



REPORT

ENERGY SUBSIDY REFORM IN ACTION

FROM AMBITION TO ACTION

Practical Insights on Energy Subsidy Reforms

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Defne Gencer and Beatriz Arizu

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The Energy Sector Management Assistance Program (ESMAP) is a partnership between the World Bank and [over 20 partners](#) to help low- and middle-income countries reduce poverty and boost growth through sustainable energy solutions. ESMAP's analytical and advisory services are fully integrated within the World Bank's country financing and policy dialogue in the energy sector. Through the WB, ESMAP works to accelerate the energy transition required to achieve [Sustainable Development Goal 7](#) (SDG7), which ensures access to affordable, reliable, sustainable, and modern energy for all. It helps shape WB strategies and programs to achieve the [WB Climate Change Action Plan](#) targets. Learn more at: <https://www.esmap.org>.

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ABOUT THIS SERIES

This report is part of the “Energy Subsidy Reform in Action” series produced by the ESMAP Energy Subsidy Reform Facility, with the objective of drawing insights from recent experiences and emerging approaches related to reform of energy subsidies in developing countries. The series includes issue-specific reports from various relevant domains such as energy sector reform, macroeconomic and fiscal policy, carbon pricing, poverty and distributional analysis, social protection, political economy, and communications.

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Abbreviations

CGE	computable general equilibrium
CO	carbon monoxide
DPF	Development Policy Financing
ESMAP	Energy Sector Management Assistance Program
ESRF	Energy Subsidy Reform Facility
ESRAF	Energy Subsidy Reform Assessment Framework
ETS	emissions trading system
FB	fiscal burden
FV	financial viability
IPF	Investment Project Financing
LPG	liquefied petroleum gas
OECD	Organisation for Economic Co-operation and Development
PEA	political economy analysis
PforR	Program for Results
SP	social protection
TCP	total carbon price
VAT	value added tax
WHO	World Health Organization

All currency is in United States dollars (US\$, USD), unless otherwise indicated.

Foreword



Governments around the world spend hundreds of billions of dollars on energy subsidies every year. There are several issues with that: first, although these subsidies are aimed to help make poor people's energy needs more affordable, they frequently end up benefiting richer households who consume more energy. Second, they come with significant fiscal costs for governments. The funds spent on subsidies could instead be channeled towards more effective policies that benefit the poorest or delivering cheaper and cleaner energy for all. Third, energy subsidies, in particular those for fossil fuels, are responsible for avoidable greenhouse-gas emissions, as they artificially lower the price of the most polluting energy sources, while discouraging investments in renewable energy and energy efficiency.

This report marks the tenth-year anniversary of the first technical assistance grant from ESMAP's Energy Subsidy Reform Facility (ESRF). Since its establishment, ESRF has been working to convert ambition, ideas, and knowledge on energy subsidy reform into action. To date, ESRF has provided over US\$28 million in demand-driven technical assistance grants to support numerous energy subsidy reform initiatives in over 75 developing countries. This support translated to real impact on the ground by supporting governments as they approved critical policy and regulatory reform steps, setting energy prices that are more closely aligned with costs and introducing targeted measures to mitigate the impact of price increases. These actions, in turn, helped improve the sectors' financial performance and freed up fiscal resources. In the 2021-2024 period alone, reform initiatives

supported through ESRF grants contributed to over US\$ 4.5 billion in fiscal savings that governments could use for other priorities. ESRF support also helped leverage substantial development financing, including by informing the preparation of 78 World Bank lending operations corresponding to a US\$27 billion financing volume – nearly 100 times the grant funding.

The geopolitical context of the last few years has only rendered this work more relevant. Amid political crises and commodity price shocks, governments around the world have substantially increased subsidies for the consumption and production of energy. Going forward, as the world faces increasingly complex challenges – from poverty alleviation to tackling climate change and facilitating a just energy transition – pursuing macroeconomic and fiscal sustainability will require continued technical assistance and support.

A culmination of a decade of experience, this report summarizes emerging evidence and practical approaches for the reform of energy subsidies, drawing on experiences under ESMAP-funded technical assistance and those documented in recent literature. It also brings together eight technical reports, each with a focus on specific aspects of energy subsidy reform, ranging from in-depth analyses of energy sector performance, to assessment of potential macroeconomic, fiscal, firm and household -level impacts, to understanding political economy contexts, and development of mitigation measures and communication strategies to support reforms. It distills ten years of experience and insights from these reports into a set of 12 steps aimed at supporting developing countries practitioners in their reform efforts.

An overarching insight from the report is the importance of an integrated approach for reform design and implementation, taking into account the drivers of subsidies, potential impacts of different reform options, the critical role of mitigation measures in addressing critical impact, and understanding of political economy context to guide reform timing and phasing. It also highlights the importance of government ownership, concerted action across key agencies, effective stakeholder engagement and communications.

At the World Bank and ESMAP, we stand ready to continue supporting our client governments, working with our donors and development partners, to make progress toward shared prosperity on a livable planet.

Guangzhe Chen
Vice President for Infrastructure
The World Bank

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The report builds on extensive technical background work done as part of a stocktaking study on energy subsidy reforms, focusing on insights from emerging research and real-world approaches to supporting developing countries in reforming energy subsidies. This report is the final output of this study that involved a multiyear collaboration between the Energy and Extractives Global Practice and the Macroeconomics, Trade and Investment; Social Protection and Jobs; Poverty and Equity; and Climate Change Practices of the World Bank. The main chapters of this report (chapters 2–10) summarize the background research and analysis carried out as part of the study, including the set of technical reports published under ESMAP’s “Energy Subsidy Reform in Action” series. The reports were funded by the ESMAP Energy Subsidy Reform Facility (ESRF). The authors of each chapter are listed below.

- [Chapter 1](#) was authored by Defne Gencer, Min A Lee, and Beatriz Arizu, and draws on a review of the portfolio of ESMAP Energy Subsidy Reform Facility technical assistance grants carried out by Min A Lee.
- [Chapter 2](#) is based on the ESMAP Technical Report titled “[Approaches and Insights from Recent Research on Energy Subsidy Reform](#),” authored by Robert Bacon and Defne Gencer.
- [Chapter 3](#) was drafted by Beatriz Arizu and Defne Gencer, and is based on a review of reports and outputs of a set of ESMAP ESRF-funded technical assistance activities, carried out by Prudence Dato, with inputs from Min A Lee and Joeri de Witt, who conducted the review of policy lending operations, as presented in [appendix A](#).
- [Chapter 4](#) is based on the World Bank report titled “[Subsidizing Bottled Gas: Approaches and Effects on Household Use](#)” by Masami Kojima.
- [Chapter 5](#) is based on the ESMAP Technical Report titled “[Macroeconomic Modeling and Energy Subsidy Reform Policy Dialogue](#),” by Dominique Njinkeu, Calvin Djiofack, Defne Gencer, Lulit Mitik Beyene, and Mosuru Olukayode Alli.
- [Chapter 6](#) is based on the ESMAP Technical Report titled “[Total Carbon Pricing for Energy Consumption: The Importance of Energy Taxes and Subsidies](#),” by Paolo Agnolucci, Defne Gencer, and Dirk Heine.

- [Chapter 7](#) is based on the ESMAP Technical Report titled “[Distributional Analysis for Informing Energy Subsidy Reforms: Review of Recent Approaches](#),” by Anne Olivier, Mikhail Matytsin, and Defne Gencer.
- [Chapter 8](#) is based on the ESMAP Technical Report titled “[Cash Transfers in the Context of Energy Subsidy Reform: Insights from Recent Experience](#),” by Anit Mukherjee, Yuko Okamura, Ugo Gentilini, Defne Gencer, Mohamed Almenfi, Adea Kryeziu, Miriam Montenegro, and Nithin Umapathi.
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Key Findings

Governments' practice of spending substantial amounts of taxpayer money to artificially lower the cost of electricity, fossil fuels, or district heating is distortive and inefficient and therefore hampers development and the fight against climate change. In both developing countries and advanced economies, governments often subsidize energy sources and carriers, ranging from petroleum products such as gasoline, diesel, liquefied gas or kerosene, to electricity or district heating. This practice diverts funding from more pressing priorities such as healthcare, education, the fight against hunger, or supporting renewable energy.

Such energy subsidies, on which governments around the world collectively spend hundreds of billions of dollars each year, lead to well-documented negative impacts. Artificially cheap energy encourages households and firms to consume more than they need, use energy inefficiently, or waste it. Subsidizing the production and consumption of fossil fuel-based energy renders renewable energy sources less competitive, causing environmental damage and air pollution.

While energy subsidies are often intended to lower energy costs for poor people who depend on energy to cook their meals, study at night, or run their stores, the broad and indiscriminate application of subsidies ends up disproportionately benefiting richer households who consume more energy.

While the case for reforming energy subsidies is clear, implementing such reforms is politically and technically challenging. They require substantial efforts to develop, and success is hard to define, achieve, and maintain. Given the many challenges, it is no surprise that numerous reform efforts have failed either before or after implementation or have been reversed.

Given the challenges, designing and implementing energy subsidy reforms require a comprehensive effort. As outlined in ESMAP's Energy Subsidy Reform Assessment Framework (ESRAF), sustainable reforms need to be carefully prepared by combining in-depth understanding of countries' energy sectors, their macroeconomic and fiscal positions, poverty levels, and social protection systems. Consistent, clear and transparent public communication is equally critical.

Building on the ESRAF and drawing on recent research plus a decade of experience with country-specific technical assistance, ESMAP has distilled 12 practical steps for reforming energy subsidies:

- 1. Gain a solid understanding of the motivation for and impacts of energy subsidies.** Why are they under consideration or have already been implemented? Which incentives or disincentives do the subsidies provide? How have they impacted utility performance, finances, or investment decisions? How would a subsidy reform influence a country's energy sector or its performance?
- 2. Develop several reform options and alternative pathways.** To develop feasible and politically acceptable options, explore multiple scenarios for tariff or price increases, and analyze their implications for cost recovery, government budget, and impacts on consumers.
- 3. Understand who will be affected, how, and to what extent.** Carefully assess the potential impacts of reforms on the economy, on specific energy-consuming sectors, and on society.
- 4. Assess the political economy context.** Balance the technical work on reform preparation with efforts to understand the sectoral, institutional, and political dynamics. Combining quantitative analyses of potential impacts with qualitative inquiries will lead to reform designs and implementation approaches that are aligned with the country context and thus are more likely to be sustained over time.
- 5. Build mitigation measures into reform design and offer tangible benefits for society and the economy.** Surveys and analyses in developing countries have shown that energy subsidy reforms can be more acceptable if impacts of energy price increases are mitigated by offering other benefits, such as improvements in energy service quality or reliability, social assistance, or better healthcare, education, and transportation.
- 6. Channel fiscal savings from energy subsidy reforms towards mitigation measures and policy priorities.** Reducing spending on energy subsidies can free up budget resources which may be used to mitigate the impact of higher energy prices on energy consumers, promote economic growth, reduce poverty, support employment, or encourage private sector development (e.g., by lowering labor taxes, training employees, funding technology innovation or energy efficiency grants for firms). Freed-up funds may also be invested in infrastructure (e.g., rural electrification, renewable energy, road upgrades) or human development (e.g., schools, hospitals).
- 7. Be strategic about timing and sequencing of reform and mitigation measures.** For example, introducing mitigation efforts prior to launching the reform may help build trust in the reform plans. Gradual and moderate price increases, based on transparent adjustment formulas, can facilitate reform implementation.

- 8. Encourage government ownership and coordination across relevant government agencies.** Energy subsidy reforms are more likely to be successful when reform designs are aligned with the government's overall policy priorities and government agencies are well-coordinated in planning, public communication, and implementation.
- 9. Engage meaningfully and communicate clearly and often.** Energy subsidy reforms will be more successful if the government creates national awareness of subsidies' detrimental impacts and a recognition of subsidy reforms' benefits. To achieve this, clear, informative, and trustworthy public communication is critical.
- 10. Evaluate the impact of reform measures and refine designs based on implementation experience.** Practitioners should continuously evaluate reform implementation experience and use impact evaluations and stakeholder feedback to refine reform designs.
- 11. Never let a crisis go to waste and act fast when a reform opportunity presents itself.** Many energy subsidy reforms are carried out in the context of external shocks or macroeconomic crises, requiring governments to act swiftly. Therefore, policy makers must be prepared to seize the opportunity for reform, and their development partners must be ready to provide support.
- 12. View energy subsidy reforms through a broader reform lens.** Energy subsidy reforms occur in the context of wider energy sector policies, regulatory and institutional frameworks, and macroeconomic, fiscal, climate, environmental, or social policies. Policymakers and their development partners need to consider interactions between energy pricing policies and the broader policy and institutional frameworks across multiple policy areas. Coordinating actions among different reform efforts has the potential to amplify energy subsidy reforms' benefits.

In sum, energy subsidy reforms are an important, yet challenging, undertaking and careful planning and implementation increases their likelihood of success significantly. Thorough analysis, preparation, coordination, communication, and redirecting of government funds to pressing economic and social needs can yield the benefits to societies that such reforms promise. Examples include energy subsidy reforms in Ukraine, Dominican Republic, and Egypt during the 2010s. Implementing these reforms is critical because broad-based energy subsidies are ineffective in supporting the poor, distort markets, and obstruct the path to low-carbon economies.

Executive Summary

Context

Each year, governments worldwide spend substantial fiscal resources to artificially lower the cost of production and consumption of electricity, fossil fuels, or district heating, diverting resources away from other development priorities. In both developing countries and advanced economies, governments often subsidize energy sources and carriers, ranging from petroleum products such as gasoline, diesel, liquefied gas or kerosene, to electricity or district heating.

Energy subsidies, in particular fossil fuel subsidies, on which governments around the world collectively spent more than \$1.2 trillion in 2022, lead to multiple, well-documented negative impacts. Energy subsidies contribute to economywide economywide distortions, environmental damage, and disincentives to energy conservation, efficiency, and renewable energy development, in addition to the significant fiscal cost. Broad-based energy price subsidies are an inefficient way of reaching the poorest households, especially since most of the benefits of these subsidies tend to accrue to better-off households.

