial system as a fundamental force to drive investments which are "aligned" with the Paris goals.

The approach - The method used to assess alignment of new investment in this paper relies – in the current version - on 2017/18 data from the Global Landscape of Climate Finance (Buchner et al, 2019), IEA power sector scenarios, asset datasets such as Platts, and technology-specific assumptions to estimate the CO2 intensity that new power plants and vehicle fleets must achieve to ensure country- or region-level alignment with different decarbonization scenarios. Importantly, this calculation also considers existing, locked-in power sector assets (net of modeled decommissioning and scrappage over time). In short, the carbon intensity thresholds calculated imply that new assets added to the system must in effect compensate for emissions from locked-in carbon intensive assets; only in this way can true systemic alignment be achieved (see Figure B-1).

Figure B-1: Determining the level of carbon intensity of additional power generation required to align country/region specific carbon intensity with different temperature pathways.



More specifically, carbon intensity thresholds are calculated for all IEA's temperature pathways, resulting in four distinct alignment statuses:

- "Aligned," corresponding to temperature rise below 1.8°C, compatible with Paris goals (<1.8°C)
- "Somewhat Misaligned," corresponding to temperature rise below 3.2°C but above 1.8°C (1.8°C - 3.2°C)[4]
- "Very Misaligned," corresponding to temperature rise above 3.2°C (>3.2°C)
- "Extremely Misaligned," corresponding to temperature rise well above 3.2°C (>>3.2°C)

These carbon intensity thresholds are then used as a benchmark to assign a temperature alignment pathway to carbon intensities observed (in aggregate) in new investments. Where significant capacity is locked-in, strict carbon intensity requirements under ambitious temperature pathways may generate a negative carbon intensity threshold, implying that development of new carbon-free assets should also be accompanied by retirement of existing high-carbon generation stock. We do present negative thresholds as such when they occur, which is important as they illustrate the needs for the sector. However, for the purpose of assigning temperature pathways we set the carbon intensity thresholds floor to 0, as data on carbon-negative activities[5] are not covered in this study.

4 The "Somewhat misaligned" term has been chosen to make sure that enough distinctions are made between the different temperature pathways. However, it is important to highlight that temperature increases above 1.8°C, even where below 3.2°C, are already associated with significant negative long-term climate impacts.

5 Carbon-negative activities: Project activities contributing to the removal of CO2 emitted (e.g. Carbon Capture and Storage, energy efficiency).

This way carbon-positive activities[6] are coherently compared with carbon-positive thresholds.

A look at 2030 in the "decade of action" – Despite the availability of scenarios for several milestones ranging between 2025 to 2040, this paper assesses alignment of current flows relative to 2030 targets. There are several reasons for this choice: 1) the need to use a single reference year for comparison and simplicity in presenting results, 2) the opportunity to use a reference year compatible with the time horizon challenge set by the IPCC (2019), which identified the first pathway milestone in 2030;[7] and 3) the need to avoid high uncertainties associated with longer-term scenarios, which are likely to change significantly to account for new policy adjustments and new investment decisions that lock in new capacity and associated emissions.

From technology-level alignment toward country/regional, or global-level aggregate alignment – This paper presents results in two forms: First by showing alignment as the result of the carbon intensity of individual projects ("technology-level alignment"); second, by comparing new power investment's carbon intensities, aggregated at the country/region[8] or global level, with respective temperature pathways ("country/region-level alignment", and "global-level alignment"). This second approach aims to show how finance, and specific types of financial actors, are aligned – in terms of aggregate investment choices[9] - with scenario pathways for a given geographical scope of reference. In fact, individual project investment decisions, whether individually aligned or not (e.g. in a taxonomy), will ultimately – in the real world - converge on one temperature increase scenario, as the nature of climate change itself requires.[10] In this regard, our analysis complements technology-level classifications based on taxonomy approaches (e.g. thresholds set In the EU Taxonomy).

Caveats – One key limitation of the study is that while comprehensive data on transaction sources and destinations of renewables investment were available from CPI's 2019 Global Landscape (Buchner et al, 2019), most global fossil fuel investment (77%) and all nuclear energy investment had to be estimated due to limited availability of transaction-specific data in 2018.[11] Due to the varying sources, natures, and levels of detail in the data collected, this paper presents figures for both total investment (tracked + estimated) and tracked investment alone (excluding estimates of some fossil fuel and all nuclear investment figures). A second caveat is that the model built and used to test our approach in this Brief is currently half dynamic, half static. Locked-in emissions decrease dynamically over time, but we use a static scenario year (2030) to assess alignment of 2018 investments. What happens in-between, or after that, is not currently assessed. As such, alignment thresholds deriving from the analysis here presented – while introducing key elements of carbon budget accounting– should not be interpreted as the result of a full carbon budget assessment through 2030, but as a first fundamental step in that direction, and a realistic benchmark for 2030. A final caveat is dependency on underlying scenarios. While the IEA scenarios we use have been broadly cited and applied by development banks and NGOs, these scenarios have sometimes received criticism for their limited ambition relative to decarbonization needs, and for representing only one possible version of possible country-level decarbonization trajectories.

See "A Proposed Method for Measuring Paris Alignment of New Investment" for more information on the approach used in this paper.

6 Carbon-positive: Project activities contributing to carbon emissions (e.g. all energy generation projects), whose contribution cannot be less than zero.
7 Global net anthropogenic CO2 emissions decline by about 45% from 2010 levels by 2030, reaching net zero around 2050 (IPCC, 2019).
8 Country-level alignment is critical to understand how individual efforts 'add up' to achieve necessary levels of global decarbonization.
9 Scenario based approaches applied to portfolios also follow a similar approach, in which organizational alignment with a sector-specific pathway is judged by looking at its overall emission contributions, which are not broken down by the contributions of individual investment choices.
10 IPCC's estimate of temperature rises – while relying on complex models accounting for the impact of multiple sectors (projects within these sectors) – ultimately converges towards a single temperature range (where the range itself is the result of uncertainty).
11 See "*Improving Tracking of High-GHG Finance in the Power Sector*"

2. POWER SECTOR ALIGNMENT

Up to 30% of new power investment in 2018 was used to develop fossil fuel plants, putting the world on a temperature trajectory of over 3.2°C and locking in additional carbon emissions.

Despite strong growth in finance for renewables in recent years, the ratio of dirty to clean capacity funded by new investment remains far too high. Our database tracked USD 295 billion of annual asset-level investment in power generation in 2018, rising to USD 440 billion when including additional investment aggregated by technology and region (i.e. investment for which asset-level data were unavailable). Sixty percent of this total, at USD 263 billion, was invested in new renewable electricity generation capacity, driving the installation of close to 200 GW of new capacity[12], while USD 47 billion (15GW) was estimated to be invested in nuclear energy. However, high-emissions power finance totaled USD 129 billion in the same year, funding over 100 GW of new capacity.

To assess the alignment of this new investment, we looked first at the carbon intensity (the amount of emissions per unit of electricity produced) of the existing power generation fleet. Currently, high-carbon assets still account for the majority of both capacity and generation in the global power sector. The IEA World Energy Outlook (WEO) shows that total installed capacity was 7,200 GW in 2018, with fossil fuel capacity accounting for 59% of this total. By generation, fossil fuel plants provided 64% of the global electricity supply in 2018. Coal accounted for the highest proportion of global generation by fuel type, at 38%, followed by natural gas (23%) and hydropower (16%). The combined share of electricity generation from all renewable sources totaled 26%, while nuclear provided an additional 10%, for a total of 36% carbon-free generation.

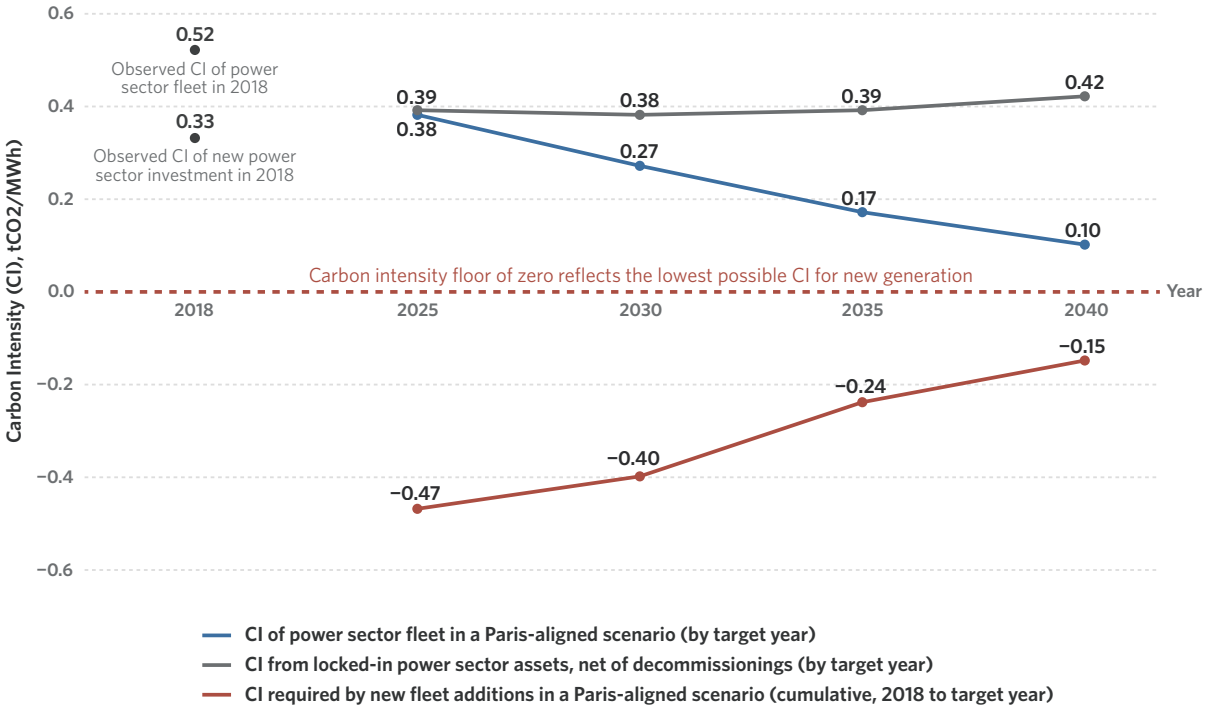
With the high carbon intensity of the existing fleet as a baseline, continued financing of fossil fuel assets keeps carbon intensity well above the levels required by a Paris-aligned decarbonization scenario. The carbon intensity of global 2018 investment in new power plants was 0.33 tCO2/MWh, below the existing fleet figure of 0.52 tCO2/MWh.[13] Yet, as shown in Figure 2, the carbon intensity of this 2018 new investment was 20% higher than the level the entire energy system needs to achieve by 2030 to meet the IEA's Paris-consistent, 1.8˚C scenario, at 0.27 tCO2/MWh. By 2040, the global emissions rate for the power generation fleet must drop to 0.10 tCO2/MWh to be Paris-aligned.[14]

The gap widens further when accounting for locked-in capacity. In this case, target carbon intensities required for new investment to realign the overall fleet with Paris goals are negative, due to the need to overcome locked-in emissions. This means that massive new

12 Small-scale, distributed energy and solar water heaters are excluded from this total, to ensure consistency with the IEA's scenarios. This produces a discrepancy with renewable finance reported in the Global Landscape. this is a high estimate, due to CPI's unique public finance datasets.
13 A Carbon Intensity (CI) of 0.33 tCO2/MWh was calculated using both transaction specific datasets and estimates. The CI drops to 0.14 tCO2/MWh when calculated only using transaction specific datasets.
14 The Sustainable Development Scenario, which gives a high chance of limiting global temperature rises to 1.8˚C. The SDS has some shortcomings, discussed in the second brief in this series, but is the leading scenario possessing the scope of data to enable our global analysis

investment is required not only to add zero-carbon generation, but also to actively remove emissions to compensate for the carbon emissions from the existing, locked-in fleet and achieve alignment.[15]

Figure 2: Global carbon intensities (CI) of 2018 power finance vs. future year alignment targets



Note: *Carbon intensity (CI) is here defined as the ratio of total power sector emissions to total electricity output. Here we compare actual 2018 CI of new power sector investment and the overall fleet (**black dots**) with the estimated CI of the power generation fleet over time required to be in line with Paris goals (**blue line**); estimated future CI from the existing fleet as power plants retire over time (**gray line**, increases slightly over time due to nuclear plant retirements in 2030s); and CI required on average by new investments between now and future year alignment targets (**red line**). The Carbon intensity floor (**dashed red line**) is used to determine alignment with a Paris-aligned emissions trajectory. To achieve alignment, new generation investment must hit this floor (i.e. all new generation investment must be zero-carbon). CI targets for Paris alignment are negative rather than zero due to the need to retire locked-in high-carbon assets in addition to building new zero-carbon generation. See Box 1 for more information.*

To measure the alignment of power sector investment we use a floor for carbon intensity thresholds to allocate power sector investment to different scenario pathways, as explained in Box 1, and more extensively in the linked methods paper in this series.[16]
This zero-emissions floor is in line with power sector investment tracked within this work, which includes aligned activities such as solar and wind generation that, by nature, cannot produce emissions rates below zero.[17]

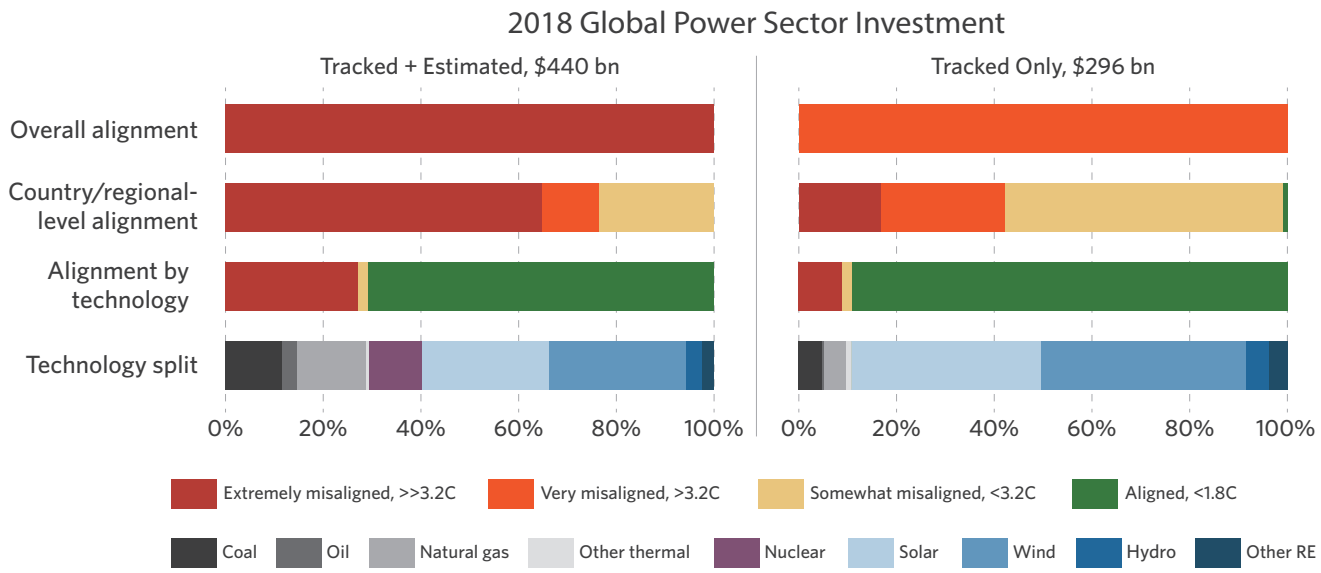
Taking the carbon intensity of new investment, aggregated at the country or regional level, flows of new investment in 2018 were at best "very misaligned" with Paris targets, and "extremely misaligned" at worst. See Box 1 for alignment status definitions.

15 The decrease in the CI thresholds of new finance required for Paris alignment derives from the fact that the farther away we look, the more (mainly) carbon intensive capacity - currently operating and locked into the electric grid - will be decommissioned, and the lower the need for new capacity to compensate for locked in emissions.
16 Brief 2: "*A Proposed Method for Measuring Paris Alignment of New Investment*"
17 If carbon-negative activities were also tracked in this work, the floor to carbon intensity thresholds would have then be removed, and negative thresholds used where appropriate.

