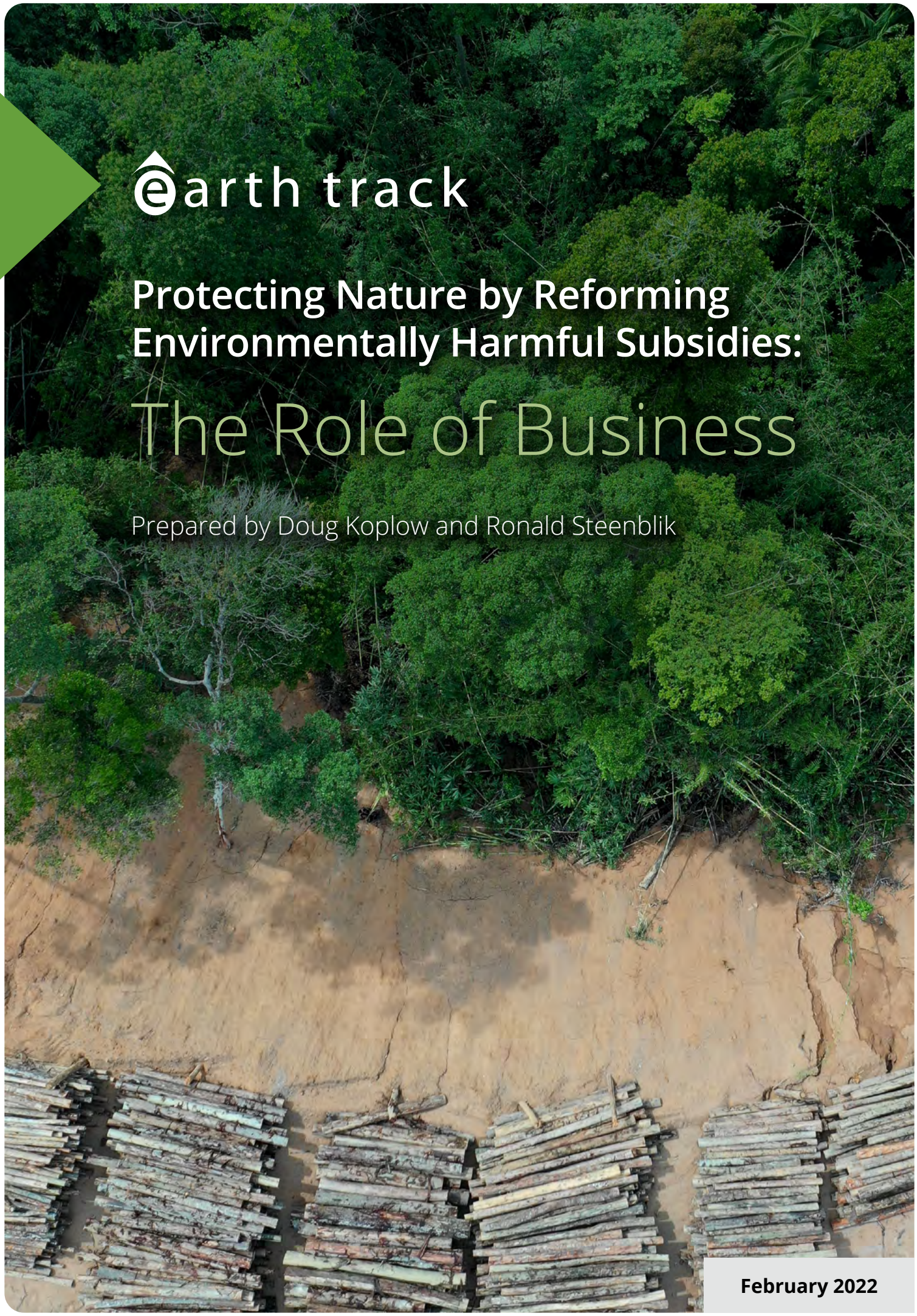

Protecting Nature by Reforming Environmentally Harmful Subsidies:

The Role of Business

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Preface

Industry-specific reviews of government subsidies have been much more common than analyses examining several natural resource sectors at once. Yet there is a great deal of overlap across sectors. Indeed, it is the combination of support provided by multiple levels of government and government programs, across numerous natural resource areas, that can accelerate resource depletion, pollution, or habitat loss in particular regions.

The terrain covered here is admittedly quite broad. We have no illusions that we have come close to capturing all of the subsidies, efforts to address them, or leverage points for near-term action by businesses. Rather, we view our work as the restart of a needed conversation on environmentally harmful subsidies and the role that business can play through improved subsidy reporting, disclosure, and reform. We look forward to helping that conversation continue, and to seeing positive action.

The initial draft of this paper was provided as a background resource to support a Roundtable "Finance No Harm: Environmentally Harmful Subsidies Reform and Redirection" convened by The B Team at COP26 in Glasgow, Scotland on November 4, 2021. We are grateful to The B Team for providing partial financial support for this work, to Business for Nature for supporting outreach, and to Spiral Brand Communications for publication design.

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Overview

Environmentally harmful subsidies (EHS) are government actions that by design or effect accelerate the production or consumption of natural resources or undermine broader ecosystems supporting planetary health.

While data availability on the scale of these subsidies varies widely across sectors and countries, even based on incomplete estimates they measure at least USD 1.8 trillion a year or about 2 percent of global GDP. Table 1 provides an overview of the scale of support by sector based on available data, some context on how they create environmental harm, and expected benefits from reform.

Eliminating these subsidies would free-up substantial government resources to support social needs; send more accurate signals to investors and producers on where to direct R&D efforts and deploy new capital, and to consumers on what to buy; and accelerate innovation to reduce greenhouse gases in all parts of the economy.

Removal of EHS would also reduce negative externalities through changes in demand patterns and the mix of suppliers, incentivizing them pursue cleaner options. This working paper explains the basic mechanisms of government subsidization, and provides an overview of important categories of EHS, their scale where known, existing efforts to value and discipline them, and areas where actions by business have the potential to overcome existing roadblocks to reform.

Table 1. Environmentally harmful subsidies: Overview of scale, impacts, and benefits of reform

Resource type and benefits of reform	EHS/year (Billions of 2021 USD, rounded)	Commentary
Fossil fuels - Tandem policy to carbon pricing; redirects investment and reduces pollution and GHG emissions. ***Residual gaps:*** The subsidy value of government-mediated credit and residual liabilities assumed by governments; support from state, provincial, and municipal governments outside of OECD countries; subsidies to energy stockpiling and security.	$640[a]	Fossil fuel subsidies were nearly 10x higher than all revenues from carbon pricing schemes world-wide. Additional large-scale financing of international fossil fuel projects via public lending institutions (about $70b/year, not included in total); heavily skewed to fossil over clean energy.[b]
Hard-rock mining - Improved price signals among alternative minerals and metals; and between primary production and recycled options. Reduced environmental damage from illegal operations. ***Residual gaps:*** Below-market and illegal leasing; tax breaks; socialized mine reclamation costs.	No estimate	Widespread illegal gold mines cause billions of dollars in environmental damage each year. A survey of 3,000 newer metal mines indicated nearly 80% of extraction in 2019 occurred in five of the six most ecologically diverse biomes in the world.[c]
Agriculture – Resource-conserving crop selection and management; reduced water diversion and aquifer depletion; expanded requirements for crop varieties increases food system resiliency. ***Residual gaps:*** much of the cost of off-farm irrigation-related infrastructure, free or below-market irrigation water.	$520[d]	Total support was more than 40% of agricultural value added within OECD countries (OECD 2021) and 15% globally (FAO/UNDP/UNEP 2021).
Marine capture fisheries - Recovery of damaged and overfished regions; reduced risk of fish loss to poor nations from international fishing fleets. Reduced bycatch of seabirds, turtles and mammals.	$50[e]	Subsidies averaged 25% of catch value in top 20 subsidizing countries. Nearly 85% of total subsidies go to large-scale fishing operations.

Resource type and benefits of reform	EHS/year (Billions of 2021 USD, rounded)	Commentary
Forestry - Improved retention of forest biodiversity; reduction of ecosystem fragmentation and damage at illegal sites. ***Residual gaps:*** tax breaks, public funding of timber roads and fire services.	$155[f]	Illegal logging reduces timber prices up to 16%, muting incentives to keep land in forests. Lost ecosystem values, including sequestration, from illegal cutting estimated at $840b-$1,730b/year.
Transport - More accurate delivered price for bulk fuels and freight; improved infrastructure decisions across modes and high-cost users; reduced pressures for sprawl; reduced subsidies to purchase of individual cars and associated parking. ***Residual gaps:*** estimates should include net public infrastructure spending globally, cross-subsidies to heavy trucks, tax exemptions and other subsidies to users.	$85[g] (illustrative)	Spotty coverage on the many potential subsidy mechanisms. This estimate includes a handful: highway user fee shortfalls and tax breaks for commuter parking (US); and tax breaks for maritime shipping and company cars (EU). Infrastructure spending is a large budget item: OECD countries averaged $350b/year from 2015-19 on roads alone.
Water – Improved efficiency in all uses, including farm, power plants, manufacturing, municipal. Price-rationing during drought, declining water table. ***Residual gaps:*** subsidies to direct water withdrawal for ag and industry; data on China and India.	$350[h]	Only 6% of subsidies captured by lowest income quintile; subsidies comprise >1.5% of GDP in lower- and middle-income countries evaluated.
Construction (including housing) - Smaller residential footprints; reduced sprawl; more infill construction. ***Residual gaps***: in addition to subsidies to construction, tax breaks to ownership and liabilities (such as flood and mortgage insurance) are also important.	$90 (illustrative)	Estimate is from two US tax breaks for single family homes alone. Federal debt insurance for single family homes exceeded multi-family by a 10:1 ratio.
TOTAL	**$1,890**	

[a] Based on most recent estimates for consumer subsidies from IEA (2021) and the OECD's total support estimates (2019), adjusted to remove overlaps. Data from 2020 are not representative of long-term trends due to severe covid-related dislocations, so were not used.

[b] Lending data from 18 export credit agencies favored fossil over clean energy 14:1; and from more than 30 Development Finance Institutions by 3:1. Data for 2016-18, based on analysis by Oil Change International and Friends of the Earth (2020).

[c] From Luckeneder et al., Global Environmental Change (2021).

[d] From F AO/UNDP/UNEP (2021), representing the 87% share of total supports that the authors assessed "price distorting or harmful to nature and health". Much of the data used in this report are based on total support estimates also developed by the OECD.

[e] Estimate is roughly half from subsidies to excess capacity and overfishing (Skeritt and Sumailla, University of British Columbia and Oceana 2021) and half from illegal fishing (mid-point of World Bank 2021 estimate).

[f] Value of illegally harvested wood; based on Interpol (2020) and the World Bank (2021). No global data on other subsidies to forestry.

[g] Some potential overlap between OECD producer subsidy inventory for fuel tax reductions. Because this estimate reflects a narrow set of available studies, the actual level of subsidies to expanded transport infrastructure and subsidizing bulk commodity movements is anticipated to be much larger.

[h] Midpoint of range in World Bank analysis (Andres et al. 2019). Does not include subsidized water through direct withdrawal by industrial, power, and agricultural users.

Why Many Subsidies to Reduce Pollution Still Need to be Included in EHS Estimates

Government support to particular industries is often the focus of fierce political battles. Recipients benefit if the support is more difficult to see and value. They frequently argue that specific policies are not subsidies at all, or at least not environmentally harmful.

Decisions on what to call a subsidy and which of these to classify as environmentally harmful vary across sectors, geography, and estimators. They also depend on circumstances, such as how they interact with other policies. The objective of this paper is not to delve into those arguments. Rather, it is to provide a rough estimate of subsidy scale to frame the importance of the problem; and then to identify leverage points for the business sector that provide much enhanced visibility of government supports and feasible near-term reform steps.

Our industry totals are based on available information, which is never comprehensive and tends to undercount total support, particularly at the global level. Where public money or other forms of support is directed to specific industries if they reduce pollution or mitigate environmentally harmful practices, we count this support in our estimates of EHS where our data sources have done so. In some places where data sources have not done so, the government spending is not included, though frequently should be.

This may seem counter-intuitive given that the funds can improve environmental quality in localized ways. However, in a dynamic economy, across competing industries and capital reinvestment cycles, even subsidies to reduce pollution in a narrow context can act as an impediment to other environmental improvements, such as decarbonization, or protecting habitat or water supplies.

- These supports reduce the cost structure of polluting industries, placing them in competition with producers elsewhere operating in less environmentally vulnerable areas or who sell substitutes that are more intrinsically benign. Examples include tax breaks for pollution-control equipment in coal plants, subsidies to livestock farmers for reducing the density of their herds on selected grazing land, or payments for carbon capture at carbon-intensive fossil fuel plants.
- The supports may provide short-term benefits, but at the expense of needed structural changes. For example, subsidies to help build plastic-recycling facilities may increase reuse rates, but if consumers and producers of plastics are thereby spared much of the cost of managing that waste stream, it will do nothing to discourage its continued growth or encourage the development of higher-value secondary markets.
- Political power plays a significant role in who gets subsidies, and some of these subsidies have been maintained to avoid costly litigation with parties who would be adversely affected by subsidy removal. In addition to slowing economic restructuring, the political dynamics mean that the resultant subsidies to waste or pollution management often end up favoring larger producers. Tax breaks for anaerobic digesters to process animal manure at large farms are an example, where the scale and concentration of the operations themselves can strain the capacity of the local environment and increase the magnitude of a pollutant release in the event of an adverse weather event, such as a flood.
- Sometimes programs are put in place to help poorer residents, which they often do in part. But benefits may also be skewed towards the wealthier. Subsidized flood insurance does help some poor communities, but since much of the value of coastal real estate is owned by wealthier individuals and corporations, here too there can be a strong argument that subsidy removal will result in environmentally beneficial changes over the long-term and reduced subsidies to flood zone construction. Trade-offs can be further improved through transitional planning that focuses support only on the most economically vulnerable population.

Are there times when subsidies to reduce pollution are still the best path forward given available options? Yes. But if the details on all these policies are excluded from disclosure up-front on the grounds they are supposedly not environmentally harmful, it is impossible to properly vet those claims. Similarly, disclosure forces recipients to justify what they are receiving, and creates pressure on politicians to find better options that achieve similar societal endpoints at a lower environmental cost, and with less leakage to wealthier constituencies.

1 General introduction to government subsidies

General introduction to government subsidies

Most government activities transfer financial benefits from the state to private actors – in effect, using the fiscal and other powers of the state to confer cash or other resources of value to selected subgroups.

This occurs not just through spending, but also through special tax breaks, extension of sovereign credit, provision of goods or services on favorable terms, absorption of private risks, and selective regulatory exemptions (Table 2). In the best of situations, these activities can enhance social stability and public welfare, and help a country adapt to changing economic, technological or political constraints or opportunities. Unfortunately, hundreds of billions of dollars also flow each year to industries and activities that have large environmental footprints.

The political power of constituencies plays a significant role in which groups get subsidies in a particular country or region and how much they receive.

Consequently, even subsidies for which there was initially a strong public purpose end up being retained far longer than necessary. Further, powerful industries often have concentrated economic interests and invest in political lobbying or similar processes to establish, retain, and expand their government support. Individuals, new industries, smaller businesses, and newer technologies may be disadvantaged as a result. In representative democracies, subsidy mechanisms that are complex, opaque, and difficult to value may be preferred to visible grants by both the recipients and the politicians supporting them as they can provide benefits with a lower risk of political fallout from groups competitively or financially harmed by the subsidies.

Table 2. Governments transfer value to private activity in many ways

Type	Description
Direct spending	Government programs, public grants to private parties, funding for energy R&D.
Tax expenditures	Special exemptions, deductions (including accelerated depreciation) and tax credits.
User fees	No or only partial fees applied to fund sector-related use of public infrastructure or land.
Terms of access to resources	Auction competitiveness, royalty rates, advantaged duration or risk sharing. Favored position in selection or dispatch rules (in the case of power plants).
Credit	Primarily, below-market loans, loan guarantees, and interest-rate subsidies. Includes favorable interest rates, terms of repayment, delayed repayment schedules, and reduced loan processing fees.
Risk	Government-provided market insurance or indemnification at below-market prices; statutory caps on private market responsibility for damages.
Induced transfers	Includes purchase mandates (Renewable Portfolio Standards, Renewable or Clean Fuel Standards, Feed-in Tariffs); price controls; import or export restrictions, tariffs; cross-subsidies.
Regulations and Externalities	Differential rules applied to activities with similar environmental or health impacts.
State-owned enterprises	SOEs often benefit from several types of subsidies provided by multiple layers of government. Absorption of market or operational risks may not even be acknowledged in financial reporting.

Source: Based on Koplow (2017).

