Fossil Fuel to Clean Energy Subsidy Swaps:

How to pay for an energy revolution

GSI REPORT

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Global Subsidies Initiative

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The IISD Global Subsidies Initiative (GSI) supports international processes, national governments and civil society organizations to align subsidies with sustainable development. GSI does this by promoting transparency on the nature and size of subsidies; evaluating the economic, social and environmental impacts of subsidies; and, where necessary, advising on how inefficient and wasteful subsidies can best be reformed. GSI is headquartered in Geneva, Switzerland, and works with partners located around the world. Its principal funders have included the governments of Denmark, Finland, New Zealand, Norway, Sweden, Switzerland and the United Kingdom, as well as the KR Foundation.

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Executive Summary

When governments reform fossil fuel subsidies, there are many competing demands for how to reallocate resources, including spending on public health, education and social protection. This report makes the case for placing the promotion of clean energy[1] alongside these other priorities and describes the economic, social and environmental benefits that such a move would bring, through a "subsidy swap." The report sets out the international context of subsidy swaps; summarizes notable country experiences with swaps in India, Indonesia, Zambia and Morocco; and calls for policy-makers to include swaps as part of their fossil fuel subsidy reform implementation strategies.

Key Findings

1. Fossil fuel subsidies are a key barrier to a transition to a clean energy system. Although linked to a reduction in emissions, their reform alone will be unlikely to deliver the permanent emission reductions necessary to meet climate change targets. A "swap"— reallocating some of the savings from subsidy reform to fund the clean energy transition—could magnify the contributions to long-term, permanent emission reductions, the economy, jobs, public health and gender equality.
2. Swaps are already taking place—at a global level, fossil fuel subsidies have declined while renewable investments are now greater than investments in fossil fuel-based energy generation. But the pace of change needs to accelerate considerably—almost 70 per cent of total energy demand growth in 2018 was still met through fossil fuels.
3. There are still significant political barriers to reform, however, that are country specific. For reformers, the challenge is to change the political dynamic by increasing the engagement of already supportive, influential actors and developing policies that address the concerns of actors that are neutral or moderately opposed to change.
4. Sharing experience between countries is a key tool to show how swaps can be implemented and that a clean energy transition funded by subsidy reforms is a feasible and possible option for other countries.
5. Going forward, there are opportunities for governments to focus on higher-impact swaps by supporting large-scale on-grid renewables and implementing mechanisms that mobilize private finance into clean energy projects.
6. Following subsidy reforms, governments can increase taxes on fossil fuels to continue to generate fiscal resources for clean energy while simultaneously reducing carbon dioxide emissions.

[1] In this report, the term "clean energy" includes both renewable energy and energy-efficiency measures but excludes nuclear; carbon capture, utilization and storage or clean coal; palm oil; or low-carbon or ethical oil.

Acronyms and Abbreviations

DC	direct current
FY	fiscal year
G20	Group of 20
GSI	Global Subsidies Initiative
IEA	International Energy Agency
IMF	International Monetary Fund
IISD	International Institute for Sustainable Development
LED	light-emitting diode
LPG	liquefied petroleum gas
PV	photovoltaic

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1.0 Introduction

The term "subsidy swap" is a shorthand term for a wide range of policies that redirect government support in the form of subsidies, from fossil fuels to clean energy.[2] The goal of the subsidy swap is to bring subsidy policy in line with social, economic and environmental priorities and promote a transition to clean energy systems. A definition of the concept is provided in Box 1.

Box 1. The definition of subsidy swap

The swap concept is simple: it refers to redirecting government support from fossil fuels to clean energy. This does not need to involve explicit earmarking (or "hypothecation") of funds: savings from fossil fuel subsidy reform and spending on clean energy could happen independently in the government budget. There is also no expectation that all reform savings be reallocated to clean energy; governments have many priorities. However, sufficient reallocation should take place to make an appreciable difference to the rate of clean energy deployment.

The core concept of a clean energy swap is that it accelerates the replacement of fossil fuel-based energy systems with sustainable energy through a shift in government priorities as expressed through funding or fiscal policy changes.

The two key elements are that: 1) fossil fuel subsidies are reduced and that 2) this happens alongside measures that increase the deployment of sustainable energy.

The Global Subsidies Initiative (GSI) uses a definition of the term "subsidy" based on the World Trade Organization's Agreement on Subsidies and Countervailing Measures. The agreement determines that subsidies exist where governments:

- Provide a transfer of funds or liabilities
- Forego or fail to collect revenue
- Provide goods or services below market rates
- Provide income or price support.

Source: Beaton et al., 2013.

This report summarizes the International Institute for Sustainable Development's experience of developing and documenting subsidy swaps over several years, sets out the international context of subsidy swaps, and makes the case for policy-makers to include subsidy swaps as part of their fiscal and energy policies.

Figure 1 shows how swaps fit into the broader subsidy reform debate. Some subsidies just do not make sense: they support fossil fuel-based energy, they are costly to governments and they undermine clean alternatives. They may also fail to achieve their objectives or have perverse, unintended consequences. In such cases, the policies can be removed. In other cases—largely, consumer subsidies for electricity and liquefied petroleum gas (LPG)—the policies may have important linkages with energy access, poverty reduction and health. Here, targeting is an important consideration of the subsidy reform process. Finally, it may be possible to continue to support energy access by swapping from a fossil fuel subsidy to a clean energy subsidy. Regardless of whether subsidies are removed or better targeted, reform can create savings to fund the clean energy transition. This is a subsidy swap: shifting government resources away from fossil fuels and toward a clean energy transition.

[2] In this report the term "clean energy" includes both renewable energy and energy-efficiency measures but excludes nuclear; carbon capture, utilization and storage or clean coal; palm oil; or low-carbon or ethical oil.

Figure 1. Three approaches to fossil fuel subsidy reform: Remove, target and swap

Source: Zinecker, Sanchez, Sharma, Beaton, & Merrill, 2018.

In practical terms the vision of the swaps concept means moving from where we are today, where fossil fuels receive huge subsidies in much of the world, to an end point where most of our energy is derived from unsubsidized clean energy. Globally there are still more subsidies directed toward fossil fuel consumers and producers than toward renewable energy: currently around USD 372 billion is spent on producer and consumer fossil fuel subsidies, overshadowing the USD 100 billion in support to renewable energy (Best et al., 2015; International Energy Agency [IEA], 2018b; Merrill et al., 2017).

However, at a macro level, we can already see a swap in financial flows beginning to take place: fossil fuel subsidies are down and investment in renewable energy is up, as illustrated in Figure 2 and Figure 3. Figure 2 shows that fossil fuel subsidies have fallen overall since 2012, but progress has not been linear: following the rebound in crude oil prices in 2017, fossil fuel consumer subsidies started rising again. Figure 3 shows that renewable investments have exceeded fossil fuel investments every year since 2008, a key inflection point. The falling cost of renewables over recent years and increasing investment implies that the same dollars can now fund more renewable-powered generation: every year since 2014 the world has installed a greater capacity of renewables than fossil fuel-based generators (Figure 4), a second inflection point. Figure 5 shows that the overall share of electricity production from renewable energy is growing, but there is still a long way to go to reach a third inflection point where renewable energy starts to generate most electricity. In 2016, 57 per cent of the gross electricity production was from fossil fuels in Organisation for Economic Development and Co-operation countries. Outside the electricity sector, the situation was less positive: 70 per cent of total energy demand growth in 2018 was met through fossil fuels (IEA, 2019a). Despite the progress made, in absolute terms, government subsidies and investments in fossil fuels still far outweigh clean energy.

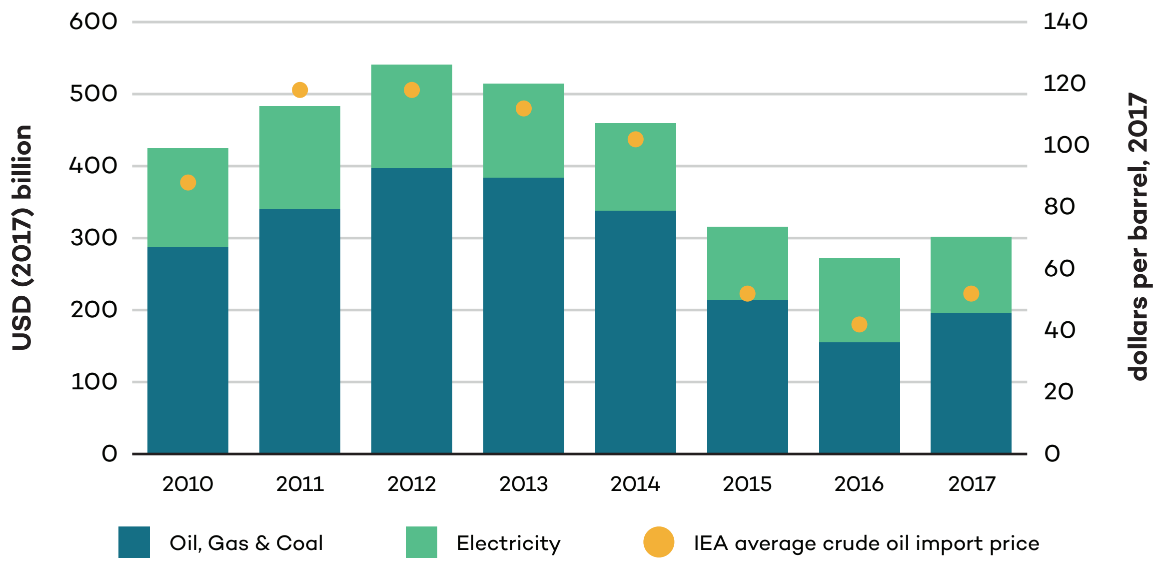

Figure 2. Global fossil fuel consumer subsidy estimates over time

Source: Matsumura & Adam, 2018.