- In an optimistic scenario,[18] tracked finance for power projects is on a "very misaligned" pathway in the aggregate.[19] When new power sector investments are aggregated at the smallest geographical grouping possible with available data, we find that less than 1% of such investment is compatible with country- or region-specific, Paris-consistent decarbonization pathways. Furthermore, 17% of new power investment is "extremely misaligned" at the country/region level.
- In the worst scenario,[20] the majority of new investments in power is "extremely misaligned" when aggregated at the country/region level.

At first glance, there appears to be a disconnect between the high proportion of renewable investment and the tiny percentage of finance aligned when aggregated at the regional level. This gap is caused by the scattering of fossil fuel investments across multiple geographies, combined with the generally higher utilization factor of fossil fuel technologies. Because all zero-emissions generation taken alone is technically aligned with Paris targets and all fossil fuel finance is misaligned to some extent, any amount of fossil fuel finance directed to a specific region pushes that region's aggregate carbon intensity profile above zero, resulting in misalignment.

Figure 3: 2018 global power sector finance alignment status and technology split



This figure shows the alignment of global investment flows. For both total investment (tracked + estimated) and tracked-only investment, the graph shows, from top to bottom:

***Overall alignment:** Alignment of all investment worldwide with global temperature pathways;*

***Country/region level alignment:** Alignment of investments aggregated by country/region with corresponding country-specific, or region-specific temperature pathways;*

***Alignment by technology:** Alignment of technologies with different temperature pathways; and*

***Technology split:** The share of investment flowing to various generation technologies.*

Figures 8 through 12 show the same four categories, broken out by individual investor types.

Figures 14 through 22 show the same four categories, broken out by investment source country.

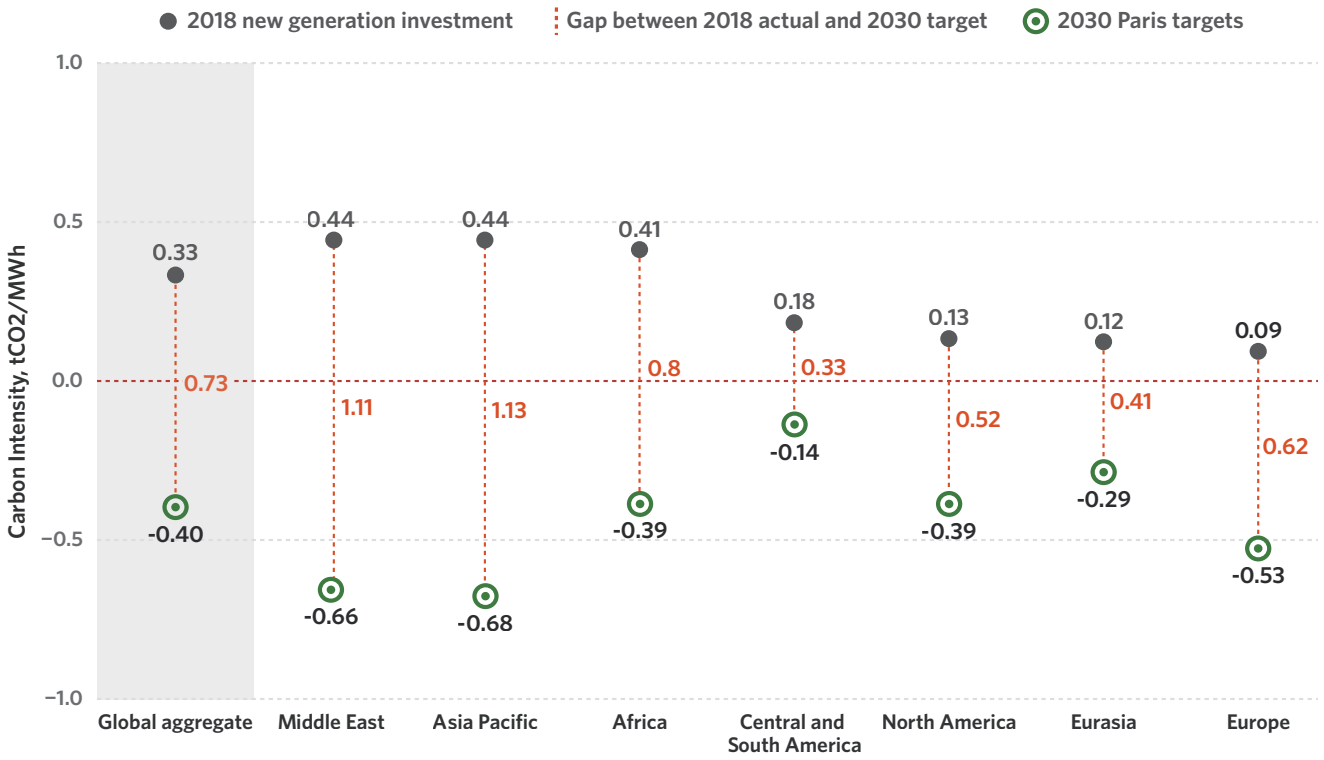
18 Where alignment estimates are calculated looking only at investments from high-quality asset-level datasets for which transaction specific data is available.

19 Details on the transaction-level datasets used for the analysis, as well as estimates used to fill the data gaps are described in Box 1.

20 When we include both tracked finance from our datasets and estimated finance from the IEA.

While investing in new zero-carbon generation is critical, the primary challenge in attaining Paris alignment in the power sector is addressing locked-in emissions from existing fossil fuel generation. Under Paris-aligned IEA scenarios, 2030 target carbon intensities for new investment are below zero for all 22 regions and countries considered in our analysis.[21] Therefore, anticipated future carbon emissions from existing assets must be prevented or offset for those regions to achieve climate goals. Figure 4 illustrates the gaps between the (negative) 2030 carbon intensity required for new generation and the actual carbon intensity of new generation added in 2018 for seven geographic regions, as well as the aggregated global figures.

Figure 4: Target 2030 vs. actual 2018 carbon intensities for power sector alignment (tCO2e/MWh)



The dashed red line represents the "Carbon Intensity Floor" of zero carbon emissions. To achieve alignment, new generation investment would have to hit this floor (i.e. all new generation investment must be zero-carbon). 2030 emissions targets are negative rather than zero due to the need to retire locked-in high-carbon assets in addition to building new zero-carbon generation.

These large gaps between the carbon intensity of new 2018 generation and the target 2030 intensity across all regions illustrate the importance of not only continuing to ramp up zero-carbon power investment, but also of swift action to accelerate the decommissioning and replacement of high-carbon capacity. Halting the financing of new fossil fuel capacity, and accelerating the retirement of existing coal, oil, and natural gas plants are critical to achieve the overall negative carbon intensities required for Paris-aligned power sector investment. A study by Cui et al. (2019) estimates that for alignment to a 2°C scenario, coal capacity would have to decrease 36% by 2030, driven by asset retirement after 30-35 years of operation, 10-15 years before the end of normal service life for many pants. A 1.5°C goal would instead

21 Despite target carbon intensity thresholds being negative for most countries, in calculating the alignment of investments, we set a maximum minimum carbon intensity target of zero, so countries where only renewable generation investments are being made will count as aligned. The reason – explained further in the methodological brief 2 – is that we are only able to track new investments in the power sector which determine a positive contribution to carbon emissions (e.g. emissions can be 0 or higher). Should our tracking methods be expanded to include energy sector investments in negative emissions projects (e.g. carbon sequestration projects), we would then be able to remove the "zero" lower bound for carbon intensity thresholds used for the comparison.

require a 94% reduction in capacity by 2030 and an anticipated retirement after 15-20 years of operation, 25-30 years before the end of normal service life. Additional measures needed include further development of innovative carbon sequestration approaches such as CCUS,[22] implementation of ambitious energy efficiency projects, and a scale-up of carbon offsets, provided that stringent guidelines are established for their use (see paragraph 4.3.2).

However, a look into the evolution of utilities' asset portfolios over time (Alova, 2020) suggests that 12% of them (mainly in the U.S. and China) are deliberately prioritizing the development of gas and coal capacity, and the vast majority (75%, mainly European firms) are failing to respond actively to the decarbonization challenge. Many companies that prioritized the growth of renewable capacity also simultaneously expanded investment in fossil fuel assets, particularly natural gas, exposing themselves to transition risk (see Box 2). According to the Transition Pathway Initiative's research on 70 major global electric utilities, only 29 currently incorporate climate risk and GHG management into their core operational and strategic practices, indicating that much of the sector has yet to confront challenges in embedding climate considerations throughout company practices and targets beyond market-driven growth in renewables investment (TPI, 2020).

Box 2: Transition risk for electric utilities

Utilities with high shares of fossil fuels are on track to suffer significant losses resulting from their inaction under all possible temperature scenarios, including business as usual. A net-zero scenario would expose fossil fuel facilities to significant financial loss as thermal coal use is eliminated and demand for oil and gas declines sharply. Even in an over 3°C business-as-usual scenario, utilities are expected to suffer annual losses of up to 7.7% on fossil fuel assets even though this projection is subject to a higher degree of uncertainty (Mercer, 2019).

Stronger climate regulation and rising carbon prices present significant and increasing transition risks for utilities, particularly those with substantial fossil fuel-generation assets (S&P Global, 2020). Additional threats to the traditional utility business and operating model stem from the increasing adoption of distributed generation and smart grids, the declining cost of renewable power below the operating cost of existing fossil generation, and the growing policy and industry push for cleantech.

Despite the risks associated with the development of new fossil fuel capacity, our data show significant new utility investment in fossil fuel power. By continuing to build, operate, and maintain high-carbon assets, utilities are threatening their own medium-term profitability and even their long-term solvency.

2.1 REGIONS AND COUNTRIES

Continued investment into new fossil fuel generation, along with the high emissions rate of the existing global fleet, is putting most countries off track for 2030 carbon intensity targets, even with rapid renewables growth.

To progress toward Paris goals, countries need to embrace a holistic approach to alignment. However, there is sometimes a discrepancy between domestic policies and financial

22 Carbon Capture, Utilization and Storage

regulation, which often translates to a disconnect between domestic and international finance. This chapter looks at country-level trends from two perspectives.

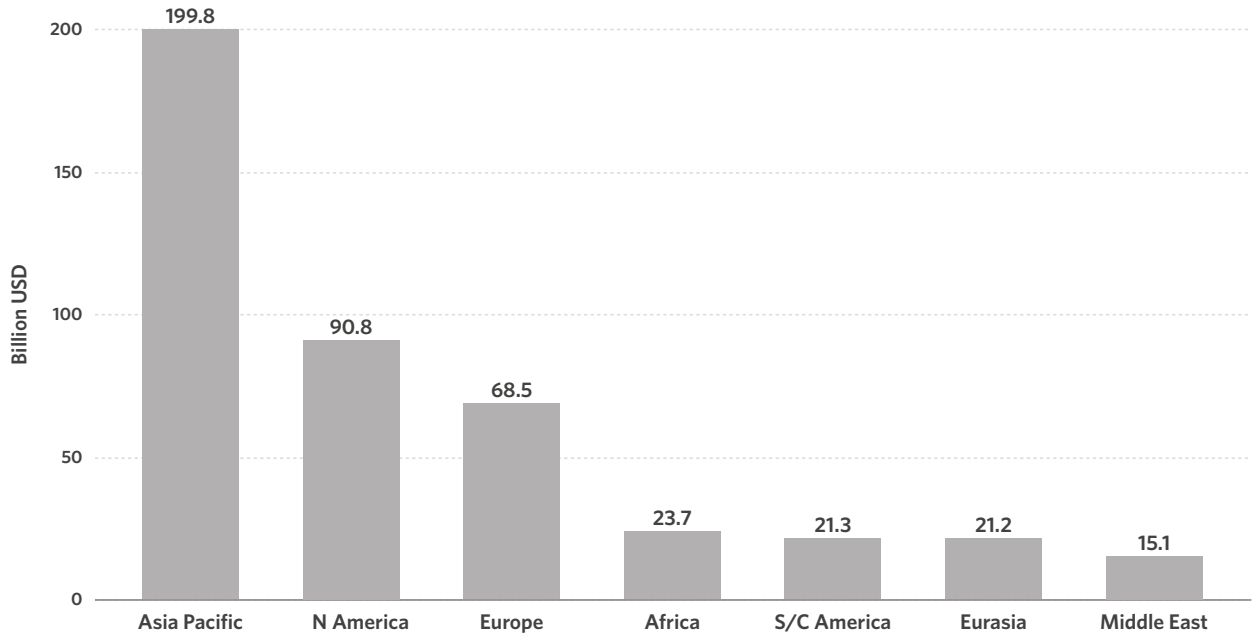
- Alignment by recipient region, to understand how power regulation in some countries is shaping investment in the sector at the country level
- Alignment by source geography, to understand how investors based in specific countries are aligning with Paris goals, supported by financial regulation

2.1.1 REGIONS AND COUNTRIES AS RECIPIENTS OF FINANCE

While renewable capacity is growing rapidly in almost all geographies, key regional differences exist in both total volume and types of power sector investments. At the regional level (see Figure 5), Asia Pacific saw by far the most power sector investment in 2018, at almost USD 200 billion, of which 70% funded new zero-carbon generation, with coal accounting for the majority of the remaining investment. North American capacity additions came second with USD 90 billion and were dominated by renewables, with 42% of finance funding solar power and another 32% flowing to wind, followed by natural gas at 17%. Europe followed closely behind, with USD 68 billion in total finance, 53% of which was in wind energy with another 16% in solar.

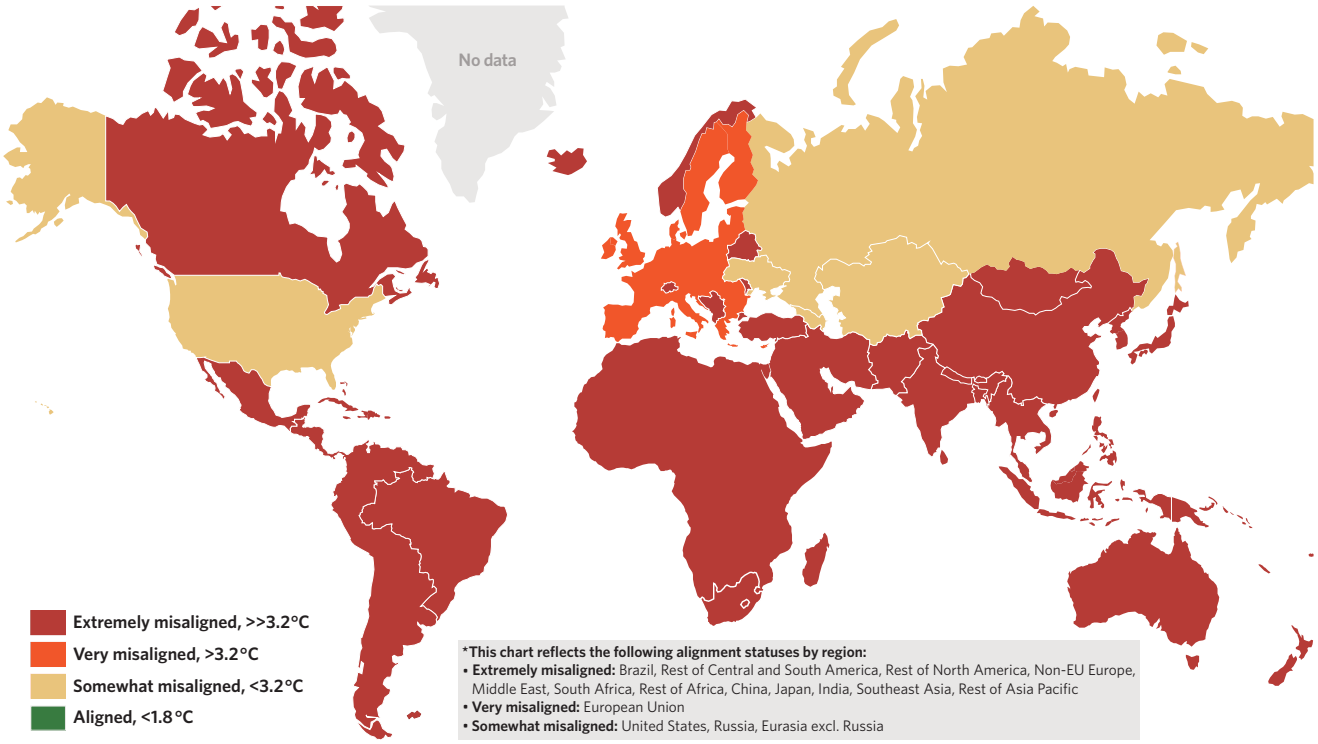
No other region received total investment over USD 25 billion in 2018. Total investment in Africa (USD 23 billion) and South and Central America (USD 21 billion) was relatively evenly distributed, with natural gas, solar, and wind each accounting for between 15% and 28% of regional totals. Africa also received significant finance for coal, while the remainder of finance for South and Central America flowed to hydroelectric projects. Power sector finance in Eurasia (including Russia, USD 21 billion) and the Middle East (USD 15 billion) was dominated by fossil fuel plants, with 61% of Eurasia's investment going to natural gas and 68% of Middle East investment split almost evenly between natural gas and oil.