Developing country governments often must manage difficult energy policy tradeoffs. They need to meet the rising energy demands of their growing economies in a cost-effective manner while continuing to expand access to the unserved and managing the environmental and climate-related impacts of energy consumption. Governments must also maintain a balance between protecting firms and households from substantial energy cost increases and inflation while keeping fiscal costs and public debt risks manageable. In addition to these tradeoffs, governments around the world recently faced significant external pressures and shocks, including the COVID-19 (coronavirus) pandemic, demand- and supply-side constraints during the resumption of regular global economic activity, followed by the energy and food price shocks of 2022. Faced with multiple disruptions, many countries introduced, expanded, or reintroduced previously eliminated broad-based energy consumption subsidies. As a result, governments not only took on additional fiscal burdens and debt sustainability risks, but also slowed progress toward climate-friendly energy policies. Reforming energy subsidies is not only critical for the energy sector's financial viability, but also for macro fiscal sustainability, the energy transition, and bridging the gap between climate ambition and action.

Given that energy subsidies affect many stakeholders, their reform can be politically sensitive and requires a clear understanding of the key parties involved.

Energy subsidies are the outcome of a complex set of factors that include government policy goals for economic development and for the energy sector, and the interests and influence of stakeholders. Energy subsidy reforms are often politically sensitive because energy costs affect nearly all sectors of the economy, and the benefits of energy subsidies accrue to a range of stakeholders, including households and firms in major energy-consuming sectors such as transport, industry, and agriculture. Untargeted energy price subsidies do not only benefit the poor and vulnerable households, which genuinely need affordable energy services, but also help better-off households and firms—who tend to be members of an influential political constituency. For countries with fossil fuel resources, governments may regard energy subsidies as a way to share the benefits of natural resources with their citizens. Where government capacity for adequately delivering social assistance or essential human development and infrastructure investments is limited, energy subsidies may be used to help achieve redistributive objectives. The longer subsidies are maintained, the more engrained they become. When subsidies continue for extended periods, stakeholders become accustomed to them and expect them to last, regardless of whether they are needed or whether the original rationale for their introduction still holds, making removal or reform potentially politically risky.

In addition to their impact on various political constituencies, energy subsidy reforms are often carried out in challenging circumstances.

A large share of energy subsidy reforms around the world have been introduced in the context of macroeconomic crises or periods of substantial fiscal pressures. A macroeconomic or fiscal crisis or an external shock can provide an opportunity for governments to take rapid action on energy subsidy reform measures. However, during such times, firms and households are also likely to experience economic hardships. Hence, reform efforts may be subject to push back from a broad set of stakeholders with negative political consequences for the government. In view of the potential political costs, decisionmakers can be hesitant to pursue ambitious energy subsidy reforms despite their urgency and necessity.

Energy subsidy reforms require substantial effort to develop, and success is hard to define, achieve, and maintain. In view of the challenges described above, it is no surprise that there are numerous real-world examples where carefully designed reforms failed to be approved, implemented as planned, or sustained. International experience shows that there is no single formula or one-size-fits-all approach to energy subsidy reforms. Multiple factors can affect the implementation of reforms and the sustainability of their outcomes. These factors include reform objectives, design, and implementation approach, along with the political economy context, macroeconomic and fiscal circumstances, and energy sector dynamics in which reforms are attempted.

BOX ES.1

COMMON-SENSE STEPS FOR PRACTITIONERS

1. Gain a solid understanding of the motivation for and impacts of energy subsidies.
2. Develop several reform options and alternative pathways.
3. Understand who will be affected, how, and to what extent.
4. Assess the political economy context.
5. Build mitigation measures into reform design and offer tangible benefits for society and the economy.
6. Channel fiscal savings from energy subsidy reforms towards mitigation measures and policy priorities.
7. Be strategic about timing and sequencing of reform and mitigation measures.
8. Encourage government ownership and coordination across relevant government agencies.
9. Engage meaningfully and communicate clearly and often.
10. Evaluate the impact of reform measures and refine designs based on implementation experience.
11. Never let a crisis go to waste and act fast when a reform opportunity presents itself.
12. View energy subsidy reforms through a broader reform lens.

Key Elements of Designing Workable Subsidy Reforms

Given the multiple factors that can affect reform implementation and outcomes, the preparation of energy subsidy reforms requires an integrated approach. Such an integrated approach needs to combine a solid technical understanding with analysis of the energy sector plus macroeconomic, fiscal, distributional, and social protection considerations in addition to political economy and communications dimensions. The [Energy Subsidy Reform Assessment Framework \(ESRAF\)](#) developed by ESMAP, offers step-by-step guidance on each of those critical dimensions of reform.

Building on the Energy Subsidy Reform Assessment Framework and drawing on recent research plus a decade of experience with country-specific technical assistance, this report distills insights into a set of common-sense steps for practitioners supporting developing country governments in their reform efforts. These steps are summarized in box ES.1 and elaborated below.

1. Gain a solid understanding of the motivation for and impacts of energy subsidies.

Seek answers to questions such as: why are energy subsidies under consideration or have already been implemented? Which incentives or disincentives do the subsidies provide? How have they impacted utility performance, finances, or investment decisions? How would a subsidy reform influence a country's energy sector or its performance? Practitioners need to invest time and resources to gain a better understanding of these foundational elements before identifying reform options. It is also important to understand how subsidies are influenced by various policies, what their fiscal costs are, and who benefits from them. Experience with real-world reform efforts indicates that the availability of reliable data tends to be a challenge across sectors and countries. Therefore, practitioners must be transparent about available data and assumptions made.

2. Develop several reform options and alternative pathways. To develop feasible and politically acceptable reform options, explore multiple scenarios for tariff or price increases, and analyze their implications for cost recovery, government budget, and consumer impacts. Assessment of different adjustment trajectories for reaching cost-recovery tariff or price levels and phasing out subsidies can enable policy makers to identify different tradeoffs. It can also help make better-informed decisions on timing, scope, and scale of increases that may be appropriate in the respective reform contexts. Finally, it is important to keep in mind the difference between one-off actions and longer-term reform, such as systematic measures that eliminate the need for political authorities to make pricing decisions.

3. Understand who will be affected, how, and to what extent. Carefully assess potential impacts of reforms on the economy, specific energy-consuming sectors, and firms and households. Several tools and approaches are available to help practitioners assess potential reform impacts. The choice of which tool to use should be guided by government objectives, reform context, and data availability. For example, macroeconomic modeling can provide insights into impacts on key sectors, households, and firms, whereas distributional analysis can explore impacts on households in greater depth. Together, these analyses can reveal who benefits from existing energy subsidies and how their reform may affect households across various income levels. Understanding how reform options may affect stakeholders can help identify political economy constraints that need to be addressed, inform mitigation measures to be included in the reform design, and guide stakeholder engagement and communications to build support for reform.

4. Assess the political economy context. Balance the technical work on reform preparation with efforts to understand the sectoral, institutional, and political dynamics. Combining quantitative analyses of potential impacts with qualitative inquiries can contribute to reform designs and implementation approaches that align with the country context and thus are more likely to be sustained over time. Efforts to understand the political economy context should build on the quantitative analyses and assessment of potential impacts to fully understand all relevant factors that impact reform implementation.¹

5. Build mitigation measures into reform design and offer tangible benefits for society and the economy. Surveys and analyses in developing countries have shown that energy subsidy reforms can be more acceptable if impacts of energy price increases are mitigated by offering other tangible benefits, such as social assistance, improvements in energy service quality or reliability, or better healthcare, education, and transportation. Also, recent research indicates that energy price increases are not necessarily detrimental to all firms as impacts vary by sector and firm characteristics, and because most firms have multiple response mechanisms at their disposal. Together, these findings show that policies to mitigate potential reform impacts on stakeholders, and offering them tangible benefits alongside other reforms, can increase the acceptability of energy subsidy reforms. In this context, social protection in general, and cash transfers in particular, are essential for mitigating impacts on households, especially the poor and the vulnerable. In addition to social assistance, tangible benefits include improved energy service quality and reliability, better roads, health and education services, or employment support, along with measures to enhance households' and firms' ability to adapt to and gradually increase their resilience to energy price increases. These measures can also help build credibility and trust in the government.

6. Channel fiscal savings from energy subsidy reforms towards mitigation measures and policy priorities. Reducing spending on energy subsidies can free up budget resources which may be used to mitigate the impact of higher energy prices on energy consumers, and promote economic growth, improved welfare, and equity. As addressing the impact of higher energy prices on key stakeholders resulting from reforms tends to be a priority for governments, using those fiscal resources that reforms may free up to finance

mitigation measures can facilitate reform implementation and enhance the likelihood of success. Indeed, experience over the past two decades has shown that even when cash transfers were offered as part of energy subsidy reforms, most reforms generated net fiscal savings after those transfers. Where reforms generate adequate fiscal savings, a portion of the resources can be used for policy measures to promote economic growth, reduce poverty, support employment, encourage private sector development, or enhance resilience (e.g., by lowering labor taxes, training employees, funding technology innovation or energy efficiency grants for firms). Funds may also be invested in infrastructure (e.g., rural electrification, renewable energy, road upgrades) or human development (e.g., schools, hospitals). Combining these approaches can help address stakeholder concerns, and thus generate public support for reforms.

7. Be strategic about timing and sequencing of reform and mitigation measures. The timing and sequencing of reform actions and accompanying mitigation measures should be guided by quantitative analyses of potential economy-wide, sectoral, and firm- and household-level impacts and the qualitative analyses that capture additional dimensions. In some countries, especially where people lack confidence in the government's ability to deliver, introducing mitigation efforts prior to launching the reform helped build trust in the reform plans. In some reforms where cash transfers were introduced, governments started with broad-based and generous cash transfers to help soften the harshest impacts from reforms and adjusted the program parameters over time as consumers and the economy gradually adapted to the new cost environment.

8. Encourage government ownership and coordination across relevant government agencies. Research and practical experience show that alignment of reform design with governments' policy priorities, and continued government ownership and commitment throughout reform preparation and implementation are vital for achieving reform objectives. Settings where credible reform champions were present with a clear division of roles, and where mechanisms were in place for coordination among government stakeholders, tended to be more conducive to achieving reform objectives. The creation of reform coordination committees can help strengthen intragovernmental coordination by facilitating the alignment of communication approaches and messages across government agencies. While technical assistance can support governments in advancing their own reform agendas, it is ultimately up to the government to prioritize time and resources to reform implementation. Technical assistance can also help governments identify their capacity-building needs early on and, where needed, enhance decision-making and implementation capabilities.

9. Engage meaningfully and communicate clearly and often. Energy subsidy reforms will be more successful if the government creates national awareness and a shared understanding of the detrimental impacts of subsidies and a recognition of reforms' potential benefits. Experience shows that to achieve this, effective and meaningful engagement and communication with the public is crucial. The way the government engages and communicates with the public about the rationale, benefits, and scope of a proposed reform can have a significant impact on reform delivery and its outcomes. Using the understanding of

potential distributional impacts and citizens' preferences, needs, and priorities, along with the broader political economy context to inform the reform communications approach can pay strong dividends. In fact, one of the most noteworthy findings from recent technical assistance was that stakeholders across highly varied contexts were not uniformly or invariably opposed to subsidy reforms or energy tariff increases. Research indicates that reform design choices and clear, informative, and trustworthy communications can help improve the acceptability of reforms. The trustworthiness of the individuals delivering the messages is also important, and the presence of communicators who come across as honest, accessible, and easy to understand help overcome trust deficits.

10. Evaluate the impact of reform measures and refine designs based on implementation experience. It is vital for practitioners to continuously evaluate reform implementation experience and impacts and use the lessons from those evaluations to refine reform designs. This includes not only price-related elements but also the effectiveness of mitigation measures and communication efforts. Periodically assessing reform design, implementation arrangements, and the political economy context can facilitate the alignment with realities on the ground, thereby contributing to the achievement of reform objectives and reducing the risk of reversals.

11. Never let a crisis go to waste and act fast when a reform opportunity presents itself. Many energy subsidy reforms are carried out in the context of external shocks or macroeconomic crises, requiring swift action by governments. It is therefore important for policy makers to be prepared to seize the opportunity for reform, and for their development partners to be ready to provide support. To ensure readiness, practitioners should focus on putting in place a foundational, up-to-date understanding of energy sector performance drivers and pressure points and explore potential reform options ready for implementation as soon as there is an opening. Development partners should continue to provide technical support, even at times that may not be conducive to reform, to ensure implementation assistance can be ramped up as soon as the window of opportunity arrives. A set of rapid-response and transitional measures should also be identified so that existing social assistance mechanisms can be leveraged to support reforms.

12. View energy subsidy reforms through a broader reform lens. Energy subsidy reforms occur in the context of wider energy sector policies, regulatory, and institutional frameworks, as well as macroeconomic, fiscal, climate, environmental, or social policies. If subsidy reforms are not accompanied by efforts to reduce energy supply costs, strengthen competition, and enhance transparency, or are not coordinated with policies to expand access, decarbonize the energy sector, and scale up renewable energy and energy efficiency, the impacts of those reforms are likely to be limited. Indeed, real-world experiences indicate that energy subsidy reforms can lead to better results when they are accompanied by a package of policies and measures within and beyond the energy sector. They include improving the quality and reliability of energy services, strengthening social protection systems, leveraging digital technologies for targeting and delivery of social assistance,

along with energy efficiency support mechanisms that enhance households' and firms' ability to respond and adapt to energy price changes. In the medium term, these measures would need to be part of enhancements to macroeconomic, fiscal, social protection, and labor policies that support the energy transition and enable resilience to future shocks. Overall, understanding how policies in various domains interact with each other and taking coordinated action can enhance outcomes.

In sum, energy subsidy reforms are an important, yet challenging, undertaking and careful planning and implementation increases their likelihood of success significantly. Thorough analysis, preparation, coordination, communication, and redirecting of government funds to pressing economic and social needs can yield the benefits to societies that such reforms promise. Examples include energy subsidy reforms in Ukraine, Dominican Republic, and Egypt during the 2010s. Implementing these reforms is critical because broad-based energy subsidies are ineffective in supporting the poor, distort markets, and obstruct the path to low-carbon economies.

