



FOSSIL FUEL SUBSIDY REFORM (FFSR)

CLASSIFICATION OF FOSSIL FUEL SUBSIDY MEASURES

Note by the Secretariat¹

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¹ This factual note has been prepared by the Secretariat at the request of the FFSR initiative. It does not represent the official position of the WTO or of the WTO Secretariat.

1 INTRODUCTION

1.1. The purpose of the present background paper is to outline different ways in which fossil fuel subsidies (FFS) have been classified based on various criteria, including the nature of the support mechanism, incidence, beneficiary, sector, and pathway of benefit as well as fiscal, environmental, and trade impacts. In this way, the paper aims to facilitate a deeper understanding of the current landscape of existing subsidies, thus informing discussions under the FFSR initiative and identifying knowledge gaps.

1.2. In its sequential approach for the assessment of government support measures and their reform, the Organization for Economic Cooperation and Development (OECD) considers that the first two steps in the reform process are to: (i) identify support measures, document their objectives, and estimate their budgetary cost; and (ii) measure the distortiveness of support measures, including their economic, social, and environmental effects.² In this regard, mapping out the landscape of fossil fuel support measures is an important initial consideration that could help to better understand the objectives and intended beneficiaries of such measures, as well as to take into account their level of distortive effect.

1.3. Energy subsidies can be classified along different dimensions, including the beneficiary, the nature of the instrument (i.e. how the transfer is provided), and its incidence (i.e. to which aspect of production or consumption it is targeted), as well as by type of fuel or energy carrier.³

2 DEFINITIONS

2.1. A first step in the classification is to understand what we are talking about when we refer to "fossil fuel subsidies".

2.1 Fossil fuel types

2.2. There is general agreement in the literature as to what constitutes a fossil fuel either through reference to the properties of fossil fuels (e.g. their origin from organic material in the geological past) or through listings of specific fuel types that constitute fossil fuels. Nuclear fuel, renewable energy, and biofuels are not covered by the term.⁴

2.3. Fossil fuels include both primary fossil fuel commodities (e.g. crude oil, natural gas, bituminous and sub-bituminous coal, and peat) and secondary refined or processed products (e.g. diesel fuel, gasoline, kerosene, liquefied petroleum gas (LPG), liquefied natural gas, compressed natural gas, and coal and peat briquettes). Primary fuels are those extracted from both conventional and unconventional sources. The latter include, for example, oil extracted from bituminous sands, shale-based natural gas, and coal-bed methane.

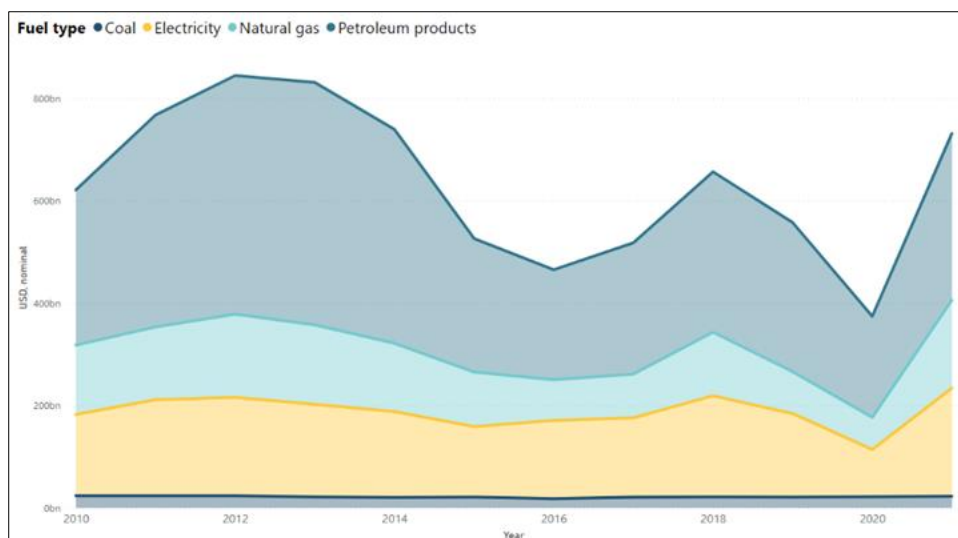
2.4. Electricity and heat are not technically fossil fuels but, in many countries, a proportion of generation is fuelled with the fossil feedstock. Therefore, subsidies to electricity and heat generation may be a natural fit for FFS reviews in such economies. The International Energy Agency (IEA) includes subsidies to fossil-fuel-fired electricity into its price-gap estimates of FFS. Meanwhile, there are non-energy uses of fossil fuels, for instance in chemistry or metallurgy, that are much more rarely subject to FFS reviews.⁵

² OECD 2021, [Companion to the Inventory of Support Measures for Fossil Fuels](#).

³ UNEP 2019, [Measuring Fossil Fuel Subsidies in the Context of the Sustainable Development Goals](#).

⁴ UNEP 2019, [Measuring Fossil Fuel Subsidies in the Context of the Sustainable Development Goals](#).

⁵ IISD 2017, [A guidebook to reviews of FFS](#).

Figure 1: Global estimates by fuel type

Source: [Fossil Fuel Subsidy Tracker 2021](#).

2.2 Subsidy definition

2.5. Different definitions are used by organizations that assess fossil fuel or wider energy subsidies, notably the World Trade Organization (WTO), the OECD, and the IEA. These definitions are based either on the form of policy intervention by governments (WTO, OECD), or the effect of some of these measures on cost and prices (IEA).⁶

2.6. **WTO subsidy definition:** In the WTO SCM Agreement, the definition of a "subsidy" contains three basic elements: (i) a financial contribution; (ii) by a government or any public body within the territory of a Member; (iii) which confers a benefit. All three of these elements must be satisfied for a subsidy to exist. The WTO subsidy definition is widely used by organizations that work on FFS, including for G20 peer reviews. The Global Subsidies Initiative (GSI) and several other intergovernmental organizations also adhere to it.⁷

2.7. **OECD support measures definition:** The OECD definition of "government support" also builds on the WTO subsidy definition.⁸ The OECD uses a bottom-up method of estimating government support to fossil fuels by identifying and quantifying individual policy measures. This approach measures fossil fuel support as all direct budgetary transfers and tax expenditures that provide a benefit or preference for fossil-fuel production or consumption. The definition of support, as opposed to subsidy, is a deliberately broader one, which encompasses policies that can induce changes in the relative prices of fossil fuels. The definition was adopted in 2019 to track and measure the Sustainable Development Goal (SDG) Indicator 12.c.1 on FFS.⁹

2.8. **IEA subsidy definition:** The IEA establishes a market reference price and then compares it with the price paid by consumers. When the end-user price is lower than the reference price, it is counted as a subsidy. The approach however does not include subsidies that do not have an impact on energy prices in short and medium terms, including, for example, certain tax breaks and cross-subsidies.¹⁰ The IEA has also recently considered an approach that goes further and explores whether, and how, it might be possible to incorporate environmental aspects into the calculation of FFS.¹¹

⁶ UNEP 2019, [Measuring Fossil Fuel Subsidies in the Context of the Sustainable Development Goals](#).

⁷ UNEP 2019, [Measuring Fossil Fuel Subsidies in the Context of the Sustainable Development Goals](#).

⁸ UNEP 2019, [Measuring Fossil Fuel Subsidies in the Context of the Sustainable Development Goals](#).

⁹ OECD, [Inventory of Support for Fossil Fuels - methodology](#).

¹⁰ IISD 2017, [A guidebook to reviews of FFS](#).