Figure 5: New 2018 power sector investment by destination country/region



When locked-in emissions from existing generation are considered, no country or region is currently making the necessary progress to reduce financing for new fossil fuel capacity and compensate for emissions from the existing generation fleet, both of which are required to meet Paris goals. Figure 6 summarizes alignment and misalignment statuses of aggregated new power investment across some of the world's largest economies. Misalignment at country level was worst in Asia, with China, India, Japan, and South Africa on extremely misaligned trajectories. Despite their carbon-intensive existing assets, these major economies still invested heavily in high-emissions fossil fuel power in 2018, locking in further emissions growth even as sharp decreases in power sector emissions are required to achieve Paris alignment. China's coal-fired fleet continued to expand, India received greater investment in fossil fuels (USD 13 bn) than renewables (USD 10 bn) during 2018, while renewable energy in Japan received USD 5 billion, versus USD 6 billion for fossil fuels. At the regional level, Africa (0.41 tCO2/MWh), the Middle East (0.44), and Southeast Asia (0.48) also added especially high-carbon generation in 2018.

Figure 6: Degree of alignment and implied temperature pathways of new power investment in major countries and regions



On the other hand, the emissions profiles of new power investment in the European Union[23] member states (0.02 tCO2/MWh) and the U.S. (0.14) were comparatively low. Countries in these regions registered carbon intensities below the levels required for the IEA 3.2ºC scenario, but still above the 1.8ºC Paris-aligned scenario targets despite the growth of robust renewable energy markets in both regions. Investment in Russia was also "somewhat misaligned," mainly due to an delayed decarbonization pathway under the IEA scenarios, which provides for minimal near-term carbon emissions followed by much sharper reductions later on. In this case, alignment targets become much more restrictive after 2030, meaning that the country should seek to decarbonize more quickly than initial targets indicate to facilitate a smoother low-carbon transition.

23 The EU is treated as a single regional unit in IEA data.

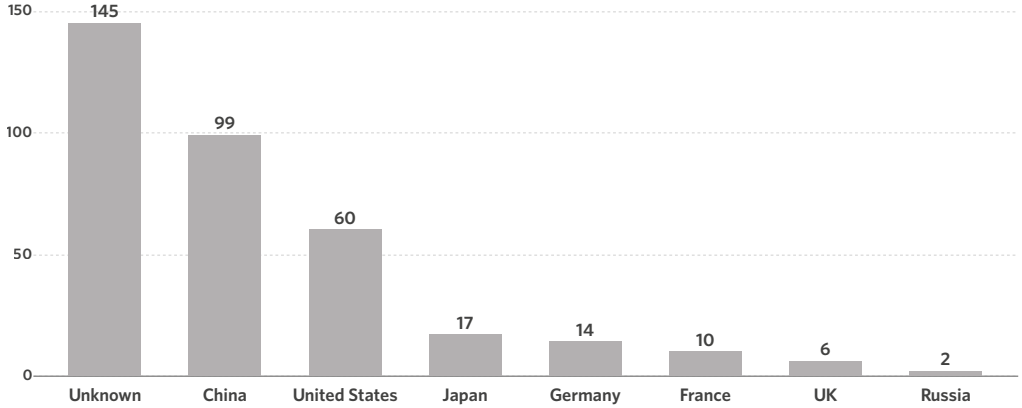
While rising energy demand plays a role in rapidly depleting carbon budgets, misalignment is largely attributable to lagging policy responses to climate change, particularly in some high-emitting economies. Current national policy frameworks are still not sufficient to drive changes in the real economy needed to fulfill the Paris Agreement. While nearly all countries have committed to substantially reducing greenhouse gas emissions, very few are enacting policies compatible with a 2˚C scenario, mainly where not economically dependent on carbon-intensive industries (CAT, 2020; S&P Global, 2020). On the other hand, high-emitting countries such as India are opening coal mining to private investment as they prioritize energy security[24], risking substantial further growth in the coal industry (IEA, 2020a). In Japan, despite international leadership in clean energy innovation including hydrogen, marine energy, and green ammonia (Crow, 2020), domestic energy projects favor fossil fuels, partly as a result of active policy engagement by corporate actors in carbon-intensive industries (InfluenceMap, 2020). However, at time of publication, recent net-zero emissions pledges from China, South Korea, and Japan (Financial Times, 2020) could portend a shift away from these countries' current climate policies and dynamics, and toward more explicit support for a low-carbon energy transition.

Lack of meaningful policy action on climate is compounded by ongoing subsidies for fossil fuel production and consumption. Between 2015 and 2019 fossil fuel-based electricity globally received an average of USD 127 billion annually in consumer subsidies, such as reduced tariffs or rebates (IEA, 2020b). Eighty percent of such subsidies are from developing countries, including China, Iran, Mexico, Russia, Egypt, Indonesia, Saudi Arabia, Venezuela, South Africa, and India. While electricity subsidies can in some cases support energy security, industry protection, support for the poor, and other social benefits, they often promote chronic dependence on uncompetitive fossil fuel-based power plants.

2.1.2 REGIONS AND COUNTRIES AS SOURCES OF FINANCE

Most finance for power projects originates just in a handful of countries: The United States, China, Japan, the European Union (as well as single actors within the EU such as Germany, and France), and the UK. In this section we examine how these countries' investments[25], taken in aggregate at the level of destination countries or regions, align with Paris-compatible emissions pathways.

Figure 7: 2018 power sector investment by country of origin (USD bn)

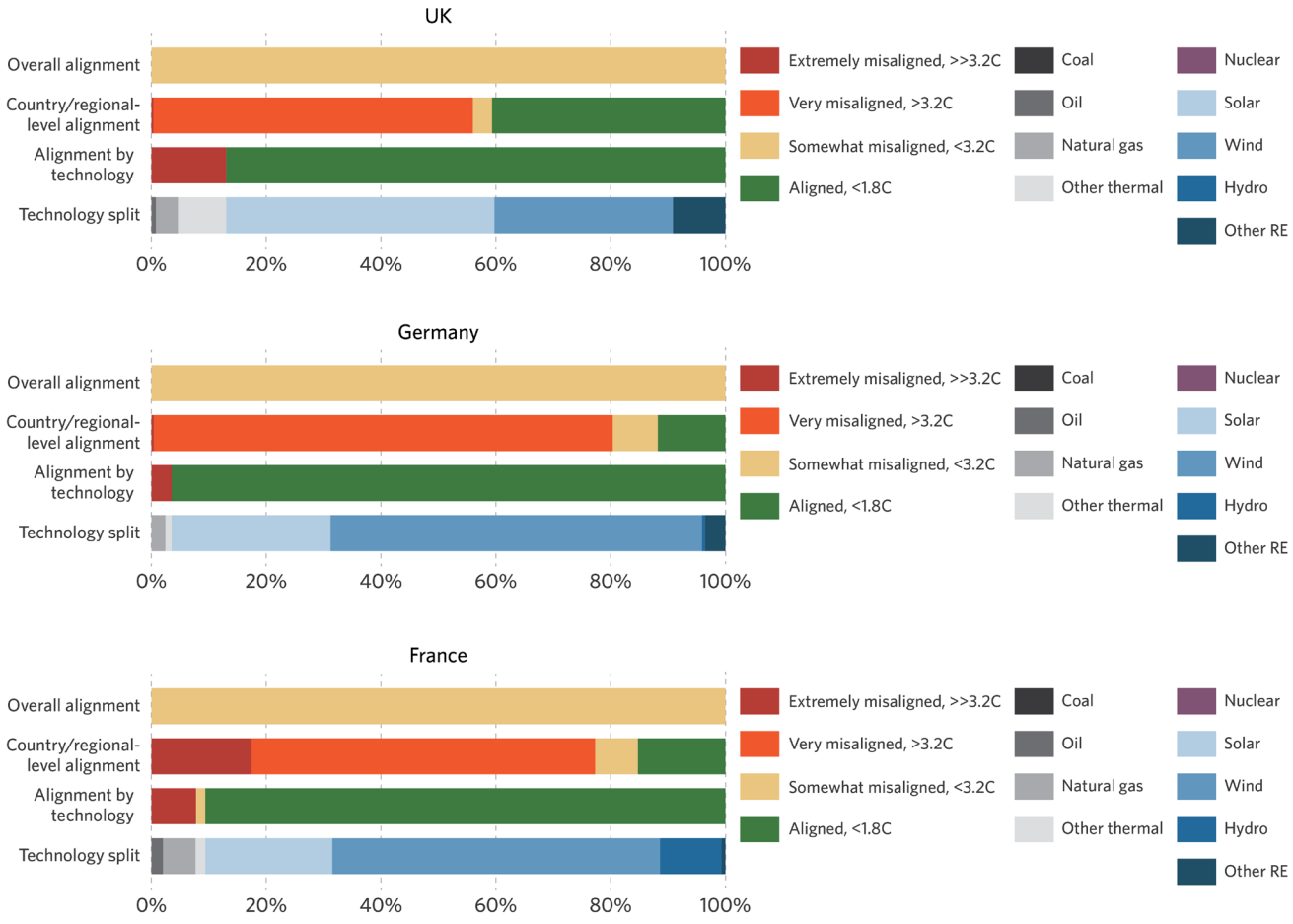


24 India provided energy access to 700 million people between 2000 and 2018.
25 Both domestic and international investment is here considered.

Investment flows originating in Europe are more aligned with the Paris Agreement, in part due to progressive regulation, particularly on climate risk disclosure and carbon pricing.

Overall, financial institutions based in the European Union are only "somewhat misaligned" with Paris goals, mainly due to a small number of thermal projects pulling the average emissions factor for new generation slightly above zero, both within the bloc and in other regions, especially Africa and the Middle East. The UK and Germany led the pack among European nations, with 41% of the USD 6 billion in UK-sourced new power investment fully compatible with country/specific Paris-aligned temperature scenarios, followed by 12% alignment of Germany's USD 14 billion. Investors in France were responsible for USD 9 billion in power finance, matching Germany's 12% alignment. However, while under 1% of finance from the UK and Germany was "extremely misaligned," 15% of French investment fell into this category, mainly due to private financing for natural gas plants in North America and Southeast Asia.

Figure 8: Alignment status and technology split of finance from the UK, Germany, and France (breakdown of 2018 investment)



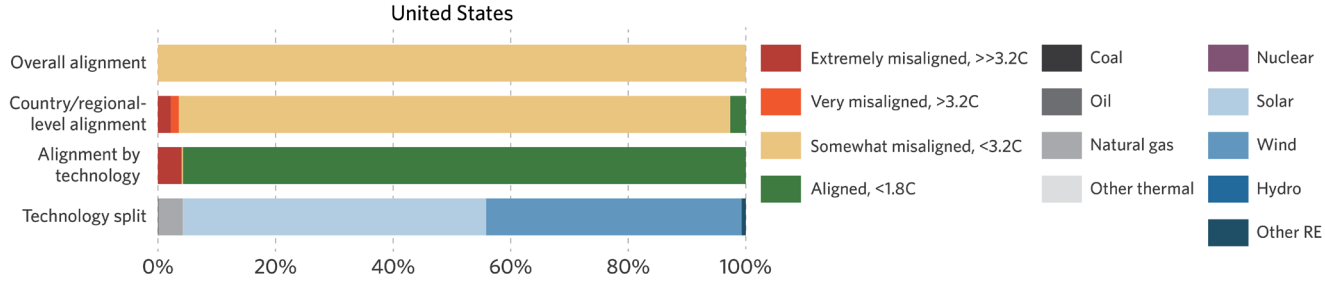
Progress in financial regulation is partly responsible for these trends and is likely to continue as some countries build out and implement regulatory frameworks for climate risk. The EU continues to advance its Sustainable Finance Agenda, including the development of a sustainable finance taxonomy and increased disclosure requirements (Mitchell et al., 2020; Nagrawala et al., 2020), and at least ten other nations or regions have expressed interest in adopting the taxonomy (Mitchell et al., 2020). Financial regulators are also increasingly

requiring investors to consider, disclose and effectively price climate-related risks (Nagrawala et al., 2020; Mercer, 2019).[26]

In the rest of the world, countries' sectoral strategies have held back progress toward both domestic and international alignment.

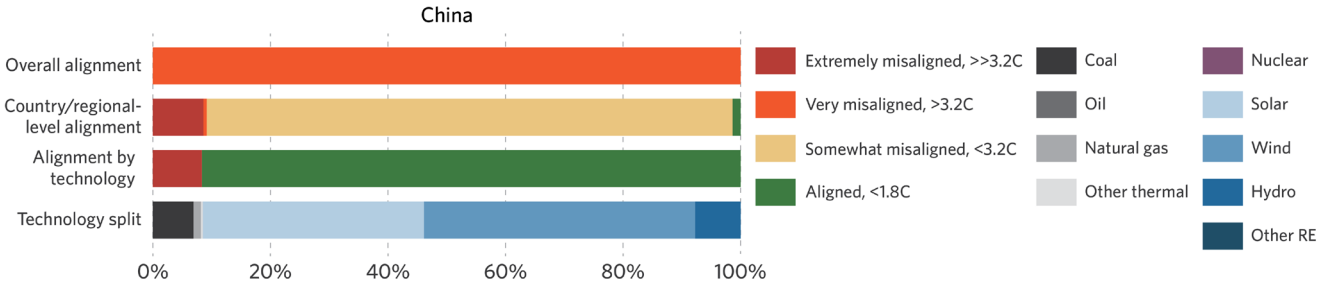
The USD 60 billion in investment originating from the U.S. is "somewhat misaligned" with Paris goals in the aggregate, with only 3% of new power investment having carbon intensities compatible with the recipient country's Paris-aligned pathways.

Figure 9: Alignment status and technology split of finance from the United States (breakdown of 2018 investment)



China's USD 99 billion in 2018 power sector investment is mainly "very misaligned," with only 1% of finance aggregated by country or region having carbon intensities in line with the respective recipient country's Paris-aligned scenario. In China, the Securities and Regulatory Commission has issued guidelines requiring listed heavy polluters to provide more specific information on emissions, to be extended to all listed firms by the end of 2020 (Mercer, 2019), but the country remained the source of the highest volume of fossil fuel finance in 2018, reflecting both its domestic energy plans and its substantial finance for international infrastructure through the Belt & Road initiative.

Figure 10: Alignment status and technology split of finance from China (breakdown of 2018 investment)

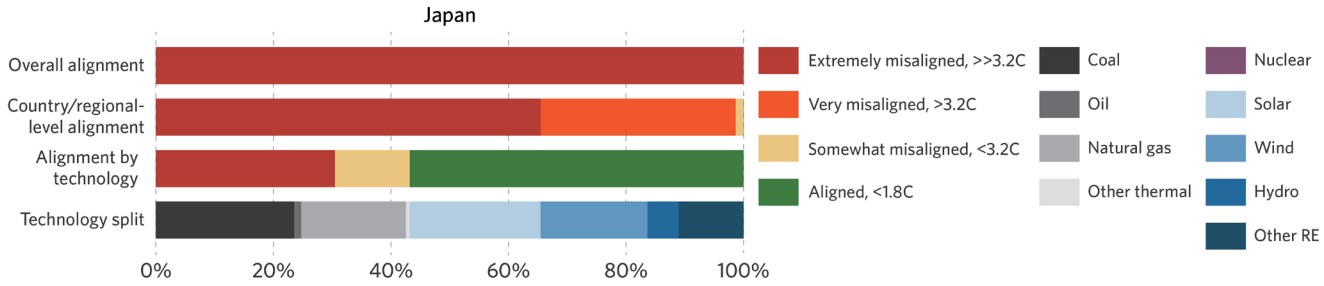


Overall, finance provided by Japanese investors is "extremely misaligned" with Paris-aligned pathways, with finance for fossil fuel power generation flowing mostly home, but also abroad to Southeast Asia and Latin America. Japan's government has recently (May 2019) launched a consortium open to all Japanese TCFD signatories with the aim of facilitating corporate climate risks disclosures, joined by several Japanese companies

26 E.g. the EU directive on Institutions for Occupational Retirement Provision (IORP) and the UK's Department for Work and Pensions also require pension funds to assess climate risk in their investment decisions (Mercer, 2019).