Learning from Recent Experience and Research to Guide Future Work

This report builds on the stepwise framework provided in ESMAP's Energy Subsidy Reform Assessment Framework (ESRAF) and complements it with insights and lessons from a stocktaking of research and technical assistance. This stocktaking effort, carried out between 2020 and 2023, reviewed evidence from research and explored how technical assistance for real-world reform efforts tackled the different reform dimensions. It resulted in a series of technical reports taking a deeper dive into research, empirical evidence, and practical experience in areas with gaps in global knowledge. This report provides a high-level overview of insights from the stocktaking effort and is directed at development practitioners supporting developing country governments. The accompanying technical reports, short summaries of which are included in this report, may also be of interest to ESMAP donors, researchers, and practitioners keen on exploring these topics in greater detail and who seek to understand recent research and real-world technical assistance supported by ESMAP's Energy Subsidy Reform Facility (ESRF).

The demand for technical assistance and cutting-edge global knowledge on energy subsidy reforms is likely to continue to grow. Given the scale of the challenge and the complexity of the issues, it is expected that developing country governments will continue to require increasingly sophisticated support from their development partners for the preparation and delivery of energy reforms. The alignment of technical analyses with government objectives and the reform context is important to ensure they are relevant in

informing reform efforts. Given the complexity of the topics involved, technical assistance for energy subsidy reforms will continue to require extensive preparatory work in multiple domains, and will have to incorporate emerging themes, such as digital technologies and resilience. In this context, there are several areas where additional global knowledge and analytical work would be useful, and chapter 11 explores some topics of interest.

Recognizing that energy subsidies are at the intersection of multiple policy domains and sectors, gradually moving away from a single sector or single topical lens toward an integrated policy perspective is essential. It is important to recognize the interaction between energy, climate, and fiscal policies as well as policies related to sectors such as agriculture, transport, and fisheries in addition to trade, and to move toward an approach that involves coordination across sectors, relevant government agencies, and development partners. Although the set of policies in each country will vary based on the specific economic, social, and political conditions, understanding the interaction of different policies and seeking out opportunities and mechanisms for coordination across domains is vital.

Endnotes

- 1 Given the importance of the political economy in affecting reform outcomes, an encouraging observation from the review of recent ESMAP-funded technical assistance is that 77 percent of the relevant activities between 2014 and 2020 involved support for the preparation of political economy analyses and communication strategies. This represents a marked improvement over the levels reported by Inchauste and Victor (2017, 2), that an “internal stocktaking of analytical reports on energy subsidies by Bank teams over the past 10 years found that only a quarter of them undertake some analysis of the political economy of reforms.”





ONE

The Challenge of Reforming Energy Subsidies



Energy subsidies continue to persist even though their negative impacts are widely documented. Energy subsidies are deliberate policy actions by governments that specifically target electricity, fuels, or district heating and that result in a reduction in the net cost of energy purchased, a reduction in the cost of energy production or delivery, or an increase in the revenues retained by those engaged in energy production and delivery (Kojima 2017). Although the drivers of energy subsidies diverge from country to country, the stated objectives of government action to subsidize the production and consumption of energy tend to involve a combination of policy makers wanting to keep energy affordable for households, manage the impacts of energy price volatility, maintain the competitiveness of exporting firms, and encourage the development of indigenous resources. Over the years, the negative effects of energy subsidies have become increasingly visible: they cause economywide distortions and have significant fiscal, distributional, and environmental impacts. Despite the stated goal of keeping energy affordable for the poor, broad-based, untargeted energy consumption subsidies tend to disproportionately benefit wealthier citizens who use more energy than the poor (IMF 2013). They create an uneven playing field between fossil fuels and cleaner alternatives while providing incentives for energy waste, and are overall environmentally harmful and undermine climate change mitigation efforts.

Governments around the world have been spending substantial fiscal resources to subsidize the production and consumption of energy, diverting valuable resources away from other development priorities. Energy subsidies have been rising gradually over the past decade. After declining briefly during the COVID-19 (coronavirus) pandemic, subsidies rebounded, driven by rising oil prices and government support measures introduced in response to the commodity price shocks. According to a World Bank report, from early 2022 to mid-2023, governments around the world announced more than 161 energy-related measures, including subsidies for electricity, transport, and electric vehicles, as well as fuel subsidies (Gentilini et al. 2023). The analysis found that, over that period, 65 governments introduced 84 measures to reduce fuel prices by fixing or partially subsidizing prices. The analysis estimates the cost of those measures to be US\$88.8 billion and their coverage to be 18.3 million individuals. Moreover, 77 measures across 47 economies were introduced to reduce utility bills (electricity, water, and heating). The International Energy Agency estimates that by the end of 2022, fossil fuel consumption subsidies exceeded US\$1.2 trillion, and the OECD estimates that another US\$428 billion was spent by governments in the form of direct transfers and tax expenditures allocated for support measures for fossil fuels. This figure that governments around the world are estimated to have collectively spent to subsidize the consumption and production of energy is in stark contrast to the annual funding needed to achieve Sustainable Development Goal 7 on universal access to modern energy services—estimated to require about US\$40 billion per year for electricity and US\$4 billion per year for clean cooking by 2030.

As governments work to strengthen the energy sectors in their countries to meet growing demand from households and firms while keeping energy affordable, action on multiple fronts is required. To enable the sector to raise enough revenue to operate, maintain, and invest in systems that can meet rising energy demand and expand access while facilitating the energy transition, addressing energy subsidies, reducing energy costs, and getting energy prices right are critical. Energy subsidy reform is essential not only for the financial viability and sustainability of the energy sector, but also for achieving decarbonization and the clean energy transition.

Experience has shown that reforming energy subsidies can be challenging, resource intensive, and politically sensitive. Implementation experiences and challenges with real-world efforts to reform energy subsidies are documented and lessons drawn in recent literature, in particular Clements et al. (2013), Inchauste and Victor (2017), Kojima (2009, 2013, 2016, 2021), Parry et al. (2014), Vagliasindi (2012), Whitley and Van der Burg (2015), as well as OECD and IEA (2021). International experience shows that a comprehensive effort to reform energy subsidies would require gaining an understanding of the impact of energy subsidies and options for reform on macroeconomic, fiscal, household, firm, and environment aspects, along with the political economy within which the reforms are being considered. This understanding would then need to be reflected in the reform design itself.

Supporting Developing Countries in their Reform Efforts

Given the complexity of the topics involved in the reform of energy subsidies, and the range of analyses that need to be carried out, developing country governments may choose to supplement their in-house expertise and knowledge with additional resources, expertise, and international experience. When governments require technical assistance, one of the ways in which they may receive this support is ESMAP, which is a multi-donor trust fund hosted by the World Bank that provides technical and financial support for developing country government efforts to strengthen sector policy and regulatory environment, develop markets and competition, strengthen utilities, plan for sector investments to meet growing demand and expand access to modern energy services, and facilitate renewable energy development and energy efficiency scale-up, among others. The Energy Subsidy Reform Facility (ESRF) under ESMAP was established in 2013 to support developing country governments in designing and implementing energy subsidy reform efforts. In addition to technical assistance grants for supporting in-country analytical work and policy advisory and lending engagements, ESRF also contributes to the global knowledge base on energy subsidy reform by developing knowledge products that provide an analytical basis for real-world action. ESRF also engages in global outreach to diverse

stakeholders and communicates on key agenda items. The main ways in which ESRF supports developing country governments in their energy subsidy reform efforts are provided in box 1.1.

Since its establishment, there has been growing demand for ESRF support. As of May 2024, ESRF had provided 102 grants for technical assistance, corresponding to US\$28.4 million in funding. In 2023 alone, the volume of grant funding provided by ESRF stood at US\$ 1.91 million and informed the design of seven World Bank lending operations approved in fiscal year 2023, with a total funding envelope of US\$1.9 billion. As of May 2024, there were 32 grants under implementation, supporting energy subsidy reform for liquid fuels, electricity, and district heating in various regions. As a demand-driven facility, the nature and scope of the activities it supports is guided by developing country governments' requests for support for meeting technical and capacity-building needs related to energy subsidies.

BOX 1.1

PILLARS OF ESRF SUPPORT

Grants for technical assistance

ESRF provides technical assistance grants and advisory support to governments' subsidy reform initiatives. This support is primarily provided through grants to multisectoral World Bank teams working with governments. ESRF can also provide recipient-executed grants for implementation of reforms, including for strategic communications.

Knowledge creation and sharing

ESRF produces knowledge products for development practitioners and policy makers, drawing insights from real-world experience and consolidating emerging global knowledge. A major knowledge product is the Energy Subsidy Reform Assessment Framework (ESRAF), a toolkit for evaluating reform options to support government efforts.

Global outreach and advocacy

ESRF contributes to the global conversation on energy subsidy reform by disseminating lessons from country experiences, cooperating with development partners, conveying messages on key agenda items and action points, and engaging stakeholders in knowledge sharing and collaboration.

The technical assistance and analytical work supported by ESRF translates into real-world impacts by contributing to governments' own policy deliberations and by informing World Bank lending. The majority of ESRF-funded technical assistance and advisory activities produced analyses and insights that helped inform governments' own deliberations in the context of their broader reform efforts. The analytical activities were used by governments as they worked to introduce or revise policies, presidential decrees, memoranda, tariff decisions, tariff increase notifications, and new methodologies, as well as new sector performance improvement plans. The technical assistance also helped inform a significant volume of development financing. Development Policy Financing (DPF) corresponded to the largest financing volume,¹ followed by Investment Project Financing (IPF) and Program for Results (PforR) operations.² As of March 2024, the technical assistance activities funded by ESRF had informed the preparation or implementation of 78 World Bank lending operations with a total financing volume equivalent to US\$27 billion. Of this total, 50 were DPF operations, 20 were IPFs, and 5 were PforRs. Given the significance of DPFs in supporting energy subsidy reforms, a review of recent DPF operations with policy actions involving macrofiscal and energy sector reforms was undertaken. [Appendix A](#) presents a summary of this review, including an overview of energy subsidy reform-related policy actions supported through DPFs as a key World Bank lending instrument for supporting reforms.

ESRF complements technical assistance with the generation, consolidation, and sharing of energy subsidy reform knowledge, experience, and research.

Complementing and building on technical assistance activities, it produces a range of knowledge products, ranging from topical papers to the comprehensive Energy Subsidy Reform Assessment Framework (ESRAF). ESRAF draws on lessons from relevant country experience and analytical work and includes a series of issue-specific good practice notes covering the main elements of a comprehensive reform approach. It provides step-by-step guidance for identifying and quantifying energy subsidies; assessing the fiscal cost of subsidies and the fiscal impact of reform; analyzing the incidence of subsidies and potential reform impacts on households; assessing the readiness of social safety nets to mitigate the impacts of reform; evaluating macroeconomic impacts along with global externalities, air pollution, and health impacts; and understanding the political economy context and designing effective communication approaches.

About This Report: Objectives, Scope, and Approach

This report is the outcome of a multiyear effort by ESRF. The overall objective is to contribute to the global knowledge base on energy subsidy reforms by drawing insights from emerging research and real-world approaches to supporting developing countries in reforming energy subsidies and filling key knowledge gaps. This exercise, referred to in short as the “energy subsidy reform stocktaking study,” was carried out between 2020 and 2023 in collaboration with various global practices of the World Bank, and focused on gleaning emerging insights from recent research and real-world experiences. As a contribution to the growing global knowledge in the field, this study aims to build on the framework provided in ESRF and to complement the “how to” guidance it provides by offering practical approaches and insights from real-world technical assistance activities that ESMAP has supported over the years.

The study started with a broad-based review of recent research and evidence on energy subsidy reforms. This review summarized the evidence, analytical approaches, insights, and themes emerging from recent energy subsidy reform literature and identified areas for further research. This early-stage review informed the design of the subsequent activities under the study using the following approach: First, where the early-stage review identified prevalent emerging themes and areas of focus in the literature, assessments of real-world practices and technical assistance focused on those themes in developing countries were carried out. Second, where the review identified gaps in knowledge and research, theme-specific papers were commissioned to conduct further research and contribute to filling those gaps. In the review of real-world experiences and technical assistance, the study drew on a select set of activities supported by the World Bank and ESMAP. Specifically, the review explored activity designs, analytical methods, and implementation approaches deployed in real-world energy subsidy reform efforts in developing countries where governments requested support from the World Bank and ESMAP, through ESRF. The study resulted in a number of technical background reports that were published by ESMAP under the “Energy Subsidy Reform in Action” series. The series includes reports on macroeconomic modeling, poverty and distributional analysis, social protection, carbon pricing, and political economy and communications, among others. The technical background work was the outcome of theme-specific collaborations among Energy and Extractives, Macroeconomics Trade and Investment, Social Protection and Jobs, Poverty and Equity Global Practices, and the Climate Change Practice of the World Bank.

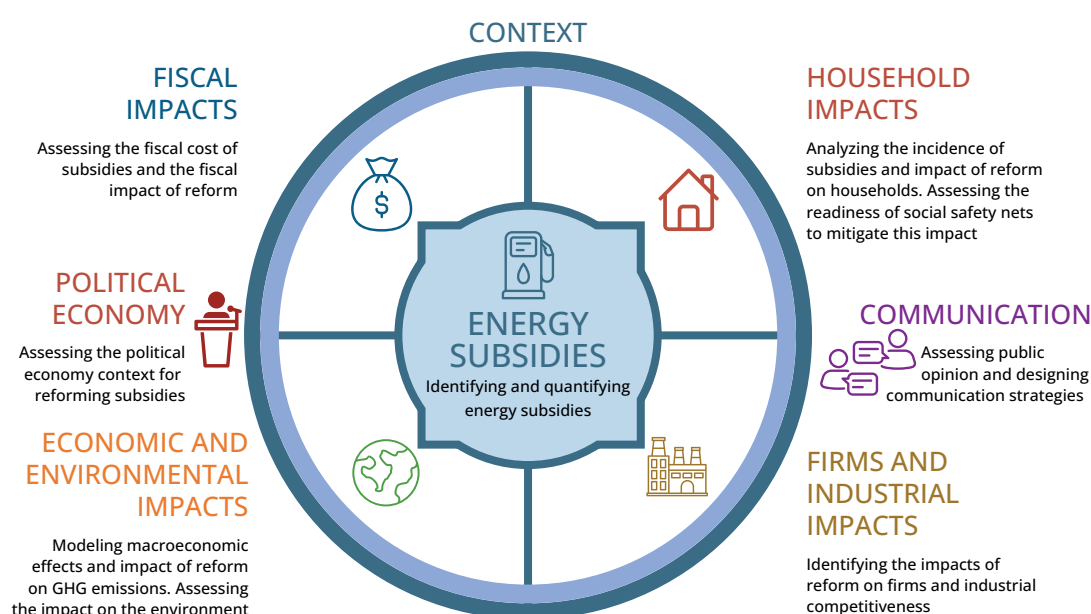
This report, the final output of the stocktaking study, is intended to synthesize and consolidate the main themes from the in-depth analyses presented in the technical background work for the benefit of a primary target audience of development practitioners. To this end, the report draws on extensive technical background work and

attempts to offer practical insights into navigating energy subsidy reforms. It explores not only the practical and analytical approaches that can inform the substance of reforms themselves, but also discusses the ways in which governments' own efforts can be supported by development partners through technical assistance.