¹¹ IEA 2023, [Fossil Fuel Subsidies in Clean Energy Transitions: Time for a New Approach?](#)

2.9. IMF subsidy definition: The International Monetary Fund (IMF) argues that failure of governments to internalize externalities confers a subsidy.¹² The IMF therefore uses the price paid by consumers for energy derived from fossil fuels as the criterion for the existence of FFS. If the price is lower than the cost of supply, then subsidies are deemed to exist. The IMF also widens the scope by including "post-tax" consumer subsidies considering that corrective taxes should be applied to fossil fuel prices for environmental damages caused, as well as additional consumption taxes. The exemption of these taxes is then regarded as a subsidy. Further, the IMF includes production subsidies drawn from the OECD Inventory.¹³

2.10. These and other definitions (e.g. those of the World Bank's Energy Sector Management Programme (ESMAP) and the System of National Accounts) can be used as a basis to identify and measure FFS and produce harmonized data. Nevertheless, the WTO definition is accepted as very comprehensive and allowing the capture of these subsidies, both to producers and consumers. It is signed by 164 members.¹⁴

Table 1: Typology of energy subsidies based on the SCM Agreement

Type of subsidies	Examples
Direct transfer of government funds	<ul style="list-style-type: none"> • Direct spending, budget and off-budget transfers • Government ownership of energy-related enterprises if on terms and conditions more favourable for business than in case of private ownership
Induced transfers (Price support)	<ul style="list-style-type: none"> • Price support, including through market regulation
Tax expenditure, other revenue foregone, and underpricing of goods and services	<ul style="list-style-type: none"> • Tax breaks and other government revenue foregone • Underpricing of government-owned energy resources • Underpricing of non-energy, government-owned natural resources or land • Underpricing of government-owned infrastructure • Underpricing of other government-provided goods or services • Below-market lending to energy-related enterprises, including loans to energy exporters, and debt restructuring and cancellations
Transfer of risk to government	<ul style="list-style-type: none"> • Credit support through risk transfer mechanisms like loan guarantees • Debt restructuring and cancellations • Insurance and indemnification • Assumption of risks related to occupational health and accidents • Assumption of responsibility for remediating environmental damage

Source: [UNEP 2019](#).

3 SUPPORT MECHANISM

3.1. Some classifications build off the type of the support mechanism or instrument used to provide them. Under the SCM Agreement, subsidies can be broadly grouped into four categories: (i) government measures involving the direct transfer of funds; (ii) government revenue that is otherwise foregone (not collected); (iii) governments providing goods and services or purchasing goods; and (iv) income or price supports.¹⁵ The OECD and GSI typologies of FFS further break down the high-level categories into more specific groups of FFS. Such fine-grained distinctions would also take into account the incidence of the subsidy, i.e. to which aspect of production or consumption it is targeted which is essential to understanding the economic and environmental effects of a subsidy.¹⁶

3.2. The OECD and the GSI classifications distinguish between direct transfers of funds, price support, tax expenditures, and transfers of risk to government.

3.3. Direct transfers of government funds are payments made by governments, or bodies acting on behalf of governments, to individual recipients. This includes direct spending, e.g. for specific support programmes, and government ownership (fully or through equity shares) of energy-related enterprises.¹⁷

¹² IISD 2017, [A guidebook to reviews of FFS](#).

¹³ UNEP 2019, [Measuring Fossil Fuel Subsidies in the Context of the Sustainable Development Goals](#).

¹⁴ UNEP 2019, [Measuring Fossil Fuel Subsidies in the Context of the Sustainable Development Goals](#).

¹⁵ See Article 1.1(a)(1) and (2) of the SCM Agreement.

¹⁶ UNEP 2019, [Measuring Fossil Fuel Subsidies in the Context of the Sustainable Development Goals](#).

¹⁷ OECD, [Inventory of Support for Fossil Fuels - methodology](#).

3.4. Capital transfers are one common form of direct payments. Direct transfers normally are reported by governments in their budgets and generally do not need to be estimated by analysts. A challenge might be data collection by the statistical agencies from the sectoral ministries and state-owned enterprises, including at the sub-national level, which depends on their capacity. In cases where direct transfers are made to a range of industries, additional analysis may be required to allocate the amount of payments that are particular to fossil fuel-related industries.¹⁸

3.5. **Induced transfers (or price support or price-gap)** are estimated subsidies due to market regulation and price support for lower end-user price relative to the full cost of supply. It refers to a change in prices received by producers and paid by domestic consumers as a consequence of government interventions, such as through direct price regulation, pricing formulas, border controls or taxes, and domestic purchase or supply mandates. The difference between the end-use price and a reference price (reflecting the full cost of the supply, which would prevail in a competitive market) amounts to the price gap or induced transfer.¹⁹

3.6. The most prevalent induced transfers are regulations that oblige producers to sell their fuel at lower than the opportunity-cost price of that fuel (consumer price support). Among the most common mechanisms are direct price controls, automatic pricing formulas and supply mandates, sometimes used in combination. Governments may also support domestic energy industries, or certain segments of those industries, such as refining. Import duties increase the price of products imported, which allows domestic producers to raise their prices by up to the amount of the tariff. In cases where fuel prices are regulated, governments generally have very good documentation of the regulated fuel prices and domestic price build-up as monitored by regulatory agencies. Furthermore, data on the prices of fuels and electricity sold domestically are generally available for most countries, even if only for certain regions.²⁰

3.7. **Tax expenditures** are tax concessions that are typically provided through lower rates, exemptions, or rebates of consumption taxes on fossil fuels (mainly value-added taxes and excise taxes) or measures to reduce the cost of the extraction of fossil fuels (including accelerated-depreciation allowances for capital expenditure, investment tax credits, deductions for exploration and development expenses, and preferential capital-gains treatment). Tax expenditures can also take less visible forms such as the special treatment of income from state-owned enterprises, tax relief for income earned on industry sinking funds (e.g. for site remediation), tax exempt bonds, the use of foreign tax credits for what may be considered royalty payments, or preferential tax rates on fuels used as inputs in fossil-fuel production. Tax expenditures are often premised on providing government support to activities or entities deemed to be socially beneficial; or on concerns relating to risk and uncertainty, energy security, capital intensity, high upfront costs, and long project timelines.²¹

3.8. Unlike direct spending, tax expenditures are almost always deliberated outside of the budgetary framework. Once in place, tax expenditures do not typically require approval by the legislature and might therefore be less subject to oversight. The lack of established accounting and reporting practices of tax expenditures, or lack of transparency can limit assessments and international comparability of tax expenditures for FFS. In addition, information on tax expenditures at the sub-national level is often hard to come by.²²

3.9. **Transfer of risk to government.** Private enterprise in the fossil-fuel industry involves managing various risks – technological, financial, price-related and policy-related, and geological. Reports show that "[m]any governments of fossil-fuel producing countries have developed ways to

¹⁸ UNEP 2019, [Measuring Fossil Fuel Subsidies in the Context of the Sustainable Development Goals](#).

¹⁹ OECD, [Inventory of Support for Fossil Fuels - methodology](#). For countries that import a given product, consumer subsidy estimates derived through the measurement of price-gaps are explicit. That is, they represent net expenditures resulting from the domestic sale of imported energy at lower, regulated prices. In contrast, for countries that export a given product – and therefore do not pay world prices – subsidy estimates are implicit and have no direct budgetary impact. Rather, they represent the opportunity cost of pricing domestic energy below market levels. For countries that produce a portion of their fossil-fuel consumption themselves and import the remainder, the estimates represent a combination of opportunity costs and direct government expenditures.

²⁰ UNEP 2019, [Measuring Fossil Fuel Subsidies in the Context of the Sustainable Development Goals](#).

²¹ OECD, [Inventory of Support for Fossil Fuels - methodology](#).

²² UNEP 2019, [Measuring Fossil Fuel Subsidies in the Context of the Sustainable Development Goals](#).

shift a portion of those risks to the government, and ultimately taxpayers."²³ This is usually through direct involvement in industry, for example through a state-owned enterprise, or by offering credit, loan guarantees or other risk-sharing mechanisms to independent companies on terms that are more favourable than could be obtained from private lenders.