2

Environmentally harmful subsidies

Environmentally harmful subsidies

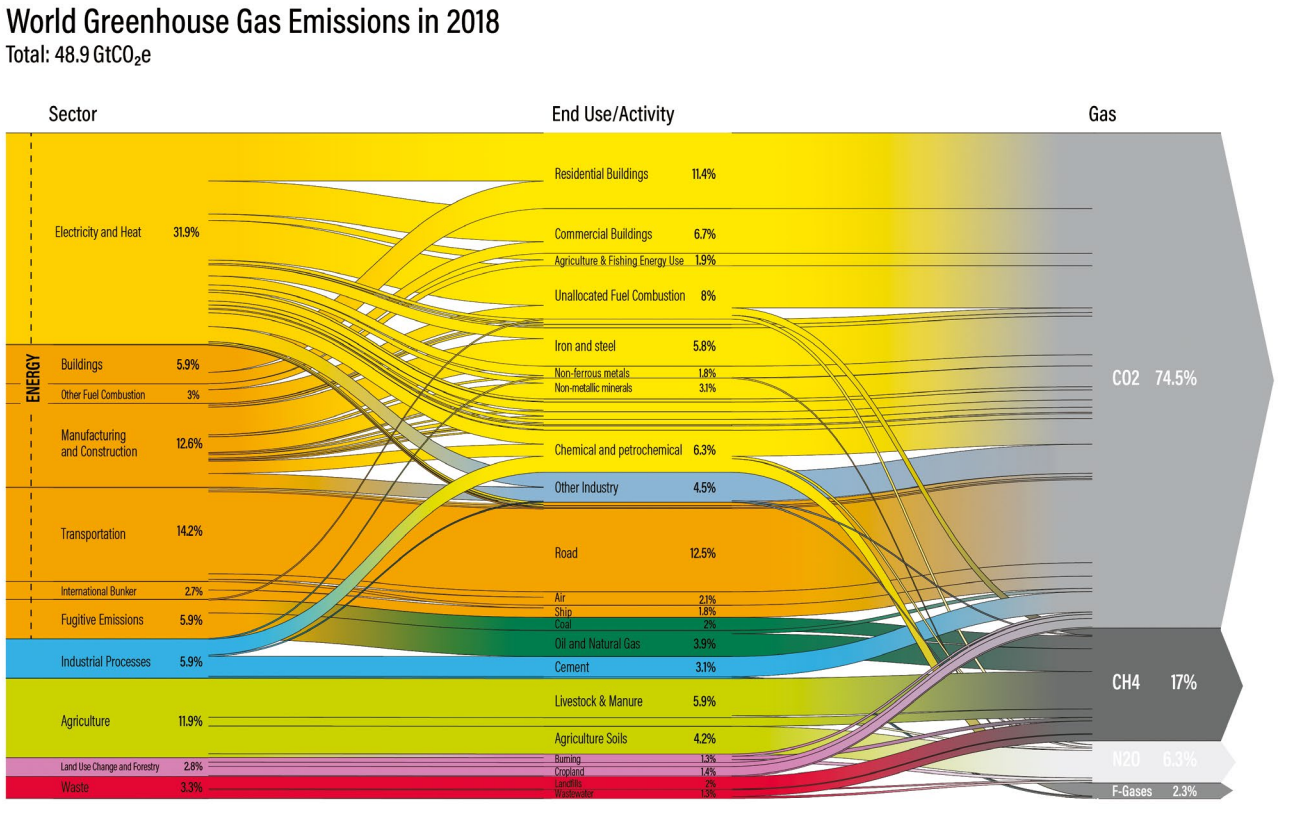
This paper focuses primarily on the subset of subsidies that have the potential to worsen environmental damage and slow economic transition to a low-carbon economy.

Sectors discussed include fossil fuels, hard rock mining, agriculture, marine capture fisheries, forestry, transport, water supply and consumption, and construction (including housing).

Not only do these sectors account for the vast majority of greenhouse gas emissions (Figure 1), but they also contribute to many other kinds of environmental harm including air and water pollution, loss of habitat and biodiversity, and degradation of critical ecosystems.

Figure 1. World Greenhouse Gas Emissions in 2018

Total: 48.9 $GtCO_2e$



Source: Greenhouse gas emissions on Climate Watch. Available at: https://www.climatewatchdata.org

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Across all these sectors, subsidies generate numerous common effects:

- **Distort investment patterns.** They may boost investment returns or production capacity; drive excess long-term investments into R&D in activities where it should be declining or insufficient investments where it should be increasing; slow market exit of more polluting incumbent plants or business practices; or slow market entry of lower-carbon or environmentally preferable substitutes.
- **Exacerbate carbon lock-in.** Where the subsidized production capacity is long-lived capital infrastructure, large amounts of GHG emissions can be locked in as a result of the capital being a sunk investment. If there are major negative shifts in market conditions, this capacity may still close, at least temporarily. However, the barriers are higher: once a facility has been built, its break-even conditions immediately drop from having to earn a return on all costs including capital investment to an often substantially lower short-term break-even based on operating and maintenance costs only.
- **Mask operating or accident risks, muting adjustments in cost of capital.** Subsidies may shift investment or operating risk from private operators to the public sector, masking the real cost of existing practices and perpetuating lower-cost access to capital than appropriate for the industry in a changing climate. This is particularly troublesome because pricing of risk is a central element of markets and a rising cost of capital associated with these higher risks can be a leading signal to shift the direction of new research or investment.
- **Create competitive barriers to environmental improvements.** Companies may also be concerned that the subsidies introduce cost-pressure on more socially oriented firms, making it more difficult for them to adopt higher-cost production or operating behaviors that are also cleaner and lower carbon. This can occur within a country as well as internationally, though likely varies by industry sector in importance. The OECD's recent work on this general topic has found on average that each 10% increase in energy costs was associated with an increase in foreign direct investment of roughly one-tenth as much (OECD 2021c). This suggests that capital flight does occur, but at a lower rate than the increase in input prices. The same OECD study also found that for particularly energy-intensive industries, there was also a strong incentive to upgrade capital to more efficient machinery and processes in the face of higher energy prices. This suggests that countries adopting more accurate prices may see strategic retooling of key industries, rather than migration.
- **Distort entire industry cost structures.** Where subsidies are provided to resource-intensive industries in highly opaque ways, such as state-owned enterprises with little disclosure of the scope or scale of public support, the cost structure of the entire industry can be distorted. This may be the case in some energy-intensive basic industries such as primary metals, cement, and petrochemicals where the subsidized producers comprise a material share of global production capacity (G7 2021, OECD 2021d).

This paper discusses EHS related to specific industries for the sake of clarity, as policy assessments most often focus on one industry or another. However, interactions across industries and sectors are common. For example, water is a major (and often subsidized) input to agriculture and cooling for thermal power stations, as well as many energy-intensive manufacturing processes. Agricultural and timber subsidies can drive the production of crops or the felling of trees for energy uses. Diesel is a major input in farming, marine capture fishing, the pumping of groundwater for irrigation, and the transport of bulk commodities. Sometimes ecological assets, such as biodiversity hot spots, can come under development pressure in part due to a whole mixture of related subsides to road building, logging, energy and hard rock mining, and agriculture. Additional interactions are listed in Table 4.

In all situations, it is the *aggregate* flow of government support that drives economic distortions and environmental damages. These are complex to measure because the subsidies are often provided:

- Using multiple mechanisms of support (Table 2), with widely varying levels of transparency and ease of valuation;
- From multiple levels of government and many different agencies or ministries at each level; and
- To multiple sectors that each contribute to a particular industrial activity (e.g., water, agriculture, and energy flowing into the production of biofuels), making estimation of the total benefits received by each stage in the supply chain difficult.

Often, the recipient will be the only party to know the full "take" from all the various subsidy mechanisms from which they benefit; improving the ability to see an integrated picture of subsidies to specific firms or industries would thus be enormously beneficial. Many non-governmental organizations (NGOs) and international governmental organizations (IGOs) have worked to establish some degree of disclosure on these subsidies and estimates for the aggregate cost to government from particular programs. However, in most cases, these organizations have little visibility on the recipient firms or individuals.

Financial and other reporting standards are gradually increasing required disclosure in some of these areas (see Section 4.2 for detailed discussion). But progress remains slow.

An additional challenge with EHS reform is that there may be positive benefits of the policy as well as the negative environmental damages.[1] Examples include expanded energy access for the poor, regional development and local jobs creation or jobs protection, and improved energy or food security. These benefits need to be taken into account when identifying reform options. It is possible that in some cases the social benefits of a policy could outweigh the environmental harm.

However, the trade-offs cannot be effectively evaluated without visibility on the scale and distribution of government subsidies. Because economic and political power are significant factors in subsidy eligibility and capture, empirical assessments indicate that a large portion of subsidy benefits tend to flow to higher income quintiles or non-target industries. This is often referred to as a high "leakage rate".

For example, a review of subsidies to more than 1,500 water and water treatment utilities by the World Bank found that only 6% of the subsidies provided supported the poorest quintile of citizens (Andres et al. 2019). The International Monetary Fund (IMF) found a similar pattern for energy: only 7% of the subsidies to gasoline, kerosene and LPG reached the lowest quintile of citizens; and only 18% reached the lowest two quintiles (Coady et al. 2015: 23). A study of Indonesian palm oil subsidies (Jong 2018) found that 89% went to 15 large producers via biofuel subsidies; only 11% supported human resource development, an activity important to the smaller palm oil producers. When smallholders sued, the government claimed it needed to subsidize biodiesel to compete with regular (i.e., petroleum-derived) diesel — a need ironically driven in part by baseline subsidies that depress the domestic price of regular diesel.

This problem of high leakage rates from subsidies is greatly compounded when the scale of support grows so large that it claims a substantial share of the public budget. In these situations, not only do wealthier residents capture much more of the subsidized resource, but the ability of governments to support the poorest citizens even through other programs can be adversely constrained. Indeed, fossil fuel subsidies to consumers in many countries crowd out available public resources to fund other social needs such as public education or health care (Table 3) with quite limited benefits to the lowest income quintiles.

Nonetheless, even where only a small portion of the benefits of the subsidies flow to the poorest segments of society, for those individuals the support can be an important stabilizing factor and reforms need to be carefully managed to protect those individuals. Often, there are alternative policy tools to achieve the social objectives of the subsidy, at a much lower environmental cost. This is critical to integrate into planning, as better-off subsidy recipients may organize the populace to challenge elimination of a poorly targeted subsidy because restructuring would harm higher income quintiles even if the poorest ended up even better off.

India's effort to subsidize basic cooking fuel for the poor, for example, relied on a two-tiered pricing system under which subsidized fuel was provided to the poorest segment of society. The system suffered from two significant problems: providing subsidized LPG for many people who financially did not need it; and development of a black market to sell the subsidized fuels to non-target audiences. To solve the problem, the government reverted to a single market price for all LPG, eliminating the corruption and black market the dual prices had supported. It then provided the subsidy via an electronic payment directly to eligible customers' bank accounts, adopting much improved customer tracking as well. The result was greatly improved targeting of subsidy payments and large reductions in subsidized LPG (and associated overconsumption) by non-target segments of the population (Mittal, Mukherjee, and Gelb 2017).

Effective structuring of subsidy reforms has been studied in depth by a number of IGOs and NGOs; Clements et al. (2013) and Beaton et al. (2013) are two examples. Both assessments provide detailed guidance and checklists on common impediments to reform and ways to overcome them. Clements et al. also report on the success or failure of energy subsidy reform efforts with which the IMF was involved in the 1990s and 2000s.

Table 3. Subsidies to fossil fuel consumers crowd out other spending priorities

Country counts	2011 fossil fuel subsidy amount as percentage of:		
	GDP	Federal revenues	Public spending on health care
Total countries	37	38	37
Subsidies > 100% of metric	0	0	18
Subsidies > 50% of metric	0	2	26
Subsidies > 25% of metric	0	5	32
Subsidies > 10% of metric	6	22	33

Source: Koplow (2015).

Table 4 provides a qualitative overview of each resource sector evaluated in this paper. The table highlights the expected benefits from subsidy reform in that sector and provides examples of common subsidies currently deployed and the associated externalities. The final column presents interactions with other economic sectors, as well as social objectives in each sector that governments also aim to support and that need to be considered in reform strategies. The table is not intended to be exhaustive, but rather as a concise framing of the broad policy parameters for each EHS sector being considered.

Table 4: Qualitative overview of environmentally harmful subsidies

Resource area overview	Benefits of reform	Examples of current subsidies	Common policy interactions
Fossil fuels	Reduced pollution and GHG emissions; fiscal space to redirect to other social goals; improved price signals for R&D, capital investment, and asset retirements.	***Production:*** Import protection; tax subsidies, unfunded decommissioning and reclamation costs, underpricing for the use of bulk fuel transport infrastructure, below-market access to resources, tax-favored corporate structures. ***Consumption:*** Government-controlled prices; export restrictions; reductions or exemptions from excise taxes for particular classes of users; direct fuel subsidies or rebates. ***Both:*** Government provision of fuel-stockpiling services; government-financed R&D related to fossil fuels. ***Externalities:*** Air and water pollution, ecosystem damage, land subsidence, climate change, road damage.	***Other sectors:*** Water for power plant cooling, agriculture for bioenergy crops, transport for bulk fuels, fuel subsidies to fishing vessels. ***Other social goals:*** Reducing energy poverty; improving energy security.

Resource area overview	Benefits of reform	Examples of current subsidies	Common policy interactions
Hard-rock mining	Improved price signals among alternative minerals and metals; and between primary production and recycled options.	***Production*:** Tax subsidies, unfunded land-restoration costs, underpricing for the use of process water and bulk transport infrastructure, below-market access to resources. ***Consumption:*** Export restrictions designed to encourage domestic processing of ores or support domestic consuming industries. ***Externalities:*** Air and water pollution, land subsidence, road damage. Specific mining locations put valuable fisheries and tourism at risk as well.	***Other sectors:*** Manufacturing of renewable-energy generators (e.g., rare-earths); agriculture and cement-making (e.g., limestone); metals manufacturing (ores); materials recycling. ***Other social goals:*** Improving security of supply for critical materials; regional development.
Agriculture	Accelerated implementation of water-conserving crops and production techniques; increased availability of water to municipal and ecosystem uses; reduced depletion of aquifers. Expanded requirements for crop varieties increases food system resiliency and reduces famine risks.	***Production:*** Crop insurance; price floor guarantees; below-market sales of irrigation water or fertilizers; tax breaks and concessional loans to farm ownership; subsidies to proper management of farm-related pollution, even for corporate farms; reduced property taxes on farmland; marketing support. ***Consumption:*** Subsidies to domestic food processors; tariff escalation designed to encourage domestic processing of agricultural raw materials; subsidies for or reduced excise taxes on crop-based biofuels. ***Externalities:*** soil erosion, water pollution, conversion of natural habitats, over-concentration of staple crops in a handful of genetic lines, land privatization and conversion of food to cash crops.	***Other sectors:*** Water for irrigation, bioenergy crops, transport of bulk commodities ***Other social goals:*** Improve the yields of subsistence farmers, improve food security, encourage regional development and jobs creation; protect small family farms.

Resource area overview	Benefits of reform	Examples of current subsidies	Common policy interactions
Marine capture fisheries	Recovery of damaged and overfished regions; reduced risk of fish loss to poor nations from international fishing fleets.	***Production:*** Grants, tax breaks or other mechanisms funding new fleet construction or the refurbishing of existing vessels; below market fees to access ports and harbors; free or low-cost provision of industry management and oversight services by governments; exemption from excise tax on fuels; subsidized fuel. ***Externalities:*** incentives to overfish international waters; poor regulation of bycatch or damaging harvesting techniques.	***Other sectors:*** Fuel subsidies. ***Other social goals:*** Protect livelihoods of subsistence and artisanal fishers; protect food security, both short-term on current catch and long-term on fishery stability.
Forestry	Improved retention of forest biodiversity; reduction of ecosystem fragmentation. Illegal logging reduces timber prices up to 16% (CRS 2019), reducing incentives to keep land in forests.	***Production:*** Below-market access to concessions and massive illegal harvesting comprising most of the cuts in some countries; improper or subsidized reclamation; state-funded building of timber access roads; tax breaks to proper land management and replanting; tax-favored corporate structures; reduced property taxes on land held as forests. ***Consumption:*** Subsidies to makers of forest-derived products (paper, cellulosic ethanol, wood-fired power plants, wood pellets). ***Externalities:*** Loss of biodiversity; replacement with monoculture timber stands; watershed runoff; loss of carbon sequestration; decline in soil fertility in tropical regions.	***Other sectors:*** Road construction, bioenergy crops, construction, secondary paper demand. Subsidies to agriculture, including improper protection of communal property rights, have been linked to roughly 80% of forest loss worldwide (ODI 2015). ***Other social goals:*** Rural jobs and development; fire suppression; watershed protection.