Report Structure

The report comprises 11 chapters that draw on the various elements of the background work. Some of the chapters focus on filling the knowledge gaps identified in the literature review by consolidating research, reviewing available evidence, and bringing new knowledge, while others focus on complementing the available research with practical information, drawing evidence and insights from real-world reform efforts, exploring how select topics were approached and how methodological questions were tackled in practice in technical assistance experience, and some of the chapters do both. The flow of the chapters is intended to walk the reader through the main elements of the step-wise approach followed in ESRAF, illustrated in figure 1.1. Accordingly, after reviewing recent literature, the report starts with exploring the analytical foundations required for understanding the drivers of energy subsidies and informing the development of reform options. The focus of the report then turns to potential impacts from reforms (beginning with the macroeconomic level, then moving to households, firms, and political economy

FIGURE 1.1
ESRAF and its elements



implications). The report then explores approaches for identifying and assessing potential impacts from reforms, followed by a discussion of mitigation of impacts on and engagement with key reform stakeholders.

The organization of chapters is presented below, and box 1.2 maps the chapters to the study objectives.

- [Chapter 1](#) offers an introduction and overview and sets the stage for the subsequent chapters that summarize the main findings and themes emerging from the background research and more comprehensive analyses in the technical background reports.
- [Chapter 2](#) summarizes the findings of the review of recent literature carried out to understand emerging approaches, evidence, trends and major strands of thinking related to energy subsidy reforms. Findings from this review guided the design of the study and informed the scope of the technical reports that were subsequently commissioned.
- [Chapter 3](#) explores the foundational energy sector analyses that need to be done in the context of broader energy subsidy reform engagements. To this end, the chapter explores the range of energy sector-specific analyses carried out in the context of ESMAP-funded technical assistance and advisory support provided by the World Bank to developing country governments and discusses how these analyses contributed to real-world reform efforts.
- [Chapter 4](#) takes a deep-dive into approaches to subsidizing bottled gas and discusses the findings of a comprehensive review of international experience.
- [Chapter 5](#) turns to approaches for understanding the impacts of energy subsidies and their reform, discussing the approaches for use of macromodeling tools and, in particular, computable general equilibrium (CGE) modeling, for assessing economywide impacts.
- [Chapter 6](#) presents the total carbon price (TCP) concept to highlight the importance of understanding the interaction of energy subsidies with energy taxation and direct carbon pricing instruments, and the price signals and economic incentives sent to a wide range of economic actors and sectors when these tools are combined.
- [Chapter 7](#) discusses the different approaches to identifying and analyzing the impacts of energy subsidies and their reform on households, and reviews examples of how these approaches were applied in real-world reform efforts supported by ESMAP.
- [Chapter 8](#) discusses the role of social protection, and in particular, cash transfers in mitigating potential impacts of reforms on households and draws on a global stocktaking of two decades of subsidy reforms, as well as cases where ESMAP support was provided.
- [Chapter 9](#) turns to the firm-level impacts of energy price increases, on which relatively limited research and evidence was available until recently, and explores what evidence and insights are available in recent literature on how policy-induced energy price changes affect firms as key economic actors, and how firms respond to those changes.
- [Chapter 10](#) highlights the importance of the political economy in influencing energy subsidy reform outcomes and reviews the role of political economy analyses and communications in ESMAP-funded technical assistance for specific reform initiatives.

- [Chapter 11](#) concludes the report by reflecting on takeaways on the substance of energy subsidy reforms, discusses insights into future technical assistance to support developing country governments in their reform initiatives, and presents potential areas for future analytical and knowledge work.

BOX 1.2

MATCHING STUDY OBJECTIVES WITH CHAPTERS

Objective: Contribute to the global knowledge base on energy subsidy reforms by

(1) Consolidating research and filling knowledge gaps

- Broad review of recent literature to document trends and emerging evidence ([chapter 2](#))
- In-depth global stocktaking of developing country experiences with bottled gas subsidies ([chapter 4](#))
- Broad review of use of macro-modeling, and in particular, CGE modeling, for energy subsidy reforms ([chapter 5](#))
- Novel approach to understanding fiscal, climate, and energy policy interactions: the total carbon price ([chapter 6](#))
- Comprehensive stocktaking of cash transfers and energy subsidy reforms, 20 years of reform episodes, designs, and country cases ([chapter 8](#))
- Extensive review of evidence on firm-level impacts of price increases, given relatively limited emphasis in literature to date ([chapter 9](#))

(2) Drawing evidence and insights from real-world reforms

Complementing recent research with review of real-world technical assistance activities, exploring how practitioners tackled emerging themes and approaches in key areas:

- Energy sector analyses and development of reform options ([chapter 3](#))
- Macroeconomic modeling of reform options ([chapter 5](#))
- Analysis of potential distributional impacts of reforms on households ([chapter 7](#))
- Use of cash transfers to support reforms ([chapter 8](#))
- Political economy and communications ([chapter 10](#))





TWO

Energy Subsidy Reform: Emerging Approaches and Insights from Recent Research



The Why: Background to the Review

In the past decade there have been multiple efforts worldwide to reform energy subsidies, each of them rendering valuable insights, and along with them, extensive analyses at country, regional, or global levels. Numerous articles and reports have been published documenting country experiences, identifying emerging approaches, and analyzing different dimensions of energy subsidy reforms, including their impacts on the economy and society. Although some of these ex ante or ex post analyses deployed standard, well-established approaches, several applied novel approaches or adapted methods from other academic disciplines.

In the energy subsidy reform literature, some themes have been less frequently covered than others, indicating potential areas that would benefit from additional work. The areas identified as requiring further research, analysis, and consideration enabled directing the focus of subsequent technical work on these less explored topics. The purpose of the technical work was to help fill knowledge gaps in these areas, and thereby contribute to strengthening the global knowledge base on energy subsidy reforms.

A review of the recent literature is a natural starting point for an exercise aimed at better understanding emerging approaches, evidence, and knowledge on energy subsidy reforms. Learning about real-world experiences and approaches to energy subsidy reform, understanding emerging ways of analyzing and addressing reform impacts, and documenting commonly encountered challenges to reform implementation and sustainability are critical. Capturing emerging approaches and identifying knowledge gaps can inform work that can help generate useful insights for practitioners, policy makers, and implementers of energy subsidy reforms. It is within this context that a review of the recent literature was carried out by ESMAP's Energy Subsidy Reform Facility (ESRF) as part of its multiyear and multidisciplinary stocktaking study on energy subsidy reforms.

The What: Review of Emerging Approaches and Analyses in Energy Subsidy Reform

A review of the recent literature on energy subsidy reforms was carried out to gain an understanding of emerging approaches, evidence, trends, and major strands of thinking related to energy subsidy reform and to identify areas for future work. This review explored the main elements and findings from recent research, analyses, and real-world experiences. The full literature review is presented in ESMAP's Technical Report titled "[Energy Subsidy Reform: Emerging approaches and insights from recent research](#)," and is summarized in this chapter. Findings and insights from the technical background

work that was informed by this review are summarized in subsequent chapters of this report. The review also formed the basis for subsequent technical work resulting in background reports to the stocktaking study and that were published as separate ESMAP technical reports.

The review focused on major policy and academic journals, and was carried out in two phases, one at the beginning and one near the conclusion of the stocktaking study. A select set of 12 policy and academic journals focusing on energy policy, economics, and other related fields were screened to identify relevant articles on subsidies for the production and consumption of fossil fuels and of electricity. The review was carried out in 2020, at the outset of the stocktaking study, and was updated in early 2022 as the background reports neared completion. The 2020 review covered more than 90 articles published during the period January 2015 to December 2019. The 2022 update covered the 2020–21 period and reviewed 22 articles to identify any new trends, approaches, or major research that had become available over the course of the study, and indeed identified work that covered topics and methods that were previously given little or no role in the literature. The literature reviewed focused primarily on developing countries; however, research on high-income countries was included when it offered lessons that could be relevant for a broader group.

The How: Review of Main Findings and Evidence From Recent Research

The review involved an exploration of the recent literature’s scope, coverage, analytical approach, findings, and conclusions. Based on an in-depth review of articles selected after the screening process, the analysis identified common themes and trends related to coverage, focus, and approaches. The approaches of recent research were also compared with earlier literature, and changes in methodology and focus were identified. The review dedicated special attention to studies adopting new or innovative approaches.

The literature reviewed was categorized by theme. The articles surveyed in the initial review carried out in 2020 (covering literature from the 2015–19 period) was organized into four main themes: (1) definition and measurement of energy subsidies, their magnitude, and models for determination of optimal subsidies [11 articles]; (2) lessons from energy subsidy reform experiences [18 articles]; (3) quantitative impacts of subsidy reforms on households, firms, and the macroeconomy [59 articles]; and (4) political economy of subsidy reforms [4 articles]. The majority of the articles reviewed fell into one of these categories; the few that did not neatly fit into this framework were categorized into the closest theme. Main findings under each theme are summarized in the subsequent paragraphs, with ideas for future work presented in italics.

In the period reviewed, the literature on the definition and measurement of subsidies and models of optimal subsidies mainly builds on and consolidates extensive work from the past. The literature published in the 2015–19 period mainly involved reviews and consolidation of earlier ideas and definitions, with some updating of historical material. In these papers, the analysis of energy subsidies and their reform typically tended to attempt to answer the following questions: (1) what constitutes an energy subsidy, and (2) how large (and significant) were energy subsidies? There are fairly well established, though varied, approaches to defining and quantifying energy subsidies used by agencies active in this space. Key international agencies continue to periodically publish estimates of global energy subsidy totals following their preferred approaches and methodologies. *Substantive new work to further define or quantify subsidies does not appear to be necessary. However, communication about the differences between the approaches and the large variation in estimates published by different entities can be useful for practitioners and policy makers.*

The literature on energy subsidy reform experiences focused on the efforts of countries that attempted reforms, documenting experiences with those that were implemented as planned, or that failed, paused, or were reversed. Several of the studies attempted to draw insights into reform drivers, outcomes, and factors that affected those outcomes and to come up with lessons and principles for future reforms. Some articles and books focused on lessons learned in specific country cases, whereas others aimed at broader lessons from multicountry cases. Several studies highlighted the substantial role of international oil prices in influencing the viability of energy subsidy reform efforts. Other studies emphasized the importance of understanding and mitigating the distributional impacts of reform, in particular, on the lowest income groups, whereas focus on impacts on firms was fairly limited. *Continued monitoring of country experiences could provide a long timeline of events that may have affected the scale of subsidies and could provide more lessons about factors that contribute to reform outcomes.*

The papers and studies covered in the review took a more systematic approach to understanding the political economy of energy subsidy reform. Earlier literature published prior to this period, for the most part, treated political economy as a separate factor in the overall explanation of the success or failure of reforms. The studies covered in the literature review, published between 2015 and 2022, on the other hand, introduced more formal frameworks for the role of political economy and offered alternative explanations for the path and outcomes of reform efforts in the countries analyzed. Some new areas were introduced, including analysis of the role and behavior of international institutions. The use of opinion surveys to supplement quantitative analyses appeared to offer insights that may be helpful for rendering a more comprehensive understanding of the potential impacts of reform, perceptions, and possible coping mechanisms. *Collection of survey data, and analysis of societal and industrial perspectives on energy subsidy reform to get a sense of potential support, would be valuable. Furthermore, the use of before and after surveys can be a valuable tracking tool for monitoring factors influencing support.*

The group of studies analyzing the quantitative impact of subsidy reforms comprised the largest share of the literature reviewed. Quantitative impacts were studied with respect to households, businesses, and the whole economy, but until recently the overwhelming topic of interest has been the impact on households. The impact on households was often coupled with considerations of income distribution and methods of support for low-income households most affected by subsidy removal. This aspect has strong links to the political economy, where considerations of the existence of winners and losers, and their ability to promote or hinder reform, can provide clues to the identification of the conditions required for the successful removal of a subsidy. *Building on work done to date, a review of practical approaches to assessing distributional impacts and discussion of the suitability of approaches in varied contexts can be useful. Further investigation of the impact of energy cost increases due to subsidy removal on firms could be interesting.*

A variety of methods were used for evaluating the impact of subsidy reforms, with varying degrees of complexity. The methods ranged from simpler approaches focusing only on the direct impact of energy price increases and zero demand elasticity, to fairly sophisticated computable general equilibrium (CGE) models allowing for the incorporation of indirect effects, economywide transmission of energy price impacts, elasticities, and substitution. An interesting finding of the literature review was the growing use of CGE modeling in the context of energy subsidy reforms. The review also found that there is relatively limited guidance on model choice for researchers looking to use a CGE-type approach to evaluating the impact of reforms on the entire economy. *An extensive write-up on approaches to CGE models for analyzing energy subsidy reform, as well as a comparison of aims, methods, and results of different modeling options, could be valuable.*

What Next: Key Takeaways and Areas for Future Work

The literature review identified various topics for which additional analysis and research could make useful contributions to the global knowledge base on energy subsidies.

Select topics identified by the literature review as areas where additional analysis and research could be useful, were the focus of subsequent technical work. These topics were explored in ESMAP Technical Reports that document main approaches, recent literature, and practical experiences from real-world reform efforts. These served as technical background reports to this study, and are summarized in this report: distributional analysis to assess potential reform impacts on households ([chapter 7](#)); the use of cash transfers to support reforms ([chapter 8](#)); CGE modeling for assessing the economywide impact of reforms ([chapter 5](#)); research on the impact of energy subsidy reforms on firms ([chapter 9](#)); and practical approaches for assessing political economy and communicating on reforms ([chapter 10](#)).