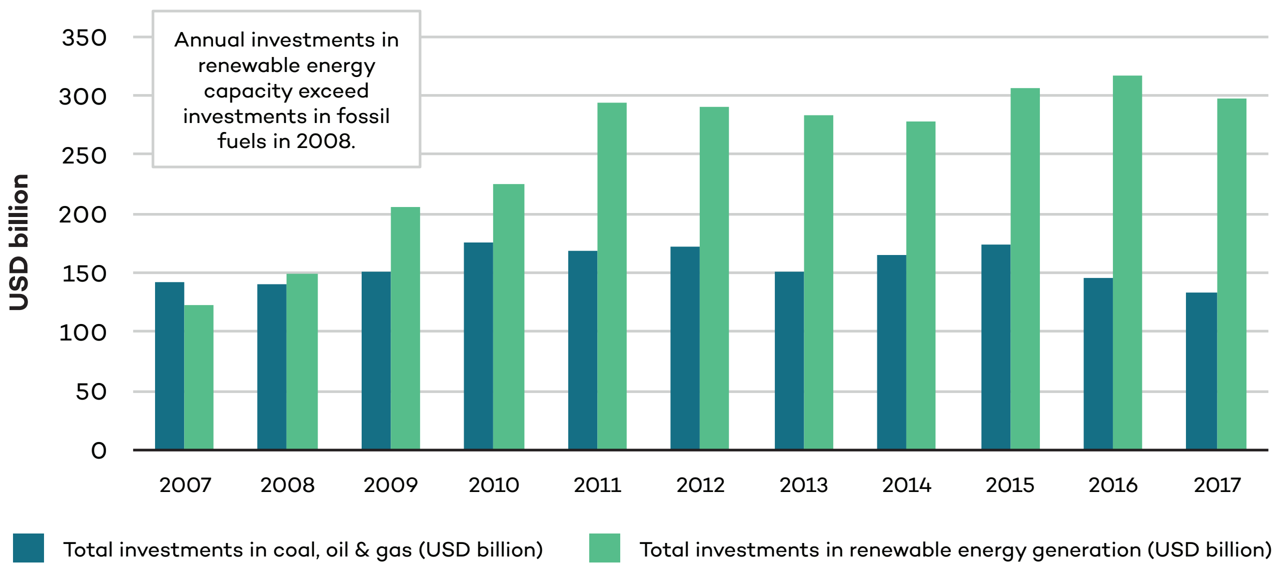

Figure 3. Fossil fuel versus renewable energy electricity capacity investment (USD billion)

Source: IEA, 2018b.

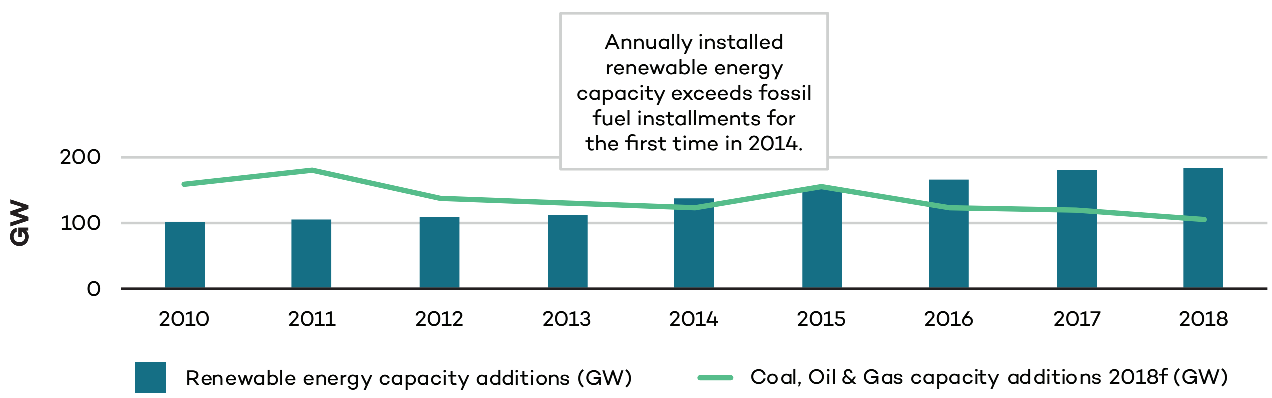

Figure 4. Annual additions: Installed electricity capacity fossil fuel versus renewable (GW)

Source: REN21, 2019; IEA, 2018c.

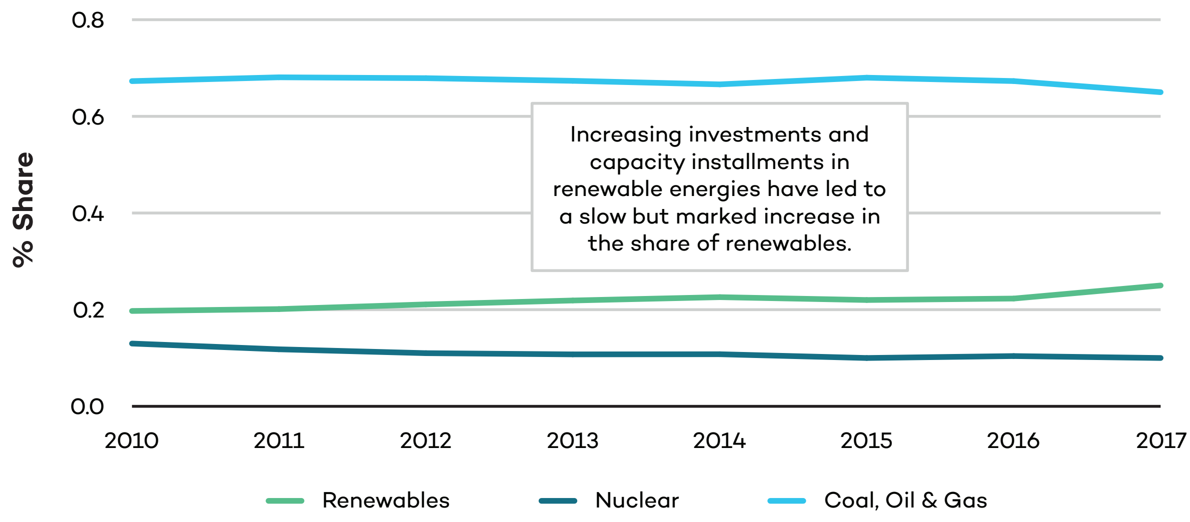

Figure 5. Global electricity production 2008–2017

Source: IEA, 2019d; IEA, 2018c.

2.0 Benefits of Subsidy Swaps

There are many competing demands for government resources, including spending on public health, education, social protection and pressure to avoid tax increases. This section sets out the case for placing promotion of clean energy alongside these other priorities and the economic, social and environmental benefits that such a move would bring.

2.1 Swaps and the Economy

Swaps can provide a number of clear economic benefits, namely freeing up resources for more pressing priorities, and avoiding investing in fossil fuel-related infrastructure that may become "stranded" while redirecting resources to and benefiting from the lower costs of renewable energy that are now a feature of many markets.

2.1.1 Expanding Fiscal Space

Fossil fuel subsidies can amount to a large proportion of government budgets, especially in times of high oil prices. The IEA's annual subsidy estimates from 2017 showed that 17 out of 40 countries reviewed spent more than 2 per cent of GDP on consumer energy subsidies (IEA, 2018c). In many cases, this is more than expenditure on health or education (see Ebeke & Ngouana, 2015, p. 1). Subsidies lead to a deadweight loss, a term used by economists to describe a loss of economic efficiency due to price distortions. The deadweight loss caused by global fossil fuel subsidies to gasoline and diesel was estimated at USD 44 billion in 2012, when fossil fuel subsidies were estimated to be USD 110 billion (Davis, 2013). All subsidies, including subsidies to renewable energy, create deadweight losses. The costs of distorting energy markets should give policy-makers pause before they commit to any subsidies. In the case of subsidies to renewables, the correction of a market failure, principally the underpricing of pollution, provides a driver to consider fossil fuel and clean energy subsidies differently.

Another study found that phasing out global fossil fuel subsidies would lead to a global GDP increase of 0.2 per cent and a carbon emissions decline of 2.32 per cent by 2030 compared to a baseline scenario (Delpiazzo et al., 2015). Research from the International Monetary Fund (IMF) finds that subsidy reform and economically efficient taxation[3] of fossil fuels could provide an average revenue stream to governments of around 2.6 per cent of GDP globally (Parry, Heine, Lis, & Li, 2014). For example, when Indonesia reformed gasoline and diesel subsidies in 2015, the fiscal savings were estimated to be USD 15.6 billion, over 10 per cent of state expenditure. These savings were reallocated to fund a wide range of economic development and infrastructure investments (Pradiptyo, Susamto, Wirotomo, Adisasmita, & Beaton, 2016).