Resource area overview	Benefits of reform	Examples of current subsidies	Common policy interactions
Transport	More accurate delivered price for bulk fuels and freight; improved user financing for core transport infrastructure; slower development of remote extraction sites and reduced pressures for sprawl; potential shift to modes with lower carbon intensity (rail and barge); more efficient utilization of transport infrastructure; more accurate prices for company cars relative to mass transit.	***Production:*** State funded transit connections to remote locations, including coal mines or oil and gas wells; inability to tax fuel used in international trips; property tax exclusion on land used for roads. ***Consumption:*** Inadequate user fees on state-provided or operated transport infrastructure; inadequate pricing of road-damaging heavy loads; corporate and personal income-tax provisions that favor the provision of company-owned or -leased vehicles and free parking in lieu of higher wages; employer-subsidized fuel credit cards. ***Externalities:*** Sprawl, habitat loss, watershed damage.	***Other sectors:*** Bulk fuel movements on subsidized transit infrastructure; encroachment into forest or other habitat. ***Other social goals:*** Regional development and integration; improved market access.
Water	Improved incentives for careful management and maintenance of water and wastewater infrastructure; increased on-factory or farm treatment of complex discharges; incremental shift to non-thermal power generation and water-efficient farming and manufacturing processes	***Production:*** State funding of infrastructure and maintenance costs. ***Consumption:*** Below-market pricing or free allocation of water use rights to agriculture and industry; socialization of water treatment costs even for commercial users; use of cost-recovery rather than scarcity pricing in utility rates; poorly targeted rate reductions for lower income consumers. ***Externalities:*** Habitat and wildlife loss from water diversion; aquifer degradation due to overconsumption.	***Other sectors:*** Water as an input to agriculture, energy extraction, industrial manufacturing, and thermal power cooling. ***Other social goals:*** Universal access to clean water; adequate flows to support adjacent ecosystem needs.
Construction	Smaller residential footprints; reduced sprawl; more infill construction. Addressing agency problems between property owners and tenants can result in lower operating costs for the built environment (including for energy) supplementing building codes.	***Production:*** Tax breaks to corporate forms heavily used in real estate (e.g., REITs) and large mortgages. ***Consumption:*** Government funding and tax subsidies favoring single-family housing rather than more compact multi-family options. ***Externalities and market failures:*** Land conversion, including of fertile farmland and forests. Agency problems with lease real estate and efficiency improvements.	***Other sectors:*** demand for land and raw materials; energy through code requirements; road and network utility extensions to remote areas; lower cost wood. Increasing block rates for energy and water can penalize multi-unit apartment or commercial buildings. ***Other social goals.*** Affordable housing; regional development.

3

Measuring EHS:

Methods, institutions, and estimated scale

Measuring EHS: Methods, institutions, and estimated scale

This section provides a brief overview of the ways EHS have been measured, the institutions that have taken the lead in developing those estimates and, where available, the estimated scale of government support.

All these tracking efforts aim to provide increased transparency on the role EHS have played in related industries and how they could be made more effective both fiscally and environmentally. Further, all have faced periodic funding and data-access challenges and there may be ways engaged corporate partners could assist these efforts through improved data collection, advanced integration across data sources, or improved valuation algorithms.

Subsidy measurement has been undertaken by NGOs as well as governments. However, to date the broadest assessments to measure EHS globally have been led by intergovernmental organizations (IGOs), collecting data at the sector and country level.

In addition, with three notable exceptions (agriculture in a few countries, recipients of federal grants above CAD 100,000 in Canada, and US Paycheck Protection loans in covid-relief legislation, where recipients are listed by name), there is little transparency on EHS flows to specific corporations or SOEs. Where end-recipients have been pieced together from hundreds or thousands of discrete documents (the Subsidy Tracker tool produced by Good Jobs First, a Washington, DC-based NGO comes to mind), the effort required is extraordinary and important gaps remain. Expanding the geography, sectors, types of subsidies, and number of government agencies captured in these EHS datasets would all be beneficial, as would be much more visibility on the end-recipients.

3.1 Estimation method

An overview of the main approaches generally used to estimate EHS follows, with a more detailed summary of the strengths and limitations of each approach in Annex Table A1.

3.1.1 Price subsidies

In some ways, the simplest method of making a first-approximation measurement of subsidies to producers or consumers of a good is to compare the producers' or consumers' price with some reference price — typically, an import or export parity price, adjusted for internal transport costs and quality differences — and multiply the resulting price gap by the affected volume. Sometimes referred to as the "price gap" method, this approach is the one used by the IEA in measuring price support to consumers of fossil fuels and electricity, and for the main element of what the IMF refers to as "explicit subsidies" to fossil fuel and electricity consumption. It has also been used by some researchers in the water sector. Price-gap measurements capture the net effects of government policies, such as import or export taxes or domestic price regulations, that induce changes in prices. What the price gap metrics miss are the value of subsidies that do not result in price changes, but that may nonetheless be important in keeping older, high-cost and often more highly polluting producers in the market.

3.1.2 The Producer Subsidy Equivalent and Consumer Subsidy Equivalent (PSE-CSE) framework

This accounting framework for subsidies measures both price support and the value of grants, input subsidies and other subsidies that do not directly affect prices. The latter are reported on an individual policy or program basis, and separately for producers and consumers. While the approach can theoretically capture all types of subsidies, data and political impediments have often limited the degree to which it captures input subsidies (e.g., water to agriculture), risk transfers, credit support, and hidden aid to state-owned enterprises. The PSE-CSE framework was first applied internationally to agriculture and informed the OECD's work on measuring government support to fisheries and to fossil fuels (Steenblik 2020). However, market price support to producers was not included in the OECD's fisheries support estimates, primarily because of the difficulty in obtaining suitable producer prices, reference prices, or both. In the case of the OECD's Inventory of Government Support for Fossil Fuels, consumer price support is not reported because doing so would duplicate the work of the IEA. Rather, starting with its 2018 inventory, OECD also produces a combined estimate to give a roughly global number (OECD 2018).

3.1.3 Inventory approach

Because the OECD's estimates of government support are compiled in what it calls an "Inventory", the literature often speaks of its approach as "the inventory approach", even though it is derivative of the PSE-CSE framework. Nonetheless, many NGOs and government agencies use a similar approach when tracking government support. Most often, these assessments quantify the subsidy value of the transfer. In other situations (for example, Bast et al. 2015), NGOs also add the principal value of government-mediated finance (loans and loan guarantees), rather than the subsidy element of this financing alone, and capital expenditure by SOEs. Proponents make two main arguments to support this mixed approach: first, that the supplemental data streams illustrate the potential bias the supporting state may provide to particular forms of energy over others; and second, that the gross values of loans or SOE capex spending are the only data available.

The insights from including these other support flows are important to policy makers (and indeed have played a role in pressuring many development funders and export credit agencies to stop funding new coal projects). However, the principal values of loans or capex should not be added to subsidy estimates because they are not the same thing.

Most NGO reports now keep the items separate; and, hopefully, increased disclosure in the future will make the subsidy component of government loans, insurance contracts and state-ownership visible.

3.1.4 Asset-level modeling

The price gap and inventory approaches focus on generating aggregate levels of support for a particular country, state or province. Asset-level modeling (e.g., Achakulwisut, Erickson & Koplow 2021) instead applies the eligibility rules of specific subsidies and estimates how those subsidies affect the profitability of specific firms or assets. This approach requires substantial baseline data on the economics and cost structure of the subsidized industry. Its advantage is that it can be used to compile a wide range of subsidies from any level of government into an integrated estimate of support; indeed, the approach comes closest to measuring the total subsidy "take" flowing to particular economic interests. The approach can also differentiate the degree to which the subsidies trigger new production rather than simply increased profits to production that would have happened anyway; and it can generate estimates for incremental emissions associated with the expanded supply.

3.2 Externalities

A long-running debate between those who do subsidy accounting, particularly those connected with the international trade community, and some environmental economists is how to treat costs externalized to the rest of society by producers or consumers. These externalities are often enormous: the IMF's estimate for global externalities associated with the consumption of fossil fuels (which they define as climate change, air pollution, and several driving-related externalities, such as traffic congestion), plus imputed fuel taxes where they estimate current rates are too low, was $5.4 trillion in 2020 (Parry et al. 2021a) – more than an order of magnitude larger than their estimated fiscal subsidies. However, except for the IMF, no other organization involved in measuring global subsidies to a sector agrees with including externalized costs in their definition of a subsidy.

Definitions aside, the scale of external damages is important to be aware of since EHS reform can reduce them, and government interventions via Pigouvian taxes (such as carbon taxes) may be warranted as well.

EHS reform is a complement, not a substitute, for carbon pricing. In fact, achieving proper price signals would involve three main pillars in combination: removal of subsidies; taxes to internalize environmental externalities; and application of the standard value-added or sales tax rates the country normally applies to goods.

Table 5 provides an overview by EHS sector of existing international data on the estimation approach being used, the lead institution(s), and the estimated scale. In addition to using different estimation approaches, values will be affected by the number of countries within the study, the mix of subsidy types captured, the years for which the analysis was completed, and the degree to which the study captures sub-national subsidies from state, provincial and municipal governments. These factors, plus gaps for some sectors in having any estimate at all, highlight the large amount that we simply do not know about EHS. And yet, even with all this uncertainty, the magnitude of what has been captured is very large; and likely to rise substantially as coverage improves.

The importance of not just focusing on pricing greenhouse gases, but on combining that type of policy with EHS reform, is clearly illustrated using the example of fossil fuels. According to the IMF, 80% of global carbon emissions remain *untaxed*, and the average price on emissions is only $3/mt CO2e (Gaspar and Parry 2021, Parry et al. 2021b). The World Bank (2021) notes that the use of carbon pricing, via taxes or permit trading systems, continues to grow around the world and raised $53 billion in revenues in 2020.

This is a positive trend, and a sizeable amount of revenue to help improve price signals to high-carbon industries. However, even with this growth, the total global revenues from all existing carbon pricing systems now in effect comprise less than one-tenth of the $638 billion combined IEA/OECD estimate for subsidies to fossil fuel producers and consumers shown in Table 5.

Table 5. Existing efforts to track or value EHS

Resource area and measurement approach	Additional information on analysis	Scale of subsidy (Adusted to 2021 USD except as noted)
Fossil fuels		
OECD – Total support estimate, 50 countries **IEA – Consumer price support, 42 countries**	Over time, OECD and IEA have captured more countries and policies; and increased both estimate precision and their ability to combine values. IEA approach often referred to as the "price gap", as it measures the gap between domestic prices and world reference prices for particular fuels. Estimates for 2020 were not used due to severe covid-related distortions in energy markets, making them unrepresentative of longer-term trends.	2019: – $208b total support estimate (OECD 2022) – $322b consumer support (IEA 2021) – Joint OECD/IEA estimate for 2019: $511b across 81 economies (OECD 2021b, OECD 2022), which OECD adjusted to avoid double-counting (where the resultant estimate is 96.4% of the sum of the OECD and IEA independent estimates) 2021 (projections): – $454b consumer support (IEA 2021b) – Ballpark joint estimate for 2021 is $638b: $454b 2021 IEA consumer subsidy estimate + $208b most recent (2019) OECD producer subsidy, scaled by the same 96.4% factor as the 2019 joint estimate.
IMF – Mostly price gap approach for their "pre-tax" (now called "explicit") subsidy estimate	Included 192 countries (more than OECD plus IEA); recent update reflects additional countries and increased precision on externality estimates and consumer subsidies.	IMF (Parry et al. 2021a) Pre-tax explicit subsidy estimate: $450b in 2020.
Achakulwisut, Erickson & Koplow (2021) – Field-specific boost to investment returns at US oil and gas fields	Most recent analysis reflected expanded policies, updated tax rules, and included some sub-national subsidies.	16 US subsidies boosted the IRR of new fields by 55-68% at 2019 average prices; for lower 2020 prices, the boost was 63-78%, with more than half of the fields dependent on subsidies to hit estimated hurdle rates.

Resource area and measurement approach	Additional information on analysis	Scale of subsidy (Adusted to 2021 USD except as noted)
Hard-rock mining		
No systematic effort; some narrow estimates by specific subsidy or mine	Coverage seems to be driven by the scale of environmental harm; thus, many studies of specific gold mines (legal and illegal).	– Not estimated. Environmental damage at often illegal gold mines in the billions of USD though. – A survey of 3,000 metal mines around the world found 79% of global metal ore extraction in 2019 originated from five of the six most species-rich biomes; and 90% occurred in areas with relative water scarcity (Luckeneder et al. 2021).
Agriculture		
FAO/UNDP/UNEP (2021) – Total support estimate for 61 countries	Measures net support to producers for the period 2013-2018.	Total support estimated to average $600 billion a year, of which roughly 87% or $522 billion deemed to be price-distorting or damaging to nature.
OECD – Total support estimate for 54 countries.	Most support based on production rather than income and is not constrained by the method of production.	$562 billion/year on average for 2016-18 (OECD 2021a), after removing government food support to citizens and policies that increase farm costs from initial OECD tally of $753b. EHS totals in this paper include policies funding farmers that are not linked to output, as they nonetheless increase returns to the sector.
OECD – Working paper estimate of EHS share	Covers average support for 2017-19 period.	$367b/year on average for 2017-19 (OECD 2021f) "is provided in ways that are most harmful to the sector's sustainability, while most of the rest does little to help." This figure would capture some, though not all, aspects of environmentally harmful.
Marine capture fisheries		
OECD (2020) – Fisheries Support Estimate	Verified inventory of support policies covering 39 countries.	(OECD 2020) $10 billion/year avg for 2016-18.
University of British Columbia and Oceana, policy inventory	Estimates of global subsidies, with focus in report on countries providing the largest fishery subsidies.	2018: Estimated $24b deemed harmful because they increase fishing capacity or capture; with an additional $14b to fishery management and other supports deemed neutral or supportive to healthy fisheries (Skerritt and Sumaila 2021).
World Bank – Illegal fishing		$26b – Midpoint of estimated values of illegally harvested catch (World Bank 2019). Bycatch and damage of the seabed are examples of fishery-related externalities. We view illegal fishing as a "terms of access" subsidy, not an externality. The practice is widespread and remains unchecked due to governmental failures in properly controlling and pricing access.

Resource area and measurement approach	Additional information on analysis	Scale of subsidy (Adusted to 2021 USD except as noted)
Forestry		
Total global subsidies of all forms to forestry	Country-specific studies suggest that terms of access to timber concessions, and government provision of timbering roads are likely to be major subsidy components.	No estimates of total subsidies could be identified.
Interpol – value of illegal timber trade		Illegal cutting >$155 billion/year; comprises 90% of wood harvest in some countries (Interpol 2020).
World Bank (2019) –ecosystem services, lost tax revenues		– Lost tax revenues from stolen timber: $6-9b/yr. – Lost ecosystem regulation and carbon services from illegal cutting: $876 - $1,814 billion. (World Bank 2019)
Transport		
Infrastructure subsidies – road, rail, inland waterways, coastal and ocean borne shipping, and aviation		
No international estimates could be found, even for single modes.	Much of the transport infrastructure, even in market economies, is owned by the state. Investments are made by national, state or provincial, and municipal governmental entities, making tracking quite complex.	No composite data. ITF estimates total spend on road construction and maintenance in its member states averaged $224b/year between 2015-19 (ITF 2021). US highway spending is in part supported by taxes on motor fuels. However, the shortfall in user fees is estimated to average roughly $18b/year (CRS 2020b: 5).
Grants and targeted tax exemptions	Study evaluates exemptions from national tax and European Energy Tax Directive. Data are old, and research has unfortunately not been updated.	EEA (2007): EU direct transfers and tax expenditures, 2007: €270 to 290 billion, dominated by road support and rail second.*
ITF – policy inventory within OECD for maritime vessels and infrastructure		At least $3.7b (€3 billion) a year (ITF 2019).
Exemptions associated with International maritime shipping related to the EU		$29b (€25 billion) a year (T&E 2019).
Subsidies to vehicles and parking		
Tax benefits for commuter parking	Provisions were narrowed in 2017 to remove tax deductibility for employers. Income exclusion for commuter parking benefits remains.	Averages $2.2 billion/year for 2021-30 period (US Treasury 2021).
Tax benefits for company cars, work-related parking	The majority of new cars purchased within the EU are company, rather than personal cars; 96% of new registrations remain petrol or diesel. The study compares tax and ownership costs from corporate and private ownership to calculate the subsidy value.	$38b (€32 billion) a year (T&E 2020).

Resource area and measurement approach	Additional information on analysis	Scale of subsidy (Adusted to 2021 USD except as noted)
Water		
World Bank – price gap	World Bank estimate does not address all water or water treatment providers; direct removal of stream flows for industry, agriculture or thermal power; or cross-subsidies between classes of users that may be particularly important to the industry sectors evaluated here.	$315 – $385b/year to water supply and sanitation, excluding China and India (Andres et al. 2019: 27)
IMF – price gap (2012: 18)	IMF estimate also focuses on public utilities and doesn't capture direct subsidies to users.	$535b
Construction		
No comprehensive estimates identified.	Subsidies to construction have sometimes been identified as a significant contributor to sprawl. This is because they have favored new construction over infill and single-family homes over multi-family.	– Federal guarantees on real estate borrowing for single family homes were more than 10x the rate for multi-family housing – $1.142 trillion to $112 billion between 2007-11 (Smart Growth America 2013).* – Two significant tax breaks for single-family homes in the US (mortgage interest rate deduction and property tax deduction) result in revenue losses of nearly $90b/year.

*Currency not adjusted to 2021 USD due to age of estimate or ambiguity on currency base year.

4

Disciplining EHS:

What has been tried and how has it worked?

Disciplining EHS: What has been tried and how has it worked?