Table 2: Typology of energy subsidies

Category	Sub-category	Examples
Direct transfers of government funds	Direct spending, budget and off-budget transfers.	<ul style="list-style-type: none"> • Agency appropriations: Targeted spending on the sector through government budgets of different levels and budgets of individual government agencies. • Equity infusions. • Government procurement of energy at above-market rates.
	Government ownership of energy-related enterprises if on terms and conditions more favourable for business than in case of private ownership.	<ul style="list-style-type: none"> • Government ownership of strategic and other energy assets that provides returns on investment at rates below-market.
Induced transfers (Price support)	Price support, including through market regulation.	<ul style="list-style-type: none"> • Consumption mandates and mandated feed-in tariffs: fixed consumption shares for use of a specific energy type. • Border protection or restrictions: controls (tariff and non-tariff measures) on imports or exports leading to unfair advantages. • Regulated prices set at below-market rates: for consumers (including where there is no financial contribution by government). • Regulated prices set at above-market rates: for producers. • Cross-subsidies in the electricity sector.
Tax expenditures, other revenue foregone, and underpricing of other goods and services, including risk	Tax breaks and other government revenue foregone.	<ul style="list-style-type: none"> • Income-tax expenditures: Tax expenditures are foregone tax revenues, due to special exemptions, deductions, rate reductions, rebates, credits or deferrals that reduce the amount of tax that would otherwise be payable. • Exemptions from excise taxes and other special taxes, or other duties: Exemption of excise taxes on fuels; special targeted taxes on energy industry (e.g. based on environmental concerns or "windfall" profits); exemption of import duties on equipment for a specific industry.
	Underpricing of government-owned energy resources.	<ul style="list-style-type: none"> • Benefits related to differences in procedures for energy resource leasing: For example, some countries auction access to larger sites, but designate a sole source for smaller sites. • Royalty relief or reductions in other taxes due on extraction: reduced, delayed or eliminated royalties.
	Underpricing of non-energy, government-owned natural resources or land.	<ul style="list-style-type: none"> • Access to government-owned natural resources such as water or land at no charge or for below-market rate.
	Underpricing of government-owned infrastructure	<ul style="list-style-type: none"> • Use of government-provided infrastructure at no charge or below-market rate.
	Underpricing of other government-provided goods or services.	<ul style="list-style-type: none"> • Government-provided goods or services at below-market rates.

²³ UNEP 2019, [Measuring Fossil Fuel Subsidies in the Context of the Sustainable Development Goals](#).

Category	Sub-category	Examples
Transfer of risk to government	Credit support.	<ul style="list-style-type: none"> • Loan guarantees: at below-market rates.
	Debt restructuring and cancellations	<ul style="list-style-type: none"> • Debt restructuring: the government-orders the easing of the debt burden on one or more firms. • Debt cancellation: the government forgives the outstanding balance of a loan it has made, with no compensation from the beneficiary.
	Insurance and indemnification.	<ul style="list-style-type: none"> • Government insurance and indemnification: market or below- market risk-management or risk-shifting services • Statutory caps on commercial liability: can confer substantial subsidies if set well below plausible damage scenarios.
	Assumption of risks related to occupational health and accidents. Assumption of responsibility for remediating environmental damage.	<ul style="list-style-type: none"> • Assumption of occupational health and accident liabilities. • Responsibility for closure and post-closure risks: facility decommissioning and clean-up; long-term monitoring; remediation of contaminated sites; litigation • Waste management and environmental damages: avoidance of fees payable to deal with waste, avoidance of liability and remediation to make the environment whole.

Source: [UNEP 2019](#).

3.10. The level of difficulty in measuring government support varies across these different transfer mechanisms, starting with the ease of quantifying the cost of direct spending programmes, to the estimation of induced transfers due to government regulation and the revenue forgone from providing tax benefits, to quantifying the support element of transferring risk to the government through concessional finance. With the exception of direct spending programmes, the estimation for the other support measures hinges on measuring the difference between either applied tax rates, regulated price, interest rate and realised equity return, and their reference counterparts.²⁴

3.11. The most straightforward government programmes to identify and measure are direct spending programmes. These are well documented, revised on a budget cycle, and subject to legislative and executive branch scrutiny. Tax expenditures, on the other hand, are often under reported by many jurisdictions. It remains that direct spending programmes and tax expenditures are the more easily measurable forms government support for fossil fuels. Government support through the financial system remains underreported despite its scale and potential for affecting the allocation of capital across sectors.²⁵

4 STAGE OF PROVISION

4.1. A common broad distinction based on the stage at which subsidies are provided is between FFS to consumers and to producers.

4.2. **Consumption subsidies** cover government support to further the consumption of fossil fuels, lowering their costs for private households or industrial consumers. These subsidies are, therefore, provided to the consumers of fossil fuels in activities that could include the use of fossil fuels in power and heat generation, as well as in industrial processes and activities outside of the energy sector, including all other final uses of fossil fuels, be it in the sectors of transport, agriculture, forestry, fisheries, or the residential sector. This is a very broad category ranging from government support for household cooking gas to economy-wide gasoline or diesel subsidies to support the price of energy inputs for domestic energy-intensive goods-manufacturing industries.²⁶

4.3. Consumption subsidies predominantly cover petroleum products for private customers for transport, lighting, cooking, or heating, or for fuels used by electricity generators and strategically important domestic industries, with the IEA recording these are often found in developing countries.

²⁴ OECD 2020, [Designing fossil fuel subsidy reforms in OECD and G20 countries: A robust sequential approach methodology](#).

²⁵ OECD 2020, [Designing fossil fuel subsidy reforms in OECD and G20 countries: A robust sequential approach methodology](#).

²⁶ IISD 2022, [Background Note of Fossil Fuel Subsidy Reform](#).

According to IEA's latest available estimations, in 2022, subsidies worldwide for fossil fuel consumption nearly doubled to more than USD 1 trillion, up from 528 billion in 2021 and by far the largest annual value ever seen.²⁷

4.4. Underpricing fossil fuel products relative to the market prices or cost recovery, through regulating domestic price or reducing tax rates, and hence the end-user price, results in increased consumption of fuels relative to a fully priced pricing counterpart.²⁸ There is also a large number of sector-specific fossil fuel consumption subsidies — for the fishing sector, for road freight, for farming, etc. For example, fuel subsidies reduce the costs of fishing, leading to an increase of fishing capacity, and contributing to continued overfishing in the ocean.²⁹

4.5. **Production subsidies** are provided to the producers of fossil fuels and can occur along all stages of fossil fuel production. Such subsidies include transfers to producers of fossil fuels and can include such activities as gaining access to reserves, exploration and field development, extraction, transportation and storage, refining and processing, as well as decommissioning of installations.³⁰

4.6. They are concentrated in the major producers of oil, gas, and coal. Producer subsidies are generally identified by an inventory approach. The OECD compiles estimates of producer support in its inventory, which currently covers 43 countries. Non-governmental organizations (NGOs) have published reports identifying individual policies and programmes supporting fossil-fuel production in individual countries. However, there are currently no global estimates of producer subsidies.³¹

4.7. Countries use tax incentives and other forms of government support, such as concessional finance or direct budgetary transfers, to attract domestic and foreign investment. Investments in the fossil fuel extractive sector have the potential to be important drivers for economic growth, but they can also cause economic, social and environmental harm. Government support to the sector can be designed to effectively and efficiently deliver benefits to its economy, but it can erode a government's ability to generate the requisite revenue to fund other public services and investments. Government support can also be distortive as it may tilt the playing field towards fossil-fuel energy sources locking in carbon-intensive assets, slowing down the uptake of less carbon-intensive technologies and crowding out investments in other industries.³²

4.8. There may sometimes be a fine line between production and consumption subsidies in terms of their trade effects. The IISD gives the example of producer subsidies in domestic transformation which could be corporate income-tax subsidies to new refineries. Such measures are not directly linked to the consumption of fossil fuels, but rather support the production of refined petroleum products. Consumer subsidies in domestic transformation, on the other hand, can take the form of price controls or tax subsidies that directly lower the price of fossil fuel inputs. Furthermore, downstream sectors and enterprises using subsidized fuels as inputs would benefit from relatively lower production costs. Thus, the effects of consumption subsidies can vary widely depending on how targeted they are and on the intended beneficiary (e.g. downstream producer or a household).³³

4.9. A third category of FFS that is sometimes used is that of "**general services**" subsidies that benefit neither individual producers nor consumers of FFS but, rather, are applied to a broader sector or economy, for example, some research and development activities or the construction of infrastructure.³⁴

²⁷ IEA 2023, [Fossil fuel consumption subsidies 2022](#).

²⁸ OECD 2020, [Designing fossil fuel subsidy reforms in OECD and G20 countries: A robust sequential approach methodology](#).

²⁹ Climate Action Network 2023, [Fossil Fuel Subsidies in the EU](#).