2.1.2 Mitigating the Impacts of Stranded Assets

Energy sector investments are made based on an understanding that assets will operate at least until they have recovered their capital and made a reasonable profit, and ideally until the technical end of life of the equipment. Asset stranding has various drivers[4] depending on local and global contexts, but the clean energy transition will create stranded assets through two mechanisms. Falling renewable energy generation costs may render expensive fossil fuel-based generation financially unviable (known as economic stranding), or policy change reflecting the need to meet carbon emission constraints may render some plants inoperable (regulatory stranding) (Carbon Tracker, 2017). This process is not a distant possibility: it is already occurring in many countries. Such concerns have recently been a topic of debate in India, where 21 per cent of coal power capacity was identified as stressed

[3] Where prices reflect the broader external costs to society, including those of carbon emissions, air pollution, congestion, accidents and damage to road infrastructure (Parry et al., 2014).

[4] For example, in India, drivers of coal asset stranding include coal shortages and financial distress of energy distribution companies, water scarcity, air pollution regulations and cost-competitiveness of renewables (Worrall, Roberts, Viswanathan, & Beaton, 2019).

and at risk of entering bankruptcy proceedings in 2019 (Worrall et al., 2019). The financial position of coal in India is by no means exclusively due to renewable energy prices, though these are a factor.

These two mechanisms may mean fossil fuel plants built today will need to cease operation decades before the end of their operational lives. Regions with relatively young coal fleets are most exposed. The average age of coal plants in Asia is just 12 years, compared to 50 years globally (IEA, 2019b). An analysis of power generation units in Southeast Asia found that 83.7 per cent of all operational and planned units were incompatible with a carbon budget required to limit global warming to 1.5°C (Caldecott, McCarten, & Triantafyllidis, 2018).

If future governments attempt to implement policies that result in the early shutdown of high carbon assets, effectively "stranding" these investments, investors may face enormous losses. They may in turn seek to recover their losses through investor–state dispute settlement mechanisms with potentially costly impacts for governments (Bernasconi-Osterwalder & Haas, 2017). While the focus is often on how to mitigate impacts on investors, lenders and the assets themselves, governments should ensure that the burden of asset stranding does not fall primarily on affected communities and workers (Worrall et al., 2019).

A swap where resources are reallocated to help accelerate the clean energy transition is in fact a driver of asset stranding in the short term. However, in the long term, an early transition will have two positive impacts. First, the removal of fossil fuel subsidies reduces additional deployment of otherwise uneconomic fossil fuel assets that may later become stranded. Second, swaps can be used to redirect resources to policies and programs that support workers and communities affected by asset stranding. These sorts of policies could include retraining programs, general employment schemes and targeted social protection measures (Worrall et al., 2019). The idea is to use the resources from swaps to promote a socially just outcome for workers and communities during a major transition (Zinecker et al., 2018).

2.1.3 Capturing Future Renewable Energy Cost Reductions

Access to low-cost energy is a key advantage for all parts of the economy. As renewable energy prices are increasingly dropping below fossil fuels, particularly in the electricity sector (see Figure 6), there is a risk that policies that delay a transition to cheaper energy sources could harm economic competitiveness for companies if they are paying the true cost of production. If governments maintain policies that support fossil fuels while the gap between costs on renewables and fossil fuel-based energy grows, taxpayers will be left with a growing fiscal burden to fund the difference.

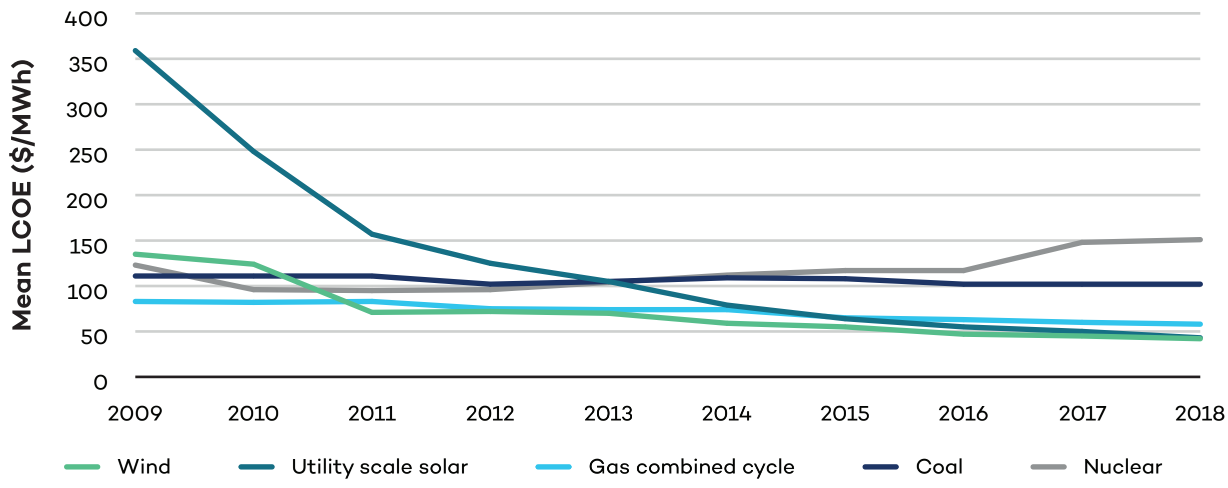

Figure 6. Lazard's levelized cost of energy comparison

Source: Lazard, 2018.

The example of kerosene subsidies in India illustrates the impact of fossil fuel subsidies on consumers and taxpayers. A recent study by GSI (Laan et al., 2019) found that micro solar products saved money for both consumers and taxpayers compared to subsidized kerosene. Kerosene subsidies are helping to reduce incentives to switch to a cleaner technology and actually increasing costs to consumers, if costs are considered over a two-year period.

2.2 Swaps and Climate Change

Aligning energy systems with the emission reductions required to avoid climate change is a huge challenge. The phase-out of subsidies to consumers and producers of fossil fuels could contribute to national emission reduction targets. In recognition of this, 13 countries listed fossil fuel subsidy reform as a measure to reduce carbon emissions under the Nationally Determined Contribution of the Paris Climate Agreement (Terton, Gass, Merrill, Wagner, & Meyer, 2015).

Research[5] indicates that the phased removal of all consumer fossil fuel subsidies could lead to a global decrease in carbon emissions of between 2.32 and 10 per cent by 2030 (Delpiazzo et al., 2015; IEA, 2015) and between 6.4 and 8.2 per cent by 2050 compared to "business-as-usual" scenarios (Burniaux & Chateau, 2014; Schwanitz, Piontek, Bertram, & Luderer, 2014). Jewell et al. (2018) estimates that the removal of both consumer and producer fossil fuel subsidies would lead to a global decrease in carbon emissions of around a quarter of the combined emission reductions currently proposed by countries as part of the Paris Agreement (between 1 and 4 per cent globally by 2030) (Jewell et al., 2018). Another GSI study found that removing producer subsidies could reduce global emissions by 37 Gt of carbon dioxide between 2017 and 2050, the equivalent of the carbon locked up in all proven oil reserves in the United States and Norway (Gerasimchuk et al., 2017). However, even with the removal of subsidies, fossil fuels are generally undertaxed and their prices do not account for external costs (Merrill et al., 2017). The IMF shows that when subsidies are removed in combination with appropriate taxation of fossil fuels, capturing environmental costs and general consumption taxes, emissions could have been reduced globally by a greater 28 per cent in 2015 (Coady et al., 2019) and by 21 per cent in 2013 (Coady et al., 2015).

[5] Other studies have modelled emission reductions due to subsidy reform and published results of differing magnitudes, depending on the assumptions. An overview of global and national research is available in Merrill et al. (2017).

Some models have observed that fossil fuel subsidy reform in the presence of an emissions cap increases emission reductions from around 8 to 10 per cent and maintains the reductions from reforms in the long term (Burniaux & Chateau, 2014). A GSI study of 20 countries with significant fossil fuel subsidies found that phasing out subsidies by 2020 and swapping 30 per cent of the savings from reform into energy efficiency and renewable energy led to increased emissions reductions from 11 to 18 per cent (Merrill, Harris, Casier, & Bassi, 2015), emphasizing the importance of not simply removing the subsidies but also making the swap to clean energy (see Figure 7). If no swap is made, it is possible that, in the long term, emissions could return "to the same level as the reference case, since the effects of the phase-out [of fossil fuel subsidies] are less important than other effects that drive emissions like population, GDP growth, or resource depletion" (Schwanitz et al., 2014, p. 886).