Subsidies have long been of interest to national competition authorities, trade authorities, and of course financial regulators. At the inter-governmental level, preventing subsidy-driven competition has been the main force driving cooperation on subsidies, organized through binding rules and remedies — collectively, "disciplines" — and, increasingly, through more informal, aspirational commitments.

Corporations themselves play an important role in subsidy governance, as it is they who bring complaints to their governments over subsidies provided to their competitors in other countries and ask them to take a unilateral action (e.g., impose a countervailing duty on the subsidized foreign product) or mount a challenge at the World Trade Organization (WTO). Further, accounting standards require certain subsidies to be reported in the organization's financial accounts.

The following paragraphs first explain the over-arching international framework governing the use of subsidies, and the more specific rules that relate to selected industries or sectors responsible for environmental damage. Some of the sector-specific rules are still under negotiation, and many others mainly take the form of non-binding commitments.

Of the latter, the environmental effects of subsidies, and not just their trade effects, are increasingly the focus of discussion.

The section then turns to accounting rules on the reporting of subsidies received by corporations or granted by governments. The rationale for establishing standards for corporate reporting of subsidies not specifically linked to environmental concerns, but rather to give shareholders a better understanding of the sources of each corporation's income and current or emerging risks the firm may face. Nonetheless, such information can often have environmental salience, increasingly important for investors focused on screening their holdings based on environmental, social, and governance (ESG) factors.

4.1 The inter-governmental framework

Multilateral and plurilateral disciplines on subsidies refer to binding rules on which subsidies are prohibited, which are actionable through dispute settlement, and which are non-actionable. They further present the remedies available to aggrieved parties. These systems have largely emerged from the domain of trade policy, which is centered on trade effects. The General Agreement on Tariffs and Trade (GATT) governed international trade from 1947 through 1994. Though the GATT included some text on subsidies, the ability to take action against them was relatively weak, especially subsidies to primary products. Since the GATT was superseded by the WTO in 1995, subsidies affecting trade have been governed by the WTO Agreement on Agriculture (in the case of agricultural goods) and the Agreement on Subsidies and Countervailing Measures (SCM Agreement) for all other goods. Subsidies affecting trade in services are still not disciplined under any WTO agreement.

Under both the Agreement on Agriculture and the SCM Agreement, certain subsidies are deemed adverse to trade based on their design.

Under the Agreement of Agriculture, both trade-distorting domestic support and export subsidies were initially reduced over a six or ten-year period and then capped.[2] Twenty years later, export subsidies for agricultural products provided by developed countries were ended. An entire third group is relegated to the "green box", where the color refers to a traffic light, not the environment. These subsidies were judged to support social goals and include many subsidies with environmental purposes. Per the traffic light analogy, they are allowed to "go" without limit. The analogous categories in the SCM Agreement are "actionable" and "non-actionable" subsidies. Actionable subsidies are not prohibited under the SCM Agreement, but they can be challenged at the WTO because of their alleged adverse effects on the trade interests of another WTO member. The category of non-actionable subsidies expired at the end of 1999, but previously covered certain subsidies for adaptation to new environmental regulations, funding of research and development, and regional development assistance.

An important limitation of the WTO's subsidy disciplines from the perspective of addressing environmentally harmful subsidies is that they hinge on trade effects, not environmental effects. The WTO Agreement on Fisheries Subsidies, should it be adopted, would by contrast expressly integrate environmental criteria, such as whether the subsidies are supporting fishing targeted at a fish stock recognized as overfished. While there is some correlation between subsidies that stimulate production to a particular industry and those that are environmentally harmful, the overlap is at best partial. For example, subsidies that reduce the price of diesel fuel consumed by private motorists have no adverse effects on another country's potential exports of diesel to the subsidizing country — indeed, they may stimulate its exports — but they can increase emissions of GHGs and local air pollutants and mute the incentive to purchase more efficient vehicles.

For these and other reasons, multiple international forums have tried to convince their members to reduce environmentally harmful subsidies in other ways. Over the past three decades, these parallel efforts have mostly been anchored to hortatory statements of a non-binding nature. A few of the more prominent examples are described below. The participating parties have varied, including regional or plurilateral efforts, as well as global initiatives involving the whole United Nations or WTO membership.

4.1.1 Environmentally harmful subsidies generally

In 2001, the Meeting of the Council at Ministerial Level of the Organisation for Economic Co-operation and Development, the top decision-making body of the OECD, endorsed a report on EHS and approved a program of work over several years to develop more information on their scope and models for reform. That resulted in several expert workshops and publications, but no significant concrete results at the member country level. At their meeting in June 2009, however, the same group adopted a non-binding "Declaration on Green Growth" that, among other encouragements to each other, called for:

- domestic policy reform, with the aim of avoiding or removing environmentally harmful policies that might thwart green growth, such as subsidies: to fossil fuel consumption or production that increase greenhouse gas emissions; that promote the unsustainable use of other scarce natural resources; or which contribute to negative environmental outcomes.

The European Commission took this admonishment more seriously than most and called in its 2011 *Roadmap to a Resource Efficient Europe* for the phasing out of EHS by 2020. Several EU Member States developed inventories and reports on their EHS, and some implemented reforms to some of their policies.

4.1.2 Agriculture

Agriculture has been the sector whose subsidies have arguably received the most directed attention at the international level. When the 1947 GATT was first drafted, agriculture was treated separately from other goods, including its subsidies. The exemptions granted to agriculture meant that there were, effectively, few disciplines on the use of subsidies, including those provided by developed countries. It was not until the GATT Uruguay Round of multilateral trade negotiations that serious efforts were made by the international community to collectively restrain what had become an out-of-control subsidy system.

Informed by work to quantify and study the effects of farm subsidies undertaken by the OECD in response to a Ministerial mandate from 1982, GATT negotiators forged an Agreement on Agriculture as part of a larger suite of agreements concluded in 1994 (van der Hamsvoort 1994). That agreement has governed the use of agricultural subsidies ever since. Different obligations were imposed on developed relative to developing countries, and least-developed countries are exempt from reduction commitments on any of their agricultural support.[3]

Agricultural support was still a central trade issue for WTO Ministers at their 4th Conference in November 2001, which launched the Doha Round of trade negotiations. That round, like previous ones, was supposed to be a "single undertaking" — that is, one in which "virtually every item of the negotiation is part of a whole and indivisible package and cannot be agreed separately. 'Nothing is agreed until everything is agreed'" (WTO 2001). However, by the turn of the decade it had become clear that the Doha Round was stalled and would likely never be completed as planned.

Accordingly, negotiations on individual priority elements were carried out. At their 10th Ministerial Conference (MC10), in December 2015, WTO Ministers agreed that all developed-country WTO members would immediately eliminate their remaining scheduled agricultural export subsidies, and developing country Members would have to eliminate their agricultural export subsidies by the end of 2018.

In the lead up to the much-delayed MC12, which is expected to take place sometime in 2022, developing countries had hoped for a negotiated deal that would have further constrained the most trade-distorting domestic support to agriculture provided by OECD countries. Supports within the EU and the United States, which some negotiators allege have exceeded those WTO members' scheduled commitments, remain a central concern. Expectations at present are muted, with the most likely outcome expected to be merely a decision for a post-MC12 work program on agriculture (Kanth 2021).

4.1.3 Fisheries

Alarm over the links between subsidies, over-capacity in the marine fishing fleet, and over-fishing date back to at least the early 1990s when the United Nations Food and Agriculture Organization (FAO) issued a special report documenting these effects (FAO 1992). At the time, global fisheries subsidies were estimated at around USD 50 billion a year (equivalent to more than USD 100 billion today). A few countries tried but failed to include fish, and therefore subsidies to fishing, in what would become the WTO Agreement on Agriculture at the Uruguay Round of multilateral trade negotiations. However, as those talks were too near their conclusion, fisheries were not added. Accordingly, language calling on WTO members "to clarify and improve WTO disciplines on fisheries subsidies, taking into account the importance of this sector to developing countries" was included in the Ministerial Declaration issued at the conclusion of the 4th WTO Ministerial Conference, in November 2001.

Progress was slow, and it wasn't until 2015 that the United Nations agreed to a set of Sustainable Development Goals (SDGs), one of which set a target (SDG Target 14.6) demanding that by 2020 UN members

- prohibit certain forms of fisheries subsidies which contribute to overcapacity and overfishing, eliminate subsidies that contribute to illegal, unreported and unregulated fishing and refrain from introducing new such subsidies, recognizing that appropriate and effective special and differential treatment for developing and least developed countries should be an integral part of the World Trade Organization fisheries subsidies negotiation.

Yet, with the 12th WTO Ministerial Conference imminent, negotiations on an Agreement on Fisheries Subsidies have still not been concluded. A successful outcome to those negotiations, which would impose new disciplines on certain subsidies relating to marine capture fishing, is not assured.

Outside the WTO, some progress has been made on fisheries subsidies, most notably in the Comprehensive and Progressive Agreement for Trans-Pacific Partnership (CPTPP Agreement), a wide-ranging regional free-trade pact among 11 APEC economies that entered into force at the end of 2018 for the first eight ratifying Parties. Language in the Environment Chapter of the CPTPP Agreement (Article 20.16(5)) states that "no Party shall grant or maintain any of the following subsidies within the meaning of Article 1.1 of the SCM Agreement that are specific within the meaning of Article 2 of the SCM Agreement:

(a) subsidies for fishing that negatively affect fish stocks that are in an overfished condition; and

(b) subsidies provided to any fishing vessel while listed by the flag State or a relevant Regional Fisheries Management Organization or Arrangement for IUU [illegal, unreported and unregulated fishing] fishing in accordance with the rules and procedures of that organization or arrangement and in conformity with international law."

Moreover, any Party to the Agreement with subsidy programs that had been established before the date of entry into force of the Agreement for that Party, and which were inconsistent with Article 20.16, paragraph 5(a), must bring them into conformity with that paragraph no later than three years from the date of entry into force of the Agreement for that Party. Enforcement of the provisions, if necessary, will be through the CPTPP's dispute-settlement procedures.

It is too early to judge the effectiveness of the CPTPP in disciplining fishing subsidies, as the three-year mark for the first eight Parties ended only in December 2021.

4.1.4 Fossil fuels

Subsidies to fossil fuels have long been held up as the quintessential examples of environmentally harmful subsidies. Studies by the World Bank in the 1990s, and by the International Energy Agency (IEA) in 1999, provided increasing clarity on the issue. Accordingly, in 2009, following a period of rapidly escalating international oil prices, when many non-OECD countries were keeping their domestic prices for fuels and electricity artificially low – in some cases through massive subsidies – the Leaders of the Group of Twenty (G20) and then of APEC issued non-binding commitments to phase out "inefficient" fossil fuel subsidies "over the medium term". Neither the term "inefficient" nor the time span covered by the phrase "over the medium term" were defined.

Initially the G20 encouraged self-reporting by its members of their fossil fuel subsidies. The results were decidedly mixed, however. Koplow (2012) analyzed the way each member country chose to interpret the reporting language under the G20 fossil fuel reform commitment and the range of supports their interpretation enabled them to exclude from reporting. Many simply declared that they had no "inefficient fossil fuel subsidies" to report at all.

Over time, particularly as the OECD, working with the IEA, developed databases on covering most G20 members' fossil fuel subsidies, this type of self-reporting exercise disappeared. In its place, members volunteered to participate in bilateral peer reviews – generally pairing a developed economy with an emerging economy, chaired by a member of the OECD Secretariat. The first six peer reviews (China and the United States, Germany and Mexico, Italy, and Indonesia) have been completed.[4] Four more planned peer reviews (Canada and Argentina, and France and India) were announced in 2018 but have yet to take place.

The peer review process starts with so-called "self-reports" by a member of their fossil fuel subsidies, in which they identify which ones they consider inefficient and which ones they want to phase out. The review team then meets with experts from the country, asking for further clarification on the self-report and the country's reform plans. With this additional information, the team then issues their own report, including an evaluation, the text of which is agreed between the team and the country under review. The review team's experience in tracking fossil fuel subsidies in many contexts enabled them to expand on the items and background information put into the reports by the country representatives.

Often, this additional data has been accepted. However, the consensus-based aspect of review completion did limit the scope and degree of conflicting views and analysis emerging from this process.

A similar peer review mechanism was instituted by APEC economies. Since APEC economies that are members of the G20 all chose to undertake their peer reviews under the G20 process, the reviews that have taken place to date (2014-2017) were carried out only on non-G20 APEC economies; in chronological order, they were: Peru, New Zealand, The Philippines, Chinese Taipei. Viêt Nam was the last peer review carried out in the series but was never published. These were carried out sequentially, rather than in pairs.

An important limitation faced by the teams writing the peer-review evaluations was that they had few set criteria against which they were supposed to make their evaluations. Thus, the reviewed countries themselves have been free to interpret what determines whether a fossil fuel subsidy is inefficient or not, and what length of time qualified as "over the medium term". For practical reasons relating to the difficulty of coordinating central and sub-national officials' positions, the reviews excluded significant discussion of sub-national subsidies, despite these being an important source of support to the fossil fuel sector. Ten years on, the International Institute for Sustainable Development (IISD), a group heavily involved with fossil fuel subsidies and the G20 reform process, remarked "G20 country action on subsidies still appears as words on the page, the absence of commitments, and certainly no clear, concrete plans to phase-out subsidies once and for all. This has got to change" (Merrill and Funke 2019).

Despite these limitations, the peer reviews have been beneficial in a few important respects. First, the review teams, comprised of experts from other G20 or APEC economies, from inter-governmental organizations and, increasingly, from non-governmental organizations, gained an appreciation for the perspective of the reviewed countries on their fossil fuel subsidies. Second, they obtained a much clearer understanding of the internal political challenges countries faced in attempting reforms, context that can be helpful in crafting other countries' reform strategies. Third, the process often forced the reviewed countries to consider why the subsidies were in place to begin with, and whether there might be ways to achieve the social objective of the existing subsidy in a manner with fewer environmental impacts.

As of January 2022, it looked likely that the G20 peer reviews would resume in 2022. It is less certain whether the APEC ones will also resume.

Meanwhile, several other initiatives are playing out. In May 2016, at about the same time as the first G20 peer reviews were getting underway, the members of the Group of Seven (G7) set the end of 2025 as the deadline for phasing out "inefficient fossil fuel subsidies". The G7 (who are all also members of the G20) had first called for "a reduction of subsidies that artificially encourage carbon-intensive energy consumption" at its Summit in L'Aquila, Italy, in July 2009. But prior to 2016, no coalition of countries had set a specific date to stop providing fossil fuel subsidies, or at least those deemed "inefficient".

Seven months earlier, the United Nations General Assembly had endorsed its 17 Sustainable Development Goals for 2030. Under SDG 12, Target 12.c calls upon the nations of the world to:

– Rationalize inefficient fossil-fuel subsidies that encourage wasteful consumption by removing market distortions, in accordance with national circumstances, including by restructuring taxation and phasing out those harmful subsidies, where they exist, to reflect their environmental impacts, taking fully into account the specific needs and conditions of developing countries and minimizing the possible adverse impacts on their development in a manner that protects the poor and the affected communities.

Along with the target were indicators for measuring progress. The indicators for 12.c.1 still had to be developed, and a method for doing it did not appear until 2019 (UNEP 2019). UN members are supposed to report against this indicator starting with data for 2020. The SDGs, including on subsidies, remain pronouncements of intent, for which compliance with the goal and specific target is aspirational, and reporting data for the indicator voluntary. However, the framework could provide a more systematic, universal source of data on country-level fossil fuel subsidies. Already, a common database (https://fossilfuelsubsidytracker.org) has been created that draws on data from the IEA, the OECD, and the "pre-tax subsidy" data from the IMF.

A few countries are also trying to use trade agreements to constrain fossil fuel subsidies. New Zealand has spearheaded several such initiatives. In 2010 it formed a group of like-minded countries: the Friends of Fossil Fuel Subsidy Reform (http://fffsr.org). In 2017, it got the trade ministers of several WTO members to submit a joint declaration on fossil fuel subsidies to the 11th WTO Ministerial Conference, calling for the WTO to become more active in this area (WTO 2017). The latest Ministerial Statement on Fossil Fuel Subsidies, from December 2021 (WTO 2021), though similar to the 2017 one, attracted many more co-signing members, including the European Union and its 27 Member States, and the United Kingdom. Moreover, a new "shared understanding" envisages the signatories elaborating "concrete options to advance this issue" at the WTO in advance of the 13th Ministerial Conference, which is expected to take place in 2024.

And, in September 2019, New Zealand and four other countries (Costa Rica, Fiji, Iceland, and Norway) announced they would soon start negotiating an Agreement on Climate Change, Trade and Sustainability (ACCTS). A few months later, Switzerland joined the negotiations. The ACCTS has four components, one of which is a binding agreement to discipline fossil fuel subsidies. As of January 2022, negotiations on that component were still on-going. The ACCTS parties hope that once the agreement (which also aims to liberalize trade in environmental goods and services and create a mechanism for reviewing private sustainability standards) is concluded, other countries will sign onto it. The UK, for one, has signaled an interest in doing that.