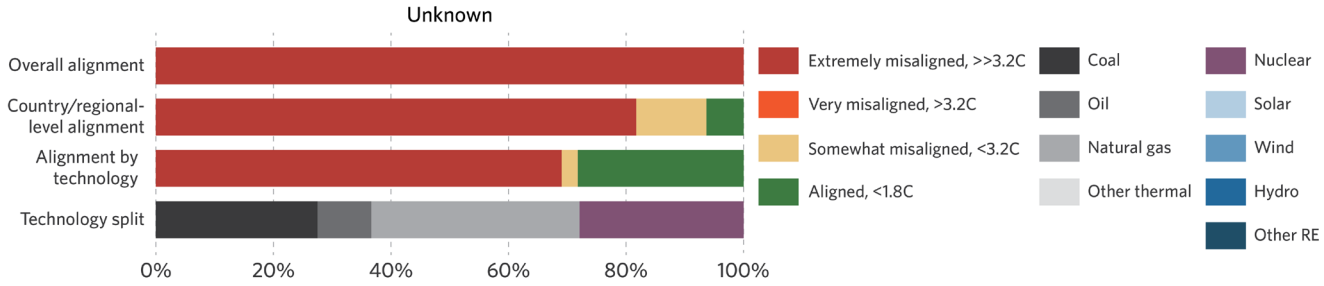
(Nagrawala et al., 2020). However, Japan's 2018 Strategic Plan still promotes relatively high-efficiency fossil power plants, while the Japan International Cooperation Agency (JICA) offers explicit support for 'efficient' coal in its definition of 'low-carbon' finance (E3G, 2019).

Figure 11: Alignment status and technology split of finance from Japan (breakdown of 2018 investment)



Finally, it is important to note that no source country could be identified for 41% of tracked 2018 power sector finance, a higher amount than any individual source country total at USD 145 billion. Unknown-source finance is extremely misaligned with Paris targets, and would likely cause a greater degree of misalignment among specific countries of origin if it could be attributed as such. For example, the alignment assessment that appears above for the United States may be optimistic if a significant portion of the misaligned finance from unknown sources is actually originating in the USA. See Box 3 for more information on unknown-source financing.

Figure 12: Alignment status and technology split of finance from unknown source country (breakdown of 2018 investment)



2.2 INVESTORS

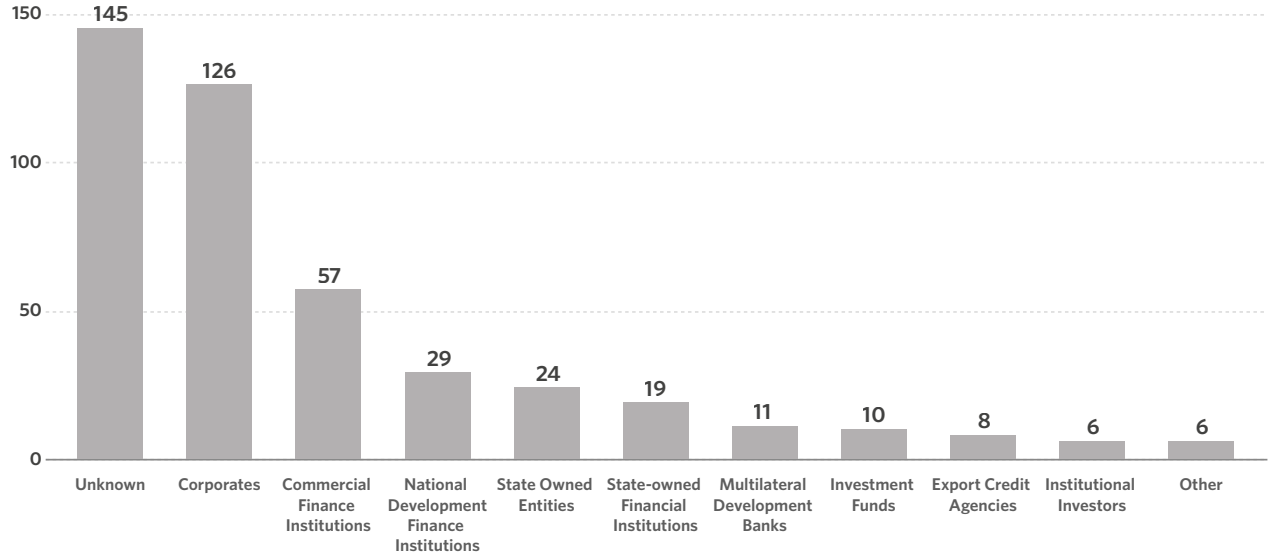
For investment patterns to change, actors need to understand the impact of their financing decisions on countries' decarbonization efforts. This section of the analysis provides this information, examining finance provided by specific groups of institutions and evaluating the alignment statuses of these groups of institutions.

No investor category engaged in investment flows which, taken in aggregate, were fully aligned with countries' or regions' pathways to meet Paris goals. However, large differences exist between the volume and degree of alignment of finance provided by different types of institutions, resulting from different strategies and mandates, regions of focus, and internal risk management practices across institution types.

However, the large amount of finance for which it was not possible to determine a source suggests that the findings presented for categories of identifiable institutions are

optimistic, or upper-bound estimates of how those groups are performing. Data gaps limit the confidence with which we can draw complete conclusions about particular actor groups. Where granular data linking the specific sources of finance to projects are not available, we label investment as coming from 'unknown' actors (see Box 3). However, we do know that of the USD 145 billion of power sector investment from unknown sources, 83% was extremely misaligned with country or regional Paris targets. Our conclusions for known sources are therefore more optimistic than if we had complete data.

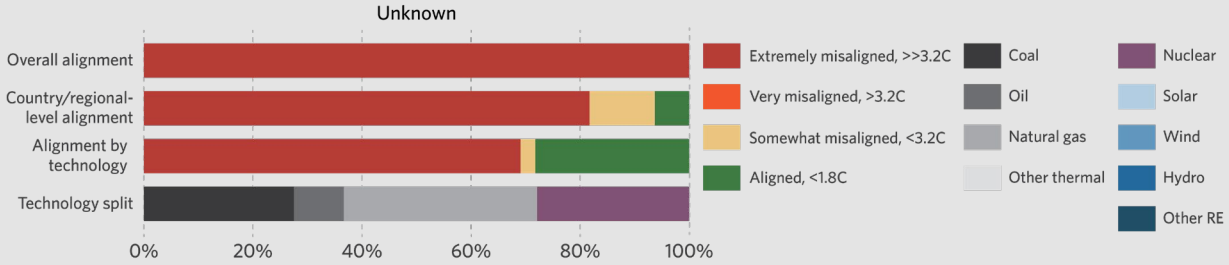
Figure 13: 2018 power sector investment by investor type (USD bn)



Box 3: Unknown sources

A large volume of misaligned investment cannot be traced to source institutions or countries. We estimate the granular high-emissions data collected only account for about a quarter of total 2018 fossil fuel finance.[27] Transaction-level data are not available for the remainder. Our approach to measuring alignment compensates for this by breaking down aggregate estimates of capital expenditures on fossil fuel power at the level of countries or regions,[28] as a result, no information exists on how this finance breaks down by financial institution type.

Figure B-3: Alignment status and technology split of finance from unknown investor types



Much of this untracked investment is likely to come from transactions taking place on corporate balance sheets (including both private and state-owned enterprises), which represent a large share of global power sector investment (IEA, 2019a). Detailed analysis of alignment trends among balance sheet finance is difficult because information is not available on either the specific type of assets being invested in by recipients or the original source of finance to those assets.

27 This number is for 2018 specifically. Granular tracked commitments in 2017 were about twice their 2018 volume. See CPI analytical brief: "Improving Tracking of High-GHG Finance in the Power Sector". However, we used 2018 data for our analysis for compatibility with more recent data on scenarios and the global generation fleet.

28 See CPI analytical brief: "*A Proposed Method for Measuring Paris Alignment of New Investment*"

Companies are not required to indicate a specific use for balance sheet investments, unlike project finance transactions, which are specifically carried out by project special purpose vehicles (SPVs). While this problem also exists for climate finance data, it is especially prevalent when attempting to track high-carbon investments for two main reasons:

There is no incentive for lenders or borrowers to disclose details on climate-harmful financial transactions, as this could be perceived negatively by regulators, politicians, or the general public, while climate-positive transactions might be celebrated and provide reputational benefits for the participants.

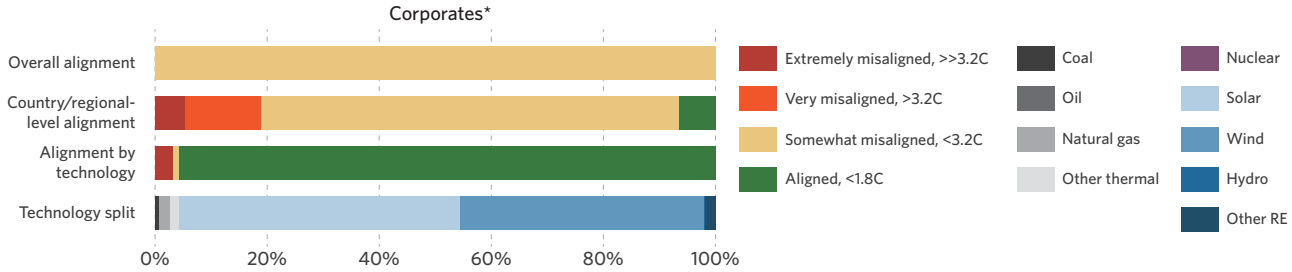
Corporates are less likely to be able to obtain project finance for fossil fuel projects, compared with renewables. While SPVs can offer advantageous financing terms to borrowers by establishing creditworthiness on the basis of project cashflows alone, a growing number of banks prohibit finance for explicitly high-emissions projects, resulting in a move toward less-transparent balance sheet borrowing (RAN 2020).

Better data on corporate climate-related investments are needed to enhance efforts to track alignment. Taxonomies of climate-positive, do-no-harm, or climate-harmful investments and activities help classify transactions which are publicly visible. However, more needs to be done to encourage transparency at balance sheet levels. Regulators, investors, and service providers each have a role to play in driving increased transparency. In Chapter 3 we provide several recommendations to drive corporate strategies away from fossil fuels and promote greater transparency over their progress.

2.2.1 CORPORATES

Much of corporate financing activity in the power sector occurs on firms' balance sheets rather than at the project level, and is therefore difficult to track, as detailed in Box 3: Unknown Sources. Despite these limitations on data availability, we tracked USD 126 billion in 2018 power sector investment by corporate entities (a category that does not include private financial institutions).

Figure 14: Corporate finance alignment status and technology split (breakdown of 2018 investment)



*Significant gaps exist in our corporate investment data. See Box 3: Unknown Sources for further details.

Ninety-six percent of this limited sample of tracked corporate finance flowed to zero-carbon electricity generation, with just 4% invested in fossil fuels. However, investments are in aggregate "somewhat misaligned" with Paris goals and incompatible with alignment pathways in most regions. As in a similar situation to those of other actor groups, small amounts of fossil fuel investment spread across several regions were enough to cause regional misalignment among 93% of finance, with 19% very or extremely misaligned and just 7% aligned at the regional level. Given that much of the actor-unknown finance is also expected to have been provided by corporates through balance sheet equity investment, and that the vast majority of this actor-unknown finance was found to be critically misaligned with Paris targets, the full picture of corporate alignment is likely to be worse.

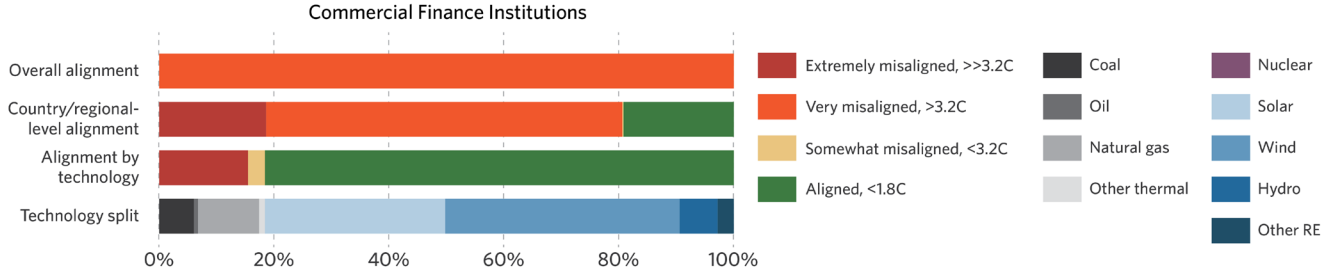
In the same way that banks should be more transparent about the climate risks associated with their lending, corporates should provide more information on the emissions profiles and climate risks associated with balance-sheet investments, in the power sector and beyond. As with financial institutions, corporates can be encouraged or even mandated to comply with these requests for climate disclosure through new regulatory approaches, including modifications to securities laws that give shareholders the right to obtain detailed information on a publicly traded firm's climate impacts and strategy.

Corporate action in the energy sector is crucial, and some meaningful climate initiatives are starting to emerge. Coalitions of businesses such as 'We Mean Business' (2020) champion climate action and encourage energy supply corporations to set net-zero emission targets and adopt impact reporting policies (Ørsted, Iberdrola, NRG). Numerous historical fossil fuel sector companies have also chosen to expand their activities and invest in renewable energy, largely because of increasing investor pressure. Investor coalition Climate Action 100+ has helped major energy companies, such as oil and gas giant Royal Dutch Shell and U.S. electric utility Xcel Energy, to establish clear 2050 net-zero targets and GHG emissions reductions plans. Further, many of these strategies link executive compensation to the completion of corporate climate objectives. However, our findings show that these initiatives must speed up progress toward transitioning away from fossil fuels completely, much sooner than many major utilities and fossil fuel producers have planned.

2.2.2 COMMERCIAL BANKS

The USD 57 billion in finance for power sector assets provided by commercial banks in 2018 was in aggregate "very misaligned". At the regional level, despite 19% of finance having carbon intensities aligned with the recipient countries' Paris pathways, the vast majority (81%) being "very" or "extremely" misaligned. Over 82% of finance to projects provided by this group went to renewable energy, including wind power in the EU, hydro in Latin America, solar in the U.S., and both wind and solar in China. However, commercial banks also provided significant finance for fossil fuel power, including more than USD 2 billion for coal in Japan and other countries in Asia Pacific, and another USD 3 billion to gas plants in the US and Southeast Asia. Since the target carbon intensity of new generation for Paris alignment is zero across all regions, financing even one fossil fuel plant in a given region is enough to cause misalignment. Commercial banks' fossil finance was spread across a wide array of geographies, driving a high degree of overall misalignment when evaluating alignment status at the regional level.

Figure 15: Commercial banks finance alignment status and technology split



The backdrop to misaligned bank finance for power sector projects is the continuing trend of corporate lending to dirty energy. One-third of commercial banks' USD 10

billion in tracked fossil fuel finance went to coal projects, driving significant differentials between target and actual carbon intensities that resulted in more severe levels of regional misalignment. Although many banks are also beginning to phase out coal finance[29], this trend has recently been outweighed by growth in finance for the oil and gas industry (RAN, 2020). Approximately UD 700 billion has flowed each year to corporations involved in the supply of fossil fuels, especially upstream activities including exploration, extraction, and transportation, illustrating that the emergent discussion around managing climate risk (e.g. Eceiza et al., 2020) has not yet translated into concrete policies to avoid locking in high-emissions infrastructure.