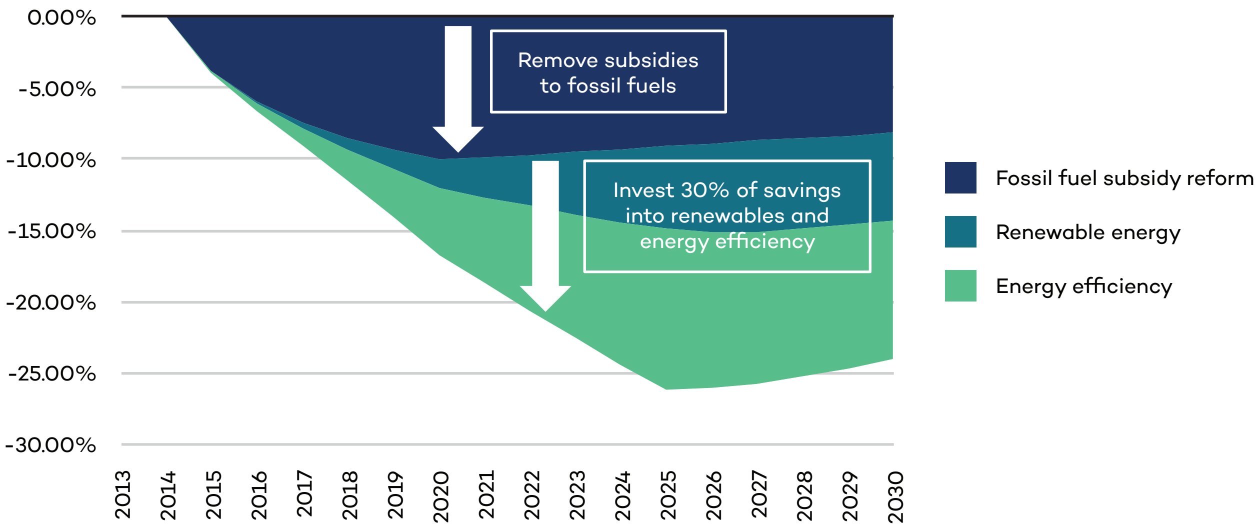

Figure 7. Average emission reduction from fossil fuel subsidy reform across 20 countries including a swap with 10 per cent savings invested in renewables and 20 per cent in energy efficiency

Source: Merrill et al., 2015; Merrill et al., 2017.

This point is key. In practice, it means that, if countries want to benefit from ongoing and permanent emission reductions from fossil fuel subsidy reform, they need to do three things:

- Undergo fossil fuel subsidy reforms.
- Tax fossil fuels at a level that captures their external costs.
- Make the "swap" to clean energy. Governments can choose to invest in energy efficiency, renewable energy and other mitigation measures in order to help move away from fossil fuel-dependent energy systems and toward those based on sustainable energy.

2.3 The Social Impacts of Swaps

If large-scale transitions such as the end of one industry and the start of another are not accompanied by appropriate mitigation policies and programs, it can create widespread hardship and damage social cohesion. Hence it is important to consider the impact of transition on social factors including job creation, job upgrading, social justice and poverty eradication, often referred to as elements of a "just transition" (Gass & Echeverria, 2017). The savings from fossil fuel subsidy reforms have historically been used to meet a range of development priorities. For example, following reforms in 2015 in Indonesia, savings were used to fund the expansion of departmental budgets, infrastructure and other policies designed to enhance social outcomes (Pradiptyo et al., 2016). In India, swaps have also been shown to mitigate the impacts of subsidy reform on poor households by financing clean energy alternatives to ensure they are affordable to those groups that are most vulnerable (see the India case study in Section 3.1 for more details).

2.3.1 Jobs

It is estimated that the growth of the clean energy sector will produce millions of new jobs: the International Renewable Energy Agency (2018) estimates that, in 2017, 10.3 million people were employed in the renewable energy sector. Similar global estimates for jobs in energy efficiency are difficult to ascertain, but the United States alone employed 2.2 million in 2016 in the energy-efficiency sector (Environment and Energy Study Institute, 2017). The International Labour Organization (2018) estimates that, in aggregate, limiting climate change to 2°C would create approximately 24 million jobs and lead to the loss of approximately 6 million jobs; an overall net increase of approximately 18 million jobs by 2030. For example, the renewable energy sector in India is already estimated to have created 432,000 jobs. While swaps would increase the pace of the energy transition, creating millions of new jobs, they would also precipitate coal phase-outs and the decline of oil and gas production.

It is important to ensure a socially just plan for the workers linked to the fossil energy sector decline (Zinecker et al., 2018). Reallocating resources to support these workers is one way that swaps can be of benefit during such a period of transition. Employment profiles vary by energy source across manufacturing, construction and operation, and the geographical location of jobs matters a great deal. Even if net employment increases, profound unemployment may still affect communities in former industrial heartlands. With careful planning, employment losses can be offset or mitigated in affected communities through a range of measures, including long, clearly communicated timelines to allow people to plan; active labour market policies; skill development and retraining; public sector policies for job creation; industrial policies for economic diversification; and support for community renewal. General welfare states and social safety nets prevent poverty and allow people time to adapt following unemployment. Setting the frameworks so that new sectors generate stable and well-paying employment can contribute to an energy transition (Zinecker et al., 2018).

2.3.2 Public Health

Burning coal for electricity generation releases toxins and produces particulate matter that can cause respiratory and cardiovascular diseases, creating a public health hazard and adding to the public health burden. China and India rely on coal for 70 per cent of their electricity generation (World Bank, n.d.), which contributed to more than a million deaths from air pollution in each of those countries in 2016 and 2017 (World Health Organization, 2018). Sixty per cent of Indonesia's electricity comes from coal (Zinecker et al., 2018), and its power plants have lower emission standards than those of China and India.

Respiratory illnesses come at a cost, to individuals and the economy. For example, the cost to an Indonesian asthma patient can be on average USD 54 per month—more than half of the monthly per capita income of the lower-middle-income class in Indonesia (Zinecker et al., 2018). At a macro level, research estimates that respiratory diseases in Indonesia could cost the country up to USD 805 billion (IDR 11,250 trillion) between 2012 and 2030. The true extent of the costs of air pollution is just beginning to become apparent. At the micro level, the energy carrier used is particularly important, as consumers may be directly exposed to pollution associated with their use. For example, use of kerosene in the home leads to direct exposure to indoor air pollution. While it is difficult to estimate the total cost to public health from fossil fuel-related air pollution, it is clear that a transition away from fossil fuels would bring significant improvements in public health.

2.3.3 Gender

Often, fossil fuel subsidies are poorly targeted, not reaching poor households and, significantly, not benefitting men and women equally. Research on the gender disaggregated impacts of fossil fuel subsidies for lighting and cooking in Bangladesh, India and Nigeria found that badly designed subsidies often have particularly negative impacts on women (GSI-IISD, BIDS, IRADe, & Spaces for Change, 2019). In some cases, subsidies distort supply chains so badly that they actually drive up prices and create shortages that prevent energy access: research in Nigeria found that 60 per cent of households in Lagos experienced scarcity (GSI-IISD et al., 2019). This predominantly affects women, who are typically responsible for fuel collection or queuing and are most exposed to indoor air pollution from traditional biomass cooking.[6] In other cases, fuel subsidies are badly targeted, representing an enormous opportunity cost—taking up funds that could help meet needs in other ways and crowding out the market for emerging clean technologies.

At the same time, reforms must be planned carefully. In Nigeria, when kerosene subsidies were suddenly withdrawn, women in particular faced hardships, as they were responsible for kerosene payments and the sudden price hikes impacted their income. In India, when faced with hypothetical LPG price hikes, households resorted to a range of different behaviours. Most households (47 per cent) reported that they would maintain current levels of LPG consumption, but 39 per cent reported that they would reduce LPG consumption but continue using it. However 14 per cent of households said they would stop LPG consumption and revert to sourcing traditional biomass, an activity that adversely impacts women's time (GSI-IISD et al., 2019).

Affordability is a key component of energy access, and one with important implications for women when it comes to household energy needs. Fossil fuel subsidy reform can help free up resources to address affordability needs, improving access to clean energy alternatives.

2.4 The Politics of Swaps: Why hasn't this already happened?

Phasing out fossil fuel subsidies and reallocating some of the savings to accelerate the clean energy transition would have benefits for the economy, the climate and society. Why then do fossil fuel subsidies persist and why do some countries still have only nascent renewable energy industries?

The answer is in the politics of energy.

At the highest levels, there is political will to take action and momentum building behind swaps. The G20 governments have committed to ending government support to fossil fuels through a number of reform pledges, starting with the G20's 2009 commitment to phase out "inefficient fossil fuel subsidies that encourage wasteful consumption" (G20, 2009). The Friends of Fossil Fuel Subsidy Reform (an informal group of G20 countries) launched a Communiqué signed by 40 countries and hundreds of business organizations that calls for increased efforts to phase out subsidies to fossil fuels (Zinecker et al., 2018). Technical support to reforming governments is increasingly available from a number of organizations, including the GSI and the World Bank's Energy Sector Management Assistance Program. Another global process includes the Sustainable Development Goals, and in particular target 12.C and indicator 12.C.1 under SDG 12 on Sustainable Consumption and Production, which includes fossil fuel subsidy reform. These multilateral pledges can be key enablers of reforms, creating a global consensus and providing confidence to policy-makers that their actions are in line with the best available analysis; however, these commitments have not yet been implemented.

[6] Traditional biomass use is uncontrolled combustion of biomass in an open fire or simple stove configuration.