Separately, in its capacity as host of APEC in 2021, New Zealand has proposed a standstill on fossil fuel subsidies. In June 2021, APEC Trade Ministers tasked their officials "to explore options, for those members that are in a position to do so, to undertake a potential voluntary standstill on inefficient fossil fuel subsidies for progress to be reported to ministers in November" (APEC 2021).

4.1.5 Summary

The subsidies provided to several primary industries with significant environmental footprints have come under increasing scrutiny over the last several decades, and in the case of agriculture are now restrained, albeit only partially, via international agreements. However, compliance with many of these agreements is voluntary; further, those that are binding, or are likely to be binding, have typically taken decades of negotiations before a final agreement has been reached.

At this moment, it is hard to predict which type of approach has worked best, and where the most progress is likely to be made over the critically important coming decade. The binding rules of the Agreement on Agriculture resulted in the reform of subsidies across a wide swath of countries. But in recent years, multilateral negotiations to further reduce farm subsidies have stalled.

A WTO agreement on fisheries subsidies in 2022 could help start the process of restoring the world's over-exploited marine fish stocks, but success at this point remains elusive. On fossil fuel subsidies, work is taking place in multiple forums (van Asselt and Verkuil 2021). It may be that the most effective pressures for reform will be applied via institutions and processes other than the WTO, at least in the medium term.

Even though they fall short of fully disciplining subsidies, the various voluntary commitments that have been made on EHS have often spurred improved data collection and reporting, which in turn can greatly improve not only the understanding about the form, scale, and distribution of EHS, but also the political pressure for reform. Support for these efforts by key businesses, including adoption of similar disclosures in their own books, can make it much harder for countries and firms to ignore or greenwash their reporting. The next part of this section addresses subsidy disclosure and financial reporting.

4.2 Corporate accounting-based approaches

Financial accounting rules have been quite effective in standardizing the reporting of many types of business transactions, in the process providing information on business structure and performance to investors, lenders, potential customers, and others. There has been some overlap with conventional accounting rules and EHS, as well as some newer developments that could help expand this disclosure. These are summarized in Table 6, and while they can serve as building blocks for EHS transparency and reform, none of the systems at present can serve this role without revisions. Table 6 is not intended to be an exhaustive list of reporting initiatives.

The UN Principles for Responsible Investment include some components that may illuminate government support, such as through tax breaks (UN PRI 2015). However, participation is voluntary, many subsidy flows are not yet incorporated, and even participating firms are generally not required to make their reporting public. The Sustainability Accounting Standards Board develops industry-specific reporting metrics for a variety of impact areas, some of which could be helpful in identifying important focus areas for subsidy review as well. The International Sustainability Standards Board was launched in November 2021 to establish sustainability reporting and disclosure standards as part of the IASB's International Financial Reporting standards.

The project aims to meet the need for "high quality, transparent, reliable and comparable reporting by companies on climate and other environmental, social and governance (ESG) matters" (ISSB 2021). While the work program does not seem to explicitly call for subsidy disclosure, many elements (e.g., on corporate valuation and climate-related disclosures) would seem to benefit from documentation and disclosure of EHS.

Even the standards shown in Table 6 have some common limitations. First, reported data are aggregated within the firm, and often across government subsidy mechanisms as well, making it difficult or impossible to allocate specific government subsidies to specific lines of business or products. Identifying the most problematic programs in terms of environmental harm, however, would benefit greatly from both. Second, coverage of subsidy mechanisms beyond grants tends to be weak, and for some of the reporting systems, non-existent.

For example, a pending rule on government support by the Financial Accounting Standards Board (FASB), a private standard-setting body that establishes and improves Generally Accepted Accounting Principles (GAAP) within the United States, will leave out reporting on most tax-related subsidies, though these are routinely worth more than $100 billion a year to US corporations according to estimates by the US Treasury (2020).

Identifying companies willing to provide full disclosure of subsidies and demonstrate that doing so will not harm their market position could pave the way toward reporting improvements for a wide array of firms by alleviating the private-sector resistance that has often been an important cause of delays in standard refinement and promulgation.

Similarly, although the Task Force on Climate-Related Financial Disclosures (TCFD) remains at present mostly voluntary, engagement with TCFD to explicitly integrate disclosures of subsidies could offer a promising route.

Rapid changes in subsidy policies do, in fact, constitute a competitive threat to some firms and are of relevance to their shareholders; and further, thousands of firms have committed to trying to implement the standards, suggesting a subset of them might find the EHS reform angle of great interest. Such a process would likely need to have formulated case-study groups willing to move quickly in this area – even if results were initially not made public – for this approach to be a relevant improvement pathway.

Table 6. Accounting-based approaches relevant to EHS transparency

Overview	Applicability	Scope of subsidy capture	Potential improvements
International Accounting Standard 20, Accounting for Government Grants and Disclosure of Government Assistance Took effect in 1984	– Mandatory outside the US (different accounting rules apply to US). – Aggregate impacts, not specific subsidies, reported. – Government grants to agriculture addressed in IAS 40.	– Includes grants, below market loans (20.10), and in-kind grants (20.23), which are recognized in accounts as the associated conditions to keep the funds are met. – Excludes: tax breaks, subsidies associated with direct government ownership of part or all of the entity, provision of infrastructure outside of specific facility (i.e., of more general use) (20.38), benefits caused by government restrictions put on competitors (20.2), or purchase guarantees (20.35) – Capital infusions by the state often masked as in broader "proceeds from issuance of new shares".	– Granular backup data rather than aggregated accounts only. – Coverage of more subsidy mechanisms, and much better capture of off-balance sheet transactions by SOEs. – More consistent and standardized reporting of below market finance. – Separation of information on property tax abatements (most firms report only income tax concessions). – Explicit accounting of support to fixed assets (rather than just deducting support cost from reported cost basis).
Government Accounting Standards Board Statement 77, Tax Abatement Disclosures Effective date: financial statements issued after December 15, 2015	– Mandatory for government entities within the US. – May be reported individually or aggregated by program area. If any are disclosed individually, all above a certain financial threshold must be similarly listed (GASB 2015, B20, B21). – Does not require disclosure of name of recipient (GASB 2015, B30). – Does require disclosure of recapture provisions, if any (GASB 2015, B44).	– Tax abatements from government entities only. Amount and basis of abatement, entity issuing and authority to do so, any other related conditions or benefits. – Focus on incentives for economic development, so does not capture all types of tax breaks.	– Many governments are reporting these abatements incompletely, leaving out critical information; others are not reporting at all (Good Jobs First 2020).

Overview	Applicability	Scope of subsidy capture	Potential improvements
Financial Account Standards Board, Government Assistance (Topic 832): Disclosures by Business Entities about Government Assistance. Proposals released in 2015 faced significant resistance from firms; less stringent revised rules expected to take effect in 2022.	– Unlike non-US companies, US GAAP rules do not require any disclosure of government support or conditions to get it. This will change somewhat when this revision takes effect in 2022. – Requires disclosure of details only if firms followed rules on non-profit or international firms on government support; not if they accounted for it as debt or received a tax break.	– Requires reporting of direct grants. – Will poorly capture tax breaks, credit support.	– Expanded reporting to capture a much wider array of subsidies so US private firms have disclosure at least approaching what foreign firms must do under IAS 20 and US government entities must do under GASB 77.
Taskforce for Climate-related Financial Disclosures (TCFD) Released recommendations for climate-related financial disclosures in 2017, with subsequent revisions. Addresses metrics for clear, standardized, and strategically useful reporting on climate impacts and risks.	– Voluntary, though gradually becoming mandatory for participating in ESG-related organizations like UN PRI. Some indications the US Securities and Exchange Commission may make them mandatory as well. At present, even where reporting is mandatory, public disclosure of those reports is voluntary.	– Changes in subsidies were expressly mentioned as a contributing risk factor to resource-intensive organizations that TCFD participants should be aware of (TCFD 2017: 27). – However, TCFD metrics don't seem to contain express subsidy disclosure requirements, and the mention of subsidies was not included in later revisions.	– More than 2,600 supporters from nearly 90 countries as of October 2021; they commit to implement the improved reporting as applicable in their organizations. – Existing private firm engagement with TCFD suggests it may be a useful platform on which to introduce much more explicit reporting with regards to EHS. – Benefits to firms and investors would be similar as with ESG reporting.

Sources: IAS 20: IFRS (2021), OECD (2021d); GASB 77 (GASB 2015), Good Jobs First (2020); TCFD: TCFD (2017, 2021); FASB (White 2021).

5

The business case for acting to remove EHS

The business case for acting to remove EHS

While not the only recipient of EHS, business is a large beneficiary and indeed frequently lobbies to create or retain its support. Business interests spent $39.2 billion lobbying the US Congress between 1998 and the middle of 2021.

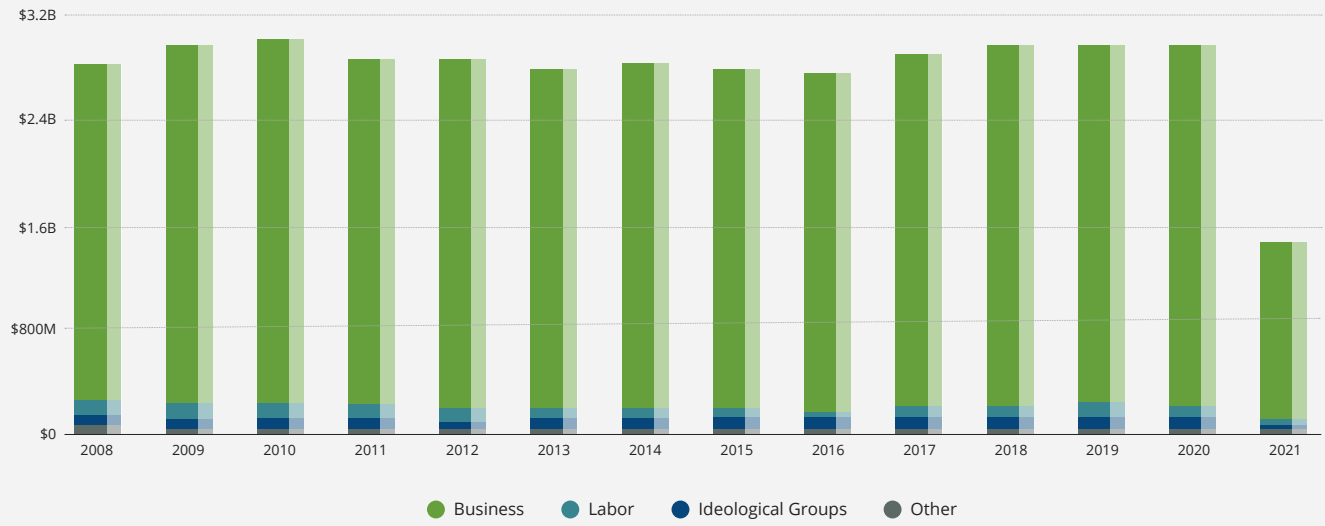
This comprised 88% of all lobbying spending during that period, according to data tabulated by Open Secrets, a Washington, DC-based NGO (Figure 2).

Further, industries relevant to EHS, including oil and gas, agriculture, and transport-related sectors, are among the largest spenders (Table A2). More generalized industry totals indicated lobbying by energy and natural resources, transportation, agriculture, and construction interests amounted to nearly one-quarter of the total. Including the finance, insurance, and real estate sector, which overlaps to some degree with construction in its involvement with the built environment, raises the share to close to 40%.

Lobbying data from the EU via their Transparency Register is not yet mandatory, and not tabulated by industry.

Though individual businesses and industries as a group have benefited from subsidies, there are several reasons many may nonetheless view reform of EHS as a plus. These include potential gains in competitive position, alignment with existing commitments to the Paris Climate Agreement and other environmental targets, reduction of operational and reputational risk, and increased attractiveness to investors.

Figure 2. Business dominates lobbying spending in the US



Source: OpenSecrets.org; 2021 data are through the end of June.

5.1 Reform can ameliorate a range of EHS-related competitive problems

Even within the same industry different firms often face disparate pressures and incentives regarding the reduction of greenhouse gases, other forms of pollution, and ESG factors in general.

- **EHS can result in diminished gains from investments for top performers.** Some firms may already be the most efficient in their industries in terms of raw material and energy inputs; subsidies therefore mostly help their competitors.
- **EHS can substitute political connections for business prowess.** For all firms, the more that EHS becomes a driver of market viability, the greater the degree to which core business skills such as innovation, production, marketing and distribution get displaced by political connections and lobbying prowess. That is not why most CEOs started their businesses.
- **EHS can create a first mover *disadvantage* for environmental upgrades.** Firms may want to make investments to improve their environmental footprints but face a first-mover disadvantage for doing so. Competitors may operate in a less stringent regulatory environment or may not have public-facing products or brand and therefore not face the same market pressure to innovate in these areas. EHS reform can generate pressure to upgrade on the entire industry at once, and potentially across countries as well. This can make upgrades less risky.
- **EHS can provide low-cost subsidized raw materials that delay or detract from strategic process redesign.** Subsidized raw materials can allow a firm to defer properly measuring and improving its operational efficiency. While EHS reforms may cause short-term cost increases, often the process of adjusting to the changes, especially if firms know the changes are permanent and not linked to a commodity cycle, can open the door to more strategic evaluations of business options that lead to long-term gains for the firm (Whelan and Fink 2016).
- **EHS can unfairly subsidize supply to competitors, depressing market prices for everybody, including unsubsidized producers.** This is common in industries considered important for national security because market returns are not the only determinant of production decisions. The issue can be compounded when a sizeable portion of global supply for a product (e.g., a primary metal) is manufactured by state-owned firms. This same dynamic can play out in industries into which there are significant flows of illicit supply. For example, illegally logged timber, often the result of favoritism or corruption in the granting of lumbering concessions, reduces timber prices by up to 16% (CRS 2019). The reduced market value provides less incentive to keep land forested in the country of origin, and lost earnings for timber firms in the importing country as well.

State ownership of resources and firms in the sectors of concern can complicate the competitive position of private firms operating in those same areas. The OECD estimated $2.4 trillion in equity value of majority SOE-owned firms outside of China, and a much larger $29.2 trillion within China, as of 2015 (OECD 2017). State ownership in the sectors of concern in this paper is significant (Figures 2a and 2b). Because the OECD survey referenced captures only enterprises for which an equity value can be calculated, core state-owned assets such as roads, bridges, ports, and government buildings are not reflected in the figures, though clearly they are also relevant to reducing global carbon footprints.

State ownership in the financial sector is large in both regions shown below, though particularly large in China. While not directly involved with EHS-related sectors, businesses in all these sectors are major bank customers, and policies relating to environmental practices and transparency for funded companies can affect long-term investment and emissions patterns.

Figure 3a.

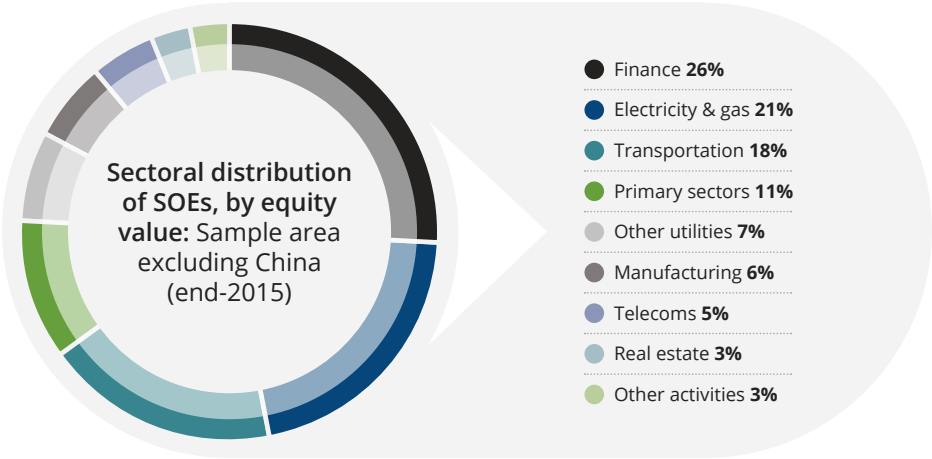
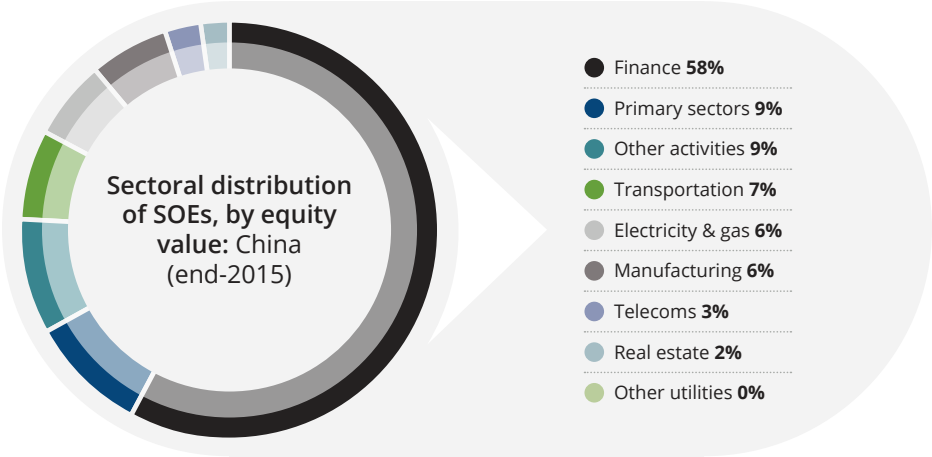


Figure 3b.