Other topics highlighted by the literature review can form the basis for future analytical work in this space. Possible topics are listed below:

- Tracking of reform implementation performance in developing countries over longer periods to provide insights into the stability and evolution of reforms
- For understanding the impacts of reform on households, exploration of dimensions of the vertical and horizontal distribution of benefits and impacts
- Analysis of price elasticity of demand and assessment of indirect relative to direct price effects across a wide range of countries
- For firms, in-depth investigation of the relation between energy costs and competitiveness of firms throughout the economy, if suitable data are available
- Analysis of the relative value of energy subsidies to the different agents, including cross-subsidies, subsidies between firms and households, or subsidies between industries
- For macroeconomic modeling, an ex post evaluation of the performance of (ex ante) analyses and modeling of reforms and their impacts
- Comparison of the findings of different macroeconomic models in the same country; comparison of the performance of models with actual results
- Exploration of different approaches for building support for reform and trust in the government's ability to deliver in the context of energy subsidy reform.

Endnotes

- 1 The proceeds of development policy loans or credits are disbursed upon the completion of a set of policy actions that capture the main elements of the government's reform program.
- 2 The main financing instruments of the World Bank are discussed in greater detail at <https://www.worldbank.org/en/what-we-do/products-and-services/financing-instruments>.

THREE
**Analytical Foundations
for Reforms: Core Energy
Sector Analyses**

The Why: Background to the Review

Energy subsidies come in different shapes and sizes and through a variety of delivery channels. As explored in detail in ESRAF Good Practice Note 1 (Kojima 2017), an energy subsidy is a *deliberate policy action* by the government that specifically targets electricity, fuels, or district heating and results in (1) reducing the net cost of energy purchased, (2) reducing the cost of energy production or delivery, or (3) increasing the revenues retained by energy suppliers. In the energy sector, subsidies are provided through four primary mechanisms: budgetary transfers of government funds, government-induced transfers between producers and consumers, forgone taxes and other government revenues, and underpricing of goods and services. Experience shows that government efforts to reform energy subsidies can result from a combination of factors, including macrofiscal pressures that require freeing up valuable fiscal resources set aside to keep energy prices artificially low or the energy sector afloat, or the need to address economywide distortions, inefficiencies, and environmental damage caused by energy subsidies.

Regardless of the driver of the reform or its ultimate objectives, assessing energy sector or energy utilities' financial performance and fiscal costs is a critical first step. Understanding factors contributing to the utility's or sector's inability to recover costs and finance day-to-day operations, maintenance, and investment are essential steps, in particular if the government has to fill the gaps. Work relevant for this purpose includes analysis of utility operational and sector performance, and reviewing policies that may affect the financial sustainability of the energy sector. These analyses can inform the development of potential future pathways for the energy sector and support decision-makers in identifying and adopting energy policy, regulatory, or sector management actions while focusing on the affordability of energy services for the poorest and most vulnerable households.

The What: Stocktaking of ESRAF-Funded Activities in the Energy Sector

A stocktaking of energy sector analytical work under ESMAP-funded technical assistance to developing country governments was carried out to understand the main topics where technical assistance was requested in the context of energy subsidy reform efforts. This chapter summarizes the findings of that stocktaking review, which attempted to document areas where there was demand for analytical and advisory support and how the relevant analyses were carried out in practice in the context of real-world reform efforts. The review explores how practitioners approached key questions and analyses in practice, and how the analyses adapted standard textbook or “ideal”

approaches to country conditions and data constraints to deliver analyses that generate useful information to inform reform designs. While this chapter focuses on activities where the primary analyses focused on energy sector dimensions, it is critical to remember that a comprehensive reform effort should consider the macroeconomic, fiscal, distributional, firm-level, and environmental implications, along with the political economy context. Topics of interest related to those dimensions are explored in other chapters of this report.

The review focused on energy sector-related technical and analytical work supported by ESMAP in the context of energy subsidy reform efforts in World Bank client countries. It explored the areas for which government counterparts sought advice, and for which ESMAP provided grant funding. It covered a select set of technical assistance activities funded by ESMAP, through its Energy Subsidy Reform Facility (ESRF), to support energy subsidy reform activities between 2013 and 2020. During this period, ESRF provided US\$20.7 million in technical assistance grants in support of energy subsidy reform efforts in 50 countries. This review explores activity designs and analyses produced, in order to distill main approaches followed in different context and extract practical insights that can be considered for future analyses in other contexts.

Between 2013 and early 2020, ESRF supported energy sector-specific analytical work on subsidy reforms in 36 countries (table 3.1). The activities covered electricity, fuels, and district heating. Regional activities covered Sub-Saharan Africa (two studies), the Europe and Central Asia region, and several countries in Latin America. The larger share of these grants was provided in support of reform activities in Europe and Central Asia and Sub-Saharan Africa, which together accounted for more than 50 percent of the grants.

TABLE 3.1

Overview of ESRF Technical Assistance Grants by Region (2013–2020)

REGION	COUNTRIES COVERED	REGIONAL ACTIVITIES	NUMBER OF GRANTS	SHARE OF TOTAL GRANTS
Europe and Central Asia	8	1	13	31.7
Sub-Saharan Africa	8	2	11	26.8
Middle East and North Africa	5		6	14.6
East Asia and Pacific	5		6	14.6
Latin America and the Caribbean	9	2	4	9.8
South Asia	1		1	2.4
Total	36	5	41	

Unsurprisingly, the majority of the activities involved in-depth analyses related to the energy sector. In this period, most of the activities involved one or more analytical outputs focusing on sector technical and financial performance in electricity, followed by liquid fuels and district heating. In most activities, detailed work on the energy sector was complemented by analyses of other dimensions, in particular social protection, distributional analyses, and political economy and communications related to energy subsidy reforms.

The scope of the technical assistance varied across countries, driven by government demand and sector context. At a high level, the focus was on gaining an in-depth understanding of the drivers of the technical and financial challenges in the energy sector, and on supporting government counterparts in identifying and assessing approaches to improving sector performance and options for reform. Activities focused on measures for improving cost recovery and utility financial viability, and eventually, reducing the financial burden on the utility and fiscal costs for the government. The main themes of the work included the assessment of energy service costs and service conditions, analysis of tariff setting and pricing approaches, estimation of subsidies under different cost recovery paths, and evaluation of potential impacts from reforming tariffs and subsidies. Naturally, the specific scope of each activity was based on country conditions and demand from government counterparts. For instance, work on fuel subsidies was more prevalent in countries that were fuel exporters or those that subsidized domestic consumption, while advice on tariff methodologies was requested in countries with tariff regulations based on efficient cost-recovery principles. In less sophisticated frameworks, cost-of-service studies were important for establishing efficient cost of service.

The How: Deep Dive into Approaches Under Energy Sector Analyses

Energy tariffs and prices were the primary areas on which practitioners focused under technical assistance. Table 3.2 provides a summary of the different types of analysis supported under different technical assistance activities, with the scope tailored to specific sector conditions. The activities included advisory support for (1) the design and methodology for cost-reflective tariffs or market-based energy prices, (2) analysis and revision of utility tariff structures, (3) assessment of the impact of tariff or price increases and periodic adjustments, and (4) development of a feasible and acceptable adjustment trajectory to reach cost-recovery tariff or price levels and phase out subsidies.

TABLE 3.2

Review of Grants by Type of Analysis

ENERGY-SPECIFIC ANALYSIS COVERED	NUMBER OF GRANTS
Cost-of-service or cost-recovery studies	20
Estimation of subsidies	18
Review of and recommendations for enhancing the tariff methodology or periodic tariff adjustment mechanisms (or both)	13
Assessment of tariff increase scenarios to reduce or phase out subsidies	16
Financial analysis or financial viability	6
Fuel pricing reform	7

Efforts to estimate the magnitude of energy subsidies and assess utility or sector financial viability was another major focus area, and approaches used varied slightly by subsector. Key observations are summarized below.

- In the *electricity sector*, the focus was mainly on quantifying subsidies, assessing utility and electricity sector financial viability, and identifying measures to reduce subsidies. With regard to the assessment of utility financial viability, 20 activities focused on cost-recovery or utility revenue requirements obtained from cost-of-service studies.
- For *fuels*, the focus was mainly on estimation of subsidies and analysis of sector financial viability. The methodology used for quantifying subsidies depended on country conditions and available information, with a near-even distribution between the price-gap method¹ and an inventory of support measures captured in the government budget. Activities assessed options for reforms, ranging from bringing domestic prices to international market or benchmark levels, to full cost recovery, and assessing the impact of full subsidy phaseout.
- For *district heating*, the focus tended to be on analysis of tariffs and sector cost recovery, combined as applicable with a focus on the efficiency of the heating system.

While quantifying subsidies or assessing their impact, a key challenge encountered across subsectors was the availability of reliable and adequate quality data, and the validity or relevance of assumptions used. Data on subsidies in the government budget and the utility may not be sufficiently detailed, and hence may not provide a full picture of the subsidies and fiscal transfers to the sector, which may be significant. In select cases where data constraints were encountered, practitioners addressed information gaps by using other indicators of performance or international, regional, or countrywide benchmarks, although in some cases those benchmarks may not have been fully reflective of actual conditions and costs in the country.

- Quantification of *electricity subsidies* was often linked to efforts to assess the financial viability of the utility, which required a financial analysis of the utility or the whole

power sector. Faced with data and time constraints, some analyses relied on existing financial models of the utility, with adjustments as necessary. Regional studies adopted approaches that allowed comparison between countries. For example, a comprehensive study in Latin America and the Caribbean estimated subsidies using the same price-gap methodology across all countries covered. However, even though the methodology was the same, the variation in the availability of data created challenges in defining the right benchmark price or cost. A regional study for Sub-Saharan Africa analyzed the financial viability of the electricity sectors of 39 countries. The approach involved using a benchmark level of cost recovery measured as the existing operating and full capital expenditure required to meet growing demand with adequate quality of service and achieve universal access.

- For *fuels* there were challenges in estimating subsidies using the difference between the actual price and reference market prices (price-gap method). In practice, the calculation of both local and reference prices can be a challenge, along with the price-gap method's inability to capture all relevant subsidies and government support measures for fossil fuels. Reference price calculations included adjustments for additional local costs,² which required more detailed study, benchmarks for efficiency, and data, along with specific assumptions. Activities that involved internationally traded fuels tended to use import- or export-parity prices (depending on the country's net trade status) as a proxy for reference prices, regardless of the inefficiency of the domestic market. Benchmarks for local costs based on costs in other countries were used to gauge relative operational efficiency that could be improved and supply costs that could be reduced. Where data limitations did not allow a full estimation to be made, information such as fuel input costs, margins, and prices were sought from regulations, and international prices were used to reflect opportunity cost.
- For *district heating*, studies to estimate cost of service or assess financial viability faced challenges in obtaining data on heating service providers and on actual end-user consumption data due to the lack of metering. To address this issue, some activities focused on performance indicators instead of in-depth studies. For example, in several countries, financial viability was assessed using indicators such as net profit margin, cost recovery, collection rate, and current ratio (the ability of district heating companies to pay short-term obligations). Such indicators were also used to compare different service providers. Cost recovery was assessed under different scenarios, including a transition period with the gradual elimination of cross-subsidies and implementation of annual tariff adjustments.

Most activities developed and assessed different reform options and cost recovery scenarios, assessed distributional impacts of tariff or price increases, and considered measures to facilitate affordability for poor and vulnerable consumers. Often, work on tariff or price reforms was accompanied by distributional analysis of reform options and exploration of alternative approaches to meeting the needs of poor and vulnerable households, either within the tariff mechanisms or through targeted social assistance.

- *Electricity* sector activities explored reform options based not only on principles of cost reflectivity, but also suitability of the tariff structure for meeting policy objectives. Activities focused on the design of cost-reflective tariffs also analyzed the tariff structure. Most of the reform options developed under the activities reviewed for this stocktaking envisaged a transition period with an initial price or tariff increase, followed by a glide path with gradual increases before full elimination of subsidies.
- Several *fuel pricing* reform analyses explored the feasibility of moving from national uniform pricing to locational pricing to reflect estimated location-specific costs for storage and transport in an effort to promote efficient cost allocation and cost recovery.
- In the *district heating* sector, tariff design and reform options included adopting consumption-based billing to better reflect cost of supply and create efficiency incentives for users. In some activities, the assessment was combined with a focus on promoting energy efficiency. Several analyses concluded that demand-side energy efficiency measures would be more attractive when accompanied by heating tariff reforms to reflect costs of supply, as it in turn would improve payback ratios for energy efficiency measures. A noteworthy activity involved the development of energy efficiency investment swaps, along with an energy efficiency fund and provision of baselines for cost-benefit analysis.

Many activities recommended the adoption or updating of tariff or pricing methodologies to enable continued alignment with costs and recommended gradual adjustment trajectories. The qualitative review of the technical analyses reveals that the majority of the activity recommendations favored tariff methodologies or fuel pricing approaches with periodic (automatic) adjustments and gradual implementation of revisions across countries and subsectors.

- In the *electricity* sector, the activities recommended methodology revisions and periodic tariff adjustments alongside exploration of new, targeted, subsidy delivery mechanisms, including through electricity lifeline rates or direct delivery of subsidies outside of the tariff schedule, where feasible. Activities that developed scenarios with two or more phases of reform envisaged full subsidy phaseout only when adequate social protection mechanisms were in place. Under these approaches, the next phase(s) of reform would only be triggered when the enabling social protection measures had been introduced or existing mechanisms had been enhanced to allow the delivery of targeted support alongside tariff reforms.
- In the *fuel* sector, the gradual phaseout of subsidies was frequently explored, along with geographic differentiation of prices. In countries with significant fuel subsidies and where potential fuel price increases were assessed to likely have a strong impact on the economy, activities recommended a gradual increase in fuel prices to move closer to reference prices. Other common topics were differentiation of pricing approach by fuel and introduction of mitigation measures. A few activities explored fuel price stabilization funds.³

- In the *district heating* sector, several activities recommended a redesign of tariffs to make them less complex and facilitate cost allocation among consumer categories, for example, through differentiated tariffs for residential and nonresidential consumers. In settings where district heating is provided through combined heat and power facilities, recommendations for district heating were accompanied by those for electricity, along with options for improving heating system efficiency and promoting demand-side measures. Where district heating companies also provided hot water, analyses explored the separation of hot water revenue from district heating revenue.