Commercial banks' progress to date has largely been in disclosure of climate risk, with less focus on tracking the impact of loans or setting specific, measurable, and transparent decarbonization targets. Sustained delays among banks in setting targets and assessing impacts across their entire loan portfolios will have severe consequences for energy system alignment, as finance continues to flow to fossil fuel projects. A 2020 study conducted by Moody's found that even among the largest banks, only a small portion had established dedicated climate-risk committees or adopted climate stress-testing methodologies (Mitchell et al., 2020).

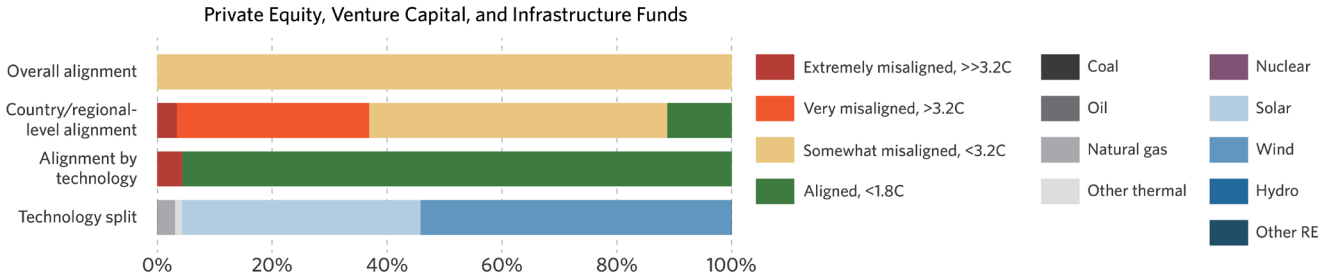
The historical role of lenders is a contributor to this inaction: Bank managers see it as their role to engage with all types of corporate clients while gradually reducing finance for fossil fuels if possible (Raval et al., 2020). However, without actively pushing companies to accelerate the decarbonization process, this strategy will fail to achieve the rapid, low-carbon transition in the stock of energy assets required to align with Paris targets, and will expose banks' loan portfolios to significant transition risk as borrowers default on financing used to construct stranded assets. New impact measurement tools and approaches are essential to link the pace at which companies must decarbonize to specific action items for lenders (e.g. PCAF, 2020). Where the uptake of such tools is slow, regulators must take broader action to hasten a transition away from the most harmful activities.

2.2.3 PRIVATE EQUITY, VENTURE CAPITAL, AND INFRASTRUCTURE FUNDS

Despite the high share of renewable energy investment (96%), finance provided by private equity (PE), venture capital (VC), and infrastructure funds was overall "somewhat misaligned" with Paris goals. Only 11% of their investment, when aggregated at the relevant level, had carbon intensities compatible with the recipient country's Paris-aligned pathways, because of the simultaneous funding of highly carbon intensive projects in regions with limited carbon budgets. Of the USD 10 billion invested in renewables by these funds - 96% of their tracked power sector investment in 2018 - wind led the way at 54%, followed by solar at 41%. Investment was particularly concentrated in North America and Europe, reflecting a blossoming market for climate friendly technologies, especially renewables, in the U.S. (PwC, 2020), and EU countries' progress in integrating green finance policy signals into capital markets. However, funds financed a scattered collection of high-emissions assets over a wide range of locations. Emissions from these new fossil fuel investments are high enough to result in aggregate carbon intensities being misaligned in several regions.

29 Over 100 globally significant financial institutions had implemented a coal restriction policy by the start of 2019 (IEEFA, 2019)

Figure 16: PE, VC, and infrastructure funds finance alignment status and technology split (breakdown of 2018 investment)



Investment funds are generally more agile and better placed to target clean energy investment compared with larger investors because of the distributed nature of many renewable energy and grid modernization projects, including but not limited to distributed generation, energy storage, and EV charging equipment, as well as the rapid growth and evolution of opportunities in the sector compared with more established fossil fuel markets.

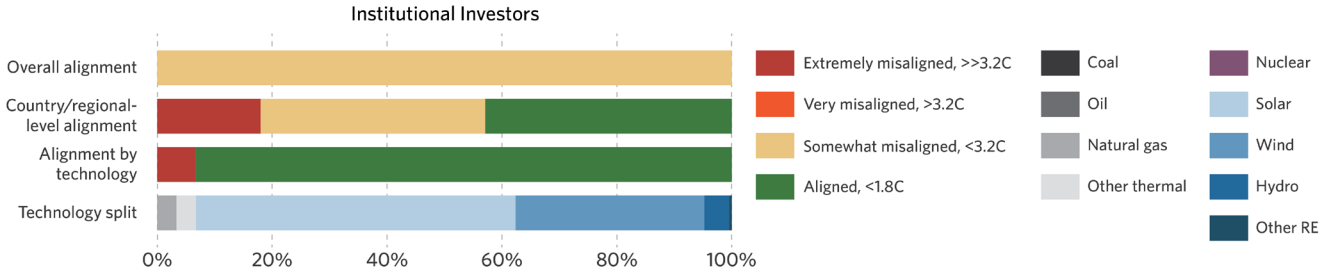
However, it is important to note that different types of funds play different roles in scaling up investment for clean energy.[30] VC funds tend to make early-stage investments, which can aid in the development of new cleantech innovations; however, energy technologies are often capital-intensive and risky, and investment in recent years has favored more established technologies and business models such as energy efficiency (OECD et al., 2018). By contrast, PE funds help to grow established businesses, often obtaining a controlling interest in portfolio companies, a model that has huge potential to mobilize clean energy finance at scale (Intentional Endowments Network 2020). This potential relies upon the industry's ability to pivot away from fossil fuel projects and firms, which many PE fund managers still consider to be attractive investment opportunities (PE Stakeholder, 2020). Infrastructure funds also have huge potential to drive a shift toward a Paris-aligned power sector through investment in and operation of both renewables and enabling assets like transmission and distribution networks and smart city systems (Childs, 2018).[31]

2.2.4 INSTITUTIONAL INVESTORS

The degree of alignment of finance provided by institutional investors[32] was similar to that of investment funds when aggregated by technology type, at 93%, but institutional investment was more aligned at the regional level. While institutional investment in renewable projects has grown over time, it amounted to only about USD 6 billion in 2018, of which USD 5.6 billion flowed to zero-carbon power projects, with wind accounting for three-quarters of this figure. The geographical spread of assets meant institutional capital was entirely carbon-free in a greater number of regions and for a higher percentage of total finance provided compared with investment funds. Aggregated at the regional level, 44% of institutional investors' power sector finance was Paris-aligned.

30 The "investment funds" category groups together private equity (PE), venture capital (VC), and infrastructure funds to maintain consistent data labeling practices.
31 Data limitations prevent the current tracking methodology from accounting for these types of investments, but future iterations are expected to incorporate estimated grid modernization and infrastructure finance as additional data become available.
32 CPI's definition of institutional investors includes asset managers, pension funds, mutual funds, and investment trusts, but excludes banks, which are categorized as CFIs.

Figure 17: Institutional investors finance alignment status and technology split (breakdown of 2018 investment)



While institutional investors performed relatively well on direct project-level investment, they must aim more broadly at aligning their entire asset portfolios, including existing assets under management. Direct investment in the construction of new assets is a marginal slice of total assets under management (USD 87 trillion) owned by institutional investors (CPI, IRENA, 2020), but many of these institutions are likely to be indirectly involved with misaligned investments, either through equity holdings in companies investing in high-carbon powers, or through purchases of bonds whose proceeds fund the development of fossil fuel generation (US SIF, 2020).

Similarly, asset managers – which are responsible for managing large-scale institutional capital – should accelerate adoption of responsible investment practices. A recent survey highlighted that despite growing interest in responsible investment among the category, and recognition of the risks and opportunities associated with climate change,[33] few are leading on all aspects of sustainable investment. The majority are lagging behind in their approach to responsible investment, failing to account for the real impacts of their investments and exposing their portfolios to transition risk (Nagrawala et al., 2020).

Recently launched initiatives such as the Net-Zero Asset Owner alliance (NZAOA) and the Paris Aligned Investment Initiative (PAII) represent solid steps in the right direction. NZAOA members commit to transitioning their investment portfolios to net-zero GHG emissions by 2050, relying on science-based approaches to measure progress (UNEP FI, 2020b). The PAII was launched by the Institutional Investors Group on Climate Change in 2019 to determine how investors can align their portfolios to the goals of the Paris Agreement (IIGCC, 2020), and is currently developing a Net-Zero Investment Framework to recommend actions, metrics and methodologies through which investors can maximize their contributions to Paris goals.

2.2.5 MULTILATERAL DEVELOPMENT BANKS

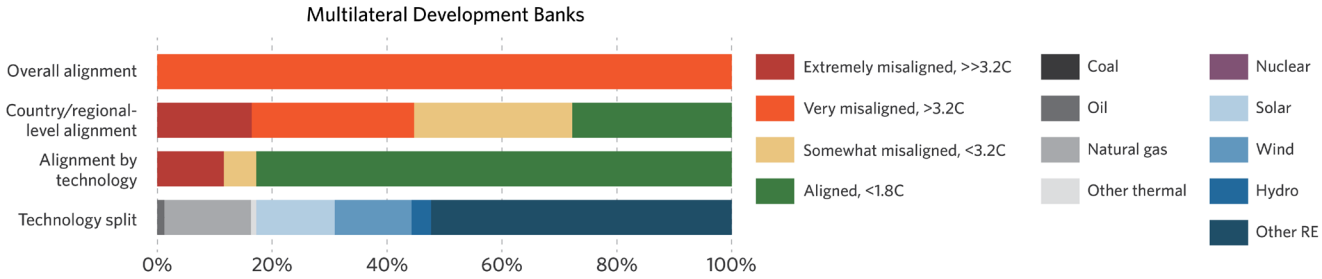
Multilateral Development Banks (MDBs), although farther along the path than some groups, have work to do to achieve Paris alignment in their new investment. MDBs provided USD 11 billion to power sector assets during 2018[34], 80% of which was directed to renewable energy sources. However, MDBs' power sector investment was in aggregate still "very misaligned" with Paris goals at the global level. When considering requirements for compatibility with a Paris consistent pathway at the country or regional level, despite 28% of

33 73% of top firms in the sector support compliance with TCFD recommendations

34 Note that in order to calculate the carbon intensity of commitments, finance for general electricity-sector programs which promote low-carbon technologies, which may be included in totals reported by other sources, has been excluded as specific emissions profiles cannot be established for these programs.

total investment being compatible with recipient regions' Paris-aligned scenario targets, and a similar amount being only "somewhat misaligned," the remaining shares of investments were either "very" or "extremely" misaligned. Alignment was most compromised in the Asia Pacific region due to financing for waste and natural gas projects in China and Southeast Asia that did not meet the emissions profile required under a Paris-consistent trajectory.

Figure 18: MDBs finance alignment status and technology split (breakdown of 2018 investment)



MDBs have a long history of efforts toward increased transparency in climate finance tracking. With the ambition to track progress towards climate finance agreed at COP21, the multilateral development finance institutions have published a Joint Report annually since 2011, reporting climate finance figures based on a jointly developed MDB tracking methodology. This initiative was amongst the first efforts to develop a climate solutions taxonomy, has been gradually updated (MDBs, 2020), and is currently being revised to provide more detailed technical screening criteria.

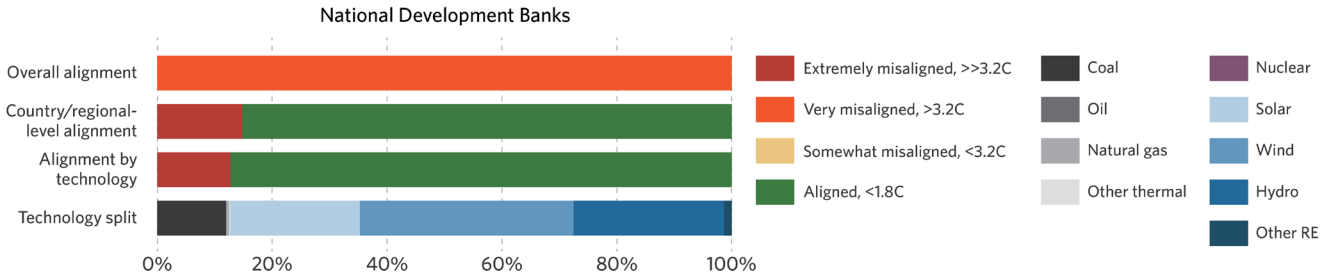
More efforts are needed to discourage fossil fuel finance, reinforcing high-level strategies with robust project approval controls. At the One Planet Summit in 2017, the group of MDBs joined with the International Development Finance Club in committing to align their financial flows with the Paris Agreement (MDBs, IDFC, 2017). However, the proposed steps toward this goal will not be completed until 2023 or 2024 (Sidner et al., 2020). MDBs are pushing past this preliminary understanding in some fields – for example, a higher proportion of MDBs have made efforts to reduce and even exclude financing for coal, relative to national and bilateral DFIs (IEEFA, 2019). These initial steps must be strengthened and built upon to ensure that all projects are assessed for Paris alignment rather than against outdated climate finance eligibility criteria, which may permit projects that appear to reduce emissions but ultimately do not sufficiently transform energy and other systems in the manner necessary for a net-zero world (Brice Affana et al., 2020). Governments or shareholders may need to apply board-level pressure or even change legal mandates for to enable some DFIs to take these steps.

2.2.6 NATIONAL PUBLIC ENTITIES

While our analysis to this point has mainly focused on private and international financial actors, it is imperative to also cover National Public Entities. This is especially true in the policy-driven power sector, where investment from National Public Entities such as state-owned enterprises, state-owned financial institutions, national development finance institutions, and export credit entities amounted to a total of USD 79 billion in 2018. Many of these entities played an important role in the misalignment of global power sector investment in 2018.

Although 85% of the USD 29 billion tracked investment from National Development Banks (NDBs) was compatible with their recipient countries' alignment pathways, NDBs were in aggregate still "very misaligned" with Paris goals. This is due to some "extremely misaligned" finance, concentrated in South Africa (USD 2.7bn) and principally originating from China. Conversely, the vast majority of aligned investment flowed to China (USD 16bn) and the EU, led by USD 4.8bn for solar and wind projects in Germany.

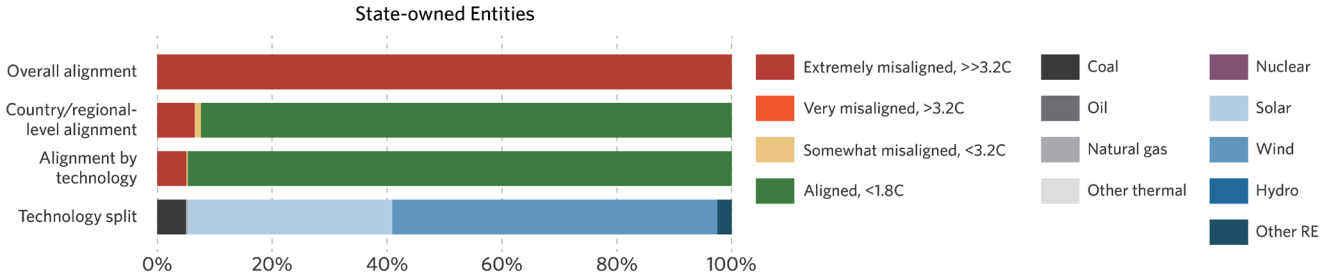
Figure 19: NDBs alignment status and technology split (breakdown of 2018 investment)



NDBs primarily serve to promote the domestic economy by supporting countries' infrastructure development, and other development priorities in areas where private capital is lacking. As the leading public financier of power plants in 2018, and their positioning between government priorities and local financial actors, NDBs are key in shaping a transition to a Paris-aligned power sector (Clark et al. 2019). NDBs are taking some important steps towards increasing climate ambition, particularly through groups such as the International Development Finance Club (IDFC),[35] which have helped to progressively integrate climate priorities within its member institutions with the signing of a Position Paper on Paris Alignment in 2018 (IDFC, 2018) and the establishment of a Climate Facility in 2019 to promote worldwide sustainable development investment (IDFC, 2020). A paradigm shift in these institutions' investment practices has the potential to address their traditionally higher exposure to potentially stranded fossil fuel assets, as observed in China (Norris et al. 2019).