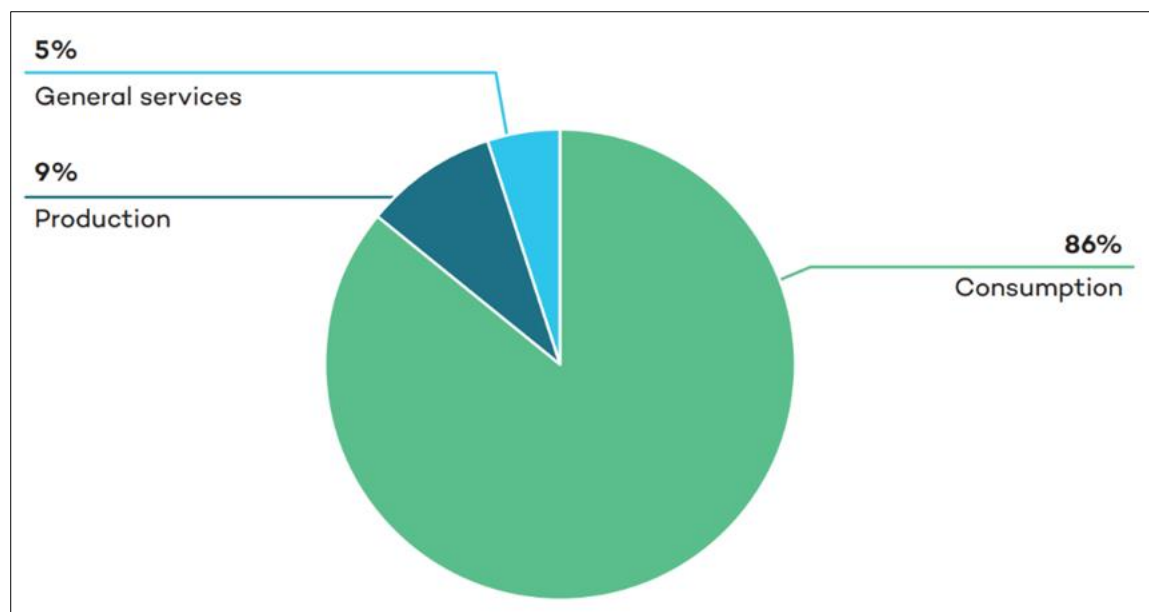
³⁰ IISD 2022, [Background Note of Fossil Fuel Subsidy Reform](#).

³¹ UNEP 2019, [Measuring Fossil Fuel Subsidies in the Context of the Sustainable Development Goals](#).

³² OECD 2020, [Designing fossil fuel subsidy reforms in OECD and G20 countries: A robust sequential approach methodology](#).

³³ IISD 2020, [Exploring the Trade Impacts of Fossil Fuel Subsidies](#).

³⁴ IISD 2022, [Background Note of Fossil Fuel Subsidy Reform](#).

Figure 2: Fossil fuel subsidies by category (2019)

Source: [IISD 2022](#).

4.10. The OECD Inventory similarly classifies subsidies by their beneficiaries as follows:

- **Producer Support Estimate:** transfers or expenditures from consumers and taxpayers to producers of fossil fuels. Fossil-fuel production encompasses the following activities along the supply chain: exploration and extraction; bulk transportation and storage; and refining and processing.
- **Consumer Support Estimate:** transfers or expenditures in favour of consumers of fossil fuels. Consumption of fossil fuels refers to the stage at which fuels are combusted or used as raw materials by various end-use sectors, whether it occurs in motor vehicles, stationary engines, heating equipment or power plants. Consumption encompasses the following activities: the use of fossil fuels in power and heat generation; their use in industrial processes and activities outside of the energy sector; and all other final uses of fossil fuels, whether in the transport sector, the residential sector, or primary industries outside of the energy sector (e.g. agriculture and forestry).
- **General Services Support Estimate:** transfers or expenditures arising from policy measures that create enabling conditions for the fossil-fuel sector through the development of private or public services, institutions and infrastructure (regardless of their objectives and impact on fossil-fuel production and or consumption). It includes policies where fossil fuels are the main beneficiaries but does not include any payments to individual producers. GSSE transfers do not directly alter producer receipts or costs, or consumption expenditures, although they may affect production or consumption of fossil fuels in the long term.³⁵

5 BENEFICIARY

5.1. The classification of subsidies by transfer mechanisms is helpful because it allows researchers to identify the sources of data and the relevant method of estimation for a particular mechanism. However, for understanding the economic or environmental effects of a subsidy, it may be more helpful to know the stage of production or consumption at which the support is targeted (i.e., as the OECD calls it, the subsidy's "incidence") since the same type of subsidy can have varying effects on production, and the environment.³⁶ Classifying subsidies by their incidence gives information about

³⁵ OECD, [Inventory of Support for Fossil Fuels - methodology](#).

³⁶ For example, a direct budgetary transfer tied to output returns will not have the same effects on production as one tied to intermediate inputs such as energy used in processing. The former effectively raises the price of the output for the producer, creating a higher optimal production amount, whereas the latter reduces the cost of specific inputs, and thus in addition to encouraging more production it will also skew the input mix towards the use of the supported inputs. A subsidy to energy inputs, for example, would encourage

the recipient of a subsidy. Initial incidence is focused on the aspect of production or consumption that is officially targeted by the measure, or on which the measure is based. The ultimate incidence of a subsidy may differ from its formal incidence – for example, a subsidy to a state-owned oil company might result in lower oil prices, making domestic consumers the ultimate beneficiaries.³⁷

5.2. The OECD identifies nine types of formal incidence of which seven relate to **production**:

- **Output returns:** Increases the price received by producers for the sales of a specific good, or make up for losses incurred at selling that good at an administered price, e.g. direct subsidization by governments of unit costs of coal production.
- **Enterprise income:** Enables a firm to earn more income over the course of a year than it would otherwise, e.g. an annual cash infusion to make up for overall losses, or a concessional rate of income tax not specifically tied to the production of a particular commodity.
- **Cost of intermediate inputs:** Reduces the unit cost of a particular input, typically through an input-price subsidy, or a reduction or exemption in a tax on the input. It can also include the provision of goods and services by the government at below-market prices.
- **Labour:** Reduces the cost of labour to companies by subsidizing wages or reducing the social charges normally paid by firms. It can also increase the wages and benefits of labourers, e.g. through an income-tax exemption or the government provision of a benefit.
- **Land and natural resources:** Allows firms to acquire land at a reduced cost when used for a productive activity, such as coal mining, through tax reductions or under-priced access to government-owned land; or reduced resource royalties or taxes for the exploitation of natural resources, e.g. oil and gas wells.
- **Capital:** Includes both grants to help a firm purchase capital equipment or invest in construction works, and assistance that reduces the financing cost of the firm or a project. Tax benefits may also be tied to capital investments or financing costs.
- **Knowledge:** Government-funded R&D, other than primary research, or the transfer of government-owned intellectual property rights to producers; indirect forms include targeted tax credits for investments in fossil fuel-related R&D.

5.3. There are also two types of incidences that relate to the direct **consumption** of fossil fuels:

- **Unit cost of consumption:** Reduces the price received by final consumers in the purchase of a fossil fuel, where consumers comprise both households and enterprises, e.g. price discounts and VAT or excise-tax exemptions.
- **Household or enterprise income:** Reduces the cost of energy purchases for households or enterprises at a rate that varies with income, e.g. lifeline electricity rates that reduce the price of electricity for households at a rate dependent on total electricity consumption.

5.4. This classification of subsidies facilitates an analysis of their effects on fossil fuel production and consumption, and consequently on the environment. The OECD considers that it creates greater value in terms of illustrating the impacts of subsidies to policymakers.³⁸

6 SECTOR

6.1. The OECD Inventory – which follows the IEA's World Energy Balances – groups fossil-fuel production and consumption subsidies under the following categories:

- **Production sector:** includes measures that support the production, exploration, trade, storage and transportation of fossil fuels.
- **Transportation sector:** includes measures that support the final uses of fossil fuels in the transport sector, including domestic aviation, domestic navigation, road, and rail.
- **Residential sector:** includes measures that support the final uses of fossil fuels in the residential sector, including consumption by households.
- **Electricity generation sector:** includes measures that support the use of fossil fuels in electricity and heat generation. This includes fossil-fuel inputs to electricity and heat plants, both main and auto producers.

the increased use of fossil-fuels, and depending on their importance in the input mix, could lead to more production than would be the case in the absence of the subsidy.

³⁷ UNEP 2019, [Measuring Fossil Fuel Subsidies in the Context of the Sustainable Development Goals](#).

³⁸ UNEP 2019, [Measuring Fossil Fuel Subsidies in the Context of the Sustainable Development Goals](#).