The What Next: Considerations for Sector-Specific Analyses

This section summarizes considerations for future analytical activity design and implementation, along with additional aspects that could be included in future energy sector-specific analyses.

Although there are various approaches and standard methodologies deployed as part of energy sector analyses, in practice, the design of the analysis will be guided by sector conditions and the data available. As found in the review of the recent technical assistance, for example, for quantification of subsidies, some methods are more data intensive than others, and each of them offers various advantages for the ability to capture different types of subsidies and yield accurate estimates. The activities assessed show that data availability can limit which subsidy estimation method can be usable and appropriate in each case.

Where relevant, cost-of-service studies can be useful inputs to assessments of tariff methodologies or tariff increase scenarios. These studies can provide useful information to guide subsequent tariff analyses and may be needed in contexts where data are limited and the understanding of the true cost of delivering energy to end users is incomplete. If recent and acceptable-quality data are available, then cost-of-service studies may not be a priority. Activities that require a rapid response may not allow sufficient time for a cost-of-service study to be undertaken. In optimal cases, financial modeling and analysis would be done after the cost-of-service study and would take into consideration the optimized least-cost system expansion plan. The financial analysis can build on that information to assess scenarios for cost recovery and sustainable subsidy reduction. In countries with low electricity access, the analysis could benefit from including different access expansion scenarios.

While developing energy pricing or tariff methodologies and adjustment trajectories, selectivity, objectivity, and transparency are critical. The review offers several insights. First, care is needed in adjustments that envisage pass-through of costs that are outside

the control or management of the utility or service provider. Second, the use of smoothing methods within an automatic adjustment mechanism can offer the opportunity for gradual adjustment, avoiding the risk of tariff adjustment delays due to concerns over its impact, and reduce the risk of public reaction to large and rapid increases in tariffs or prices. Third, for the assessment to be complete, the results of the scenarios considered need to include mitigation measures, in particular social protection, including which groups should receive targeted support and the funding sources for that support. Fourth, inclusion of “worst case” scenarios among the options considered in sector financial viability analyses can be valuable. This would enable the government to explore measures for readiness for and response to emergencies that significantly increase energy prices or costs. Lessons learned from COVID-19 (coronavirus) and the energy price shocks of 2022 need to be taken into consideration.

The scope, coverage, resources, and implementation of key energy sector analyses have a bearing on their usefulness for the design of the reforms themselves. Of

utmost importance for the relevance and usefulness of key analyses is government counterpart ownership and commitment throughout and the involvement of the right set of counterparts in the activity. Moreover, it is critical to ensure coherence between activity design and government reform and policy-making priorities, while maintaining flexibility in the activity design to adapt to the evolving needs of government counterparts and shifting energy sector objectives (for example, through multiyear programmatic support). In addition, sharing international experience that is relevant for the country context, and coordination with key energy sector stakeholders, other non-energy line ministries, and other development partners can contribute to the outcomes of the analyses.

Endnotes

- 1 The price-gap method calculates the difference between the reference price for energy in an actual or market-based transaction and the price paid by, or charged to, an end user for that same energy delivered to the same location at the same time. Primary approaches to quantification of energy subsidies are explored in great detail in Kojima and Koplów (2015) and Kojima (2017).
- 2 Additional or adjusted local costs include transport, storage, distribution, and retailing.
- 3 The potential risks and disadvantages of fuel price stabilization funds are documented in Kojima (2016).





FOUR

Subsidizing Bottled Gas: Approaches and Effects on Household Use



The Why: Background to the Analysis

To help households shift to cleaner cooking fuels, many governments in developing countries have subsidized bottled gas. In the 1980s and 1990s, several developing countries began to promote the use of bottled gas—also known as liquefied petroleum gas (LPG)—for cooking as an alternative to polluting and unsustainable cooking fuels or as part of efforts to deter deforestation. Over the years, because of a combination of factors, the focus of the policy of promoting the use of gas for cooking has shifted to addressing damage to public health from household air pollution and enhancing gender equality.

LPG is among the clean modern household energy¹ sources for which a universal access target is set for 2030 under Sustainable Development Goal 7. In countries with well-developed natural gas networks, households tend to choose natural gas for cooking as incomes rise; but where natural gas is not available, better-off households tend to cook with electricity or LPG,² and charcoal or kerosene is favored by well-off households in lower-income countries.

LPG tends to be more expensive than more polluting fuels and is subject to high price volatility. To support less well-off households in switching to cleaner cooking, many governments spent billions of dollars over decades subsidizing household use of LPG.

Until recently, subsidies for household use of LPG were dominated by universal price subsidies with varying delivery mechanisms. These subsidies were typically in the form of artificially low prices set for LPG cylinders considered to be suitable for household use. As with other universal price subsidies, those for LPG led to unintended, even if predictable, consequences, including being captured disproportionately by the better-off, large-scale diversion to nonhousehold consumers, black markets, and fuel smuggling. They have also led to unsustainable fiscal burdens and fuel shortages.³

The What: Understanding Approaches to Subsidizing Bottled Gas

In developing countries, delivery mechanisms for subsidies for bottled gas have evolved over time. Recently, faced with significant fiscal burdens, several governments have begun to refine their approaches to subsidizing bottled gas. Some countries have concentrated their efforts on improving the targeting of subsidies, whereas others have focused on eliminating loopholes that affect the size and cost-effectiveness of the subsidies.

To better understand different policies and real-life implementation experiences with LPG subsidies, approaches in nine developing countries were reviewed. The review, which gave special attention to measures for supporting less-well-off households, explored steps taken by selected developing countries⁴ to promote household use of LPG and the evolution of its use in response to policies and implementation measures. The review is presented in the technical papers “[Subsidizing Bottled Gas: Approaches and Effects on Household Use](#)” (Kojima 2021), and “Cooking with Bottled Gas: Issues and Challenges in Developing Countries” (Kojima 2022), prepared with ESMAP financial and technical support. This chapter summarizes select findings from those reports.⁵

The How: Review of Approaches to Subsidizing Bottled Gas

Historically, the most common form of government support for LPG has been a universal price subsidy. Price subsidies are often not accounted for in the national budget or scrutinized annually by the parliament. Especially in countries with significant upstream oil and gas production, producers—typically national oil companies—may be officially or informally required to cross-subsidize LPG. The net result is lower upstream fiscal revenue in the form of lower taxes, reduced dividend transfers, or both.

Closer examination of the experiences of nine countries with LPG subsidy histories shows that, despite different starting points, LPG price subsidies proved to be unsustainable in most countries, prompting reforms. Several countries moved from universal price subsidies to conditional cash transfers or to subsidy elimination with strengthened social protection. Among the country cases surveyed for the 2021 review, more than half had moved from universal price subsidies to targeted cash transfers conditional on LPG purchase; four still had price subsidies at that time. There are, however, significant differences in the degree of restrictions on criteria for eligibility for cash transfers, varying from considerably restrictive to nearly universally available.

Country experiences also show that subsidy reforms are frequently reversed. Several governments announced the phaseout of universal price subsidies for fuels. Some governments substituted targeted cash transfers for untargeted LPG price subsidies, only to reintroduce universal price subsidies later and implement them side by side with targeted cash transfers. As of 2022, Ghana was one of the few countries that had eliminated LPG subsidies and maintained market-based pricing with no distinction in the treatment of LPG according to end use.

Compared with universal price subsidies, targeted cash transfers could offer a more cost-effective way to support intended beneficiaries. Artificially low prices offered only for LPG sold in small cylinders are almost always accompanied by diversion to and

exploitation by ineligible consumers, often increasing subsidy costs substantially above initial estimates. Cash transfers can allow the use of market-based pricing at the point of sale, thereby reducing economic distortions and leakage. In the cases reviewed, replacing universal LPG price subsidies with targeted cash transfers appears to have helped mitigate diversion, black marketing, and fiscal burdens on governments, LPG suppliers, or both. While initially facing a range of teething problems, governments have continued to improve the delivery mechanisms for cash transfers.

Cash transfers for LPG can be conditional or unconditional, and the preferred approach depends on country circumstances. Conditional cash transfers are contingent on the beneficiary purchasing LPG. As such, they are not technology-neutral and can become a case of governments' picking a winner for clean cooking among the different options. Further, conditional cash transfers are in essence a different delivery mechanism for what is effectively a consumer price subsidy and are vulnerable to the same risks associated with price subsidies. However, if other clean cooking options are impractical or not consistently available in a specific country context, and if there is little appreciation of the harm to the public of continuing use of polluting household fuels, conditional cash transfers for LPG merit serious consideration. Unconditional cash transfers provide cash assistance regardless of whether the beneficiaries purchase LPG, are technology-neutral, can help the poor meet their most pressing needs, are simpler to administer (because there is no need to verify each purchase), and can be integrated into a broader social protection program. However, where there is limited awareness or motivation to avoid the damaging effects of polluting household fuels, unconditional cash transfers cannot discourage reversion to such fuels.

The country experiences reviewed show that subsidies for consumption helped increase the adoption of LPG but did not necessarily ensure its regular use. In five of the countries studied, price subsidies—whether at the point of retail or offered in the form of conditional cash transfers—led to a rise in household use of LPG, even among the rural poor, as long as prices were kept artificially low. Pricing reforms, however, can lead to reversion to traditional use of biomass where it is a much cheaper option, and especially among cash-constrained households.

Subsidies to cover the initial cost of LPG adoption can help poor households, but many households were found to discontinue LPG use once price subsidies were reduced or eliminated. Without subsidies to keep the cost of consumption low for households, achieving sustained use of LPG among the less well-off tends to become difficult. Even among those who continue to use LPG, abandonment of traditional stoves using solid fuels—a necessary step for fully realizing the benefits of universal access to clean modern energy—has been much more challenging.

Striking the right balance in terms of coverage and beneficiaries is a key policy challenge. If targeting criteria are so strict that cash transfers cover a negligibly small fraction of total LPG consumption, the economic distortions would be correspondingly small. However, such an approach would also have limited impact on encouraging LPG

adoption unless the majority of the population can already afford clean modern energy and cash transfers are aimed at the remaining few. At the opposite end of the spectrum, if cash transfers are very generous, provided to a significantly large number of people, and cover a substantial share of the LPG purchase cost, many more households would use LPG. However, this would increase the fiscal burden.

Approaches envisaging self-selection as part of price subsidies have not worked well. Even in cases in which prices of only inconveniently small cylinders were subsidized, it was observed that many, if not most, better-off households chose cost over convenience, switching their cooking setup to use subsidized cylinders.

The What Next: Key Takeaways and Areas for Future Work

Country experiences highlight the challenges of designing and implementing LPG price subsidies, as well as of eliminating them. Universal price subsidies come with numerous well-documented downsides, in particular diversion to ineligible consumers and larger subsidy bills. Country experiences point to the difficulties of ending price subsidies once started, and, in reality, many reforms face a high risk of policy reversal.

Selling LPG at market prices and offering cash transfers is a significant improvement over universal price subsidies. When cash transfers bypass LPG suppliers altogether, the suppliers do not have to wait for reimbursements and can operate on a commercial basis. Some economic distortions remain with conditional cash transfers, although careful targeting can reduce them. Transfers offered to a large share of the population and covering a significant part of the LPG cost reduce incentives to improve efficiency along the supply chain. This concern requires that eligibility criteria be drafted, a list of eligible beneficiaries be created, an appropriate amount and frequency of cash transfers be determined, and a decision on whether they will be delivered to the supplier or the purchaser be made. Adjusting transfer amounts based on the market price of LPG to stabilize end-user prices risks prolonging the politicization of fuel pricing.

Unconditional cash transfers take the LPG supply chain completely out of the subsidy delivery mechanism, typically are targeted, and have the least distorting effects. The fiscal burden, however, can be greater than that of conditional cash transfers with the same targeting, given that not every eligible household chooses to participate in conditional cash transfers. Transaction costs associated with initial enrollment can deter uptake. Where there is inadequate appreciation of clean household energy as a merit good, unconditional cash transfers may be less effective at protecting public health and air quality.

Consumer complaint mechanisms can help improve cash-transfer delivery. These mechanisms are especially important during the initial implementation of a new scheme

and can help identify illegal diversion of the cash being transferred. But making complaint mechanisms useful requires the cooperation of LPG suppliers and government agencies.

Digital technologies can facilitate delivery and uptake of cash transfers for LPG.

Recent country experiences indicate that advances in digital technologies, and mobile banking in particular, enabled wider adoption of targeted subsidies. In fact, Kojima (2022) finds that most countries offering cash transfers for LPG used digital technologies.

There are no-regrets steps that a government can take to support LPG use while managing fiscal costs. As a general principle, nonfinancial government policies to promote LPG are preferable to the provision of subsidies, arguably the most important of which is to improve the regulatory environment and create a market with fair and healthy competition and with adequate safeguards for consumers. Governments can (1) set, monitor, and enforce standards for the thermal efficiency of LPG; (2) monitor and enforce rules against short-selling (selling less than the claimed amount); (3) make the market as efficient as possible and promote competition so that efficiency gains are passed on to consumers in the form of lower prices; and (4) monitor and enforce safety standards and regulations. The first three steps can also help reduce the overall cost of LPG delivery and use. For large-scale subsidy schemes, audits can help identify issues and improve and refine designs and can be well worth the cost.

Endnotes

- 1 The World Health Organization (WHO) defines clean fuels and technologies as those that attain the fine particulate matter (PM_{2.5}) and carbon monoxide (CO) levels set forth in the 2021 WHO global air quality guidelines. Accordingly, WHO considers electricity, natural gas, LPG, biogas, alcohol, and solar cookers to be clean fuels (<https://www.who.int/tools/clean-household-energy-solutions-toolkit/module-7-defining-clean>).
- 2 Although this chapter focuses on bottled gas, it is important to consider the factors involved in the choice between electricity and LPG for clean cooking. Kojima (2022) treats this topic in greater detail, including the greenhouse gas emission dimension.
- 3 See Kojima (2017) for more on delivery approaches and consequences of these subsidies.
- 4 The countries were selected based on (1) sizable use of LPG as the primary form of clean cooking, (2) different subsidy histories and policies enabling illustration and assessment of different approaches, and (3) the availability of sufficient data published by the government to enable analysis.
- 5 Kojima (2021) also includes a detailed description of each of the nine country cases reviewed.