But at the national level, the politics become more complicated. Politicians must balance public sentiment, the information they receive from their experts, their own beliefs and values, and the interests of influential stakeholders. Reform of consumer subsidies often leads to tariff increases, which are unpopular. The benefits of clean energy, including future price reductions and improved air quality, are often less tangible and can take years to materialize. This provides an opportunity for opposition parties to adopt a populist stance against price hikes, subsidy reform and the clean energy transition. In some cases, these concerns may well be justified. Badly designed reforms without adequate mitigation of price shocks may cause unreasonable suffering for consumers. Similarly, industries and employees that have benefited from low prices may be difficult to convince that the reforms will benefit them or the economy as a whole. To overcome these factors, politicians must build a compelling case that a clean energy transition provides real benefits and convince stakeholders they can deliver what they promise. These are often challenging tasks.

Understanding the political landscape analysis of the engagement, interests and influence of various actors can be illuminating. Figure 8 shows a visual representation of various groups' support for, influence over and engagement with policies that promote renewable energy in Indonesia. In this case, the most supportive groups—non-governmental actors and the clean energy industry—were actively engaged but lacked the incumbents' level of influence on policy that comes with history, financial resources and providing employment in the sector. Meanwhile, the state-owned energy company, PLN, a very significant stakeholder, saw little potential benefit and a lot of potential risk from renewable energy deployment. The result was an impasse and very low levels of renewable deployment.

For reformers, the challenge is to change the political dynamic through targeted communication activities to increase engagement of already supportive, influential actors, and to develop policies that address the concerns of actors that are neutral or moderately opposed to change.

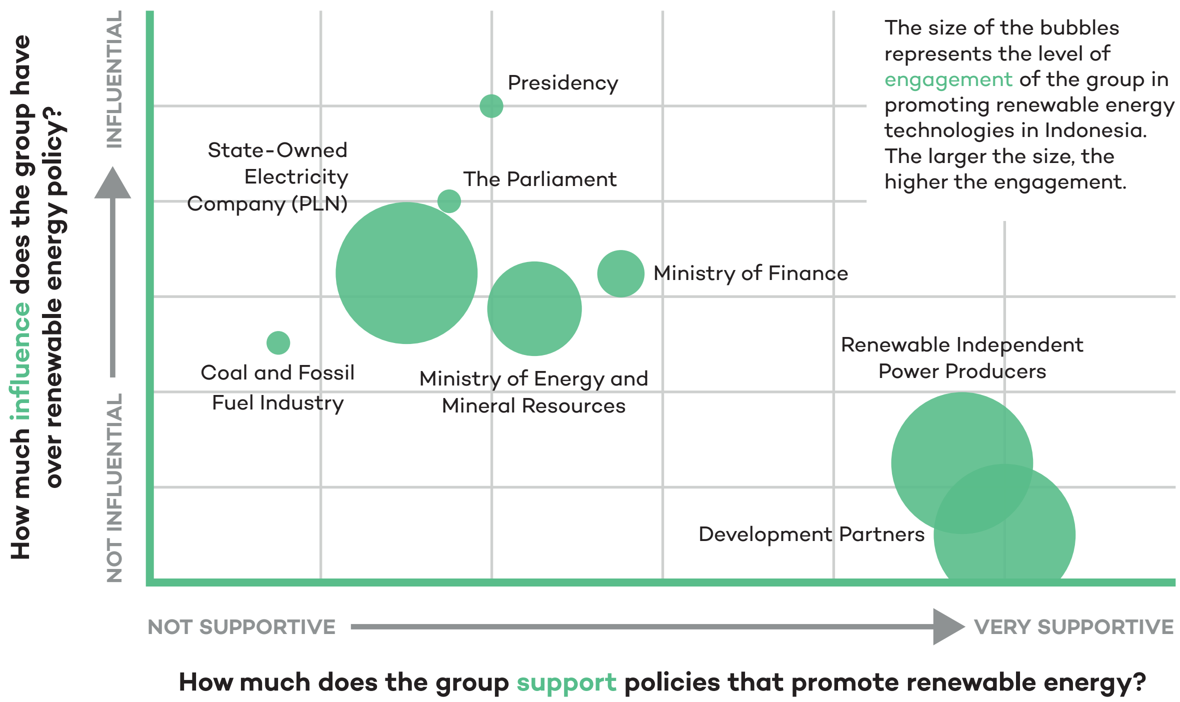

Figure 8. Relative support for policies promoting renewable energy, influence and level of engagement of stakeholder group in Indonesia

Source: Bridle et al., 2018.

3.0 Countries Shifting Flows of Public Resources

There is potential to implement high-impact swaps in many countries. Below are illustrative examples from four countries that have already been playing a leading role in taking concrete action on fossil fuel subsidy reform and the promotion of clean energy: India, Indonesia, Zambia and Morocco.

3.1 India

India has been gradually removing financial support to fossil fuel subsidies, which creates an opportunity to transfer support to clean energy. In this overall transition, there is still room to further shift resources away from fossil fuels and toward a clean energy transition. For example, ongoing kerosene subsidy reforms are a natural opportunity to redirect revenue to off-grid solar schemes for marginalized households.

3.1.1 Ongoing Efforts to Shift Public Financial Flows

India's energy consumption is expected to grow faster than that in other major economies until 2040 (IEA, 2018c). This growing energy demand, particularly for electricity, has resulted in a very dynamic policy environment—with subsidies linked to debates on meeting demand, improving energy security and ensuring energy affordability (see Box 2). But there is increasing concern about the impacts of largely coal-based electricity supply and fossil transport fuels on air pollution. A renewable energy target is aiming to change India's electricity generation mix by installing 175 GW of renewable energy capacity by 2022 (Government of India, 2015). The government has ambitions to see 30 per cent penetration of electric vehicles in the transport fleet by 2030 (Shah, 2019). Falling air quality in large Indian cities has prompted a National Clean Air Program. Throughout the overall transition to clean energy, India has continued to make progress with its 2009 G20 commitment to phase out inefficient fossil fuel subsidies, having largely eliminated gasoline (petrol) and diesel subsidies (Gerasimchuk et al., 2018).

At the aggregate level, these policies have resulted in a shift in public financial flows from petroleum products to electricity transmission and distribution and renewable energy (see Figure 9). Between India's fiscal year (FY) 2014 and FY 2017, support to petroleum products fell by almost three quarters—reflecting a combination of policy reforms and lower world oil prices—while support for renewable energy has increased almost six times. This makes India a striking example of an emerging economy that is shifting where it invests its public resources. It should be noted, however, that at an absolute level, support for fossil fuels is still higher than for renewable energy. This does not include electricity consumer subsidies—INR 83,313 crore (USD 12.9 billion) in FY 2017—which predominantly benefit fossil fuels, as coal is responsible for 65 per cent of the electricity generation (Gagnon-Lebrun et al., 2018). As such, there is still significant potential for this shift in public resources to be increased in scale and ambition.

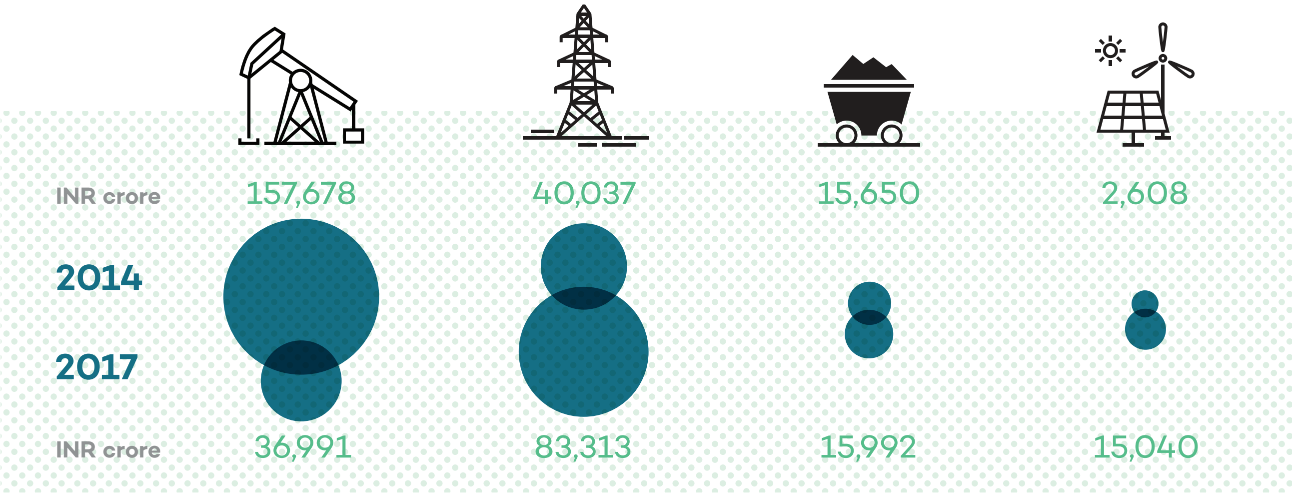

Figure 9. Big shifts in India's energy subsidies from 2014–2017 (INR crore)

Source: Soman et al., 2018.