Source: OECD (2017a). Secretariat calculations based on questionnaire responses submitted by national authorities or other contributing institutions.

5.2 Alignment with commitments the firm has already made

Many firms have already taken very public positions on their commitments to address climate change and other environmental harms, as well as hiring staff and altering their investments and production processes to meet those goals.

With respect to climate change, for example, the World Bank (2021) notes that nearly half of the 500 largest companies in the world by market capitalization either already use internal carbon pricing in their corporate and investment planning or plan to do so within the next two years.

Because EHS often increase environmental harms and create an incentive to use more natural resources, not only does continuing to accept them seem in clear conflict with the firms' environmental statement and commitments, but it may make those commitments harder to achieve as well.

Indeed, the resulting changes in operations and production from EHS reform can help the firm to meet its carbon-reduction goals under the Paris Climate Agreement or other environmental metrics it has set targets for.

Further, many of these EHS flows to firms are not easily visible in current corporate reporting. Accepting the subsidies in an environment of secrecy and non-disclosure compounds the conflict, as it can convey almost a willful effort to hide actions contradictory to a firm's public statements. This exacerbates the risks to brand image should information on the scale and duration of subsidies come out through leaks or litigation, rather than voluntary disclosure.

5.3 EHS reform may reduce firm risks in several other ways as well

As noted above, the conflict between the subsidies and stated goals creates reputational and brand risk, particularly as many younger customers care strongly about threats to global ecosystems. However, the firm is also at risk of a supply shock were regulatory actions to cut significant subsidies they now receive, affecting important inputs and changing the market environment for them quickly.

Risks of large and rapid asset repricing subsequent to undeniable climate-related risks remain significant and are likely continuing to rise. Indeed, this issue lies at the core of the Inevitable Policy Response initiative of the United Nations Principles for Responsible Investment (UNPRI). In addition to the risks associated with rapid shifts in GHG regulations, shareholders also have a financial interest in understanding the degree to which their firm is dependent on continued public largesse for its profitability. EHS reform gives the firm or industry more control over the timing of the pricing adjustments, and if done well may reduce the need for state actions.

The risk of a negative backlash from EHS-related issues is not merely theoretical, as the examples below illustrate:

- The Harvard University endowment bought up vineyards and water rights to deep wells in a water-scarce region of California starting about seven years ago, before drilling was heavily restricted (Valdmanis 2015). The deep wells can continue to pump water even once the heavily over-drafted aquifer drops below well levels of nearby farms, and the purchases have continued. The issue has become contentious, with new environmental impact studies ordered in 2019 (Chaidez and Vrotsos 2019). The endowment has run into similar issues on property rights to key natural resources with farmland holdings in Brazil (McDonald and Freitas 2019), a controversy that contributed to Harvard Management Company, which manages the University endowment, spinning out its natural resources group.
- There have been numerous cases in which large firms ran into trouble through their consumption of large amounts of shared water resources, harming other users. Often, industries obtain permits to take water directly from an aquifer or surface-water body; sometimes there is a cap on their consumption, and sometimes they violate it. Frequently they pay little or nothing for the water they take. The value of the subsidies associated with these direct withdrawal rights is not captured in the water section of Table 5.
  - Coca Cola bottling came under attack in India for using so much fresh water, even during droughts, that other users did not have adequate access. Groundwater withdrawals were lowering the water table, and even surface water withdrawals were litigated and restricted to both Coke and Pepsi bottling plants in 2016. The events forced Coke to work internally to boost water efficiency (though the water intensity of sugar cane, a key ingredient remains an issue); and to build out water infrastructure or nearby residents to address the scarcity problem (Carmichael and Moriarty 2018).
  - In California, Nestle was permitted to use water for its bottled water product, but was taking far more than allowed. Similar issues were occurring in many other US states, with similar attributes: permitted water use and heavy withdrawals that are affecting ecosystem health or access to water for others.

  There are little data on what, if anything, the firm is paying for the water it uses. This type of disclosure should be routine and standardized. Further, there is linkage of access to water rights (via often small-town oversight boards) with promises of job creation and donations of municipal infrastructure by the large company. Generally, the pricing and consumption of decisions related to natural resources should be vetted independently and not "packaged" with other things. It is also not clear whether the deals on water retain for the municipality the ability to boost fees and restrict withdrawals during periods of drought, ecosystem damage from diversions, or increased demand needs from growth in other parts of the watershed. This type of flexibility should be a basic element of any permit agreement.
- Beef operations and soy production are a major cause of tropical rainforest loss in Brazil (Song et al. 2021). Although many major grocery chains committed years ago not to sell beef produced on lands converted from rainforests, they have not been successful and continue to do so (UCS 2016; Wasley and Heal 2021). This risks their brand and creates continued pressure for land conversions as a result.

  One other example of note: access to subsidies is often the result of rather bizarre rules, with favorable rates secured in part by restrictions on selling the resources on the open market. California water provides such an example: arcane rules prevent the Palo Verde Irrigation District from charging for the water; fees are restricted to recovery of the District's administration costs only.

Continued overleaf...

When the water is artificially inexpensive in an otherwise good growing district, strange things happen to exploit the opportunity. In this case, a Saudi Arabian company purchased farmland to access the water; uses the scarce water to grow water-intensive alfalfa; and then loads the crop on ships to feed to cattle operations at home.

It is one of many firms in the region using almost-free water to produce water-intensive crops for export (Markham 2019). The trouble is that the water really is scarce, and the more that gets consumed in the districts governed by agreements made in the 1800s, the less is left for other users.

5.4 Potential benefits in investment markets from EHS reform

EHS reform by governments, or improved policies and disclosure initiated by the firms themselves, can boost a firm's standing in terms of ESG screens and with investors. This is particularly true if the firm provided enhanced disclosure of subsidies received and whether those subsidies increase pressure on ecosystems and natural resource inputs or, in the firm's view, are helping to reduce environmental harm. A big challenge for investors and analysts concerned with both EHS reform and ESG attributes of a firm is the clarity, scope, and standardization of the data. There are opportunities for partnerships with first-mover companies to make progress in all these areas.

EHS reform can provide some other benefits on the investment side of business operations as well. For example, the projects that a firm undertakes to retool for reduced emissions and increased efficiency once subsidies are removed may qualify for targeted financing for "green bonds" or similar products.

On the investment side of things, asset managers building passive investment products face particular challenges in that they will need to continue to retain constituent firms even in environmentally problematic activities in order to reproduce the external indices.

One promising lever is their ability to push for full disclosure of EHS flows to constituent firms, similar to what is starting to happen with ESG issues in general. By augmenting the information available to investors on EHS and ESG, the large asset managers can generate market pressure for those firms to improve performance. This can work even when the asset manager cannot remove all the firms from the index.

While the current focus for asset managers has been on disclosure in financial statements, there are broader and more powerful levers as well.

For example, minimum expectations for emissions monitoring could be communicated to each constituent firm (discussed more in Section 6). Firms would need to meet it, or else their unwillingness even to monitor and report their own emissions would be made public by the asset manager. The approach would generate much improved performance data that would, in turn, feed into better investment decisions. It can be a particularly strong boost to environmental performance for firms located in jurisdictions around the world with weak regulatory oversight. Though an asset manager cannot mandate additional monitoring like a regulator could, the ability to display which facilities refused to install strong (or accurate) monitoring by itself provides substantial leverage. Indeed, all passive indices build a portfolio by sampling the full set of index members, so this enhanced disclosure could help the index manager to select the better firms in any market area.

It is hard to overstate the power this simple idea could have if implemented well; the example of the US Embassy in Beijing is instructive. In 2008 it installed an air-quality monitor on the roof, specifically to measure PM2.5, the smallest pollutant particles that are associated with the most severe respiratory damage. The data were sent out automatically by tweet once per hour and quickly became a widely accessed and trusted source for environmental data (which the official reports from the Chinese government were not). The Chinese government initially challenged the United States, claiming the readings were "illegal". However, as the measurements spread to other locations and fed into popular concerns over air quality that predated the Embassy effort, the Chinese government embarked on an extensive monitoring and air-quality improvement effort. The decentralized measurement and disclosure of the data can drive enormous changes in complex economic and moribund political systems (Roberts 2015).

5.5 EHS reform and particular advantages from business engagement

Governments and NGOs have been working to disclose and discipline EHS for decades. As described in Section 4, these efforts have faced many roadblocks. Some attributes of corporate action have the potential to overcome barriers faced by other types of institutions and to do so with rapidity.

With international agreements, consensus is often required for formalized action, slowing and often watering down implemented rules and timelines. An important advantage of corporate engagement is that a small group of businesses can act quickly and without broad consensus across their trade associations or industry.

This offers tremendous flexibility for first movers, who may then benefit commercially both from positive attention and from operational efficiencies that can result from paying the real price for natural-resource inputs or from forcing more transparency on EHS for competitors that rely on them more.

Because these actions can be less constrained than what has prevailed in most government-led initiatives, businesses can change the understanding of what is possible and expectations on what should be done for lenders and other firm stakeholders. Where the first movers are large, well-respected industry leaders, the impacts will be magnified. So, too, if they are operating in sectors of particular concern for climate change and nature loss and can demonstrate that they can continue to thrive without subsidies.

Changes implemented by core businesses will also cut across multiple political jurisdictions, including countries with lax government oversight. This can result in systematic industry-wide changes decades more quickly than if all the individual governments needed to act.

5.6 Corporate actions on EHS reform can incrementally expand from case studies to broad-scale changes

While some of the changes discussed here seem potentially risky for a handful of businesses to do on their own, developing a range of options for responding to changes depending on how broadly and quickly they are implemented, allows companies to try different approaches and minimize the risks of errors.

One concern of partial actions that requires addressing from the outset is that many past business proclamations have proven to be more symbolic than a start of real changes. Thus, outsiders will be monitoring these incremental steps worried that they, too, will be short-lived, largely symbolic, or worse, mostly greenwashing. It will be incumbent on the first-mover businesses to develop a design that quickly demonstrates the potential for real changes in business operations, and then actually implements them in a way that scales.

Some illustrations of the continuum of possible actions on EHS are below:

- **Push for full reform of EHS and no longer accept the subsidies.** This action can be taken company-wide, or initially just for particular lines of business for which the environmental impacts are largest.
- **Establish fully transparent reporting of the type and associated value of individual government subsidies received.** To avoid the potential definitional conflicts on what is environmentally harmful and what is not, the focus would be on reporting all subsidies received whether EHS per the company definition or not. This approach also aligns with the emerging disclosure requirements on government support from the accounting standards pathway.

Data in annual reports may still need to be broadly aggregated across subsidies and operations; however, those types of compilations do not provide the needed granularity to see the patterns of distortion and environmental damage associated with subsidized activities. Thus firms would also benefit from having a standardized reporting format for each subsidy they receive, at a reporting granularity similar to the way they might track accounts receivables from vendors. This information would be made publicly available on the web for comparison and analysis by outside researchers.

Similarly, although privately held firms may have legitimate reasons not to publish their financials, there is little such justification for not disclosing environmental and EHS data. Indeed, at a recent discussion at MIT's conference on Financial Policy and the Environment, BlackRock Chairman and CEO Larry Fink (2021) suggested that accounting and other rules risked putting pressure only on public firms to reduce climate impacts. He worried that could result in many operations being sold or shifted to privately held firms with even worse environmental impacts. Ensuring that disclosure of key environmental and EHS data applies across any producer, regardless of ownership form, is critical. This would include privately held firms, as well as SOEs, whether they have been partially or fully floated on public markets or remain entirely government owned.

We have identified a few examples for which this highly granular disclosure of subsidies already exists. These can potentially serve as models for a more expansive effort, recognizing that even in these examples not all types of government support are captured.

- All U.S. recipients of bailouts under the Paycheck Protection Program of Covid relief.
- Farm-level data on US federal agricultural subsidies compiled by the Washington, DC-based NGO, the Environmental Working Group.
- Detailed information on the money received, by beneficiary, under the European Agricultural Guarantee Fund (EAGF) and the European Agricultural Fund for Rural Development (EAFRD), as provided by each EU member state.

Though some firms in some countries will resist disclosure of subsidies received, this position will become a metric of lagging engagement on climate risk disclosure. Further, as the number of firms disclosing EHS rise, the choice not to will become increasingly untenable within relationship networks these firms have with international consumers, supply chain partners, financial regulators, and other investors. That is, while government actions are often pushed to the lowest common denominator agreements in order to reach the approval levels for passage or ratification, with enough participation within key industries, pressure from stakeholders will push non-transparent firms to adopt more adequate disclosure.

- **Continue to accept subsidies, but with full public disclosure along with development of transition plans to incrementally wean from them.** Important interim steps would be to immediately integrate subsidy-free resource prices and shadow carbon pricing in capital budgeting and other long-term decision-making tools the company uses. General partners and investors in venture capital and private equity firms can implement similar requirements for pricing carbon and subsidies in deals that they are considering. The opposite strategy — continuing to run life-cycle assessments for investment decisions as though these subsidies and externalities do not exist — risks locking the firm into many years of capital that would become marginal in the face of strong and binding climate legislation.
- **Lobby to restructure eligibility for existing subsidies such that they are less environmentally harmful and more socially oriented.** An example might be that in order to participate in key crop production subsidy programs in the US, the farmer would need to implement a suite of practices to protect topsoil and water quality (also referred to as "cross-compliance"). Another might be that use of any of the tax breaks for oil and gas drilling would require a much higher level of bonding for plugging and abandoning a well, retiring associated infrastructure, and properly reclaiming the site. While these types of policies tend to be second-best, in the face of political resistance to EHS elimination the approach could still be a useful step forward. Further, firms already at the upper end of environmental performance for their industry could benefit competitively from this type of retargeting.

Increasingly large and powerful investor groups are focused on ESG, and there is growing pressure for business alignment with climate change concerns and the Paris Climate Agreement. In this context, it is important to recognize the power that changes in norms, such as those identified above, can have in accelerating positive environmental changes in the way a broad set of businesses operate.

6

EHS reform:

Identifying potential high-leverage points for business sector action

EHS reform: Identifying potential high-leverage points for business sector action

An initial approach to identifying corporate leverage points for EHS reform is to look for competitive problems that can be improved through reform, or informational gaps that hinder innovative cleaner firms by hiding detrimental subsidy flows to, or emissions from, more problematic firms.

Another promising approach builds up from the skillsets of the firms themselves: in what areas do they have world-class capabilities, and how can those skills be deployed to address EHS or ameliorate limitations in the existing institutions (government, NGO or private) currently working on the issue?

Using a series of hypothetical market situations in which a firm finds itself, this section brings some examples to the table where business-led EHS reform, or technical assistance to existing efforts, could have an impact. Opportunities that enhance competitive opportunities for first movers, overcome first-mover disadvantages through joint action, or provide coordination and skills that overcome limitations driven by challenges in jurisdictional coordination or limited mandates of political institutions, seem the most likely places for the flexibility, focus, and existing skills of business leaders to make a real difference.

However, this framing is intended merely as a starting point for discussion, and to move from the theoretical to real actions. Indeed, the experience of executives within first-mover companies will be instrumental in identifying further options and tailoring implementation steps in a manner that allows even a sub-group of firms to provide ideas, case studies, and undertake pilot projects that they believe can work at scale, and scale quickly.

The following sections frame the types of conditions under which high-impact solutions are more likely to succeed as a launching point for examples of current efforts, and longer-term conversations with first-mover firms.

6.1 Competitive disadvantage due to lax emissions standards or enforcement

Scenario: *We have invested heavily in GHG mitigation and environmental quality, or we have new technologies that allow us to produce much more efficiently and cleanly, but we are being undermined by competitors that face weaker constraints on emissions or none at all.*

Potential leverage point(s): *Support the expansion of efforts to track emissions from producers around the world; build capabilities to link emissions data to specific plants and producers, and to other related metrics creating an unfair competitive playing field.*

Regulatory oversight varies widely around the world and is often weakened by lobbying or corruption. Wild swings in policy between administrations can complicate the investment planning for private firms as well because newer capital equipment often embeds a variety of improvements in environmental performance as well as productivity gains, yet has multi-year payback periods that depend in part on the regulatory environment in which the firm is operating. The policy uncertainty creates incentives to delay deployment of new capital. Price competition from imported commodity products subject to weaker environmental controls can also be problematic.

Establishing distributed monitoring can remove this uncertainty, generating a much more consistent oversight framework across time and political boundaries. For example, mismeasuring or mis-reporting emissions would become far more difficult; gaps in emissions monitoring could in some cases be addressed via remote sensing (as in the methane examples below) or at least visible such that firms would be under pressure from their stakeholders to address the gaps or else pay a penalty in selling to developed markets or tapping into ESG-attentive financial flows.

These types of programs would address EHS caused by regulatory exemptions, and would have secondary benefits in reducing long-term subsidies to site closure and reclamation, since the expanded data on emissions would make it more difficult for firms to pretend they had no remediation or reclamation issues on the site.