FIVE

Macroeconomic Modeling for Energy Subsidy Reforms

The Why: Background to the Analysis

Energy subsidy reforms can have varied impacts across different segments of the economy. Understanding the potential impacts of reform on households, firms, energy-consuming sectors, and the broader economy can allow reforms to be designed that mitigate the most critical impacts. However, identifying and measuring those impacts can be challenging. In this context, macroeconomic modeling has a key role in providing an understanding of the potential impacts of reform and assessing different reform options.

The potential impact of energy subsidy reforms on the economy can be analyzed using various macroeconomic modeling approaches. In 2020, ESMAP carried out a review of the recent energy subsidy reform literature and found that, in practice, a variety of methods were used to assess the potential macroeconomic impacts of real-world energy subsidy reform efforts. These approaches varied in complexity, ranging from simpler approaches focusing only on the direct impacts of energy price increases and assuming inelastic demand to fairly sophisticated computable general equilibrium (CGE) models. An interesting observation from that review was that there was growing use of CGE modeling to evaluate energy subsidy reforms, possibly reflecting these models' strengths in capturing and analyzing potential reform impacts.

CGE models have various attributes that are useful for assessing energy subsidy reforms. These models can (1) capture major structural features of an economy and the interactions between sectors, (2) enable industry disaggregation, (3) enable evaluation of the economywide impacts of policies and shocks in the presence of economic distortions, and (4) model policy reforms with a significant share of economic transactions that can modify the sectoral structure of output, trade, demand, employment, and prices. In particular these models allow reflection of indirect effects, the economywide impact of energy prices, elasticities, and substitution.

Despite their potential value for informing energy subsidy reform efforts, relatively limited guidance was found to be available on the use of CGE-type approaches to evaluating energy subsidy reforms. The review of recent literature carried out at the outset of the stocktaking exercise concluded that there would be value in a survey of different CGE modeling approaches.

The What: Review of Macromodeling Approaches

To contribute to the global knowledge base on macroeconomic modeling of energy subsidy reforms, a set of real-world energy subsidy reform efforts that involved macroeconomic modeling were reviewed, with a particular focus on CGE models. This chapter summarizes the main elements and findings from the ESMAP Technical Report titled [“Macroeconomic Modeling and Energy Subsidy Reform Policy Dialogue: Recent Experience, Insights, and Perspectives,”](#) which explores how CGE models were deployed in the context of real-world energy subsidy reforms. The purpose was to understand the different approaches, drivers, and impacts of CGE modeling in support of energy subsidy reforms in different contexts, based mainly on the relevant technical assistance activities funded by ESMAP’s Energy Subsidy Reform Facility between 2017 and 2020. These were complemented with reports from other CGE modeling exercises that were part of operational and analytical engagements supported by the World Bank and other institutions were reviewed.

The modeling exercises reviewed supported actual reforms that were either at the planning stage or in implementation. The review covered 16 CGE modeling exercises in the context of energy subsidy reforms in different jurisdictions, mainly in Sub-Saharan Africa, Asia, and the Middle East and North Africa. The report documents how different modeling approaches, each with varying capabilities and data requirements, were chosen, how standard designs and approaches were adapted to country circumstances, what the models found, and how those findings contributed to reform.

The modeling exercises were carried out in diverse contexts and involved different design elements. The modeling exercises varied in terms of energy subsidy reform context, transmission channels incorporated in the model, the data collection and consolidation process, and key model parameters such as calibration of shocks and choice of elasticities. The review also explored how CGE model designs were adapted to the context.

Modeling design choices were guided by country and reform-specific factors. Key design elements included model type, baseline data choice and coherence, use of simulations, coverage of energy sector data, specifications related to production technology, energy demand, efficiency, and sector structure.

The How: Observations on Model Designs, Findings, and Contribution to Reforms

Design elements varied across modeling efforts in different countries. Select findings and takeaways related to design of CGE modeling exercises are summarized below.

- Model designs were influenced by reform aspects that were prioritized as well as by the availability of data, resources, and time. Sector coverage varied widely across countries and included electricity, natural gas, and petroleum products and combinations.
- While some models were able to perform more granular or sophisticated analyses, others had to involve pragmatic choices because of constraints. For example, in the disaggregation of the energy sector, the level of detail varied depending on data availability, the type of simulations considered, and the urgency of the dialogue: the CGE modeling in the Arab Republic of Egypt considered 12 subsectors, while there were 11 for Algeria, 7 for Tunisia, 4 for Iraq, and 2 for Bangladesh.
- Models varied in terms of approach for estimating distributional impacts, assumptions about how the economy achieves equilibrium, choice of channels for reform impact on growth, how fiscal savings or additional revenue (if any) from reforms are used, and estimation of environmental effects and externalities from reforms.
- Key direct and indirect impacts were covered in all modeling exercises reviewed. In most cases, analyses of potential impacts were combined with an assessment of measures to mitigate reform impact on the poor, the middle class, and others.
- The models assessed explicit and implicit subsidies, which were commonly estimated by comparing retail prices with a reference price or “recovery cost” of a given energy product, or the opportunity cost.
- The simulations generally consisted of reducing the rate of explicit subsidies or increasing consumer prices by the amount of the implicit subsidy to be removed.
- The magnitude of price shocks considered in the modeling exercises reviewed varied significantly, from a 50 percent increase in liquefied petroleum gas prices in one case, to a more than 300 percent increase in electricity tariffs in another country, to an almost 1,000 percent increase in residential gas tariffs in another situation.
- The majority of the activities involved collaboration with government counterparts and included an element of capacity-building for the entities involved.

The models reviewed explored a range of potential impacts from reforms. These impacts included the direct impact of higher energy prices on firms’ use of inputs and households’ final consumption; second-round effects, such as a change in production in energy-intensive sectors; agents’ behavior change in response to energy price changes; differentiated impacts on households, especially the vulnerable; and environmental effects.

Findings from the CGE models offered insights into potential reform impacts. The CGE modeling exercises and associated analyses centered on potential macroeconomic, sectoral, and income distribution impacts of the reforms under consideration. Select

observations from different CGE modeling exercises are summarized below to illustrate the main themes. It is important to highlight that these findings are directly dependent on the specific reform context and scope as well as on model design and underlying assumptions.

- Overall, assumptions about how the economy achieves equilibrium and how fiscal savings or additional revenue from energy subsidy reforms are used were key drivers of the economic outcomes captured by the CGE models.
- CGE analyses found varying impacts on growth in different contexts. Most models found that although the impact of the proposed reform on growth could be negative or not significant in the short term, in general the long-term impacts would be positive.
- The net effect of a reform on growth was influenced by how the revenue generated or the fiscal savings were to be used. Given how strongly the choice of “fiscal closure rules” affect models’ findings on reform outcomes, it would be advisable for modeling exercises to undertake a sensitivity analysis exploring how results change depending on how the government uses the increased fiscal space provided by reform. A mix of assumptions on what the government does with the savings can be considered, as was done under the relevant CGE modeling exercises in Algeria, Egypt, and Iraq.
- Several CGE analyses found that reductions in energy subsidies could reduce household welfare unless they were complemented by mitigation measures focusing on impacts on the poor, the middle class, and key stakeholders. On that note, all the CGE analyses reviewed included compensatory measures to mitigate potential adverse impacts.

The use of CGE modeling as part of broader technical assistance to governments can strengthen the analytical foundations for subsidy reform. In the activities reviewed, the models were helpful for capturing the interdependencies between sectors and economic actors and for strengthening the government’s understanding of the direct, indirect, and feedback effects of policies and price shocks. Although varied across cases, the results were mainly used to (1) enhance the understanding of potential impacts of reform options—including how fiscal savings are spent, (2) raise awareness of the social and distributional impacts of subsidies and their reform, and (3) assist in improving the understanding of the political economy of reforms.

The activity design and implementation approach can affect the results of the activity. The review identified factors that contributed to the quality and impact of the work.

- The benefits of CGE modeling were amplified when government agencies showed ownership and were closely involved and when capacity-building was provided.
- The effectiveness of the modeling exercise was further enhanced when it involved expertise from multiple sectors, was complemented by other simulation tools, and incorporated an assessment of key environmental impacts.
- Activities that bring together a multidisciplinary team, comprising experienced macro modeling experts, economists, and sector specialists along with their counterparts in various government departments, tend to use CGE modeling more effectively and lead to better-informed and more realistic reform designs.

The What Next: Key Takeaways and Areas for Future Work

CGE models can help assess the implications of various energy subsidy reform options and serve as a useful part of analytical tool kits available to policy makers and their development partners. These models can help decision-makers understand the range of structural effects and outcomes and offer the opportunity to refine reform designs to address the impacts that are important to the government. By providing a comprehensive assessment of alternative policy choices, interdependencies, and long-term effects, these models can help highlight the opportunity cost of energy subsidies and the potential outcomes if fiscal resources set aside for subsidies were directed to other policy priorities.

The choice of macroeconomic modeling approach for supporting energy subsidy reform efforts should be driven by country and reform context. CGE modeling can be helpful in certain circumstances, but it might not be the best fit for others. For example, CGE models are not suitable for assessing the short-term impacts of price reform on households and firms; for rapid assessments of such impacts, partial equilibrium or macro-structural models can be more appropriate. Overall, for practitioners considering supporting their government counterparts with macromodeling for energy subsidy reforms, critical factors that should be considered include government reform objectives, demand, ownership, priorities, timelines, data availability, and institutional capacity.

A case can be made for wider use of CGE modeling to support energy subsidy reforms when the reform context is conducive to its use and the modeling approach is aligned. Based on the activities reviewed, factors to consider while designing CGE modeling and analyses for energy subsidy reforms are summarized below.

- Resources, data availability and quality, are important, along with transparency about limitations and assumptions that can affect modeling results.
- Considerable preparatory work can be done for CGE modeling, even if all prerequisites to allow for an effective assessment of reform options are missing.
- Assumptions, as well as actual reform design choices, about the use of fiscal savings or revenues from reform have a strong bearing on model outcomes related to reform impacts on growth and welfare.
- Inclusion of potential mitigation measures in the modeling exercise can help generate alternatives and strengthen the reform design.
- Complementing CGE with tools such as partial equilibrium models, institutional and political economy analyses can strengthen analytical foundations for reform.



SIX

Total Carbon Pricing for Energy Consumption

The Why: Background to the Analysis

Faced with the urgency of mitigating climate change, many governments around the world are considering and deploying different approaches to pricing greenhouse gas emissions. The efforts to put a price on carbon—aiming to capture the social, economic, and environmental costs resulting from these emissions—have traditionally centered on carbon taxes and emissions trading systems. In reality, governments use a broad set of energy, climate, and fiscal policy instruments that affect the price signal on carbon emissions, even when sending such a signal is not stated as an explicit objective. In addition to stipulating emissions trading or carbon taxes, governments take actions that influence the prices of the fuels that generate those emissions, whether by directly setting retail prices, providing energy subsidies, or levying energy taxes. However, the carbon price signals resulting from the combination of multiple policy instruments are often unclear. Understanding how different policy instruments that directly and indirectly affect the price of carbon interact, and what overall price signals and economic incentives result from their combination, can allow policy makers and practitioners to make informed decisions.

It is important to recognize the negative carbon pricing signal from energy subsidies. By artificially lowering the cost of producing and consuming energy, and fossil fuels in particular, subsidies can encourage excessive consumption of energy and influence short-term decisions and long-term investment choices. They encourage emissions-intensive end uses and contribute to higher local air pollutant and greenhouse gas emissions, along with land degradation and biodiversity loss (Clements et al. 2013; OECD 2021; World Bank 2019). The role of energy subsidies in sending negative carbon pricing signals is explored in the literature (CPLC 2017; UNDP 2021; Wright et al. 2018).

The What: Assessing Direct and Indirect Carbon Pricing Signals

The total carbon price (TCP) is a metric that can help estimate the carbon price signal resulting from key energy, climate, and fiscal policy instruments that affect the price of carbon emissions. This metric, introduced in Agnolucci et al. (2023a; 2023b), allows an assessment of the net price signal resulting from combining different policy instruments and can be useful for making comparisons across fuels and jurisdictions and over time. The TCP can help guide the choice of instruments to provide the intended signals.

To better understand the role of energy subsidies in influencing carbon price signals, the impact of energy subsidies on the total carbon price was explored. Illustrative

calculations of the TCP were carried out using best-available multicountry data sets. The specific focus of the analysis was on understanding how energy subsidies affect carbon price signals from climate and fiscal policy instruments. The conceptual and analytical framework, the illustrative calculations and insights are presented in the ESMAP Technical Report [“Total Carbon Pricing for Energy Consumption: The Importance of Energy Taxes and Subsidies.”](#) This chapter summarizes the main elements of that report.

The How: Illustrative Calculations of TCP Using Best-Available Data Sets

In simple terms, the TCP is calculated as an average of direct and indirect carbon prices, which are weighted based on the emissions covered by each instrument. The main elements of the TCP involve price signals from direct carbon pricing (as determined through emissions trading systems and carbon taxes) and indirect carbon pricing (through energy subsidies and excise taxes) instruments. The calculation of the TCP can be performed by fuel, sector, country, or a combination. The extent and depth of the analysis depend on data availability. TCP calculations can be broken down in various ways to render different perspectives, such as by countries’ income level and trading status.

Illustrative calculations were carried out to demonstrate the application of the TCP concept. The calculations used the best-available data sets from credible international sources, including the World Bank (direct carbon prices), the International Energy Agency (energy consumption), and the International Monetary Fund (fuel taxes and subsidies). The data set covered 142 countries and included data on coal, diesel, gasoline, kerosene, liquefied petroleum gas, and natural gas and covered energy consumption in the industrial, power, residential, public administration, services, and transport sectors from 1991 to 2021.

The TCP has several methodological limitations. It is limited to greenhouse gas emissions from the combustion of fossil fuels, including in power generation, but excluding emissions from agriculture and land-use change. Production subsidies and taxes are not taken into account, given data constraints. Moreover, the price-gap approach, which the TCP uses, cannot capture some forms of subsidies, such as cash transfers, because not all subsidies result in net changes in end-user prices (Kojima 2017; Koplow 2009).

Where detailed data for the instruments included in the TCP were not available, the rates for those instruments were computed using available data, with assumptions transparently documented. The approach used available data to estimate the main elements of the TCP. Agnolucci et al. (2023a, 2023b) adopted data from the World Bank for direct carbon prices while following Parry, Black, and Vernon (2021) in computing indirect carbon prices from data on retail price, supply cost, and value added tax rates, given that rates for these policy instruments are not available at the global level. These best-available data sets incorporate various simplifications.