3.1.2 What Next? Potential for further reallocation

There are many possible ways in which India could harness its existing shift in resource allocation to strengthen the clean energy transition. One example is to shift public resources away from kerosene and toward off-grid solar for marginalized households. Kerosene is used as a lighting fuel by marginalized households, but the burning of kerosene releases particulate matter, causing indoor air pollution and creating health impacts. The mechanism for distribution of subsidized kerosene has a significant amount of leakage; 51 per cent (by volume) of subsidized kerosene is lost to illegal diversion (Jain & Ramji, 2016). Kerosene subsidies are expensive for the public budget. In addition, through a combination of reducing the volumes of subsidized fuel available to state governments, domestic price increases and low world oil prices, subsidy reforms have already decreased costs from INR 31,255 crore (USD 5.2 billion) in FY 2014 to INR 4,785 crore (USD 710 million) in FY 2018 (Jain & Ramji, 2016), liberating an enormous source of revenue.

Replacing kerosene lighting with cleaner lighting systems is a priority. Grid expansion has gone some way to reducing the need for kerosene, but, in many areas, households experience only limited and unpredictable hours of electricity, forcing them to continue their dependence on kerosene as a supplementary lighting fuel (Laan et al., 2019). In these areas, solar lighting systems are already cheaper than kerosene when making lifetime cost comparisons. For the cost of two years of subsidized kerosene, a household could receive an entry-level solar lantern, in turn saving them money. Solar lighting also provides superior light, enabling better educational and income-generating opportunities (Jain & Ramji, 2016). It can also provide ancillary services like mobile phone charging.

Shifting subsidies from kerosene to off-grid solar is an opportunity in India. There are several pathways available to execute such a swap. Funds liberated from the reforms that have reduced spending on subsidized kerosene (INR 4,778 in FY 2018, see Figure 10) could either be directly transferred to households to assist in purchasing solar products or transferred to manufacturers making subsidized solar products available to households. A third option is to subsidize financial products such as loans to make borrowing for solar products affordable for marginalized households (Laan et al., 2019).

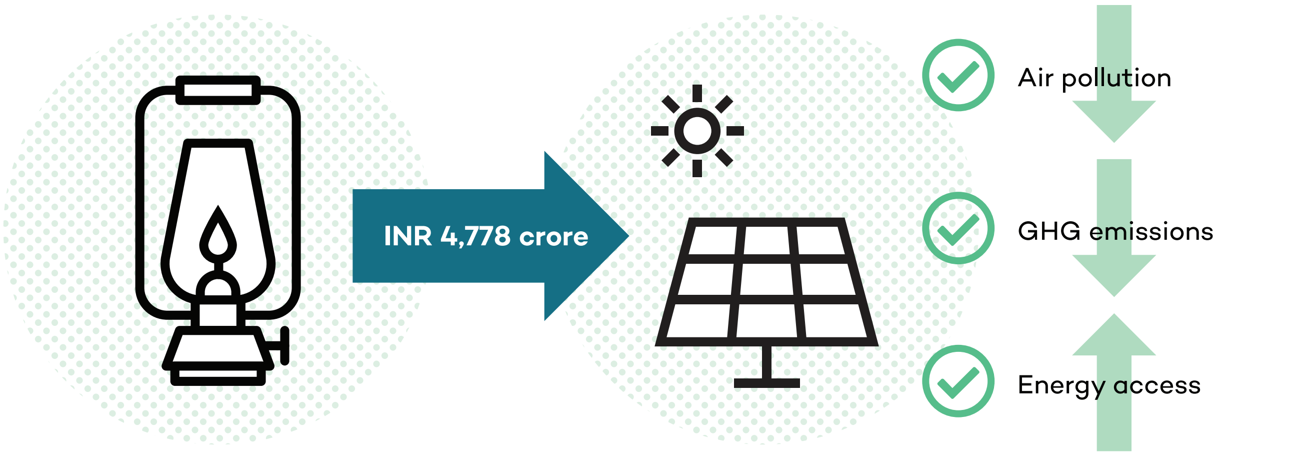

Figure 10. The effect of swapping India's kerosene subsidies into solar photovoltaic (PV)

Box 2. Saubhagya, Energy Access for All

India is giving remote rural households access to off-grid electricity. In 2017, a new electricity subsidy was introduced, Saubhagya, that aims to provide free electricity connections to poor households. The subsidy offers remote rural households a solar battery pack (200 to 300 Wp with battery bank), five LED lights, a DC fan and a DC power plug. This off-grid connection also includes repair and maintenance for five years (Press Information Bureau, 2017).

Poor households identified using the 2011 socioeconomic caste census are eligible. To avoid exclusion errors, households who identify themselves as poor but are not on the census can access this connection subsidy by paying a nominal fee of INR 500 (USD 7) in 10 installments. Saubhagya has a budget of INR 163 billion (USD 2.3 billion) (Press Information Bureau, 2017).

3.2 Indonesia

Indonesia has been successfully reforming some fossil fuel subsidies, but the transition to clean energy is proceeding very slowly. Subsidy reform makes Indonesia ready for a swap, but the relatively high cost of renewable energy makes it difficult to implement. Learning from other countries, particularly India, about making renewables more affordable and achieving scale can help Indonesia execute a swap.

3.2.1 Ongoing Efforts to Shift Public Financial Flows

In 2016, 66 per cent of Indonesia's primary energy was sourced from fossil fuels, with electricity generation dominated by coal (55 per cent) and gas (26 per cent) (IEA, 2019c). In line with its international commitments in its Nationally Determined Contributions, Indonesia aims to source 23 per cent of its primary energy from new and renewable sources by 2025. Forty per cent of its installed electricity capacity is to be supplied by renewables, hydro and geothermal.

Indonesia has a successful history of reforming subsidies to electricity and transport fuels. When electricity consumption subsidies reached USD 7.5 billion in 2014, the country introduced automatic monthly price adjustments to reduce subsidy costs. Similar reforms conducted in 2015 for gasoline and diesel in the transport sector saved IDR 211 trillion (USD 15.6 billion), which was subsequently reinvested in social and welfare schemes designed to boost growth, reduce poverty and develop infrastructure in Indonesia's many remote regions and villages (Pradiptyo et al., 2016). Successful past reforms indicate that Indonesia has the political willingness to initiate future reforms and reallocate investments away from fossil fuel subsidies.

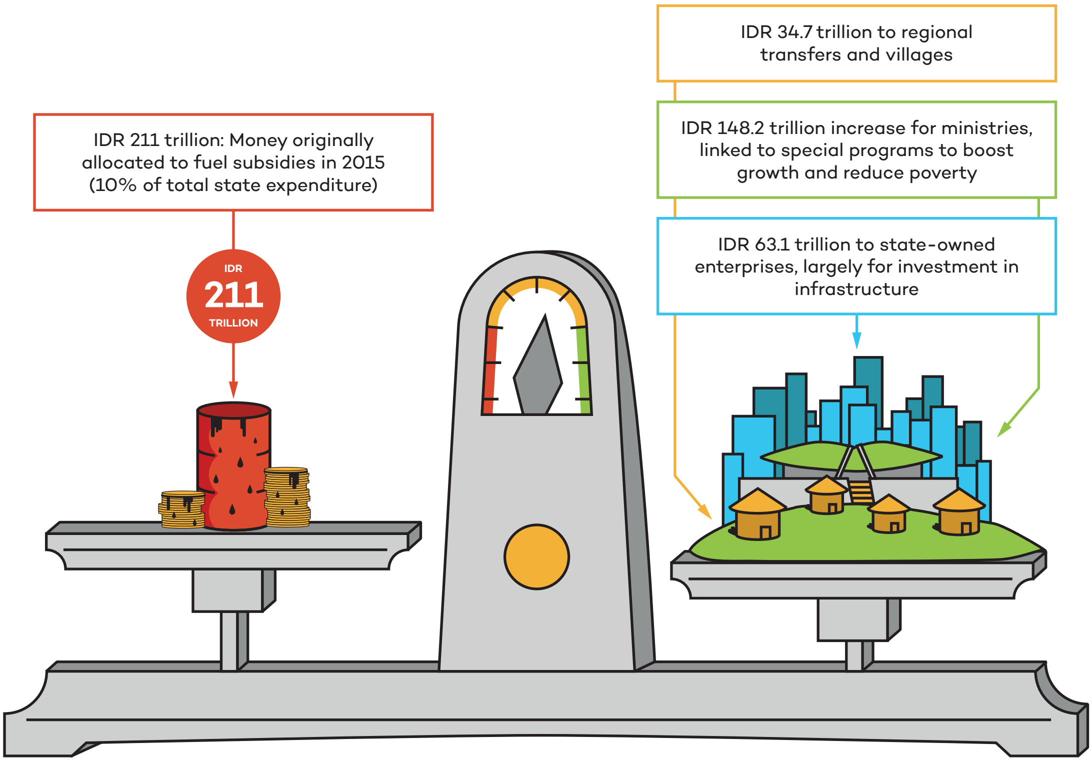

Figure 11. Breakdown of how fuel subsidy savings in 2015 were reallocated in Indonesia

Source: Pradiptyo et al., 2016.