Some initiatives in these areas have been launched, a few of which are described below as potential models. Even in areas where initiatives already exist, supplemental engagement by first-mover firms via funding, enhanced monitoring or analytics, and linking satellite data with the names of the firms and principals involved on the ground, could further and materially leverage the coverage and impact of the programs. First-mover firms could also serve as testing sites to expand the capabilities for remote and ground-sensing options to be deployed more widely in the future.

Current examples include:

- The Climate Trace initiative (with RMI as a key partner in the coalition) for monitoring global emissions from oil and gas operations, steel, shipping and aviation, forest fires and rice production.
- EDF methane monitoring at oil and gas fields in the US and abroad.
- Open access air pollution monitoring data repositories from the US EPA, the European Environmental Agency, and Open AQ which aims to expand the collection points for air pollution data (they currently pull data from 130 countries) and aggregates and harmonizes disparate air quality data into a single format that will be easier to use. At present, measurements focus on PM2.5, PM10, ozone (O3), sulfur dioxide (SO2), nitrogen dioxide (NO2), carbon monoxide (CO), and black carbon (BC).

6.2 Competitive risk or current disadvantage from subsidized or improper access to core minerals or other natural resources

Scenario: *We operate in an industry that relies on sound management of large, interconnected ecosystems. But competitors are accessing state-owned raw materials for free or well below market costs undermining our market; or other subsidized activities are encroaching on these ecosystems and damaging the commons on which we rely.*

Potential leverage point(s): *Build, enhance, or expand spatial and ground-based tracking systems to detect illegal or suspicious activity; expand physical monitoring efforts to link to individuals or companies involved in the supply chain of these products and map relationships among companies within the supply chain. Develop improved transparency on subsidies to ancillary activities, and comparisons of potential returns from them versus damage to activities dependent on the ecosystems put at risk. First-movers here might participate in the same industry but suffer from their competitors benefiting from access to low-cost or illegal supplies. Or they may be engaged in an ancillary industry reliant on ecosystem services being undermined by the activity.*

Sovereign states dominate the ownership of energy and non-energy minerals and timberlands worldwide. For example, state-owned oil companies control up to 90% of the world's oil and gas reserves, comprise about 55% of its oil and gas production, and carry high debt levels that comprise a signification portion of their countries' GDPs. Nearly two-thirds rank as "poor," "weak," or "failing" in terms of public transparency (NRGI 2019).

Almost three-quarters of the world's forests are also owned by governments or SOEs, though the private share has been increasing in recent years (Chuddy and Cubbage 2020). Timber trade has often been a contentious trade issue, such as softwood lumber between Canada and the United States (Markle LaMontagne and Obale 2021). Except for farmed fish, marine fishery resources are also mostly state-controlled, either by the littoral country or by international convention if outside of territorial waters. In all cases, state policies regarding who gets concessions to extract resources, at what price, and under what oversight for proper management and closure of activities dramatically affect the market pricing, competitive positioning, and environmental impacts. For internationally controlled pool resources like deep sea fisheries, incentives to pull more from the commons are a continuing problem.

Resource theft associated with weak governance is not always accidental and can often be considered under the "terms of access" category in Table 2. Further, transfers of resource rights under non-competitive auctions or tenders to parties connected to the government leadership are unfortunately also common. So too are subsidies that enhance the ability of national industry to access and deplete international fisheries. Even in countries such as the United States, where government accountability is normally viewed as fairly strong, concerns over the competitiveness of natural-resource leasing decisions and related auctions have long been raised. For example, large coal (Lappen 2018) and offshore oil and gas leases (Hilzenrath and Pacifo 2018) have often been awarded in auctions that had only a single bidder.

Disclosure of routine data on resource auctions, including the name and number of bidders, principals in the bidding companies (to make hiding behind shell companies more challenging), winning bid amounts, and compliance with lease obligations over time can help. For regions with gray or black-market extraction, organized monitoring via remote and ground sensing, and integration of that information with complex algorithms to link it with the companies involved on the ground with extraction, processing and export can potentially be much improved. Existing efforts may also benefit from more financing or technical expertise.

As with emissions sensing, there is ongoing work; the question is how business expertise can leverage and expand it. Improved information on the firms active in these areas, and their distribution networks, can expand the window for effective intervention to curb the activity.

Some existing initiatives:

- **Illegal fishing**. Satellite tracking of ocean borne vessels, fishing fleets (Global Fishing Watch seems to track all vessels but focuses on fishing).
- **Forest conversion and illegal timbering.** The Global Forest Watch portal captures data on forest loss in near real-time, with a focus on trying to retain intact landscapes. The portal was launched by the World Resources Institute (WRI) in 2014, and includes many corporate partners, including Cargill and Unilever. Data on the controlling company is captured when available; information on individual principals in these firms and cross-relationships between them is not consistently available or easily accessed. The Trase platform tries to link resource extraction to supplier networks, and Forests and Finance works to link destructive extractive activity to the organizations funding it.
- **Non-competitive awards of natural resource concessions.** Large government sales or trades of resource rights and other sources of corruption are the focus of TNRC, Targeting Natural Resource Corruption, a consortium of government and NGO partners overseen by the World Wide Fund for Nature (WWF). Data leaks such as the Panama Papers and the more recent Pandora Papers (examples include Chilean mining and Mexican oil) have highlighted the significant role that intra-country corruption has played in natural-resource concessions granted or the sale of state-owned interests.
- **Missing payments for extraction or leasing rights.** The Extractive Industries Transparency Initiative and Publish What You Pay have been working on resource contract transparency and disclosure of payments to governments to reduce corruption and bribery for years. In many of the countries in which they work, revenues from natural-resource sales provide substantial uplift to national budgets, so diversion to individuals under corrupt practices has large and negative implications for citizen welfare as well as for climate and ecosystems.

6.3 Competitive barriers to capital upgrades due to lack of jurisdictional authority to tax fuel use or regulate emissions

Scenario: *We could relatively easily integrate GHG-reducing strategies into our business, and we want to. But unfortunately, many of these changes cost more and will mean we would not be able to match the prices offered by our competitors. Important types of EHS our industry receives arise because our operations cut across international borders and have been exempt from taxes or fees on our fuel use or carbon footprint. No company can make these upgrades until all of us do. This problem is most acute with international shipping and transport.*

Potential Leverage Point(s): *This is a joint-action problem. Work with key players in the transport sector to overcome barriers they put up to prevent fees and taxes on their fuel and emissions from rising to levels equal to the same transport mode within countries. If international agreements or political opposition prevent instituting more conventional taxes or carbon fees that send revenues to specific governments, look for opportunities to institute similar fees on operators but to pool the funds within the industry (rather than paying the government) as a type of industry-wide trust. So long as collections can only be used to greatly accelerate reductions of GHG and emissions within the sector, the environmental outcomes should be similar (and not that different from government fuel taxes that are hypothecated for related transport infrastructure to the fuel base that was taxed).*

Fuel taxes are common within most countries. The revenues often pay for part or all related infrastructure or support general governmental operations as well. Increasingly, fossil fuels also see some price on carbon (World Bank 2021).

When fuel is consumed by commercial vehicles crossing jurisdictional boundaries, taxes and emission fees can drop to zero. The World Bank notes that international agreements limit the ability of individual states to tax fuel in international aviation, and extreme tax competition has a similar impact in shipping, including inland shipping (Strand 2013). Within countries, differential tax policies on fuel across state or provinces can also complicate sending better price signals through the tax system. The avoided taxes and fees on fuels and emissions reduce the price incentives for shipping companies to upgrade their fleets for reduced carbon impact. Further, reduced long-distance shipping costs for bulk commodities can boost competitive advantages of foreign state-owned or subsidized commodity producers, and mute incentives to shorten supply lines.

There have been some improvements in recent years to address the gap in international fuel pricing. These include technology applications to track fleets and automate tax calculation and payment to multiple jurisdictions (see, for example, ProMiles), some efforts to narrow tax exemptions, and modifications to international conventions to start integrating climate concerns (albeit usually by study or policy changes rather than via pricing). However, corporate involvement may be able to expand the reach of these successes by:

- Assisting with overcoming political barriers to adopting them.
- Supporting the reduction or removal of exemptions creating disparate tax treatment by transport mode or international versus domestic shipping.
- Where treaties or in-force conventions prevent taxes, facilitating agreements among parties to collect similar fees from transit and rather than allocating to a government (which may be disallowed by the convention), establishing an intra-industry allocation regime to accelerate migration to lower carbon transit vehicles and technologies. Ideally the fees would be larger on more polluting, less efficient, infrastructure and vessels.

Automation of fuel tax tracking and payments for interstate trucking. Fuel tax rates can differ from one US state or Canadian province to another. Commercial vehicles above a certain size and passing through multiple jurisdictions are governed by the International Fuel Tax Agreement, which establishes rules for the assessment and payment of state and provincial fuel taxes. These can get very complicated; however, many companies now offer services that automatically tabulate where fuel was purchased, and the miles driven in each state using electronic logging devices. Such approaches can simplify the fuel-tax calculations and payments and may be applicable to facilitating international taxation as well.

International maritime shipping. In 2018, international maritime shipping accounted for between 2.0% and 2.5% of global anthropogenic CO2 contributions, depending on the calculation method used. While the analysis by the International Maritime Organization (IMO) did estimate emissions of other GHGs and tabulate the CO_2e for all waterborne shipping (including domestic and fishing), a breakdown for all contributing emissions for international shipping alone was not provided (IMO 2021). Total emissions of CO_2 from international maritime shipping were estimated at between 740 and 919 million tonnes; at the social cost of carbon value set by the Biden administration of $51/tonne (Chemnick 2021), the CO_2 costs from the sector would be $38 billion to $47 billion a year.

Exemptions under the European Energy Tax Directive and national tax legislation are estimated to subsidize international maritime shipping by €24 billion a year (T&E 2019). While the United States does not have a value-added tax (VAT), similar exemptions apply to fuel taxes on international trips. Fuel taxes are levied on modes of domestic travel, including inland waterways. User fees have long been set too low to cover system costs. The FY2020 budget for the United States' inland waterways, for example, funded only 10% of system costs via user fees, with the residual $1.2 billion funded from general tax revenues (CRS 2020).

The IMO has begun addressing the climate footprint of international maritime transport, primarily though goal setting and improved tracking of vessel characteristics and fuel consumption.

Under current scenarios by the IMO, the carbon intensity of fuels declines in the near-term "primarily because of the introduction of biomass-based low-carbon fuels, such as advanced biofuels" (OECD 2017).[5] Unhappy with the pace and scope of these changes, the EU has proposed moving most maritime shipping within its emissions trading system; the industry opposes the change (Saul and Abnett 2021).

International aviation and rail. Similar exemptions apply to these sectors, and instituting fuel taxes and carbon fees where other modes face such charges would result in climate gains as well. Overlap between cargo air and the other sectors of concern evaluated in this paper will be smaller than is the case for lower cost transport modes such as rail, truck, maritime and inland shipping.

6.4 Competitive barriers to capital upgrades: competitors get large subsidies that are not disclosed anywhere and create barriers to our investments in cost-increasing GHG abatement strategies

Scenario: *Our company manufactures products using raw materials, a sizeable share of which are furnished – to other companies, not ours – by state-owned enterprises in other countries. We believe they are heavily subsidized, but it is hard for us to document it, and even if we did, it would not amount to much.*

Potential leverage point(s): *Develop mechanisms to pressure SOEs to more clearly and granularly report subsidies received as a supplement to regular financial reporting, such that specific policies flowing to specific areas of production in particular locations are visible in a standardized, automated format. This will enable third parties to scrape the data and develop the comparative assessments needed to facilitate political or operational changes.*

This approach would benefit companies that receive few subsidies compared with their competitors, as pressure on more heavily subsidized firms to similarly disclose would benefit the first movers here.

A second leverage point could be to bring a case before the WTO alleging actionable subsidies per the SCM Agreement. Indeed, a climate-related test case for this would be especially useful in many respects. Characteristics of such a case would be (a) an industry with a large percentage of a commodity supply coming from subsidized SOEs (so materially harmed by the status quo), and (b) for the parties bringing suit not to have production or a large volume of sales in the subsidizing country (so they need not fear retaliation by the subsidizing government).

As described in Section 4, engagement to accelerate and expand corporate disclosure of EHS would be an effective and wide-reaching mechanism to address this competitive challenge. First-mover companies could run case studies of their own businesses to refine disclosure approaches; and large asset managers can (and should) begin setting disclosure expectations for EHS among constituent firms. Since these firms are now the largest shareholders in many public companies, their leverage is substantial. Further, major asset managers also have substantial engagement with privately held firms through direct investments or private equity funds they manage, so could facilitate similar disclosure expectations in those market players as well.

6.5 Competitive barriers to mitigating climate risk in structures and landscapes: risks of poor placement, construction, or management of physical assets do not result in fewer government contracts, or higher costs of capital or insurance

Scenario: *We believe our customers would value the way we incorporate more resilient features into our buildings and factories, but these changes are invisible to them. Yet, firms that continue construction as though climate risks do not exist continue to get government money and see no increased liability or insurance costs.*

Potential leverage point(s): *Build new, or expand existing, tools to benchmark climate-related risks to specific locations first, and eventually to asset-specific characteristics.*

Socialized risks are among the most challenging government subsidies to identify. Statutory levels may be too low or coverage quality poor. Risks may be internalized by firms unable to bear losses (where they operate until there is a problem, then they go out of business) or by sovereign governments in SOEs with no acknowledgment of the coverage or fees to fund it. Examples of relevance to EHS include caps on offshore oil spills; subsidized flood insurance for construction in high-risk areas, crop insurance for agriculture, and export insurance for large manufacturers; inadequate bonding levels for oil and gas well closure; and emerging issues regarding liability for failed carbon sequestration.

In some of these areas, governments may charge a fee for the service provided — even setting fees equal to their "cost" of borrowing, such as the Treasury's borrowing rate in the case of export credits. However, the pricing of that guarantee is often much lower than in a private market risk transfer. Thus, being able to access the subsidized intermediation in credit or insurance becomes particularly valuable, and such firms and industries tend to be politically connected. Fair-value-based pricing of credit aims to counter this problem, though has not been widely deployed (Lucas 2014).

State-owned enterprises may implicitly receive subsidized or free coverage from the state to hedge risks on operations, business interruption, or accidents; in market economies, the risks would need to be formally recognized by management, and adequate insurance coverage purchased or funded internally in an actuarially fair captive insurance vehicle. In addition to subsidizing the associated goods and services, risk subsidies can dampen investments to improve safety and resilience at production sites.

Mapping those risks can open the possibility to level the competitive playing field for private firms. Doing so can help to provide one of the most important leading indicators of how climate risks affect real business decisions. Ideally, that information would ripple through to the cost of capital in high-risk areas or types of operations and encourage increased investment in risk-prevention. This can happen through modifications in operating practices to boost business resiliency and early warning systems and accelerated retrofits to plant and equipment. Importantly, decisions on where to locate new or replacement plants will be tilted to geographies better suited to a warming world. Some examples in which business engagement and innovation might be quite valuable:

- **Public access, free, algorithmic estimates of climate risk and insurance costs.** The point of greatest leverage to reduce climate risks to physical structures is before they are built and choices on where to build and what climate resiliency features to include in the design in remain in-play. While there is general knowledge that many coastal areas are at risk from climate change, these risks are not well monetized into property prices. Indeed, the costs are often socialized through the properties benefiting from subsidized flood insurance, insufficient flood insurance, or having no insurance coverage at all. This situation creates a subsidy to all sorts of coastal infrastructure, including large oil and gas installations and commercial real estate. The Seaport District of Boston is a good example: it was entirely redeveloped after concerns about climate change were well known and benefitted from an estimated $20 billion in public investment. Even then, the project made little effort to incorporate concerns over more intense and more frequents storms and sea level rise into its planning (Remedios 2021).

  New tools can change this. For example, map layers for broad-based providers such as Google, or asset pricing firms like Zillow, could be developed such that they introduce a new cost element of asset ownership. Data should (a) help all firms identify areas of highest risk for near-term attention; and (b) start to develop more accurate risk pricing into liability insurance and asset location, construction, and management decisions.

- **Machine-readable, standardized financial assurance disclosure at the asset, not company, level.** Many natural-resource operations, particularly in extractive industries, have complex and expensive site closure and reclamation costs. These costs hit firms' cash flows just as the revenues from mineral extraction drop sharply or end entirely, creating incentives to abandon sites. This problem led to financial assurance laws in the United States starting decades ago. But coverage levels have often been too low, and some of the allowed mechanisms for compliance turn unstable during firm restructuring, bankruptcies, or distress.

  Insurance cover also tends to be buried in larger financial reports, making it challenging to evaluate the adequacy of coverage levels, strength of the instrument or insurer, or reinsurance backstops. Achakulwisut, Erickson and Koplow (2021) estimated that unfunded legacy liabilities related to US oil and gas wells exceed $500 billion. And the problem continues to grow as bonding levels are woefully low and blanket bonding rules in many states allow operators with larger numbers of wells to reduce average bonding coverage still further. Obtaining higher coverage does not seem to be a financial burden in most cases. Carbon Tracker, an NGO that recently launched a national database to track data on abandoned wells, found that annual premiums for existing well bonds in states like Colorado were as low as $1 per well (Carbon Tracker 2021).

