



Burning Billions: Record public money for fossil fuels impeding climate action

Methodology note and reference list

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Purpose

This methodology note and reference list accompanies the briefing *Burning Billions: Record Public Money for Fossil Fuels Impeding Climate Action*. The briefing brings together the most recent data (at the time of writing) on

- government financial support to fossil fuel production and consumption between 2013 and 2022, namely
 - subsidies
 - capital investment by fossil fuel state-owned enterprises (SOEs)
 - international public finance
- externalities associated with the burning of fossil fuels
- government financial commitments for renewable power generation
- investment (public and private) in fossil fuels and renewable energy.

The purpose of the methodology note is to provide information on the definition of government support, sources and data used, overarching assumptions, and data gaps.

The digital story follows a briefing released in August by the International Institute for Sustainable Development (IISD) and partners looking at public support for fossil fuels provided by the G20 countries (Laan et al., 2023). Both briefings build on a 2020 publication by IISD and partners, *Doubling Back and Doubling Down: G20 Scorecard on Fossil Fuel Funding* (Geddes et al., 2020a), and use the same methods for estimating fossil fuel support (except for the 2022 fossil fuel subsidy data). Please see the 2020 [Methodology Note](#) for details (Geddes et al. 2020b).

The current methodology note provides sources for all data and any estimation methods that differ from the G20 scorecard, namely 2022 fossil fuel subsidies and renewable energy support and investment.

Types of Government Support

Governments support energy production and consumption through different types of public financial flows, concessional tax rates, and foregone revenue, as well as through policies that have an impact on the sector but are difficult to quantify financially (e.g., environmental regulation exemptions).

In the briefing, we aim to bring together data on several key types of government policies that provide financial support to fossil fuels and renewable power. We define and track “government support” as follows (see Table 1 for more details):

- subsidies (e.g., direct budget transfers, tax expenditures, and consumer price support [induced transfers] through regulated below-market prices for consumers);
- public finance (e.g., loans and guarantees) at both market and below-market value; and
- SOE investment (capital expenditure [capex]) at both market and below-market values.

Sources and Methodology

Table 1 provides an overview of the support measures and data sources used in the briefing, which are described in more detail in the following sections.

Table 1. Overview of support measures and data sources covered in the briefing

Data type	Period	Beneficiary	Method, source, and date collected
Fossil fuels			
Subsidies	2017–2021	Producers and consumers of fossil fuels	2017–2021: Fossil Fuel Subsidy Tracker (FFST) (FossilFuelSubsidyTracker.org, n.d.-a, n.d.-c) Data obtained May 16, 2023
	2022	Producers and consumers of fossil fuels	IMF Fossil Fuel Subsidies Data: 2023 Update (Black et al., 2023)
International public finance	2013 - 2022	Producers of fossil fuels and clean energy, including power	Public Finance for Energy Database (n.d.), G7 and MDBs only Data obtained September 2023
SOE investment	2017– 2019	Producers of fossil fuels, including power	<i>Doubling Back and Doubling Down: G20 Scorecard on Fossil Fuel Funding</i> (Geddes et al., 2020a)
	2020–2022	Producers of fossil fuels, including power	Capex data collected by IISD from company annual reports and government reports Data obtained from April to October 2023
Renewable energy			
Subsidy commitments	2020–June 2023	Producers and consumers	Energy Policy Tracker (n.d.), Government Energy Spending Tracker (International Energy Agency [IEA], 2023e); Internet searches (data provided on request) Data obtained September 2023
Investment		Private and public	<i>Global Landscape of Renewable Energy Finance 2023</i> (Climate Policy Initiative & International Renewable Energy Agency [IRENA], 2023)
Taxation			
Externalities	2021	Producers and consumers	IMF Fossil Fuel Subsidies Data: 2023 Update (Black et al., 2023)

Source: Authors' description.

Fossil Fuel Subsidies (2013–2021)

The source of information for subsidies for all countries for the years 2013 to 2021 was the [FFST](#), a data aggregator that draws together the latest subsidy data from the IEA (n.d.-a), International Monetary Fund (IMF, 2022), and Organisation for Economic Co-operation and Development (OECD) (n.d.).¹ See the Overarching Data and Assumptions section below for details on data conversions from nominal to real.

Fossil Fuel Subsidies (2022)

At the time of writing, the OECD had not yet released its estimates for 2022, therefore, we could not use consolidated data from the FFST. Instead, we use the IMF’s estimates of “explicit” subsidies as the most recent global estimate.