3.2.2 What Next? Potential for further reallocation

An illustrative area for clean energy swaps in Indonesia is to shift coal sector and LPG subsidy savings toward renewable sector support. Subsidies to coal play an instrumental role in making coal cost-competitive compared to renewables. The total subsidy to coal in 2017 amounted to USD 1.2 billion (Indonesia Investments, 2018), while in 2015, coal-based electricity received USD 600 million in support compared to USD 130 million for renewables (Bridle et al., in press). In addition, a coal price cap policy introduced in 2018, where the price of coal paid by power plants is capped at USD 70 per tonne (Indonesia Investments, 2018), artificially reduces the cost of coal-fired electricity in comparison to renewable-based electricity generation (Bridle, Suharsono, & Mostafa, 2019). Reforming coal subsidies, and particularly the coal price cap, can make renewables more cost competitive. With respect to LPG, Indonesia experienced a sudden escalation in the cost of its LPG subsidies when reforms for kerosene led to increased LPG consumption, with subsidies reaching USD 3.9 billion in 2014, or 2.8 per cent of state expenditure (Toft, Beaton, & Lontoh, 2016). The government is now looking to reform LPG subsidies to better targeted poor households with affordability challenges (Zinecker, Gagnon-Lebrun et al., 2018).

Reforming these coal and LPG subsidies can free up financial resources for establishing renewables in Indonesia. The country has an immense potential for renewables, but is not deploying them at scale: currently, the country generates less than 1 per cent of electricity from wind and solar (IEA, 2019c). Various barriers, including power purchase price caps, regulatory delays, lack of a national grid and policy uncertainty, are suffocating investment and development in solar, and wind and renewable projects are considerably more expensive in Indonesia compared to international benchmarks. Figure 12 shows an analysis of recent power purchase auctions in India and Indonesia. It shows that the cost of electricity from subsidized coal is broadly similar in both countries, but the costs of wind and solar are far higher in Indonesia.[7] By reforming coal subsidies in Indonesia and reallocating resources to help address existing barriers, the costs for renewable energy projects could be reduced to approach international benchmarks and compete with coal-based electricity.

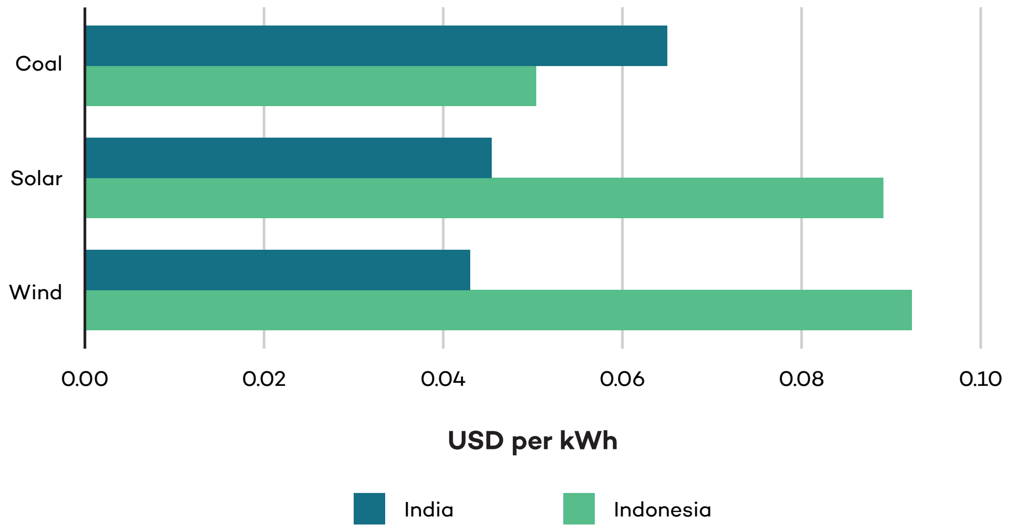

Figure 12. Comparison of power purchase agreement prices for coal, wind and solar from India and Indonesia

Sources: Bridle et al. (in press); Jain, 2018.

3.3 Zambia

Zambia is committed to reforming fossil fuel subsidies, which presents an opportunity to implement a swap. Implementing energy efficiency in the mining sector can reduce the sector's demand for electricity subsidies and, in turn, subsidy costs for the government. Zambia also has a high potential for solar. Solar-based electricity generation, however, is negligible but has the potential to replace diesel-generated electricity. As Zambia scales up electricity generation in response to rising demand, renewables can become a part of future electricity generation capacity.

3.3.1 Ongoing Efforts to Shift Public Financial Flows

As of 2016, Zambia's national installed capacity was heavily dominated by hydropower (85 per cent) followed by coal (10 per cent), diesel (3 per cent) and fuel oil (2 per cent). The country currently faces an electricity deficit, with peak demand significantly greater than peak generation. Despite having high potential for solar energy, it currently accounts for just 0.1 per cent of the country's power generation capacity (Bridle, Halonen, Klimscheffskij, Mukumba, & Siwabamundi, 2018). One of the long-term measures of the Zambian government is to fast-track the development of grid-connected PV generation.

[7] Read more about the roadblocks to renewables in Indonesia here: https://www.iisd.org/sites/default/files/publications/roadblocks-indonesia-renewable-energy.pdf

Energy subsidy reform in Zambia has been driven by a desire to reduce public expenditure. The World Bank (2016) reported that fuel and electricity subsidies in Zambia cost USD 576 million between September 2015 and May 2016. In 2016, Zambia successfully eliminated consumption subsidies on petroleum products.[8] Electricity prices were reformed in 2017, but subsidy costs remain high, as the reforms did not apply to the mining sector, which accounts for 55 per cent of all electricity consumption (Bridle, Halonen et al., 2018). Thus, reforming electricity subsidies to the mining sector could be instrumental in establishing cost-covering revenues for the electricity sector. Additionally, replacing diesel with clean energy can also deliver financial savings, because diesel generators receive additional subsidies, making diesel-generated electricity costly. Overall, the country is strongly committed to reforming fossil fuel subsidies and increasing the uptake of clean energy.

3.3.2 What Next? Potential for further reallocation

Zambia's current commitment to reforming fossil fuel subsidies can further fund its transition to clean energy. Additional government resources that could be redirected include diesel-generated electricity subsidy savings to support solar PV and supporting energy efficiency in the mining sector in order to reduce electricity price subsidies.

With current annual expenditure on diesel-generated electricity costing USD 8 million, replacing diesel with solar can deliver fiscal savings (Bridle, Halonen et al., 2018). A transition to solar PV is currently taking place, with the Zambian government initiating a program with the World Bank to support solar PV while diesel subsidy reforms are underway, an example of a de facto swap. Under the program, the World Bank is assisting the Zambian government with procurement activities through a recent competitive tendering process in which two solar power plants (47.5 MW and 28.2 MW, respectively) are expected to be awarded power purchase agreements. Diesel-generated electricity power purchase agreements cost USD 0.16—0.17 per kWh, while the tariffs from the recent solar auctions are a competitive USD 0.07 per kWh. Even though solar is in the early stages of its development, there is high potential for it to undercut the prices of diesel-generated electricity. Swapping diesel with solar will generate savings in the long term by reducing the cost of generation.

Zambia's mining sector, by far the largest electricity consumer, has the potential to reduce electricity subsidies. Promoting energy efficiency in the mining sector will reduce its consumption, which in turn reduces the need for subsidies while simultaneously mitigating the impact of potential future price increases on the sector. It is conservatively estimated that an increase of 10 to 20 per cent in electricity efficiency is possible (Bridle, Halonen et al., 2018). This could be achieved, for example, by an energy-efficiency fund that provides mines with (co-)funding for energy-efficiency investments.

[8] There is a difference in the subsidy estimates between Zambia's finance ministry and international observers. The former records the subsidy as the shortfall between the cost of purchasing fossil fuels and the revenues generated from consumer sales, while international observers like GSI define subsidies as foregone tax revenues, provision of goods or services below market rates and market price support through tariff regulation in addition to direct transfers (GSI, 2014).

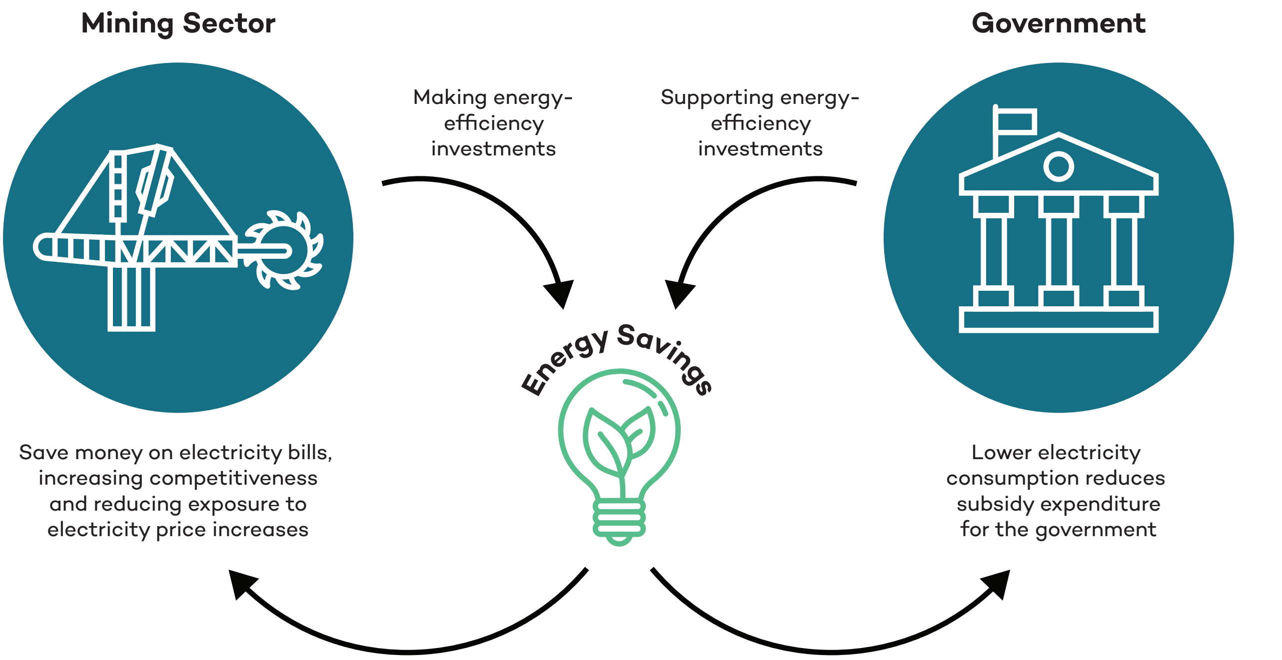

Figure 13. Energy-efficiency measures can reduce costs for the mining sector and the government

Source: Authors' interpretation

3.4 Morocco

Morocco has ambitious renewable energy targets that can be financially supported by reforming fossil fuel subsidies, particularly those to butane gas. Solar-based appliances are easy replacements to reduce rising butane demand. A swap helps Morocco achieve a clean energy transition as well as emission targets.