- **Other sectors:** includes measures that support the use of fossil fuels in the energy transformation sector other than electricity and heat generation; industrial and manufacturing sector; commercial and public services; agriculture, forestry and fisheries sector; non-energy use.³⁹

6.2. The effects of FFS differ depending on the sector. IISD research suggests that the most direct trade impacts of fossil fuel production subsidies are in **upstream markets for crude products**.⁴⁰ They consider that, based on empirical results, the scale of these impacts is likely very significant. The most important direct trade impact is the effect that oil, gas and coal subsidies have on displacing or impeding competitors' exports of crude fossil fuel products to the market of the subsidizing economy or third-country markets. This impact can materialize in three ways: (1) increasing the market share of subsidized products; (2) reducing the decline of subsidized products' market share; and (3) protecting the existing market share of subsidized products, compared with a scenario without subsidies.

6.3. **Energy transformation and industrial activities** can benefit from FFS in three main ways. First, upstream production subsidies can lower the production costs of crude products and therefore the input costs of businesses that transform those products into refined energy carriers or other products. Second, consumption subsidies also decrease the costs of these inputs, but more directly. Third, producers of refined energy carriers can also directly benefit from subsidies to their production. When FFS lower the production costs for producers of value-added energy products or non-energy products, then these sectors gain a competitive advantage both within the home market vis-à-vis imports and in international markets. This is particularly the case for energy-intensive products or services but could also apply to other sectors with stiff competition in which small changes in production costs can alter the competitive position of various producers. FFS can also affect trade in competing products. If oil, gas and coal subsidies benefit certain products that have available foreign and unsubsidized substitutes, then the producers of those substitutes lose out on potential market uptake in the subsidizing economy and even in other markets.⁴¹

6.4. **Final consumption subsidies** can also have global economy-wide effects. If many countries have economy-wide fossil fuel consumption subsidies, then their combined effect leads to excess demand for and consumption of energy products and energy-intensive products on a global scale. This can create adverse trade impacts for countries with liberalized energy pricing mechanisms. Another trade effect can occur because FFS result in air pollution and global climate change, which negatively affect the productivity of workers and firms. This can occur through a decline in the productivity of human capital as a result of air pollution or a decline in general productivity as a result of temporary and partial shutdowns of (parts of) production processes.⁴²

7 PATHWAY OF BENEFIT

7.1. Depending on the way the benefit is received, subsidies, including FFS, may be grouped into direct and indirect ones. **Direct subsidies** are generally provided through targeted (cash-based) payments, such as loans or tax preferences. These subsidies may be implemented per unit of output or per unit of input used into the activity, or per unit of output or input value. The OECD labels a fixed subsidy per unit a "specific subsidy", and a fixed subsidy per value "ad valorem".⁴³

7.2. The effects of direct FFS are more straightforward. A financial contribution or price/market controls directed toward a specific product can create a benefit in the form of a competitive advantage that the producer of such a product would enjoy against un- or less-subsidized competitors producing like products. FFS enhance the competitiveness of subsidized products both in the subsidizing jurisdiction and in other markets. They also enhance its competitiveness against alternative or like products, especially when such subsidies are used to start or maintain production in circumstances that would make fossil fuel extraction less profitable.⁴⁴

³⁹ OEDC, [Inventory of Support for Fossil Fuels - methodology](#).

⁴⁰ IISD 2020, [Exploring the Trade Impacts of Fossil Fuel Subsidies](#).

⁴¹ IISD 2020, [Exploring the Trade Impacts of Fossil Fuel Subsidies](#).

⁴² IISD 2020, [Exploring the Trade Impacts of Fossil Fuel Subsidies](#).

⁴³ OECD 2013, [Analysing energy subsidies in the countries of Eastern Europe, Caucasus and Central Asia](#).

⁴⁴ IISD 2022, [Background Note of Fossil Fuel Subsidy Reform](#).

7.3. **Indirect subsidies** are received indirectly by the recipient as a higher market price for output and/or a lower market price for input goods and services, purchased from an upstream industry that is able to discount its prices thanks to the subsidies it also receives.⁴⁵

7.4. Indirect subsidies are explained by the fact that adverse effects on trade can accumulate downstream in the value chain of fossil fuel products. Producers that are not directly subsidized may enjoy cheaper inputs into their production process as a result of subsidies provided upstream to fossil fuel producers, thus conferring on them a comparative advantage against competitors. Having access to below-cost energy inputs, preferential transport costs, or subsidized electricity could be converted to increased market share, displacing a competitor's imports in their own or a third-country market, as well as in the reduced attractiveness of alternative products. Midstream and downstream markets in which such "pass-through" effects of FFS may occur include those of transport fuels (gasoline, diesel, and jet kerosene), grid-scale electricity generation, energy-intensive industries (iron and steel, cement, fertilizer, petrochemicals, paper), and electricity-intensive industries (aluminium, steel, and other non-ferrous metals).⁴⁶

7.5. Another distinction used by the IMF categorizes FFS into explicit and implicit subsidies. **Explicit subsidies** occur when the retail price is below a fuel's supply cost. For a non-tradable product, the supply cost is the domestic production cost, inclusive of any costs to deliver the energy to the consumer, such as distribution costs and margins. In contrast, for an internationally tradable product, the supply cost is the opportunity cost of consuming the product domestically rather than selling it abroad plus any costs to deliver the energy to the consumer. Explicit subsidies also include direct support to producers, such as accelerated depreciation.

7.6. **Implicit subsidies** occur when the retail price fails to include external costs and/or there are preferential consumption tax rates on energy. External costs include contributions to climate change through greenhouse gas emissions, local health damages (primarily premature deaths) through the release of harmful local pollutants like particulates, and traffic congestion and accident externalities associated with the use of road fuels. According to the IMF, to get energy prices right these adverse effects on society must be reflected in prices and general consumption taxes to household fuels must be applied.⁴⁷

7.7. Using this categorization, the IMF estimates that, globally, FFS were USD 5.9 trillion or 6.8% of GDP in 2020 and are expected to increase to 7.4% of GDP in 2025 as the share of fuel consumption in emerging markets continues to climb. 8% of this IMF calculation of 2020 subsidies reflects undercharging for supply costs (explicit subsidies) and 92% for undercharging for environmental costs and foregone consumption taxes (implicit subsidies).⁴⁸

⁴⁵ OECD 2013, [Analysing energy subsidies in the countries of Eastern Europe, Caucasus and Central Asia](#).

⁴⁶ IISD 2022, [Background Note of Fossil Fuel Subsidy Reform](#).

⁴⁷ IMF, [Fossil Fuel Subsidies](#).

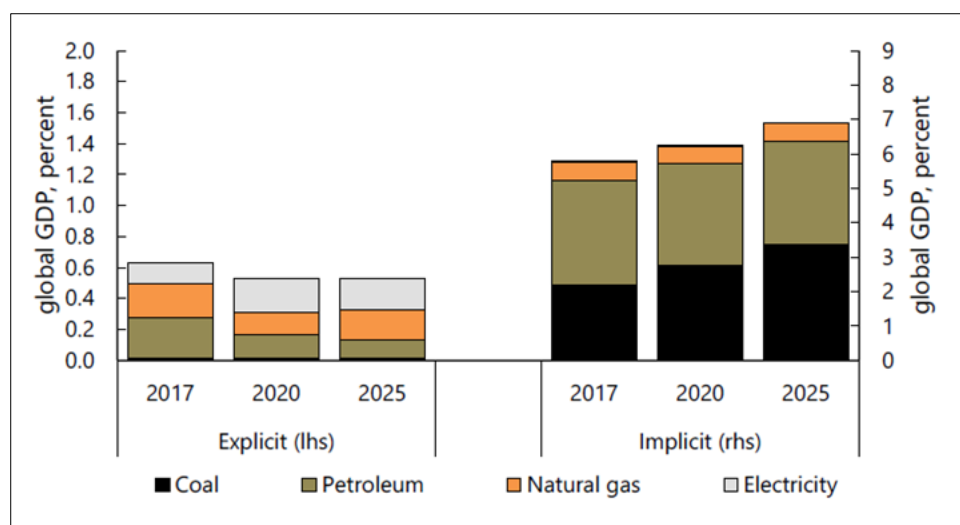
⁴⁸ IMF, [Fossil Fuel Subsidies](#).

Figures 3 and 4: Subsidies by Year (% of GDP and US\$ at constant 2021 prices)

Source: [IMF](#).