In October 2023, the IEA (n.d.-b) estimated that global consumption subsidies for fossil fuels were USD 1.1 trillion in 2022, covering 47 countries, including a mix of advanced, emerging, and developing economies. The IEA estimates are based on a “price gap” measurement, which estimates the difference between international market benchmarks for each fuel and the corresponding domestic prices in each country.

In August 2023, the IMF issued a global estimate of what it categorizes as “subsidies” for fossil fuels, totalling USD 7 trillion in 2022 (Black et al., 2023). This estimate covered 170 countries and includes what the IMF calls “explicit” and “implicit” subsidies. Their estimate of explicit subsidies largely comprises consumer price support, but also includes some fiscal incentives commonly understood as subsidies. The IMF’s estimates of explicit subsidies—using the price gap approach and a projection of some producer subsidies (based on OECD data)—are provided in this briefing, given that theirs is a global estimate (USD 1.3 trillion in 2022). The IMF’s explicit subsidies and the IEA’s consumer price gap subsidies are closely aligned. We use the IMF’s because the country coverage is greater, and it includes an estimate of producer subsidies.

What the IMF calls “implicit subsidies” are more commonly known as externalities or social costs. Social costs include the failure to fully charge for environmental damages, such as from air pollution and climate change, traffic-related costs² including accidents, congestion, and road damage, as well as exempting fuels and electricity (including the externality component) from general consumption taxes. We provide the IMF’s estimates of external costs in our section on taxes and social costs, but we do not classify them as subsidies.

In 2022, subsidies were also provided to fossil fuels that were priced above international benchmark market prices in the form of tax cuts and transfers to reduce energy costs, such as heating, electricity, and transport fuels. The majority of these subsidies would not be captured by the IMF’s price gap measures. At the time of writing, no global source was available that reconciled consumer price gap estimates with energy crisis-related

¹ The methodology and definitions of the FFST apply to this work and can be found on its website: <https://fossilfuelsubsidytracker.org/about/>.

² We note that the IMF’s inclusion of traffic-related costs is controversial. See the section on externalities for a short discussion.

affordability measures. This should be possible after the OECD inventory for 2022 is released.

SOE Investment (2013–2022)

This report uses the information made publicly available by majority government-owned SOEs focused on fossil-based energy through their annual reports from 2017 to 2022. Only national-level SOEs with a 50% or greater share of government ownership are included in this analysis. However, we recognize that some SOEs may have lower government ownership but still be directed by the state. For example, the Italian Ministry of Economy and Finance owns 30% of ENI (the Italian oil and gas company) with a golden share, meaning that the government has veto voting rights. ENI's second-largest shareholder is an Italian development bank whose largest shareholder is the Italian Ministry of Economy and Finance. However, we were unable to examine these details for all fossil fuel SOEs across G20 countries; therefore, we used the 50% ownership rule and note that the amount of SOE investment is most likely underestimated.

Where annual reports had not yet been published with 2022 data (6 of the 51 SOEs), we used the 2019–2021 average as an estimate for 2022. This is valid because historical data show that SOEs' capex does not fluctuate dramatically year-on-year.

Data were collected on renewable energy capex when readily available. Renewable energy capex was observed in SOEs in China, India, and France. However, the results are only indicative because not all companies publish disaggregated data on capital investments.

In China, not all energy SOEs' annual reports show how much they have invested in fossil and renewable technologies; some present only gross figures, which makes it impossible to determine from the outside if shifts have happened, for example, from fossil fuels to renewables or in reverse. Transparency is better for companies listed on a stock exchange because they must fulfill certain transparency requirements, including publishing annual reports that contain capex figures and descriptions of how their business is structured.

In our analysis, in several cases, financial data is given only for a Chinese listed subsidiary and not the whole group because the SOE as a whole is not as transparent as its listed subsidiary. Many of China's energy SOEs are conglomerates, and—given the strong economics of renewables—they tend to have some renewable investments mixed in, even if they started out as a company purely focused on fossil fuels. Without specific reporting to separate these investments, it is hard to determine their size and quantify or establish trends. Also, renewable and “new energy” companies are sometimes involved in the fossil fuel business, such as coalbed methane, and transition bonds have been spent on fossil fuels (e.g., “clean” natural gas). Such mixing of renewables and fossil fuels under creative terminologies makes it difficult to draw a clear line and identify precisely how much a company is investing in fossil fuels and renewables.