3.4.1 Ongoing Efforts to Shift Public Financial Flows

Morocco's growing energy consumption is heavily dependent on its imported energy: nearly 95 per cent of its energy is currently imported (IEA, 2016). Morocco has ambitious renewable energy targets, aiming at 42 per cent of total installed capacity by 2020 and 52 per cent by 2030 (Middle East Institute, 2016). Apart from competitive tendering processes for large electricity generation projects, Morocco currently has several smaller solar programs in operation. The national solar pumping program, with a budget of MAD 400 million (USD 41.6 million), promotes the use of solar pumps for irrigation among small and medium-sized farms. A supplementary project promotes the scaling of solar pumps for irrigation by creating awareness among various stakeholders, thereby increasing adoption. A solar water heater program, Shemsi, aims to scale the adoption of solar water heaters nationally. All of these programs together indicate Morocco's commitment to transitioning to renewable energy.

Morocco offers consumer subsidies, and, in 2012, energy subsidies rose to 6.6 per cent of GDP, making them financially unsustainable. As a response to growing subsidies, in 2014 Morocco embarked on a path of subsidy reform called "decompensation" that removed petroleum subsidies, phased out diesel subsidies and introduced a phased increase in electricity prices and a partial reform of butane gas subsidies. After the 2014 decompensation, the only remaining fossil fuel subsidies are those to butane gas, which are expected to reach USD 1.2 billion in 2018 (IISD, 2018). Under the Paris Agreement, Morocco is committed to reducing its greenhouse gas emissions to 42 per cent by 2030 and also recognizes the immediate need to reform butane subsidies as a priority (IISD, 2018).

3.4.2 What Next? Potential for further reallocation

Morocco's largest expenditure remains on imported petroleum products, of which butane is heavily subsidized. Morocco could use its fossil subsidy reforms to accelerate its clean energy ambitions by using butane subsidy savings to provide an additional source of financing for scaling up solar programs. Reforming butane subsidies is a political priority, but it is difficult and sensitive to implement.

Households, followed by the agriculture sector, are the biggest consumers of butane gas. Households use butane for cooking and water heating while farmers use butane for irrigation, as it is cheaper than diesel. Reforming butane gas subsidies can generate savings that can be reinvested in solar water heating for households and solar pumps for farmers.

Solar water heaters' high installation cost acts as a deterrent to widespread adoption. Under the current Shemsi program, 50 per cent of the installation cost is subsidized. No subsidy, however, is granted toward the capital cost of the equipment. In agriculture, the cost of solar pumping (USD 0.043 per m^3) is comparable to the cost of pumping with butane gas (USD 0.042 per m^3). The current national solar pumping program partially subsidizes the installation cost of solar pumps and gives farmers access to a line of credit. However, the national solar pumping program is only partially operational, with subsidies for farmers delayed due to financial reasons. Both of these programs could receive a financial push from savings generated by reforming butane subsidies.

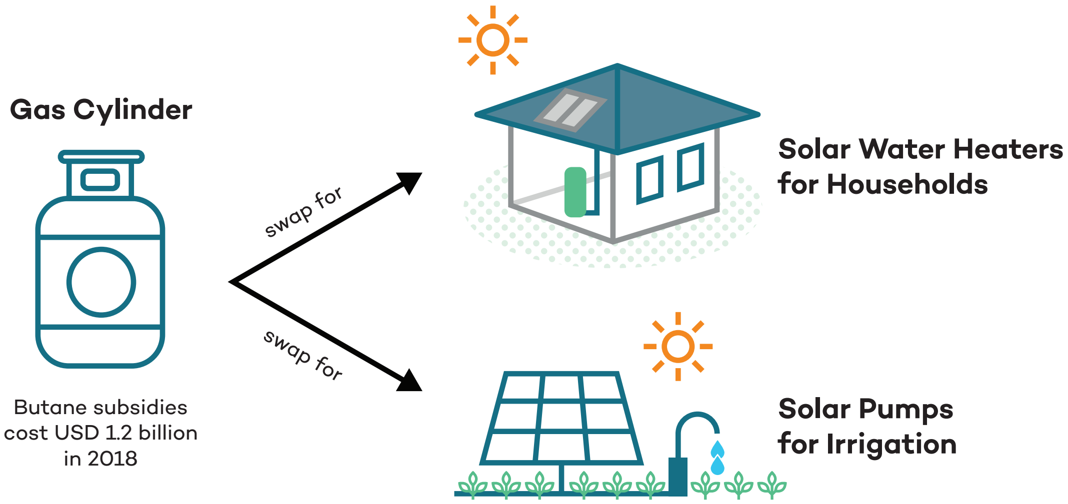

Figure 14. Offsetting butane consumption with solar irrigation and solar water heating

Source: Authors' interpretation

4.0 How Can Swaps Be Applied and Expanded to Deliver Maximum Impact?

There are clear benefits from shifting resources away from fossil fuels to clean energy. Policy-makers, donors and practitioners seeking to further strengthen this shift can examine two opportunities that can have the greatest potential for impact: (i) implementing large-scale grid-connected (on-grid) renewable energy swaps in emerging economies and (ii) using resources from broader fiscal policy reform to support, and leverage private finance for, clean energy projects.

A focus on large-scale opportunities to increase impact: on-grid renewables in emerging economies

In order to support long-term energy demands sourced from clean energy, large flows of public resources need to shift away from fossil fuels and into technologies that have large-scale potential for clean energy generation, such as large-scale on-grid renewables. Ambitious renewable energy generation targets will also require significant changes to power system planning and robust grid integration. For countries that have already made significant progress with renewable energy deployment, efforts may need to focus on-grid, system-wide innovations to improve system flexibility and help balance variable renewable energy,[9] such as via grid improvements and storage (IEA, 2018a). These changes require that public financial flows are redirected toward on-grid renewable energy.

Greater fiscal policy reform to generate resources

More ambitious fiscal policy reform can generate greater financial resources to accelerate a clean energy transition. In addition to reforming fossil fuel subsidies, governments need to implement the correct taxation of fossil fuels. The IMF estimates that this kind of fiscal reform represents revenue of approximately 3.8 per cent of GDP globally or USD 2.8 trillion (Coady, Parry, Le, & Shang, 2019). Taxing will also internalize externalities from fossil fuels, including greenhouse gas emissions.

Swaps to leverage private finance

Governments can reallocate their public finance resources to de-risk clean energy projects and leverage additional private finance. To encourage this shift, a range of mechanisms can be proposed—from direct (co-)investment by governments in projects, to paying a premium under a feed-in tariff, to providing data or technical assistance of value to project developers and investors. Using governments' limited public finance to de-risk projects can be particularly effective in emerging and developing economies where it has been shown that higher perceived investment risk leads to higher financing costs, pushing up capital costs for clean energy projects (Schmidt, 2014).

[9] Read more about addressing concerns on variable renewable energy here: http://www.ren21.net/gsr-2017/chapters/chapter_08/chapter_08/

5.0 Conclusion

Fossil fuel to clean energy subsidy swaps are already taking place—at a global level, fossil fuel subsidies have declined while renewable investments are now greater than investments in fossil fuel-based generation. But the pace of change needs to accelerate considerably. Although fossil fuel subsidies are linked to emission reductions, their reform alone will be unlikely to deliver the permanent emission reductions necessary to meet climate change targets. A swap, reallocating some of the savings from subsidy reform to fund the clean energy transition, could magnify the contributions to long-term, permanent emission reductions while bringing additional economic and social benefits, in particular in relation to jobs, public health and gender equality.

Four countries—India, Indonesia, Zambia and Morocco—have already been taking concrete action and leading the way by implementing fossil fuel to clean energy swaps. Sharing their experiences is a key tool to show how swaps can be implemented and that a clean energy transition funded by subsidy reforms is a feasible option for other countries. Going forward, governments have an opportunity to focus on higher-impact swaps by redirecting support to large-scale on-grid renewables and implementing mechanisms to leverage private finance for clean energy projects.

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