In 2018, state-owned entities (SOEs) provided more than USD 23 billion in power sector finance, which were overall "extremely misaligned." However, 92% of these financial flows complied with the "Paris-aligned" carbon intensity pathways of their recipient country. Important zero-carbon investments were made in China (USD 17bn) and in the EU (USD 2.5bn), with more than USD 1.5 billion flowing to wind projects in Denmark alone. Although SOE investments were carbon-free in most regions, USD 1.6 billion of "extremely misaligned" finance flowed to India (USD 0.9bn) and Southeast Asia (USD 0.6bn), 77% of which went to high-carbon intensive coal projects.

Figure 20: SOEs finance alignment status and technology split (breakdown of 2018 investment)

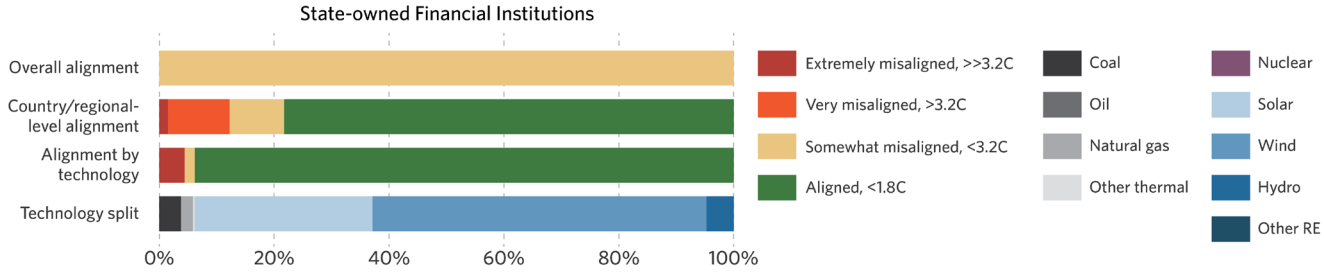


35 The group represents 26 national and regional development banks around the world

SOEs are companies largely or primarily owned by a national government. The category is strongly associated with energy, as it includes some public utilities, but also key energy users such as heavy industry, some of which self-supply electricity for their own needs. Generally, state-owned utilities are more likely to invest in new renewables technologies in countries driven by similar regional policy objectives (Steffen et al., 2020). While policy action is fundamental to reduce misaligned investment from SOEs, declining government revenues and budgetary allocation resulting from the COVID-19 pandemic and the associated economic crisis may help accelerate the process, especially in oil and gas exporting nations (IEA, 2020d).

The USD 19 billion of tracked finance provided by state-owned financial institutions (SOFIs) was overall "somewhat misaligned" with Paris goals. Just 2% of finance provided was "extremely misaligned" with recipients' regional decarbonization pathways, mainly in the Middle East and Asia Pacific regions. Still, 78% of SOFI investments were "aligned" at the regional level, including in China (USD 11.4bn), India (USD 1bn), and more generally in Central and South America (USD 1.7bn), where all financed assets were carbon-free.

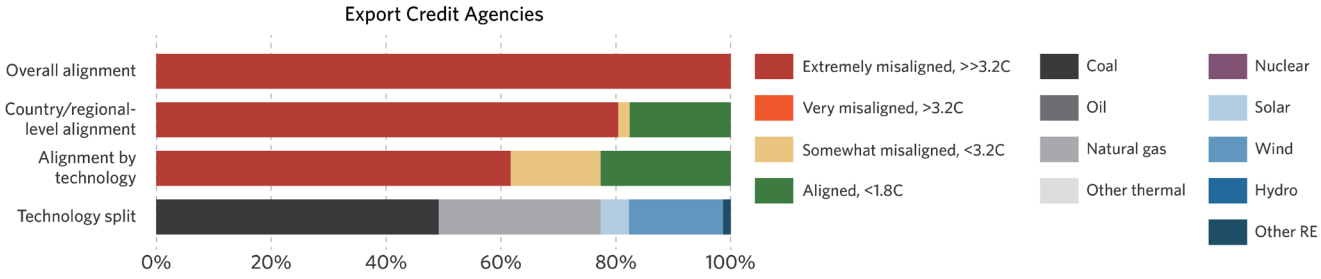
Figure 21: SOFIs finance alignment status and technology split (breakdown of 2018 investment)



SOFIs are banks with a majority public ownership share. On top of being among the world's largest financial institutions – with combined assets for USD 15tn, China's four largest state-owned commercial banks are also the largest banks in the world (Choi et al. 2020) - they play a key role in funding national strategic assets such as energy projects. However, compared to national development and policy banks, which are more focused on furthering governments' policy mandates, SOFIs operate commercially. This incentivizes them to pay attention to the growing profitability of renewable energy projects and the risks of stranded assets, and as a consequence they tend to register relatively lower exposure to fossil fuel generation (Norris et al. 2019). At the same time, their higher risk appetites enable them to support investments in more innovative renewable energy projects, especially when the organization formally endorses some non-commercial objectives (EBRD, 2020), a fundamental role in demonstrating the business case for green lending (Choi at al., 2020).

Finally, Export Credit Agencies (ECAs), which originated USD 8 billion in power finance, were overall "extremely misaligned" with Paris goals. Nearly half of ECA investments tracked (USD 3.8bn) financed coal power projects, the highest such proportion of any other institution type in 2018. As a result, ECAs were also the investors with the highest asset carbon intensity (0.64 tCO2/MWh). Eighty percent of the investments were "extremely misaligned" at the regional level, mainly flowing to countries in South East Asia (USD 3.6 bn), Asia Pacific (USD 1.2bn), and Africa (USD 1.8bn). Ninety-five percent of ECA fossil fuel power finance was foreign investments from two countries: China (USD 4.2bn) and Japan (USD 1.6bn).

Figure 22: ECAs finance alignment status and technology split (breakdown of 2018 investment)



ECAs are government-backed financial institutions that provide financial support with the aim of supporting exports of goods or services from their country to outside markets. The stance of many ECAs on coal projects – particularly in Japan and China - still remains unclear (DeAngelis et al., 2020) and trends on fossil fuel financing, particularly coal financing, were still significant in 2018 despite the 2015 agreement on restrictions for ECAs in OECD countries (OECD, 2015), which took effect in 2017. Without an expansion of international efforts, stronger enforcement, and bolder commitments to renewable energy investment (DeAngelis et al., 2020; Hopewell, K., 2019), ECAs will become a barrier to the low-carbon energy transition.

Box 4: Alignment of new investment in the U.S. Road transport sector

To explore the potential for expanding the method to sectors **beyond the power sector**, we chose to assess the alignment of financial flows in light road transport[36] in the U.S. This sector has natural dispositions for the method: It contributes to 14% of global CO2 emissions (IEA, 2017) and is composed of fleets of emitting assets (road vehicles), like the power sector. Detailed data on the U.S. light duty road fleet were obtained by the U.S. Department of Transportation and the EPA, and light duty road carbon budgets[37] from the IEA. With access to similar data, our methodology could be replicated in other regions.

As in the power sector, the multi-year lifespan of light duty road vehicles **results in 'locked in' CO2 emissions**. Indeed, vehicles that are already on the road offer little flexibility. Their energy efficiencies will remain constant while their scrappage rates depend on a combination of socio-economic factors and public policies (Bento et al., 2018). In 2025, we estimate that 75% of the 1.8°C carbon budget[38] of that year will be spent by vehicles that were already on the road in 2017. Therefore, new vehicles have to compensate for these locked-in emissions to meet emission targets. We assess the alignment of these new vehicles' carbon intensity (CI) with temperature increase trajectories in two milestone scenario years: 2025 and 2030. That alignment assessment is conducted for private (households and businesses) and government new vehicle acquisition expenditures.

	2018 investment (USDm)	2025 carbon intensity of 2018 investment (g/mi)	2025 tempera-ture trajectory	2030 carbon intensi-ty of 2018 investment(g/mi)	2030 temperature trajectory
Total	581,450	440 - 441	>2.7°C	439 - 441	>2.7°C
Households and Businesses	578,369	440 - 441	>2.7°C	439 - 441	>2.7°C
Government	3,081	201 - 220	<2°C - <2.7°C	180 - 219	<1.8°C - <2.7°C

Carbon intensities (CI) and corresponding temperature increase trajectories of new vehicle investments, by financial actor. CI ranges correspond to decreasingly ambitious IEA power sector scenarios (2019b). The lower bounds reflect Paris-aligned power sector scenarios.

36 Light road vehicles are defined here as highway vehicles under 10,000 pounds.
37 The IEA builds its sector-specific CO2 scenarios with carbon budgets: the total amount of CO2 that can be emitted by a sector throughout the scenario years.
38 50% chances of limiting global temperature rise to 1.8°C (by 2100)

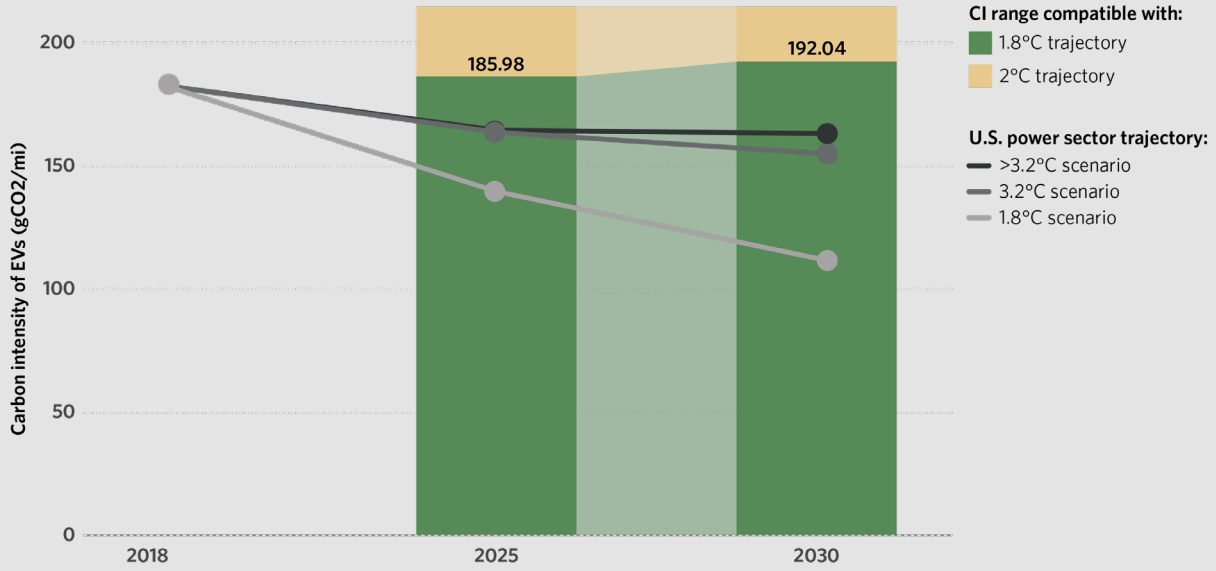
Ninety-eight percent of 2018 sales are internal combustion (ICE) vehicles. As a result, new vehicle sales are on a path of more than 2.7°C of warming when compared to their 2025 and 2030 CI requirements. With a CI of 440 gCO2/mi, 2018 new vehicles are nowhere near the 1.8°C CI target estimated for these two years (186 gCO2/mi and 192 gCO2/mi respectively). New investments' CI is mainly driven by extremely misaligned households and business purchases.

Combined, they represent 99% of the light road vehicle financial flows. The U.S. government, through its federal fleet acquisition policy and the incentives it offers on electric vehicles (DOE, 2020), is performing better. Their investments' CI could be aligned with the 2025 and 2030 requirements of a 2°C scenario[39], should the U.S. power sector be aligned with Paris Agreement goals.

In spite of a sharp increase in recent years, **the market penetration of Electric Vehicles** (EVs, both Plug-in Hybrid and Battery) **remains insufficient** to impact substantially light road CO2 emissions. More importantly, though perceived as low-emitting assets, EVs depend on the power sector transition to lower their CI. With the 2018 U.S. electricity CI, not all 2018 EV models match the 2025 1.8°C threshold (28% of Plug-in Hybrid and 87% of Battery models). However, unlike petrol-fueled vehicles, EVs' CI can decrease extensively after they enter the fleet (Figure B-2). As a result, 2018 EVs comply with the 1.8°C scenario in 2025 and 2030 in all three power sector scenarios (IEA, 2019b). In view of the above, **mass roll-out of affordable EVs combined with low carbon power generation investments are needed.**

However, with Internal Combustion Engine (ICE) vehicles still accounting for the large majority of sales, stricter **fuel efficiency standards need to be set.** Yet, in 2020, the U.S. lowered their 2021-2026 standards' ambitions (NHTSA, 2020). In that respect, the increasing market share of SUVs (50% of light vehicle sales in North America in 2019), is a major setback for fuel efficiency and CI improvements (IEA, 2020c). In the U.S., a perhaps even greater challenge is to promote modal shifts towards less carbon intensive modes. In 2015, more than three in four workers commuted by driving alone (BTS, 2016).

Figure B-4: Impact of power sector scenarios on EVs' carbon intensity.



Power sector scenarios (light to dark grey). <1.8°C- (green) and <2°C- (yellow)" to reflect the color changes

39 50% chances of limiting global temperature rise to 2°C (by 2100).

3. SOLUTIONS AND NEXT STEPS

The past decade, and in particular the past three years, have brought significant growth in sustainable finance, especially in the power sector as renewable energy deployment has exploded. However, the ratio of dirty to clean power investment remains far too high. Even in 2018, when investment in renewable energy grew to represent 60% of total power finance, new fossil fuel investment raised the overall carbon intensity of new generation to levels incompatible with a Paris-aligned decarbonization scenario

While continuing to invest in zero-carbon generation is important, emissions from existing fossil fuel generation is a challenge of equal magnitude in attaining Paris alignment in the power sector. We have identified solutions to both of these issues, which broadly target the following goals:

1. Halt new carbon-intensive investments
2. Accelerate retirement of locked-in fossil-fuel generation assets
3. Continue to scale up low-carbon investments including in renewable energy, energy efficiency, carbon capture and storage, and carbon removal

While the solutions presented below center around three key groups of actors - public, private, and services providers - the breadth and intrinsic complexity of the challenge requires cross-sectoral collaboration between all players to deliver on Paris commitments.

3.1 SOLUTIONS FOR THE PUBLIC SECTOR

3.1.1 RAISE AMBITION AND LEVEL THE PLAYING FIELD FOR POWER

Policy signals are fundamental drivers for energy sector transition and decarbonization, with ambitious climate goals including toward net zero emissions playing a crucial role in public investment and policy. As renewable energy development continues to grow, there is a room to further develop the implementation of these targets, including through carbon pricing mechanisms using a two-step approach:

- First, governments can end "positive incentives" for carbon intensive activities by eliminating fossil fuel subsidies – both at production level and at consumption level, as these distort competition between energy sources, hinder decarbonization efforts, and incentivize climate-harmful consumption patterns.
- Further, governments can introduce "negative incentives"[40] for carbon intensive activities by using carbon pricing to internalize the social cost of carbon emissions, strengthening the business case for low-carbon products and services.

40 Or disincentives

3.1.2 FACILITATE ACCELERATED FOSSIL FUEL PLANT RETIREMENTS

Currently, two-fifths of the global coal fleet has operating costs greater than the levelized cost of energy from new storage-backed solar and wind capacity. This means that the transition to a low-carbon power sector represents a huge cost savings opportunity (Bodnar et al., 2020). To capture these cost savings and emissions reductions, new mechanisms are needed to:

- Refinance coal assets to fund low-carbon investment, supporting and accelerating the transition. Concessional finance from governments and DFIs can drive coal plant retirements where coal remains cost competitive. The new low-cost capital could then be used to address unrecovered investment balances (e.g. outstanding loans), and to reinvest equity in clean energy, allowing owners to replace returns from coal plants with returns from renewable energy, energy storage, and grid modernization (Bodnar et al., 2020; Kanak, 2020; Lehr et al. 2018 and 2019)
- Extend savings obtained from the transition to workers and communities to ensure a just transition. The net cost to society of retiring all coal capacity to replace with renewable generation is expected to be below zero in 2020 and generate USD 100bn in net savings every year by 2025. These savings that could be directed to support workers and communities impacted by the transition, along with a portion of the new capital raised through refinancing. In Europe, for example, the European Commission's planned Just Transition Fund can take a leadership role, financing social support mechanisms as the energy system moves away from fossil fuel assets (Cameron et al., 2020). Additional resources may come from redirecting budgetary support for fossil fuels to clean energy sources (IISD, 2019).