Fossil Fuel Public Finance, 2013–2022

This report uses the information made publicly available by majority government-owned financial institutions. These data can be found in Oil Change International's Public Finance for Energy Database (n.d.). Data on all global international public finance for 2022 was not available at the time of writing (expected in 2024). Data for the G7 and MDBs, however, was

available from 2013–2022, so this was used as an indication of public finance trends over the period.

The Public Finance for Energy Database (n.d.) collects all data on any institution that lends internationally. Some domestic development financial institutions lend internationally as well as domestically. In these cases, the database includes some domestic lending as international lending. This means that most domestic public finance is likely not included, and estimates are therefore highly conservative in nature.

The international public finance categories include the following technologies and fuel types:

- clean: solar, wind, wave, biomass, geothermal, batteries, green hydrogen, small hydro, fuel cells+hydrogen, energy efficiency, and related grid.
- fossil fuels: coal, oil, and gas, including these same fossil fuels for power generation.

Externalities

We use the IMF (Black et al., 2023) implicit subsidies as the global estimate of fossil fuel externalities. The externalities estimated by the IMF include the failure to fully charge for environmental damages, such as from air pollution and climate change, traffic-related costs (including accidents, congestion, and road damage), as well as exempting fuels and electricity from general consumption taxes.

We do not classify these as subsidies. The World Trade Organization definition of subsidies we have used does not include externalities arising from the use of fossil fuels. Some argue (including the IMF) that quantifying and presenting these costs provides a more accurate picture of the total cost to governments—or the revenue foregone—due to the use of fossil fuels. While we do not classify these costs as subsidies, we agree that taxes should be increased to reflect at least some external costs.

The inclusion of traffic externalities is controversial. Some argue that these costs also occur for electric vehicles. Others argue that, in the absence of a road user charge or specific congestion charge, fuel use is the next-best option for internalizing these costs for producers and consumers. Fuel prices are closely correlated with road accidents, road damage, and vehicle congestion (Burke & Nishitateno, 2015) (Zhang & Burke, 2020).

Renewable Energy Subsidies (2020–2023)

There are no up-to-date databases on global renewable energy subsidy expenditures. The most recent global estimate of renewable energy subsidies was published in 2020 by IRENA using 2017 data. Subsidies to renewable power generation technologies were estimated to be USD 128 billion in 2017, with the majority (91%) arising from the five largest subsidizing economies (China, the European Union, India, Japan, and the United States) and 9% from the rest of the world (IRENA, 2020).

Estimating global annual spending on renewable energy subsidies was beyond the scope of this project; instead, we estimated government spending commitments using data from the

IEA (2023b) Government Energy Spending Tracker (data available to June 2023, contains data for 41 countries).

For G20 countries, we also added any additional measures from the Energy Policy Tracker (n.d.) (data available to December 2021) and Internet searches to find additional policies not captured by the Government Energy Spending Tracker. This was only done for G20 countries due to resource constraints.

The data covers renewable energy power generation (i.e., solar, wind, tidal, small hydro, and geothermal) and commitments to upgrade and expand the electricity grid with the goal of boosting the integration of renewable energy sources.

These announcements relate to funding committed over the Q2 2020 to Q2 2023 period, and that will be spent over future years (different time periods for each policy). As such, they are not directly comparable to the data on fossil fuel subsidies, SOE capex, or international public finance, which are annual data and relate to actual expenditures (for subsidies and SOE capex) or financing for projects that have closed in the given year. More transparency is needed on actual subsidy expenditures for renewable energy.

Fossil Fuel and Renewable Energy Investment Data

Data were provided by the Climate Policy Initiative and IRENA from their *Global Landscape of Renewable Energy Finance 2023* (2023). These data represent “primary” financial transactions going into both large- and small-scale projects that directly contribute to the deployment of renewable energy. They therefore exclude secondary transactions—for example, refinancing of existing debts or public trading in financial markets—as these do not represent new investments targeting new renewable energy assets but rather capital being exchanged for existing assets. Moreover, investments are recorded at the time of a project reaching financial close.

Overarching Data Assumptions

Nominal to real USD: All the USD values were adjusted for inflation and set to real 2022 USD based on the U.S. GDP price deflator, sourced from the World Bank (2013 to 2021) and Economic Research (2022).