7.8. According to IMF estimations, petroleum, natural gas, and electricity accounted for 28, 27 and 42% of the explicit global subsidy in 2020 (Figure 5 below), while coal accounted for just 3% (as coal prices generally cover supply costs). Globally, 8% of the explicit IMF's calculations of explicit subsidies in 2020 reflects support for fossil fuel producers (92% is consumer-side subsidies). The breakdown by fuel product looks very different for total (explicit plus implicit) subsidies in 2020: coal accounts for 41% of the global total in 2020, reflecting underpricing for carbon and air pollution damage. Petroleum accounts for 46% of the global subsidy, largely reflecting the failure of excises on petroleum products to fully reflect environmental costs and broader externalities. Natural gas (where environmental costs are more moderate) and electricity (where environmental costs are attributed to fuel inputs) account for 9 and 4% of the IMF's global subsidy calculations, respectively.⁴⁹

⁴⁹ IMF 2021, [Still Not Getting Energy Prices Right: A Global and Country Update of Fossil Fuel Subsidies](#).

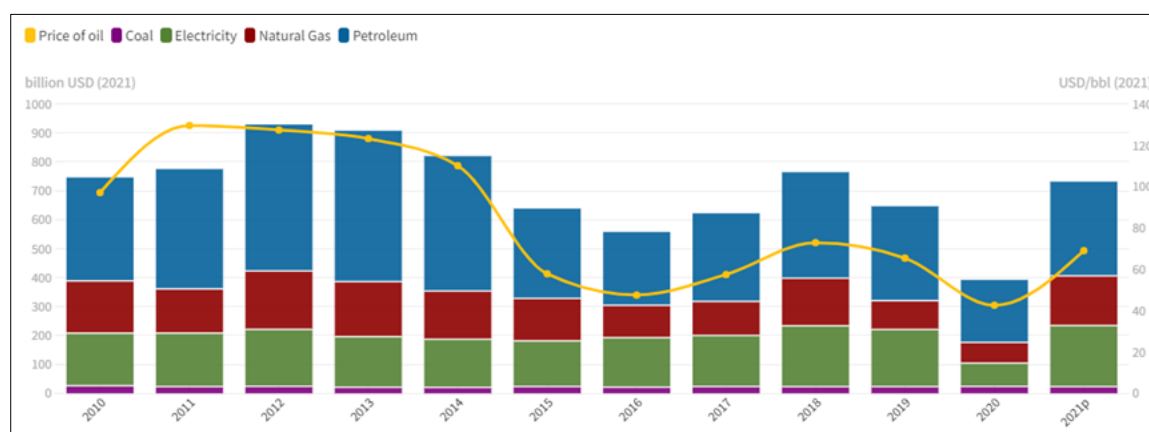
Figure 5: Global Fossil Fuel Subsidies by Fuel

Source: [IMF 2021](#).

8 IMPACT

8.1 Fiscal impacts

8.1. The latest available OECD and IEA data show that overall government support for fossil fuels in 51 countries worldwide almost doubled to USD 697.2 billion in 2021, from USD 362.4 billion in 2020, as energy prices rose with the rebound of the global economy. In addition, consumption subsidies are anticipated to rise even further in 2022 due to higher fuel prices and energy use.⁵⁰

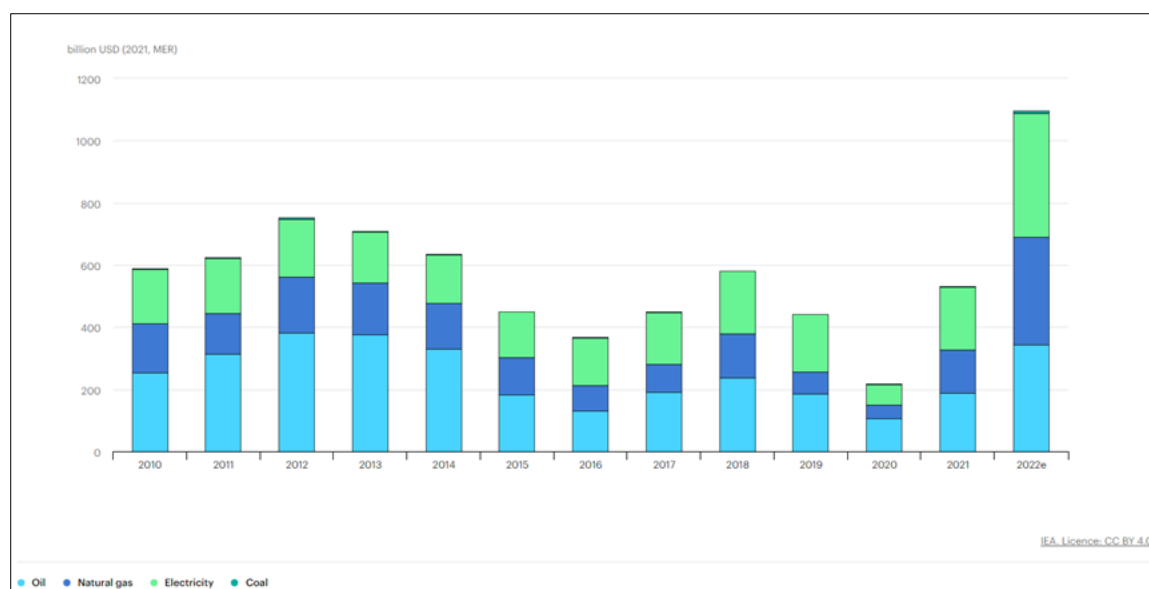
Figure 6: Fossil fuel support by energy product: OECD-IEA combined estimates (82 economies)

Source: [OECD 2022](#).

8.2. The IEA's first estimates for 2022 consumer subsidies show that subsidies for natural gas and electricity consumption more than doubled compared with 2021, while oil subsidies rose by around 85%.⁵¹

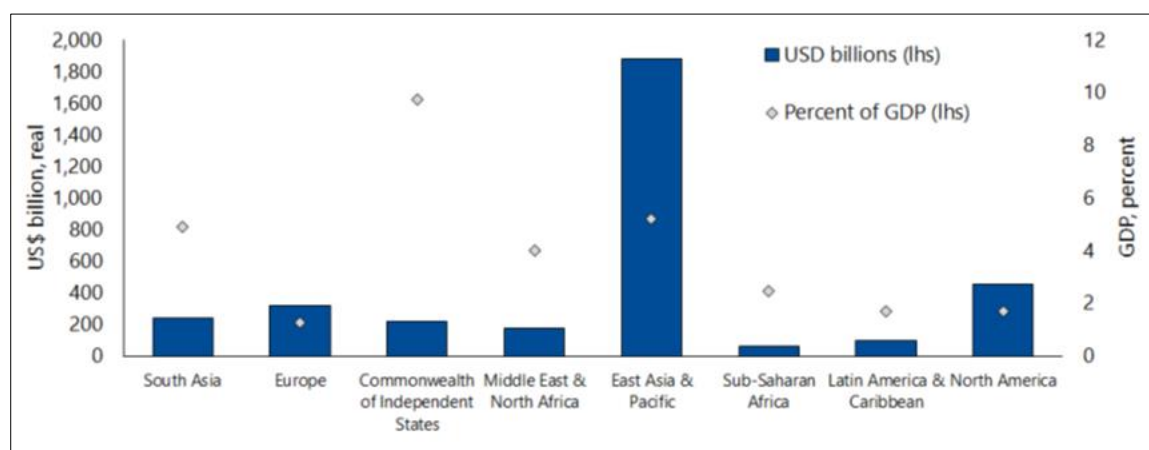
⁵⁰ OECD 2021, [Support for fossil fuels in 2021](#).

⁵¹ IEA 2023, [Fossil fuel consumption subsidies 2022](#).

Figure 7: Fossil fuel consumption subsidies by fuel, 2010-2022

Source: [IEA 2023](#).

8.3. The IMF underscores that underpricing fossil fuels not only undermines domestic and global environmental objectives but is a highly inefficient policy for helping low-income households and has a sizable fiscal cost – too little revenue is raised from fuel taxes, implying other taxes or government deficits must be higher or public spending lower. According to IMF estimations, full price reform (addressing both explicit and implicit subsidies) would raise revenues of USD 4.2 trillion, 3.8% of global GDP, in 2025 (relative to business-as-usual levels and accounting for revenue losses due to erosion of pre-existing fuel tax bases). Revenue gains vary substantially across regions, largely mirroring the distribution of (explicit and implicit) subsidies. The IMF estimates that revenues generated by full price reform in 121 emerging market economies and developing countries in 2025 would amount to USD 3 trillion, which is broadly in line with their additional spending needs for Sustainable Development Goals.⁵²

Figure 8: Revenue Gain from Reform, 2025

Source: [IMF 2021](#).