3.1.3 PROMOTE THE USE OF PRECAUTIONARY PRINCIPLES IN THE ASSESSMENT OF FOSSIL FUEL INVESTMENT

Climate risks are increasingly being considered by financial institutions, but measurement uncertainties are delaying deployment of comprehensive climate risk frameworks and policies. Likewise, financial regulators and supervisors have come far in recognizing the threat climate change represents for financial stability, but their actions so far have focused on promoting transparency measures such as TCFD, developing stress tests, and encouraging green investment (Philipponnat, 2020). By comparison, regulators have taken little action to discourage high emissions investment. In this regard, financial regulators could introduce:

- Precautionary principles by using high-risk default weights for situations where the probability of climate risk losses cannot be precisely assessed. This would curb lending to these activities, making them entirely reliant on equity finance (Philipponnat, 2020).[41]
- Regulatory requirements to make carbon intensive loans more burdensome for lenders.

41 Such measures already exist in the EU regulation and must now be enforced, while the adoption and enforcement of similar prudential requirements could be promoted globally through the engagement of the Basel Committee on Banking Supervision, and the Financial Stability Board (Philipponnat, 2020).

One such tactic, commonly referred to as the "brown penalizing factor," entails increasing capital requirements for lenders financing high emissions activities This would strengthen banks' capital base by helping to manage unforeseen losses from stranded assets and reduce market failures from mispricing of climate risks (Berenguer et al., 2020)

These approaches would enable regulators and central banks to address climate-related prudential risks such as potential stranded asset exposures for fossil fuel generation and accelerating extreme weather damage.

3.1.4 LEVERAGE THE POLITICAL AND FINANCIAL STRENGTH OF DEVELOPMENT FINANCE INSTITUTIONS TO SUPPORT THE PARIS AGREEMENT

Current investment from development finance institutions (DFIs) still includes some finance for fossil fuel power, causing a significant share of new DFI investment to be misaligned, and locking in fossil generation in countries that urgently need to decarbonize. However, DFIs also play a critical role in bridging public and private finance to maximize benefits to recipient countries. Therefore, DFIs – especially multilateral development banks – should:

- Utilize their status as concessional finance providers to promote the adoption of Paris-aligned policies and practices in governments and financial institutions (NCI, Germanwatch, 2018).
- Emphasize the rate of replacement of existing fossil fuel assets with new low carbon alternatives as a key impact metric. Prioritizing this metric would emphasize the need to retire existing high-emissions generation, especially in the many countries and regions where adding new renewables alone is insufficient for Paris alignment due to locked-in emissions. This would incentivize deployment of new innovative financing mechanisms to co-finance the decommissioning of existing fossil capacity alongside the development of new renewables, enabling full Paris alignment.

National governments can also enable DFIs to fulfill their potential as drivers of the low-carbon finance transition by passing legislation or otherwise modifying DFIs' governance frameworks to increase institutional risk appetite and investment volume. This includes reducing capital adequacy requirements to enable increased institutional leverage and risk appetite (G-24 and GGGI, 2015). MDBs have historically been well-capitalized, with equity to debt ratios of 30-60%, two to six times higher than those of typical private financial institutions, suggesting that there is a significant opportunity to increase leverage while maintaining financial stability. This would empower DFIs to accelerate investment in low-carbon projects and technologies.

3.2 SOLUTIONS FOR THE PRIVATE SECTOR

3.2.1 EMBRACE MARKET OPPORTUNITIES IN RENEWABLES AND PHASE OUT FOSSIL FUELS

Large-scale private investment is required to decarbonize the power sector, presenting a huge market opportunity as firms rush to fill global demand for carbon-free electricity. This includes a half-trillion-dollar annual investment gap in renewable power as well as significant investment needs in other power sector decarbonization solutions, including accelerated decommissioning of fossil plants, expanded energy efficiency programs, and implementation of carbon sequestration technologies such as CCUS (IRENA & CPI, 2020). Some major actors have recently started shifting their investment strategies to catch up with these opportunities, including JPMorgan Chase (BusinessWire, 2020), and General Electric's recent coal-for-wind swap investments (Seeking Alpha, 2020), while overall in the United States Solar and wind rose dramatically to 76% of new capacity additions (EIA, 2020).

3.2.2 EXPAND, STRENGTHEN, AND HARMONIZE CLIMATE RISK REPORTING AND RATING

Private coalitions and initiatives by financiers – with the support of regulators – should push for expanded adoption of climate risk disclosures practices by financial actors, and ensure that their investment teams and asset managers properly assess climate risks and prioritize risks and opportunities related to their (fossil fuel) investments (Nagrawala et al., 2020; Mercer, 2019). This is particularly relevant for financial institutions with fiduciary obligations to their stakeholders.

The TCFD's guidelines are currently the main instrument companies have been using to identify, assess and manage climate risks. However, to be effective, related reporting must be standardized across companies, and strengthened to include minimum quality requirements. These may include impact metrics, detailed information on how climate-related risks are identified and factored into both passive and active investment approaches across different sectors and asset classes. (Nagrawala et al. 2020, REN 2020).

3.2.3 IMPLEMENT A MORE HOLISTIC, TRANSPARENT APPROACH TO CLIMATE CHANGE INTEGRATING IMPACT THE REAL ECONOMY

Though the actions of private financial institutions cannot replace policy reform, they can reinforce, prepare for, and collectively move beyond the minimum requirements of existing policy regimes (Mitchell et al., 2020). Meaningful commitments to climate alignment require a conceptual shift from considering solely the financial and material risks of climate to assessing the potential real-world environmental and societal returns of climate action (Nagrawala et al. 2020). These more holistic commitments include effective stewardship and ownership activities, such as:

- Influencing cost or availability of capital or financial services;
- Implementing transparent voting rights[42] and encouraging companies across sectors to transition;
- Lobbying and supporting governments to support sustainable investment through policy changes (Mitchell et al., 2020).

3.3 SOLUTIONS FOR INFORMATION SERVICE PROVIDERS

3.3.1 HARMONIZE DATA COLLECTION AND REPORTING METHODS

To ensure that actions taken by the financial sector in support of decarbonization are effective and that expectations are realistic, there is a need to harmonize the collection, analysis and presentation of information available to investors (Mitchell et al., 2020). This can be supported by reconciling existing and emerging initiatives to converge toward the adoption of standardized methodologies regarding benchmarks, scenarios, pricing of climate risks, and other metrics.

3.3.1 EXPAND AVAILABILITY OF FOSSIL-FUEL FINANCE DATA

To have granular alignment insights on Paris-alignment trends, more transparent and accessible data are required, particularly on corporate-level investments. While asset-level transaction data are generally available for renewable energy investment, our high-emissions tracking recorded asset-level data for just 24% of global high-emissions power finance. Most listed companies report revenue information broken down by activity or line of business, but reporting in financial filings or annual reports is not standardized and is not always easily accessible, as highlighted in the EU Taxonomy report (EU-TEG, 2019), particularly with respect to financing for high-carbon activities such as fossil fuel power.

Further, fossil-fuel data should be expanded to cover offset efforts occurring within the power sector (or negative emissions), in line with net-zero principles. However, it is critical to acknowledge that the definition of what constitutes an offset is currently under discussion. IIGCC latest version of the Net Zero Investment Framework (IIGCC, 2020) recommends that offsetting through climate solutions should not count purchased offsets, and focus on the decarbonization of activities within sectors to the extent possible (e.g. for the power sector this would include CCS, energy efficiency solutions, anticipated decommissioning of plants). Oxford University has also developed a set of principles for credible carbon offsetting,

42 Transparency of voting right records, would enable to track active ownership performance in fostering Paris alignment. This could be accomplished through the creation of online databases that allow the tracking of shareholder votes on the basis of date, country and name, at least for larger asset managers (Nagrawala et al., 2020). Although the disclosure of active ownership activities has been included in the stewardship codes of several countries, only 55 of asset managers discloses their voting records publicly, and of these only 70% reports data in accessible format.

prioritizing direct reduction of own emissions, or offsets that target the removal of carbon from the atmosphere, and the long-term storage of emissions (Allen, et al., 2020).

A strict approach to offsetting can ensure coherent accounting of mitigation efforts within sector-specific decarbonization pathways, and would reduce the risk of double counting.[43] Alternatively, if cross-sectoral offsets must be allowed, the creation of a single carbon offset market – or more effective and integrated linkages between existing ones - can ensure proper accounting and attribution of emissions reductions, avoiding double counting through the use of transparent global registries that can track origination and current ownership of offsets.

3.3.2 INCORPORATE HIGH EMISSIONS ASSET RISKS AND ALIGNMENT STATUS IN CREDIT RATING

Given the ratio of high emissions finance flows putting lenders at risk, credit rating agencies must act swiftly to develop and sharpen their focus on carbon thresholds and climate risks. New methods and tools are emerging amongst credit rating agencies, for example, Moody's are currently using scenario analysis in their assessment of the credit impact for rated issuers (Moody's, 2020). However, credit rating based on climate risks should take a wider adoption to influence climate aligned investment decision making. Defining and collecting data on high emissions assets and activities, therefore, would have a greater credit implication (FitchRatings, 2020) to disincentive investment and enact stricter prudential policies discussed above.

3.3.3 ENHANCING CROSS-ORGANIZATION COORDINATION IN INVESTMENT DECISION-MAKING.

Tools that support investment decision-making through scenario approaches must ensure that information on the impact of a single investment is not siloed away from other financing decisions occurring in parallel within or even beyond the organization. As our analysis demonstrates, the financing of one fossil fuel plant may alone be compatible with Paris goals and the flexibilities that the financing organization wants to allow itself, but when multiple organizations apply the same approach, the result is an aggregate emissions pathway incompatible with sector-wide decarbonization. This calls for service providers to enable cross-organizational coordination in investment decision making, with the development of open datasets where pipelines of high-carbon projects can be compared against the carbon budgets they contribute to collectively deplete.

43 Offsets – unless strictly monitored - can determine double counting on two levels.
-entity level: by benefit simultaneously the owners of the assets delivering the offset, and the purchaser of the carbon offset credit.
-sector level: by simultaneously accounting reduction for the sector where asset delivering the offset is located, and the sector where the deriving carbon offset credit is used.

3.4 NEXT STEPS

Our broad assessment of global power sector alignment was made possible by CPI's previous methodology papers on tracking high-emissions finance and estimating the level of alignment of new investment, both of which contributed to the findings presented in this paper. This is a first attempt at applying the proposed methodology, and the analysis stemming from our work may evolve as more tools and data become available in the future. We therefore welcome any feedback to improve our methodology and analysis.

The full series of three papers tracking and analyzing high-emissions finance and the Paris alignment of global investment provides a strong base for future exploration of the impact of finance on climate goals, and corresponding institutional action.

Having broadly surveyed the global alignment landscape for the power sector, follow-up work could focus on:

- **Follow-up work assessing the consistency of new (2020) power sector investment with Paris goals with improved methodology, data and assumptions.** The new work would rely on novel Global Landscape of Climate Finance data covering 2020 commitments, more recent asset datasets to reflect the status of locked-in assets, and more ambitious decarbonization scenarios from the IEA, who has already updated its WEO to reflect net-zero goals. At the same time, if requested, the underlying power sector model could be upgraded to account for the full interannual accounting (e.g. 2018-2030, as opposed to 2030 only) of carbon budgets. This work would enhance the depth of our methodology, and help reveal whether, between 2018 (year covered in this report) and 2020, financial institutions have progressed in aligning new power sector investments to Paris goals, mindful of the narrowing carbon budgets.
- **A deeper dive on possible levers to connect capital markets to climate objectives and outcomes in the real economy.** This report presents an initial overview of possible solutions to address global misalignment of investment discussed in Chapter 3. A follow up study could focus on high-impact countries (e.g. the most misaligned in terms of power sector investment including China, Bangladesh), or more mature economies that are struggling to quickly retire coal capacity (including Europe), and explore how current incentives in the financial system and in the power sector, can be corrected to support power sector low-carbon transition.
- **National power sector case studies.** Country- and region-level analysis of power sector trends and trends/patterns observed in the financial sectors were briefly explored in Section 2.1. Those trends could be examined in further detail in a follow-up report, especially as CPI's ability to track high-emissions finance at the transaction level improves over time. For most countries, this would require direct collaboration with government agencies to obtain and apply more granular assumptions around technical characteristics of existing and new generation, as well as deeper transaction datasets at the country level.
- **Expanding the scope of our alignment methodology within and beyond the power sector.** Our current work only considers strictly emissions from power generation (carbon-positive activities), but does not track carbon-negative activities within the sector. For this reason, we apply a carbon intensity floor of zero to prevent aligned clean energy investment from registering as misaligned relative to negative overall carbon

intensity targets. Possible follow-up work could include full accounting of emissions and sectoral mitigation and offsetting efforts, as mapping net emissions from power plants would enable their carbon intensities to be compared against unrestricted carbon intensity thresholds. Investment alignment analysis can also be expanded beyond power generation and applied to other sectors, as discussed in the methodology papers, and further explored herein through a first attempt to measure alignment of the transport sector in the U.S. (see Box 4, Transport Alignment).

In all cases, increased availability of higher-quality data and greater transparency from financial actors will be critical to improve the comprehensiveness and rigor of our approach to assessing alignment.

4. REFERENCES

2 Degrees Investing Initiative, 2020. Paris Agreement Capital Transition Assessment. Available at:https://2degrees-investing.org/resource/pacta/

Allen M., K. Axelsson, B. Caldecott, T. Hale, C. Hepburn, C. Hickey, E. Mitchell-Larson, Y. Malhi, F. Otto, N. Seddon, S. Smith, 2020. The Oxford Principles for Net Zero Aligned Carbon Offsetting. University of Oxford. Available at: https://www.smithschool.ox.ac.uk/publications/reports/Oxford-Offsetting-Principles-2020.pdf

Bento, A., Roth, K., & Zuo, Y, 2018. Vehicle lifetime trends and scrappage behavior in the US used car market. The Energy Journal, 39(1).