Exchange rates: OECD’s average annual exchange rates (indicator), obtained in April 2023, were used to convert local currencies to USD.

National and subnational coverage: It is difficult to gather information on subnational support, which means it is likely that some subnational measures have been overlooked. Where possible, the data include measures provided at the national and subnational levels. The OECD inventory of direct budget transfers and tax expenditures (OECD, n.d.), which feeds into the FFST, covers some subnational-level measures. For example, OECD (n.d.) subnational data coverage for the United States only include selected key producer and consumer states (OECD, n.d.). There are also SOEs that exist at the subnational level, including those established by municipal, state, and provincial governments. Investment by

these SOEs would have an impact on the level of overall support provided within a G20 country. However, due to the challenges of data access, they are not included in the estimates of SOE investment.

Data Gaps

Transparency of information on all types of government support for fossil fuels and renewables remains limited. Overall, our analysis of reporting demonstrates the significant gap globally in terms of their reporting on government support.

The study collects data only on national-level subsidy and SOE policies due to the huge resource effort needed to extend data collection to subnational bodies. Subnational jurisdictions can provide large subsidies and include large SOEs. In addition, the data does not capture a global estimate of SOE investments in fossil fuels. Therefore, it is likely that our findings underestimate the level of government support for fossil fuels across all support measures.

For some of the SOEs included in the analysis, no available data could be found for their capital investment for the entire period considered (e.g., for Argentina's YCRT and Energia Argentina); for others, data were missing for specific years in the period considered. This contributes to a further underestimation of governments' SOE investments.

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Appendix 1. List of Public Finance Institutions Reviewed

G7 Country/ MDBs	Institution
Canada	Export Development Canada, Sustainable Development Technology Canada
France	Proparco
Germany	Euler Hermes, KfW IPEX-Bank, German Investment & Development Corporation, German Investment & Development Corporation, Kreditanstalt für Wiederaufbau
Italy	Servizi Assicurativi del Commercio Estero
Japan	Japan Bank for International Co-operation, Nippon Export and Investment Insurance, Japan Oil Gas and Metals National Corporation, Japan International Cooperation Agency, Japan Oil Gas and Metals National Corporation, Development Bank of Japan, Japan International Cooperation Agency
United Kingdom	UK Export Finance, CDC Group Plc
United States	Export-Import Bank of the United States, Overseas Private Investment Corporation
MDBs	African Development Bank, Asian Development Bank, Asian Infrastructure Investment Bank, European Bank for Reconstruction and Development, European Investment Bank, Inter-American Development Bank, Islamic Development Bank, New Development Bank, North American Development Bank, World Bank Group (International Bank for Reconstruction and Development, International Development Association, International Finance Corporation, Multilateral Investment Guarantee Agency)

Appendix 2. List of Majority State-Owned Enterprises Reviewed

G20 Country	SOE Name
Argentina	YPF, Yacimientos Carboníferos Río Turbio, Energia Argentina (ENARSA/ IEASA), Pampa Energy
Australia	(No national-level energy state-owned enterprises [SOEs])
Brazil	Petrobras
Canada	Trans Mountain Pipeline
China	Sinopec Group (China Petrochemical Corporation), Petro China (CNPC), CNOOC, China Huadian Corporation, China Coal Energy, China Huaneng Group Corporation, China Datang Corporation, China Energy Investment Corp, China Guodian Corporation, Shenhua Group, Dongfang Electric Corporation, State Development & Investment Corporation, Sinochem Group, State Power Investment Corporation, China Resources Power Holding
France	EDF
Germany	(No national-level energy SOEs)
India	ONGC, GAIL, IOCL, BPCL, HPCL, CIL, SCCL, NTPC, BHEL
Indonesia	Pertamina, PTBA, PLN, PGN
Italy	(No national-level energy SOEs)
Japan	(No national-level energy SOEs)
Mexico	Pemex, Comisión Federal de Electricidad (CFE)
Russia	Gazprom, Rosneft, Bashneft
Saudi Arabia	Saudi Aramco, Saudi Electricity Company
South Africa	Petro SA, Transnet, Eskom, AEMFC

G20 Country	SOE Name
Korea	KNOC
Korea	KEPCO, KOGAS, KOCOAL
Turkey	TKI, TTK, EÜAŞ, BOTAŞ, TPAO
United Kingdom	(No national-level energy SOEs)
United States	(No national-level energy SOEs)

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