⁵² IMF 2021, [Still Not Getting Energy Prices Right: A Global and Country Update of Fossil Fuel Subsidies](#).

8.2 Environmental impacts

8.4. Increased fossil fuel use contributes not only to climate change but also exacerbates air, water, and plastic pollution, worsens land degradation, and locks economies into high-carbon production cycles.

8.5. **Greenhouse gas emissions:** Burning fossil fuels is an important source of greenhouse gas emissions that cause climate change. The latest modelling exercise by IISD estimates that FFSR by 2025 by a set of 32 economies, including major developed, emerging, and developing countries, would reduce CO₂ emissions by an average of 6% in 2030, and in the case of some countries, the emissions can be reduced by up to 35%. The reinvestment of just a third of the savings from such reform into energy efficiency and renewable energy (a "subsidy swap") would add an additional 3% reduction in CO₂ emissions by 2030.⁵³

8.6. Client Earth estimates that, in terms of carbon emissions, coal contributes the most, responsible for over 0.3 degrees C of the 1 degree C increase in global average temperatures. This would make it the single largest source of global temperature rise. Oil also releases a huge amount of carbon when burned – approximately a third of the world's total carbon emissions. While natural gas is often seen as a cleaner energy source than coal and oil, it still accounts for a fifth of the world's total carbon emissions.⁵⁴

8.7. **Air pollution:** The economic impact of fossil fuel combustion's health effects has been estimated to have cost the world approximately USD 2.9 trillion or 3.3% of global GDP in 2018, as well as contributing to the death of 4.5 million people.⁵⁵ Air pollution from burning fossil fuels can cause multiple health issues, including asthma, cancer, heart disease, and premature death. Combusting the additives found in gasoline – benzene, toluene, ethylbenzene, xylene – produces cancer-causing ultra-fine particles and aromatic hydrocarbons.⁵⁶

8.8. Sulphur dioxide (SO₂), nitrogen oxide (NO_x) and fine particulate matter (PM_{2.5}) are some of the main pollutants resulting from the combustion of fossil fuels. These pollutants can cause adverse human health effects, but they can also cause reduced agricultural yields, damage to forests and fisheries (acid rain), and damage to buildings and infrastructure.⁵⁷

8.9. **Land degradation:** The Natural Resources Defense Council highlights that unearthing, processing, and moving underground oil, gas, and coal deposits take an enormous toll on landscapes and ecosystems. The fossil fuel industry leases vast stretches of land for infrastructure, such as wells, pipelines, and access roads, as well as facilities for processing, waste storage, and waste disposal. As a result, critical wildlife habitat – land that is crucial for breeding and migration – ends up fragmented and destroyed.⁵⁸

8.10. **Water pollution:** Coal, oil, and gas development also pose threats to waterways and groundwater. The Natural Resources Defense Council highlights that coal mining operations wash toxic runoff into streams, rivers, and lakes and dump vast quantities of unwanted rock and soil into streams. Oil spills and leaks during extraction or transport can pollute drinking water sources and jeopardize freshwater or ocean ecosystems. Meanwhile, drilling, fracking, and mining operations generate enormous volumes of wastewater, which can be laden with heavy metals, radioactive materials, and other pollutants.⁵⁹

8.11. **Plastic pollution:** Over 99% of plastics are made from fossil fuels, according to the Environmental and Energy Study Institute. Globally, 300 million tons of plastic waste are produced

⁵³ IISD 2022, [Background Note of Fossil Fuel Subsidy Reform](#).

⁵⁴ ClientEarth 2022, [Fossil fuels and climate change: the facts](#).

⁵⁵ IISD 2022, [Background Note of Fossil Fuel Subsidy Reform](#).

⁵⁶ Environmental and Energy Study Institute 2021, [Fact Sheet | Climate, Environmental, and Health Impacts of Fossil Fuels](#).

⁵⁷ IRENA 2016, [The True Cost of Fossil Fuels: Saving on the Externalities of Air Pollution and Climate Change \(REmap brief\)](#).

⁵⁸ Natural Resources Defense Council 2022, [Fossil Fuels: The Dirty Facts](#).

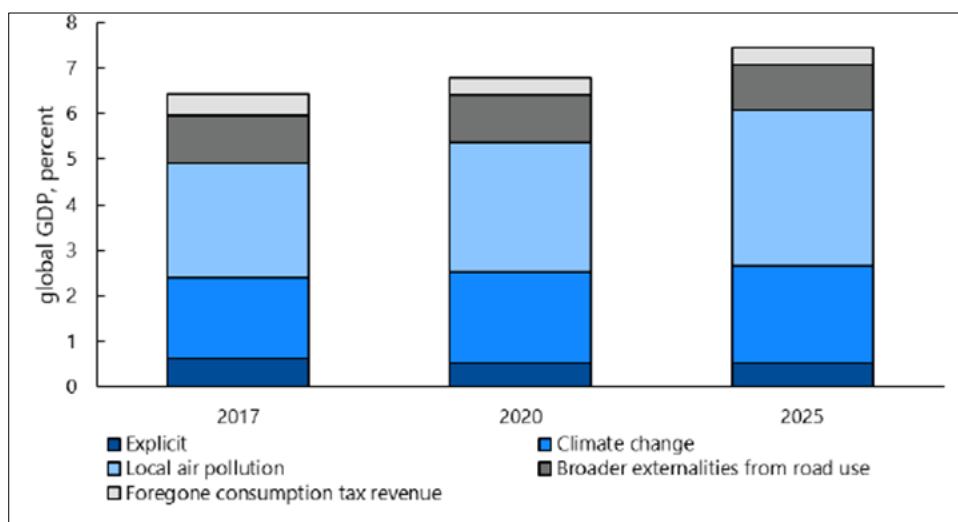
⁵⁹ Natural Resources Defense Council 2022, [Fossil Fuels: The Dirty Facts](#).

each year, 14 million tons of which end up in the ocean, endangering wildlife and polluting the food chain.⁶⁰

8.12. **High-carbon economy lock-in:** Support for renewable energy development remains approximately three times lower than that for fossil fuels. Prioritising subsidies for fossil fuels thus slows down not only the innovation and investment needed for transition into renewable energy grids, but also reaping the benefits that the deployment of renewable energy technologies could have for energy intensity. FFS also tend to contribute to poorly targeted social welfare policy with its fiscal costs and tendency to benefit higher-income groups. An IMF study reviewing the estimates of welfare impacts in 32 developing countries shows that 80% of gasoline subsidies go to the top 40% of the households and that the top 20% of households benefit six times more from the subsidies than the poorest 20%.⁶¹

8.13. According to IMF estimates, broken down by component (Figure 9 below), undercharging for air pollution, global warming, broader externalities from road use, supply costs, and general consumption taxes account for 42, 29, 15, 8, and 6% respectively of total (explicit and implicit) subsidies in 2020. For coal, local air pollution and global warming account for 58 and 40% of total subsidies respectively, while for petroleum underpricing for local air pollution and broader externalities account for 39 and 33% of the total subsidy respectively, and global warming a smaller 16%. In contrast, for natural gas global warming is 59% of the total subsidy.⁶²

Figure 9: Global Fossil Fuel Subsidies by Component



Source: [IMF 2021](#).

8.3 Trade impacts

8.14. Trade impacts of FFS have not been thoroughly explored.⁶³ IISD research highlights that FFS trade impacts are closely connected to the product markets that benefit directly and indirectly from those subsidies. One fossil fuel subsidy may have trade impacts on several markets and one single market can be affected by several FFS.⁶⁴

8.15. Markets that are affected by FFS can be found across the entire value chain. There are markets upstream in fossil fuel production, downstream in end uses of energy and energy-intensive products, and midstream in refining, transmission and distribution support (e.g. transport and storage). Upstream markets for primary fossil fuel commodities include those for crude oil, natural gas and coal. Midstream and downstream markets include those for transport fuels (gasoline, diesel, and jet

⁶⁰ Environmental and Energy Study Institute 2021, [Fact Sheet | Climate, Environmental, and Health Impacts of Fossil Fuels](#).

⁶¹ IISD 2022, [Background Note of Fossil Fuel Subsidy Reform](#).