Berenguer M., M. Cardona, J. Evain, 2020. Integrating Climate-related Risks into Banks' Capital Requirements. Institute for Climate Economics (I4CE). Available at: https://www.i4ce.org/wp-core/wp-content/uploads/2020/03/IntegratingClimate_EtudeVA.pdf

Bodnar P., M. Gray, T. Grbusic, S. Herz, A. Lonsdale, S. Mardell, C. Ott, S. Sundaresan, U. Varadarajan, 2020. How To Retire Early Making Accelerated Coal Phaseout Feasible and Just. Rocky Mountain Institute. Available at: http://rmi.org/wp-content/uploads/2020/06/How-to-retire-early-June-2020.pdf

Brice Affana, J. P., Bartosch, S., and Ryfisch, D., 2020. Climate Finance: Accelerating the Transition to Carbon Neutrality and Climate Resilience. In memo series 'Raising the Game on Paris Alignment', Germanwatch, NewClimate Institute and World Resources Institute, March. Available at: https://www.germanwatch.org/en/17309

BTS, 2016. Commute Mode Share: 2015. U.S.. Bureau of Transportation Statistics (BTS). Available at: https://www.bts.gov/content/commute-mode-share-2015

Buchner B., A. Clark, A. Falconer, R. Macquarie, C. Meattle, R. Tolentino, and C. Wetherbee, 2019. Global Landscape of Climate Finance 2019. Available at: https://www.climatepolicyinitiative.org/publication/global-landscape-of-climate-finance-2019/

BusinessWire, 2020. JPMorgan Chase Adopts Paris-Aligned Financing Commitment. 6 October 2020. Available at: https://www.businesswire.com/news/home/20201006006106/en/JPMorgan-Chase-Adopts-Paris-Aligned-Financing-Commitment

Cameron, A., Claeys, G., Midoes, C., and Tagliapietra, S., 2020. A Just Transition Fund - How the EU budget can best assist in the necessary transition from fossil fuels to sustainable energy. Policy Department for Budgetary Affairs, European Parliament. April. Available at: https://www.bruegel.org/wp-content/uploads/2020/05/Bruegel-JTF-report-for-EP-BUDG2.pdf

Carbon Tracker Initiative, 2018. Powering Down Coal. Navigating the economic and financial risks in the last years of coal power. November, available at: https://carbontracker.org/reports/coal-portal/

CAT, 2020 (access). Climate Action Tracker. Available at: https://climateactiontracker.org/

Childs, M., 2018. Infrastructure Funds are Hauling In Record Amounts of Cash. Barron's. Available at: https://www.barrons.com/articles/infrastructure-funds-are-hauling-in-record-amounts-of-cash-1539121800

Choi J., D. Escalante, M. L. Larsen, 2020. Green Banking in China – Emerging Trends

With a spotlight on the Industrial and Commercial Bank of China (ICBC). CPI Discussion Brief August 2020. Climate Policy Initiative (CPI). Available at: https://www.climatepolicyinitiative.org/wp-content/uploads/2020/08/Green-Banking-in-China-Emerging-Trends-1.pdf

Clark A., J. Choi, B. Tonkonogy, V. Micale, C. Wetherbee, 2020. Implementing Alignment with the Paris Agreement: Recommendations for the Members of the International Development Finance Club. Climate Policy Initiative (CPI). Available at: https://climatepolicyinitiative.org/wp-content/uploads/2019/09/19-09-25-CPI_IDFCalignmentstudy.pdf

Climate Action 100+, 2019. 2019 Progress Report. Available at: http://www.climateaction100.org/

ClimateWatch, 2020. Global Historical Emissions. Available at: https://www.climatewatchdata.org/

IRENA, CPI, 2020. Global Landscape of Renewable Energy Finance 2020. International Renewable Energy Agency (IRENA), Abu Dhabi. Available at: https://www.irena.org/publications/2020/Nov/Global-Landscape-of-Renewable-Energy-Finance-2020

Crow A., 2020. Rising solar: Investing in Japan's energy transition. Available at: https://www.atlanticcouncil.org/blogs/new-atlanticist/rising-solar-investing-in-japans-energy-transition/

Cui, R.Y. N. Hultman, M. R. Edwards, L. He, A. Sen, K. Surana, H. McJeon, G. Iyer, P. Patel, S. Yu, T. Nace & C. Shearer, 2019. Quantifying operational lifetimes for coal power plants under the Paris goals. Nature Communications volume 10, Article number: 4759 (2019). Available at: https://www.nature.com/articles/s41467-019-12618-3

DeAngelis, K., B. Tucker, 2020. Adding Fuel to the Fire. Export Credit Agencies and Fossil Fuel Finance. Friends of the Earth and OilChange International. Available at: http://priceofoil.org/content/uploads/2020/01/2020.01.30_Adding-Fuel-to-the-Fire_final.pdf

DOE, 2020. Federal Laws and Incentives. U.S. Department of Energy (DOE). Available at: https://afdc.energy.gov/laws/all?state=US#:~:text=Under%20the%20Energy%20Policy%20Act,alternative%20fuel%20vehicles%20(AFVs).&text=Fleets%20that%20use%20fuel%20blends,credits%20toward%20their%20annual%20requirements.

EBRD, 2020. Transition Report 2020-21. European Bank for Reconstruction and Development (EBRD), London. Available at: https://www.ebrd.com/documents/oce/transition-report-202021-pdf.pdf

Eceiza, J., Harreis, H., Hartl, D., and Viscardi, S., 2020. Banking imperatives for managing climate risk. McKinsey, June. https://www.mckinsey.com/business-functions/risk/our-insights/banking-imperatives-for-managing-climate-risk

EIA, 2020. New electric generating capacity in 2020 will come primarily from wind and solar. Today in Energy, 14 January 2020. Energy Information Administration (EIA). Available at: https://www.eia.gov/todayinenergy/detail.php?id=42495

EU-TEG, 2019. Taxonomy Technical Report. European Union Technical Expert Group (EU-TEG) on Sustainable Finance (ed.). European Commission, Brussels. Available at: https://ec.europa.eu/info/sites/info/files/business_economy_euro/banking_and_finance/documents/190618-sustainable-finance-teg-report-taxonomy_en.pdf

Financial Times, 2020. China's carbon pledge revives hopes of a climate game change. September 23. Available at: https://www.ft.com/content/e893f840-361c-4858-94e1-517d6016ec65

G-24 and GGGI, 2015. Infrastructure Finance in the Developing World. Available at: https://www.g24.org/wp-content/uploads/2016/05/MARGGK-WP08.pdf

Hopewell, K., 2019. How Rising Powers Create Governance Gaps: The Case of Export Credit and the Environment. Global Environmental Politics 2019 19:1, 34-52. Available at: https://www.mitpressjournals.org/doi/abs/10.1162/glep_a_00490#authorsTabList

IDFC, 2020 (access). IDFC Climate Facility. International Development Finance Club (IDFC). Available at: https://www.idfc.org/idfc-climate-facility/

IDFC, 2018. IDFC Position - Paper Aligning with the Paris Agreement - December 2018. International Development Finance Club (IDFC). Available at: https://www.idfc.org/wp-content/uploads/2018/12/idfc_alignment-with-paris-agreement_position-paper_12_2018.pdf

IISD, 2019. Fossil fuel to clean energy subsidy swaps: How to pay for an energy revolution. International Institute for Sustainable Development. Available at: https://www.iisd.org/system/files/publications/fossil-fuel-clean-energy-subsidy-swap.pdf

IEEFA, 2019. Over 100 Global Financial Institutions Are Exiting Coal, With More to Come. 27 February. Institute for Energy Economics and Financial Analysis. Available at: http://ieefa.org/wp-content/uploads/2019/02/IEEFA-Report_100-and-counting_Coal-Exit_Feb-2019.pdf

IEA, 2020a. Energy subsidies: Tracking the impact of fossil-fuel subsidies. International Energy Agency (IEA), Paris. Available at: https://www.iea.org/topics/energy-subsidies

IEA, 2020b. India 2020: Energy Policy Review. January. International Energy Agency (IEA), Paris. Available at: https://www.iea.org/reports/india-2020

IEA, 2020c. Fuel Consumption of Cars and Vans. International Energy Agency (IEA), Paris. Available at: https://www.iea.org/reports/fuel-consumption-of-cars-and-vans

IEA, 2020d. World Energy Investment 2020. International Energy Agency (IEA), Paris. Available at: https://www.iea.org/reports/world-energy-investment-2020/key-findings

IEA, 2019a. World Energy Investment 2019. International Energy Agency (IEA), Paris. Available at: https://www.iea.org/reports/world-energy-investment-2019

IEA, 2019b. World Energy Outlook 2019. International Energy Agency (IEA), Paris. Available at: https://www.iea.org/reports/world-energy-outlook-2019

IEA, 2017. Energy Technology Perspectives 2017. International Energy Agency (IEA), Paris. Available at: https://www.iea.org/reports/energy-technology-perspectives-2017

IIGCC, 2020. Paris Aligned Investment Initiative: Net Zero Investment Framework for Consultation. The Institutional Investors Group on Climate Change (IIGCC). Available at:

https://www.iigcc.org/download/net-zero-investment-framework-consultation/?wpdmdl=3602&refresh=5f844782a4d901602504578

InfluenceMap, 2020. Japanese Industry Groups and Energy Policy. August. Available at: https://influencemap.org/presentation/Japanese-Industry-Groups-and-Climate-Policy-899704d005cb96359cc5b5e2a9b18a84

Intentional Endowments Network, 2020. Addressing Climate Change Through a Private Equity Lens. Available at: https://www.intentionalendowments.org/addressing_climate_change_through_private_equity

IPCC, 2019. Global Warming of 1.5°C - Summary for Policymakers, Technical Summary and Frequently Asked Questions. Intergovernmental Panel on Climate Change. Available at: https://www.ipcc.ch/site/assets/uploads/sites/2/2019/06/SR15_Summary_Volume_Low_Res.pdf

Kanak, D., 2020. How to replace coal power with renewables in developing countries. World Economic Forum. Available at: https://www.weforum.org/agenda/2020/05/how-to-replace-coal-and-accelerate-the-energy-transition-in-developing-countries/

Kessler L., T. Matsuo, D. Nassiry, P. Bodnar, 2019. Reinventing Climate Finance: Four Levers to Drive Capital Stock Transformation. Rocky Mountain Institute. Available at: https://rmi.org/insight/climate-financelevers-drive-capital-stock-transformation

L&G, 2019. Climate Impact Pledge: Tackling the climate emergency. Legal&General. Available at: https://www.legalandgeneralgroup.com/media/17251/21062019-climate-impact-pledge-2019-tackling-the-climate-emergency.pdf

Lehr R., M. O'Boyle, 2018. Debt for Equity Utility Refinance. Available at: https://energyinnovation.org/wp-content/uploads/2018/11/Debt-for-Equity-Issue-Brief_12.3.18.pdf

Lehr R., 2019. How Utilities Can Swap Coal Debt For Clean Energy Equity. In Forbes – 4 February 2019. Available at: https://www.forbes.com/sites/energyinnovation/2019/02/04/how-utilities-can-swap-coal-debt-for-clean-energy-equity/#146a8cfa32c2

MDBs, 2020. 2019 Joint Report on Multilateral Development Banks Climate Finance. Multilateral development banks (MDBs), composed of the African Development Bank (AfDB), the Asian Development Bank (ADB), the Asian Infrastructure Investment Bank (AIIB), the European Bank for Reconstructionand Development (EBRD), the European Investment Bank (EIB), the Inter-American Development Bank Group (IDBG), the Islamic Development Bank (IsDB) and the World Bank Group (WBG). Available at: https://www.ebrd.com/2019-joint-report-on-mdbs-climate-finance

MDBs, IDFC, 2017. Joint IDFC-MDB Statement at One Planet Summit. https://www.oneplanetsummit.fr/IMG/pdf/10_idfc_mdb_statement.pdf.

Mercer, 2019. Investing in a Time of Climate Change - The Sequel 2019. GLOBAL WEALTH. Available at: https://www.mmc.com/content/dam/mmc-web/insights/publications/2019/apr/FINAL_Investing-in-a-Time-of-Climate-Change-2019-Full-Report.pdf

Mitchell J., L. Schafferer, T. Matsuo, and R. Lalit, 2020. Breaking the Code: Deciphering Climate Action Efforts in the Financial Sector. Rocky Mountain Institute. Available at: https://rmi.org/insight/breaking-the-code/

Moody's, 2020. Moody's - Scenario analysis key tool in assessing credit impact of climate change. Available at: https://www.moodys.com/research/Moodys-Scenario-analysis-key-tool-in-assessing-credit-impact-of--PBC_1217369

Nagrawala F., K. Springer, 2020. Point of No Returns A ranking of 75 of the world's largest asset managers' approaches to responsible investment. Asset Owners Disclosure Project. Available at: https://shareaction.org/research-resources/point-of-no-returns/#:~:text=A%20ranking%20of%2075%20of%20the%20world's%20asset%20managers%20approaches%20to%20responsible%20investment&text=Crises%20in%20the%20natural%20world,very%20existence%20of%20human%20society.

NCI Germanwatch, 2018. Aligning investments with the Paris Agreement Temperature Goal – Challenges and Opportunities for Multilateral Development Banks. NewClimate Institute (NCI), Germanwatch. Available at: https://www.germanwatch.org/sites/germanwatch.org/files/Aligning%20Investments%20with%20the%20Paris%20Agreement%20Temperature%20Goal.pdf

NHTSA, 2020 (access). Fact Sheet: SAFE Vehicles Rule. National Highway Traffic Safety Administration (NHTSA). Available at: https://www.nhtsa.gov/corporate-average-fuel-economy/safe-fact-sheet

Norris, J., L. Hartzell, F. Xiaochang, 2019. Greener Power Projects for the Belt & Road Initiative (BRI). Natural Resources Defense Council (NRDC). Available at: https://www.nrdc.org/experts/han-chen/greener-power-projects-belt-road-initiative-bri

OECD, UNEP, World Bank Group, 2018. Financing Climate Futures: Rethinking Infrastructure. Available at: https://www.oecd.org/environment/cc/climate-futures/synthesis-financing-climate-futures.pdf

OECD, 2015. Statement from Participants to the Arrangement on Officially Supported Export Credits. Organisation for Economic Co-operation and Development (OECD), Paris. Available at: http://www.oecd.org/newsroom/statement-from-participants-to-the-arrangement-on-officially-supported-export-credits.htm

PCAF, 2020. The Global Carbon Accounting Standard for the Financial Industry. version for public consultation. Draft August. Partnership for Carbon Accounting (PCAF). Available at: https://carbonaccountingfinancials.com/consultation-signup

PEStakeholder, 2020. As climate change requires cuts to coal, Private Equity buys more – Despite economic and political trends to reduce coal usage, PE firms continue to invest. Private Equity Stakeholder Project (PEStakeholder) – June 2002. Available at: https://pestakeholder.org/wp-content/uploads/2020/07/PESP-As-Coal-Declines-PE-Buys-More.pdf

Pfeiffer et al., 2018. Committed emissions from existing and planned power plants and asset stranding required to meet the Paris Agreement. Environmental Research Letters, 13.5, IOP Publishing Ltd. Available at: https://iopscience.iop.org/article/10.1088/1748-9326/aabc5f/pdf

Philipponnat T., 2020. Breaking the climate-finance doom loop - How banking prudential regulation can tackle the link between climate change and financial instability. Finance Watch.

Available at: https://www.finance-watch.org/wp-content/uploads/2020/06/Breaking-the-climate-finance-doom-loop_Finance-Watch-report.pdf

RAN, 2020. Banking on Climate Change. Fossil Fuel Finance Report 2020. Rainforest Action Network. Available at: https://www.ran.org/wp-content/uploads/2020/03/Banking_on_Climate_Change__2020_vF.pdf

Raval A., O. Walker, N. Hume, S. Morris, 2020. Biggest banks sustain coal financing despite defunding drive. Financial Times – 3 September 2020. Available at: https://www.ft.com/content/38d0daf6-17a4-4280-8293-d07eb6f20d02?shareType=nongift

Seeking Alpha, 2020. GE Bails On Coal While Announcing 2 Big Wind Turbine Orders. 5 October 2020. Available at: https://seekingalpha.com/article/4377654-ge-bails-on-coal-while-announcing-2-big-wind-turbine-orders

S&P Global, 2020. The Big Picture on Climate Risk. Available at: https://www.spglobal.com/en/research-insights/featured/the-big-picture-on-climate-risk

Sidner, L., Bartosch, S., and Kachi, A., 2020. INSIDER: Multilateral Development Banks Have Made Progress Towards Paris Alignment, but Still Need to Fill in Critical Details. March 19, 2020. Available at: https://www.wri.org/blog/2020/03/insider-multilateral-development-banks-have-made-progress-towards-paris-alignment-still#fn:1

Steffen, B. V. J. Karplus, and T. S. Schmidt, 2020. State Ownership and Technology Adoption - CEEPR Working Paper 2020-016, August 2020. Center for Energy and Environmental Policy Research (CEEPR). Available at: http://ceepr.mit.edu/about

TPI, 2020. TPI Tool: All Sectors. Transition Pathway Initiative (TPI). Available at: https://www.transitionpathwayinitiative.org/sectors

UNEP FI, 2020a. UNEP FI Corporate Impact Analysis Tool. United Nations Environment Programme Finance Initiative (UNEP FI). Available at: https://www.unepfi.org/publications/positive-impact-publications/corporate-impact-tool/

UNEP FI, 2020b. United Nations-convened Net-Zero Asset Owner Alliance. United Nations Environment Programme Finance Initiative (UNEP FI). Available at: https://www.unepfi.org/net-zero-alliance/US SIF, 2020. Fossil Fuel Divestment and Reinvestment. US Forum for Sustainable and Responsible Investment (US SIF). Available at: https://www.ussif.org/climatereinvestment

We Mean Business, 2020 (access). Better Future Faster. Available at: https://betterfuturefaster.org/power/

Willis Towers Watson, 2020. A changing climate of risk and opportunity. Available at: https://www.willistowerswatson.com/en-GB/Insights/2019/12/a-changing-climate-of-risk-and-opportunity

FitchRatings, 2020. ESG Credit Quarterly: 1Q20.

FitchRatings, 2020. ESG Credit Quarterly: 1Q20. Available at: https://www.fitchratings.com/research/corporate-finance/esg-credit-quarterly-1q20-20-04-2020?FR_Web-Validation=true&mkt_

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