- **Increased disclosure of liability coverage and quality for proposed projects in environmentally sensitive areas.** Where extractive industry operations are located close to other valuable land uses, whether it is open pit metal mining near prolific fisheries in Alaska or uranium mining near global tourism sites such as the Grand Canyon, there are opportunities to force liability insurance into the equation on whether proceeding with the development makes economic sense or not. This is different from cost-and-benefit assessments, where assumptions can be modified and interpreted differently based on the views of the administrations then in power. Because liability coverage needs to be purchased from an objective third party (self-insurance should not be allowed in many of these situations), and that party faces large financial losses if they guess wrong, the liability pricing can send a much more accurate signal about expected damages, risk, and uncertainty. At the very least, the amount and form of whatever accident, liability, and environmental damages insurance these projects have in place should be published at the outset and in standardized, machine-readable format to allow third party consolidation and analysis.

- **Develop new and more robust insurance mechanisms.** Poor availability and the prohibitively high costs of insurance for key risks is a sign that innovation is needed to develop more secure and robust options, and to address free-rider problems that drive up long-term costs to everybody. There seem to be many opportunities to improve data on risk subsidies to environmentally damaging industries.

  The U.S. Federal Emergency Management Agency (FEMA) recently updated its flood maps and has begun to move to more location-specific pricing for flood insurance on coastal properties. This may help introduce climate risk more directly into land development and redevelopment decisions. However, federal flood insurance is voluntary in many situations and even when purchased provides only a few hundred thousand dollars of coverage, a level that is insufficient given the property values in many coastal regions. Further, the significantly higher premiums being phased in are likely to lead many single-family homeowners who are not required to purchase coverage by lenders to drop their flood insurance coverage entirely. Better risk-sharing models are needed such that some premiums go in by default and insurance mechanisms can grow larger and more diversified (for example, broadly syndicated catastrophe bonds rather than more narrowly distributed risks from a handful of oligopolistic specialized insurers and reinsurers).

- **Algorithmic routines to develop "missing insurance" estimates for SOEs that at present implicitly shift key operating, accident, and environmental risks to the state.** Data on risks and premiums from market economies should be used to develop risk-pricing algorithms for SOEs. To the extent this "risk-bearing" service is provided below-market or free by governments, it should be treated as a subsidy in trade or other legal cases. Where SOEs publish annual reports, these subsidized costs should be disclosed. This type of tool would have substantial market value to both regulators and firms competing with SOEs and could be an attractive business for a start-up. It may also be attractive to SOEs, as it can help them deploy risk-reduction strategies in both investment and operations that reduce the enterprises long-term fiscal and environmental costs.

6.6 Competitive barriers to reduced climate and environmental footprint of our products

Scenario: *Our products may look like others you see on Amazon, but we pay careful attention to the inputs we use, whether they can be recovered when the product life has ended and extending the service life of what we make. These changes help reduce our carbon footprint and take extra effort and cost; but customers cannot always see them. This constrains how much we can do.*

Potential leverage point(s): *Growth of sustainable and fair-trade products has been robust in developed markets, but these are often sold at a premium to a small part of the customer base. For most customers, pricing drives the consumption decision, and the ancillary impacts of the products' processes and production methods remain invisible. For short-lived products such as packaging, the full shifting of disposal costs from producers onto consumers and municipalities creates a subsidy to the materials use, and a disconnect between design and disposal.*

Again, with an emphasis on standardized, short, machine-readable disclosure, producers of consumer packaging and products can provide data on the post-consumer recycled content, materials composition, warranty life, and post-consumer options for reuse and recycling based on that materials composition, including data on actual rather than theoretical recovery rates. This type of approach would make it much more difficult for packaging companies to introduce new containers or technologies without fully vetting recovery and recycling technical and logistical problems first. Problems, such as have sprung up with black-colored high-density polyethylene, food pouches, and laminated juice boxes, all of which have been in the market at high volume for years with quite limited recycling, could be avoided. (The EU has some capability to recover the paper layer from juice boxes, but not the plastic and aluminum.)

6.7 Leveraging specialized business skills to reduce EHS and associated ecosystem damages

Scenario: *We are often frustrated that data systems developed and managed by governments, inter-governmental organizations and non-governmental organizations try to do important things but are frequently discontinued. Further, when they are in operation, they often contain data that are limited in their geographic coverage or otherwise incomplete, are updated too infrequently, and do not pull in related information from other data systems that would magnify the reach and insights that should be available. Even if we work in different subject areas, we have internal data and data analytics systems that handle these types of information challenges all the time, and we've had them for many years. We don't understand why these other organizations are so far behind.*

Potential leverage point(s): *There are three main limitations with the public systems that corporate engagement can help with (and already does on some partnerships): budgetary, political, and technical.*

For budgetary limitations, provision of supplemental funding can be useful, though it needs to be done in a manner that preserves full independence of the data provider. On the political front, for consensus-based organizations such as many IGOs, certain data may be difficult to get approval to collect, or to publish once collected. Collection of that information outside of the IGO, and development of applications to facilitate simple merging of data sets, can be helpful. Finally, there are technical constraints to what these public organizations can execute. Some large private companies, particularly those with a primary focus on software, data integration, or data management, could propose and develop new tools that enhance and expand what existing platforms can do.

Another important improvement based on IGO and NGO representatives with whom we've spoken is to develop much greater standardization of data reporting, at the company level, on government support of all types and environmental performance and performance metrics.

6.8 Competitive gains by expanding environmental performance metrics and subsidy disclosure to incentivize improved performance among broad-based investment portfolios

Scenario: *We manage investment assets owned by other people. Though we have committed to large improvements in our GHG and environmental footprint, we are constrained in some of the actions we can take. For example, we can't simply exclude certain firms or sectors from our passive index programs, and we cannot simply stop financing legal activities even if they are large carbon emitters or pollute in other ways.*

Potential leverage points(s): *All financial firms have the power of selection to direct their efforts and funding more towards cleaner firms with a better ESG profile. However, these are service organizations for the most part, and customers will have different views on all these issues. Thus, a primary leverage point on the investment side is to establish metrics, expected disclosure of environmental parameters, and new products that highlight which firms are benefitting disproportionately from government subsidies or poor environmental management and that make it easier for customers to invest in the subset of firms that are doing much better. S*

ome specific areas where actions might be possible:

- A handful of asset-management firms each hold an enormous amount of bonds, stocks and other assets. Often, they build and market mutual funds and ETFs to match particular indices, few of which exclude natural-resource intensive firms. Thus, the asset managers cannot just jettison firms with high GHG impacts or even with large subsidies. Some have said they will start vetting proxy votes with an eye towards climate; this is a fairly weak check and not always followed (Verecky 2021).

  More active strategies, such as developing or adopting existing transparency guidelines that all companies they hold need to follow — else they get called out by the asset manager — could be more effective.

  By choosing the items carefully, and standardizing reporting in a way that is easily compiled and analyzed by others, this type of approach can be quite powerful. And as the market leaders gain competitive advantage by implementing these disclosures, it becomes more and more difficult for the laggard firms to do nothing.

- A related approach could be to require that all large GHG-emitting assets have continuous emissions monitors and for those emissions to be reported in a standardized way to a centralized database that can be accessed by the public and investors. We know that methane emissions are substantially underreported, and that environmental standards and enforcement differ dramatically across states and countries. This type of disclosure could level the playing field globally in very important ways. An analogous disclosure for real-estate assets would be to require disclosure of natural-resource-related operating costs (amount, type and cost of energy consumed per year; amount and cost of water consumed) so that landlords in rental property have a much stronger incentive to invest in efficient equipment.

- Segregate bond underwriting such that firms with no EHS, or with full transparency on what they are getting, can access a lower-cost underwriter pool.

- Push for enhanced disclosure of EHS in private equity, venture, and real-estate funds through institutional investor ESG networks, asset managers, and other first mover general partners.

Annex Tables

Table A1. Overview of subsidy measurement approaches

Approach	Strengths	Limitations
Inventory Quantifies value of specific government programmes to particular industries and then aggregates programmes into overall level of support. Transfers include reductions in mandatory payments (e.g. tax breaks) and shifting of operating risks to the public sector, not just cash. Mandated purchase requirements often captured, at least qualitatively.	– Captures transfers whether or not they affect market prices. – Can incorporate the value of risk transfers (e.g. via lending or insurance subsidies) rather than just the direct government costs. – Can feed into a variety of evaluative frameworks and support detailed policy reviews needed for reform efforts.	– Does not measure support provided via pricing distortions. – Sensitive to decisions on what programmes to include. – Requires programme-level data. – Differential baselines across political jurisdictions (particularly regarding taxes) can complicate aggregation and cross-country comparisons.
Price gap Evaluates positive or negative 'gaps' between the domestic price of energy and the delivered price of comparable products from abroad.	– Can be estimated with relatively little data; very useful for multi-country studies even if there is limited access to government documents. – Good indicator of pricing and trade distortions.	– Sensitive to assumptions regarding 'free market' reference prices and transport prices; and to frequency and geographic dispersion of key data inputs. – Understates full value of support as it ignores transfers that do not affect market prices and may miss important supports such as purchase vouchers or cross-subsidies. – Estimates for non-traded goods (e.g., electricity), require much more detailed analysis to generate reference prices.
Producer Subsidy Equivalent, Consumer Subsidy Equivalent, and Total Support Estimate suite of indicators. Systematic method to aggregate transfers plus market support to particular industries.	– Integrates transfers with market supports into holistic measurement of support. – Separates effects on producer and consumer markets.	– Limited empirical PSE/CSE data for fossil fuel markets, though this is improving for OECD countries and a handful of others. – Data-intensive.
Asset-level modelling Simulates the impact of all quantifiable subsidy flows on the rate of return of the asset and the investment decision.	– Captures subsidies from multiple agencies, multiple levels of government, and multiple subsidy mechanisms. – Integrates eligibility criteria such as limitations on type of reserve, type of corporation, production level etc., generating a more accurate estimate.	– Requires high level of data on asset-level economics that may not exist for every sector.

Sources: Koplow and Dernbach (2001); Kojima and Koplow (2015).

Table A2. Spending on lobbying at the US Federal level, by industry

(Sorted by cumulative spending; highlighted sectors EHS-relevant)

Industry	1998-2021	2020	2021 (to 06.30)
Pharmaceuticals, Health Products	$4,846,336,677	$309,139,988	$171,262,239
Insurance	$3,159,537,515	$154,088,164	$75,708,089
Electronics Mfg & Equip	$2,709,318,492	$160,073,769	$87,196,840
Electric Utilities	**$2,697,567,684**	**$108,328,019**	**$53,994,293**
Business Associations	$2,589,985,812	$120,231,131	$48,541,823
Oil & Gas	**$2,454,707,813**	**$112,132,376**	**$55,616,285**
Misc Manufacturing & Distributing	**$1,994,919,400**	**$105,367,993**	**$51,293,389**
Hospitals and Nursing Homes	$1,951,019,212	$110,625,090	$55,365,197
Education	$1,880,017,289	$82,105,469	$41,218,949
Real Estate	**$1,866,784,118**	**$131,839,597**	**$41,772,440**
Securities & Investment	$1,854,166,652	$104,284,218	$51,719,372
Telecom Services	$1,847,120,391	$105,429,377	$51,464,510
Health Professionals	$1,723,511,038	$89,413,822	$43,992,779
Air Transport	**$1,721,782,666**	**$106,108,918**	**$52,412,166**
Civil Servants and Public Officials	$1,670,859,798	$78,848,596	$38,563,814
Health Services, HMOs	$1,387,441,128	$100,939,669	$52,715,013
Automotive	**$1,297,190,569**	**$63,031,225**	**$35,202,127**
Misc Issues	$1,217,517,837	$0	$29,697,533
Defense Aerospace	$1,210,572,067	$62,050,133	$0
TV, Movies, and Music	$1,197,479,647	$0	$0
Internet	$0	$80,604,317	$43,874,461
Misc Energy	**$0**	**$51,361,492**	**$27,401,639**

Source: OpenSecrets.org, accessed 11 October 2021

Table A3. Fossil fuel subsidy reform in international processes

Venue	Year	Description
G20	Since 2009	Member countries have committed to "rationalize and phase out inefficient fossil fuel subsidies that encourage wasteful consumption." Peer-reviews are available for China, Germany, Indonesia, Italy, Mexico, and the United States.
APEC	Since 2009	Member countries committed to "rationalize and phase out inefficient subsidies that encourage wasteful consumption" and to "encourage further efforts to facilitate subsidy reform". Peer-reviews were undertaken and released publicly for New Zealand, Peru, Philippines, Chinese Taipei.
	2021	APEC Leaders welcomed "the options, as reported by officials [responsible for trade], that member economies could take to pursue a voluntary standstill on inefficient fossil fuels subsidies." They also called for member economies to continue discussions in 2022 "to facilitate future implementation".
G7	Since 2009	Member countries have committed, by 2025, "to rationalize and phase out inefficient fossil fuel subsidies that encourage wasteful consumption".
OECD Declaration on Green Growth	Since 2009	Encourages domestic reforms to avoid or reform subsidies that could slow or block green growth "such as subsidies: to fossil fuel consumption or production that increase greenhouse gas emissions..." The Declaration has more than 40 signatories.
Friends of Fossil Fuel Subsidy Reform (FFFSR)	Since 2010	A Communiqué on Fossil Fuel Subsidy Reform was presented to the 21st Conference of Parties of the UN Framework Convention on Climate Change (UNFCCC) in 2015, endorsed by 42 countries.
Convention on Biological Diversity	2010	Strategic Plan to include the Aichi Targets; target 3 calls for the elimination of "all incentives, including subsidies, harmful to biodiversity" to be eliminated, phased out or reformed.
2030 Agenda	2015	The 2030 Agenda for Sustainable Development included fossil fuel subsidy reform in SDG 12 and related reporting on fossil fuel subsidies.
European Commission	2011	Set a 2020 milestone to phase out environmentally harmful subsidies. This includes, but is not limited to fossil fuels.
UN Framework Convention on Climate Change (UNFCCC)	2015	Paris Agreement, Art. 2, calls for "making finance flows consistent with a pathway towards low greenhouse gas emissions". The Report of the Conference of the Parties "recognizes the important role of providing incentives for emission reduction activities, including tools such as domestic policies and carbon pricing". Fossil fuel subsidy reform is included in 14 Nationally Determined Contributions.
	2021	Para. 36 of the Glasgow Climate Pact (UNFCCC 2021) calls upon Parties "to accelerate ... efforts towards the phase-out of unabated coal power and inefficient fossil fuel subsidies, recognizing the need for support towards a just transition".

Venue	Year	Description
Financing for Development	2015	Fossil fuel subsidy reform was included as an Action Area in the Addis Ababa Action Agenda.
US-Nordic Leaders Joint Statement	2016	Calls for promotion of "access to affordable, reliable, sustainable and modern energy for all by encouraging the reduction of fossil fuel subsidies, promoting renewable energies and fuels, and enhancing energy efficiency."
WTO	2021	Trade ministers from 45 WTO members issued a Ministerial Statement calling for greater engagement by the WTO to rationalise and phase out inefficient fossil fuel subsidies that encourage wasteful consumption (WTO 2021).
European Parliament	2017	As part of an integrated EU policy for the Arctic, the EC calls on member states to "ban fossil fuel subsidies that lower the cost of fossil fuel energy production, with a view of discouraging the exploitation and use of fossil fuels."
Others	2016 and 2017	– 200 civil society organisations delivered a statement to the G20 Finance Ministers calling for government action on fossil fuel subsidy reform. – Insurers investment for than $2.8 trillion in assets called for the G20 to make real progress to phase out fossil fuel subsidies, including clear timelines addressing subsidies and public finance by 2020; and formalizing rapid peer review of subsidy reporting by all G20 members. – Nations most vulnerable to negative impacts from climate change plus others (40 in total) committed to removal of fossil fuel production subsidies no later than 2020 and more rigorous evaluation and restructuring of consumption subsidies to identify less damaging ways to help the poor.

Sources: UNEP et al. (2019); Gerasimchuk et al. (2017); authors' updates

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End Notes

[1] Shill (2020) notes that "A subsidy is successful if it raises the level of a given activity above a counterfactual baseline, but is justified only if the increase enhances social welfare on net."

[2] Developed country WTO Members were required to reduce, in equal annual steps over a period of six years, their base-period volume of subsidized exports by 21% and the corresponding budgetary outlays for export subsidies by 36%. The required cuts for developing countries were, respectively, 14% and 24% over ten years.

[3] Specifically, developed country WTO Members had to reduce their base period support by 20% over six years (starting in 1995), and developing country members by 13% over 10 years.

[4] The self-reports and peer reviews can be found at https://www.oecd.org/fossil-fuels/publicationsandfurtherreading/

[5] Research suggests that achieving net GHG reductions from advanced biofuels is possible in some circumstances, though requires careful management of land use choices and induced land use change (Field et al. 2020).

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