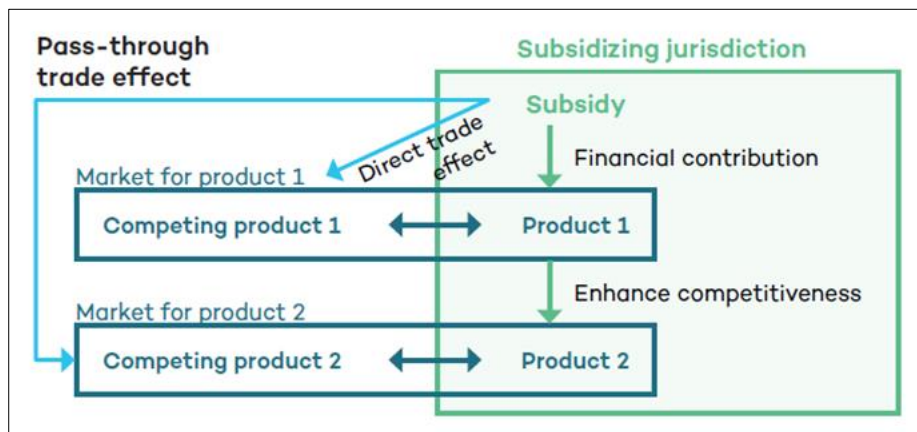
⁶² IMF 2021, [Still Not Getting Energy Prices Right: A Global and Country Update of Fossil Fuel Subsidies](#).

⁶³ The WTO Secretariat will release a working paper on the topic in the latter part of 2023.

⁶⁴ IISD 2020, [Exploring the Trade Impacts of Fossil Fuel Subsidies](#).

kerosene), grid-scale electricity generation, energy-intensive industries (petrochemicals, fertilizer, iron and steel, cement, pulp and paper, food), and electricity-intensive industries (aluminium, steel and other non-ferrous metals such as copper, zinc, and tin).⁶⁵

Figure 10: Direct and pass-through effects of fossil fuel subsidies



Source: [IISD 2020](#).

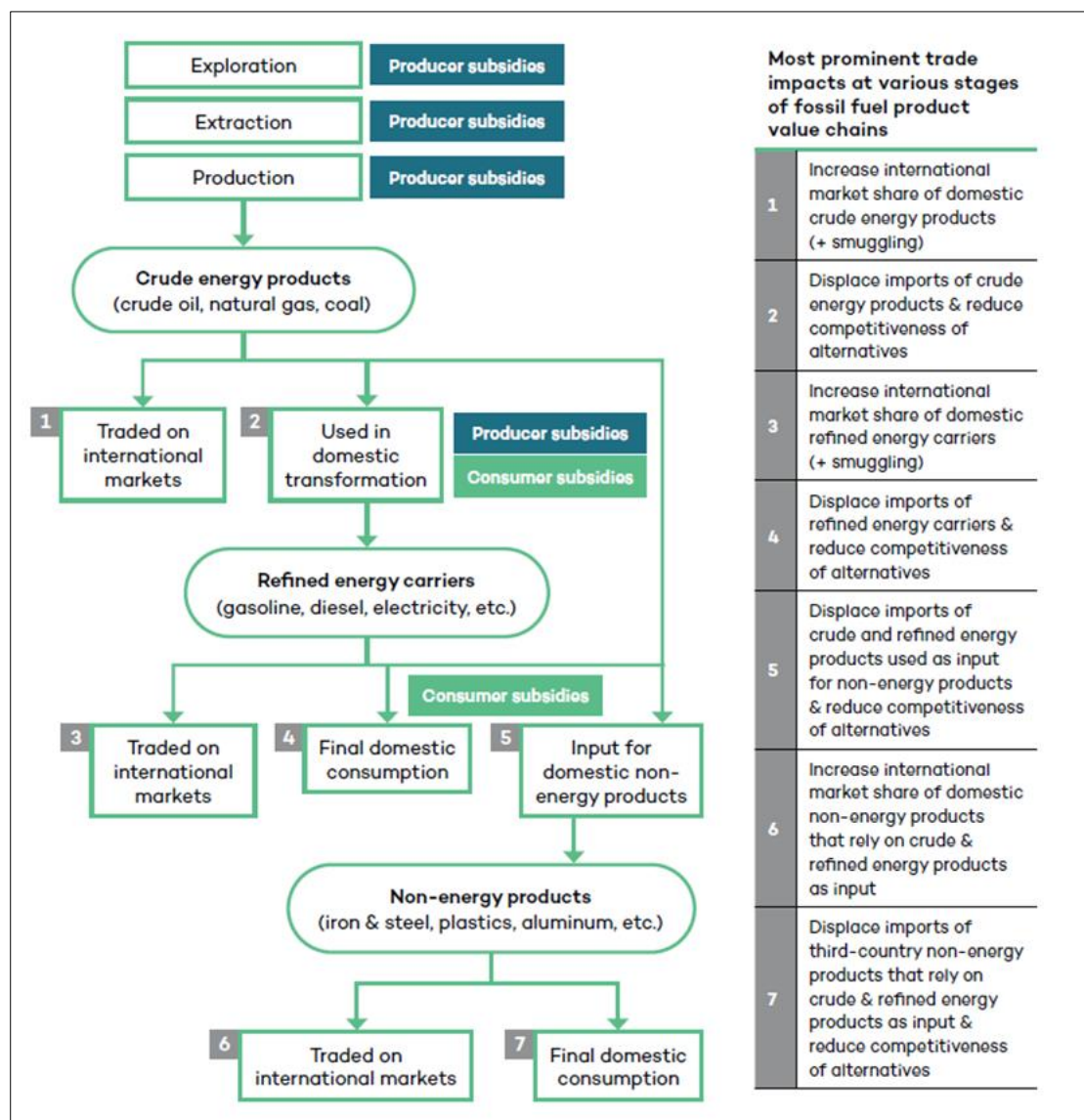
8.16. **Direct trade effects** occur when subsidies provided to fossil fuel producers affect the markets for energy commodities such as crude oil, natural gas or coal, as well as transformed energy products, through reducing producers' costs of extraction or transformation, respectively. They also manifest when fossil fuel consumption subsidies directly decrease the costs of fossil fuel inputs used by various industries, whether they process feedstocks into value-added energy types (e.g. gasoline, diesel, electricity) or they use energy products as inputs to produce non-energy products (e.g. iron & steel, plastics).

8.17. **Pass-through trade effects** occur when FFS provided to upstream fossil fuel producers lead to lower-cost energy products that can then be used as input in other production processes downstream. Part of the subsidy benefit is "passed through" to downstream producers. For example, a steel producer may not enjoy a direct subsidy, but it can still benefit from upstream coal subsidies that lower the price of coal, which is a key input into steel production.

8.18. There are also **impacts across different markets** when a country that subsidizes a certain product uses less of a non-like substitute product. For example, a country subsidizing coal that benefits coal-fired power plants will very likely use less renewable energy technologies than in a scenario in which there were no coal subsidies. Not only do FFS thus affect trade in fossil fuels and energy-intensive products, but they also affect the relative costs of cleaner alternative technologies.⁶⁶

⁶⁵ IISD 2020, [Exploring the Trade Impacts of Fossil Fuel Subsidies](#).

⁶⁶ IISD 2020, [Exploring the Trade Impacts of Fossil Fuel Subsidies](#).

Figure 11: Trade impacts of fossil fuel subsidies at various stages of fossil fuel product value chains

Source: [IISD 2020](#).

8.19. In terms of sectors, fossil fuel subsidies can directly or indirectly reduce the marginal cost of the production of crude energy products, transformed energy carriers or energy-intensive products. As a result, industries within the subsidizing jurisdiction can see their competitive advantage vis-à-vis non-subsidized foreign products increased. This can provide them with an opportunity to capture more market share in domestic or international markets compared to a no-subsidy baseline. IISD analysis suggests that the trade impacts of FFS are likely the largest when those subsidies affect upstream markets, as well as markets for petroleum and energy-intensive products and energy-intensive products. While the size of the effect would depend on the form of the subsidy and the prevailing market price in each case, trade openness in these sectors is generally very high, with large volumes traded for large sums of money. If FFS affect the marginal cost of production of these products, then it is very likely that subsidies will allow their producers to gain a competitive edge in these highly competitive and valuable markets. Many producer subsidies reduce the cost of investment but can also lower the marginal cost of production and thus affect international trade significantly.⁶⁷

⁶⁷ IISD 2020, [Exploring the Trade Impacts of Fossil Fuel Subsidies](#).