The What Next: Takeaways from the Application of TCP

Insights from the analysis of policy instruments and the TCP itself are summarized below.

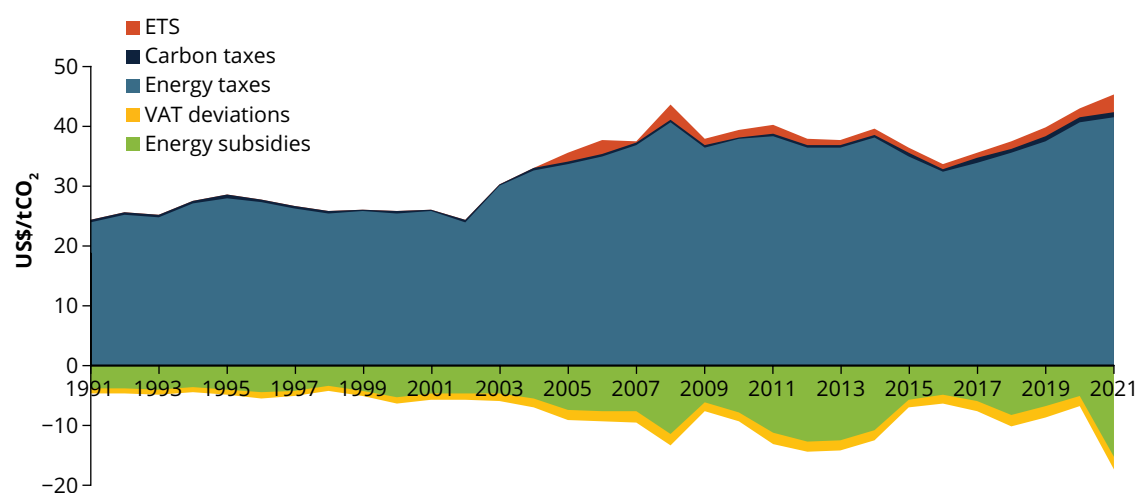
Insights on policy instruments

The application of the TCP highlights the importance of policy coordination between energy policy, climate policy, and wider fiscal policy. Some of the findings are summarized below and are worth exploring in future work and validating with country data.

- Illustrative TCP calculations using best-available global data sets indicate that price signals sent by energy subsidies, taxation, and direct carbon pricing instruments vary across countries, fuels, and sectors of the economy.
- Disaggregating TCP levels and their evolution by fuel and by sector reveals a considerable amount of heterogeneity in TCP patterns and its components.
- Globally, a significant share of carbon price signals is delivered by indirect carbon pricing through energy taxes and subsidies. Figure 6.1 explores the individual components of the TCP—emissions trading systems, carbon taxes, energy taxes, and subsidies—and illustrates their relative contributions to the resulting TCP.

FIGURE 6.1

Composition of the TCP over Time

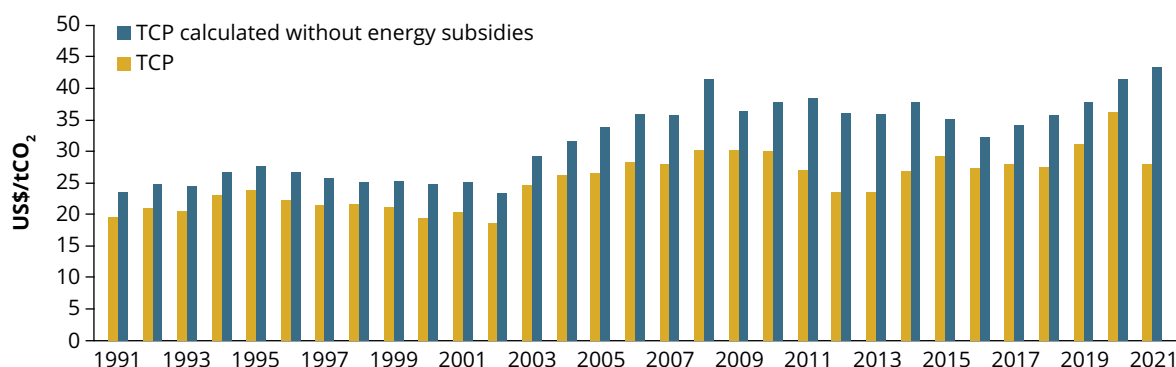


Source: Authors' reproduction based on Agnolucci et al. (2023a).

Note: The figure shows net energy taxes, carbon taxes, emissions trading systems (ETS), value added tax (VAT) deviations, and net energy (consumption) subsidies. The way in which net energy taxes and subsidies are computed is discussed in Agnolucci, Gencer, and Heine (2024). TCP = total carbon price; US\$/tCO₂ = US dollars per ton of carbon dioxide.

FIGURE 6.2

Illustrative Calculations of Total Carbon Price with and without Energy Subsidies



Source: Authors' calculations using IEA, IMF, and World Bank data sets.

Note: TCP = total carbon price; US\$/tCO₂ = US dollars per ton of carbon dioxide.

- Energy consumption subsidies substantially undermine the signals from direct carbon pricing and energy taxation. By dampening the strength of the price signals from other instruments subsidies weaken the economic incentives for reducing emissions. Figure 6.2 uses illustrative calculations to show TCP levels that could have been achieved without energy subsidies.
- Exploration of the TCP for energy-consuming sectors shows that the transport sector faces the strongest carbon price signal by far. This is not surprising, given that the main fuels consumed by the sector, namely gasoline and diesel, are the fuels for which the TCP is strongest, driven by taxation. Residential energy consumption faces a relatively low TCP, followed by power, industrial, and service sectors.
- More granular analysis of the TCP by countries grouped by income levels and fossil fuel trading status shows that aggregate pricing signals vary by country grouping.
- The analysis finds differences in the level of the TCP and its components across countries, by per capita income level, and by fuel trading status. When direct carbon pricing, energy taxes, and subsidies are assessed together, several countries and sectors end up with negative aggregate carbon price signals.
- In view of the gap between global climate ambitions and the current reality, it is imperative to recognize how energy consumption subsidies counteract and undermine direct and indirect carbon pricing efforts.
- The significant impact of energy subsidies on TCP highlights the central role of energy subsidy reform at the nexus of energy, fiscal, and climate policy.

Insights on the Methodology

While the analysis offers useful perspective, the methodology, data set, and approach have limitations that need to be tackled in future work, as listed below.

- An analysis is only as good as the underlying data. Although illustrative calculations using best-available data sets help demonstrate the importance of policy interactions and prove the value of an aggregate metric for different carbon pricing instruments, this approach should only be seen as an initial step in a process to be improved by collecting more precise data. For an analysis to render relevant, useful, and trustworthy conclusions, the importance of accurate, good-quality data that are periodically updated and validated in-country cannot be overemphasized.
- Given data constraints, assumptions and approximations had to be made to get to some key components of the TCP. For instance, net energy taxation or subsidy levels had to be calculated rather than being based on observed data. It is important to be transparent about these assumptions and complement them with sensitivity analyses where appropriate and make an effort to gather reliable data over time.
- The TCP can be further strengthened and some of its limitations can be overcome through refinements in future applications and improved data availability.
- It is critical to recognize that TCP components are influenced by country-specific structural and economic factors. Although global aggregate estimates are useful for illustrating the role of indirect carbon pricing instruments, what matters most for any given jurisdiction are the signals sent by instruments in force within it.
- Going forward, a critical area of focus should be enabling applications in specific countries using country-level data. In-country application would enable use of much more reliable data that can be validated and improved over time, enhancing the usefulness of the analysis and enabling meaningful and relevant policy advice. Country applications can also generate insights useful for the methodology itself.
- The TCP, in its current form, focuses on objectively measuring the carbon price signal, rather than the more complicated endeavor of assessing the decarbonization impacts related to specific levels of the carbon price. This can be the focus of future work on measuring progress toward achievement of mitigation goals.



SEVEN

Distributional Analysis for Energy Subsidy Reforms

The Why: Background to the Analysis

Energy subsidies are regressive and costly and divert scarce fiscal resources away from pro-poor public spending. Broad-based energy subsidies tend to benefit better-off households that consume more energy instead of channeling support to those who need it the most. In other words, despite all the government spending to finance them, these subsidies do not always fully and exclusively benefit the poor. To make matters worse, sometimes it is not fully clear to governments who the subsidies benefit.

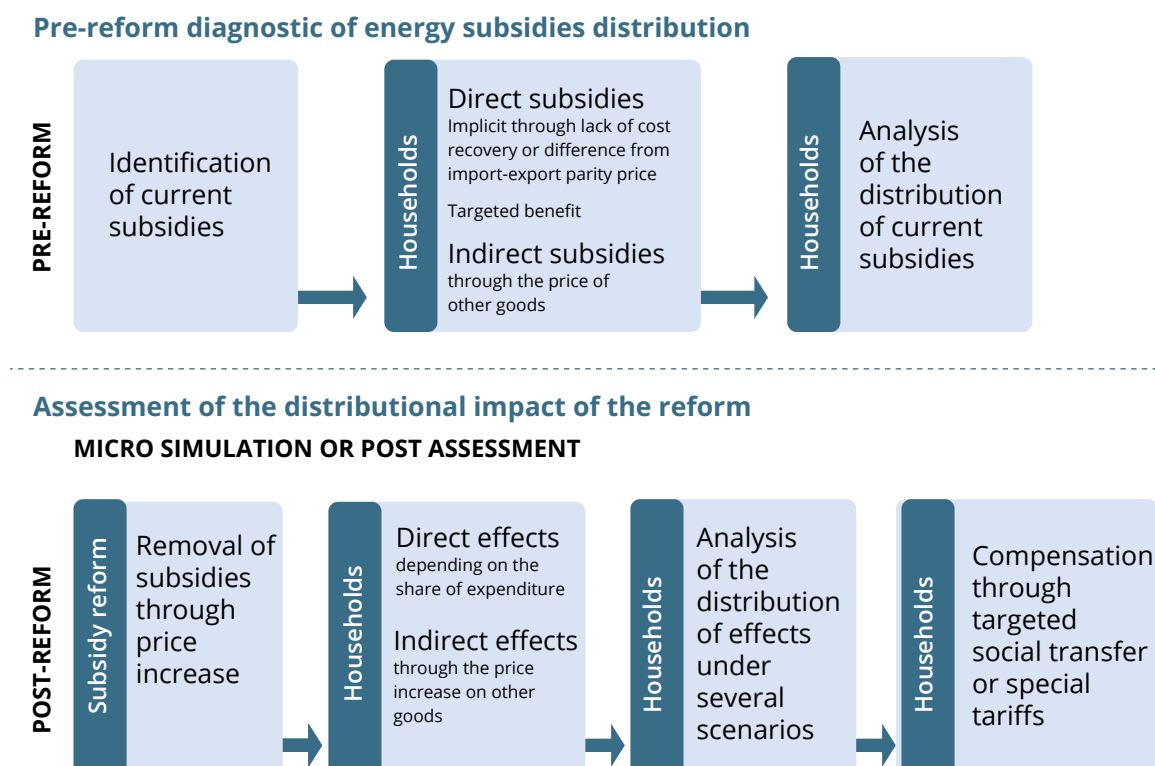
With limited fiscal space for poverty reduction and social protection, governments interested in reforming energy subsidies are exploring ways to support poor and vulnerable households in a more efficient and effective way. Despite their regressivity, the poor still extract some benefit from universal subsidies, and their sudden and whole-sale removal can negatively affect poor and vulnerable households. Thus, it is critical to understand who the existing beneficiaries of energy subsidies are and how different groups may be affected by reform options.

The What: Understanding the Distributional Impact of Energy Subsidies

Distributional analysis helps policy makers understand whom existing energy subsidies benefit and how their reform may affect households across the income distribution. International good practice suggests careful assessment of distributional impacts of existing subsidies and their potential reform is critical for the development of mitigation measures (Inchauste and Victor 2017; Olivier and Ruggeri Lederchi 2018). Understanding the incidence of existing pre-reform subsidies and assessing the potential impacts on different segments of society as a result of price increase scenarios under consideration can help governments get a sense of various possible outcomes and identify workable ways to strengthen subsidy reform designs. Understanding these impacts can allow governments to channel resources to address them, including through better-targeted mitigation measures to support the poor, the vulnerable, and those who are affected the most, or by directing some savings from reform into broader pro-poor social programs.¹ Well-designed mitigation measures can help build trust, address political economy constraints, and facilitate reform acceptability and implementation. Figure 7.1 presents a conceptual framework while [chapter 8](#) discusses how cash transfers, as part of broader social assistance, have been deployed to support reforms.

FIGURE 7.1

Conceptual Framework for Distributional Analysis of Energy Subsidy Reforms



Source: Authors' illustration based on original work.

The How: Review of Main Approaches and Practical Applications

There are different approaches to assessing the distributional impacts of energy subsidies and their reform. A review of the main approaches to distributional analysis was carried out to gain a better understanding of those approaches and how they have been deployed in real-world reform efforts. The review was complemented by deep dives into select reform cases that illustrate each approach, based on technical assistance supported by the World Bank with funding from ESMAP, through ESRF. The chapter summarizes main elements and takeaways from the ESMAP technical report [“Distributional Analysis for Informing Energy Subsidy Reforms: Review of Recent Approaches.”](#)

Quantitative approaches entail assessing the direct and indirect effects of reform leading to higher prices paid by energy consumers. Drawing on data from household budget and expenditure surveys, and using simulations and modeling tools, these

approaches can help policy makers compare the welfare of various groups of households before and after the reform. The main approaches are summarized below.²

- *Partial equilibrium approaches.* The simplest quantitative assessment focuses on the partial equilibrium effects of an energy price increase, at least as an intermediate step, and does not take into account the effect of the price increase on other goods consumed by households. A more comprehensive approach involves assessing the impact on households as measured by their welfare loss, which can be approximated using different methodologies presented in the theoretical and empirical literature (Araar and Verme 2016; Cory et al. 1981; Hicks 1942).
- *General equilibrium approaches.* To account for the effect of energy price increases on other economic sectors, general equilibrium approaches are required. Increases in the prices of the goods produced in each sector may feed through to other sectors, so that the process is iterative and sensitive to the possibility of switching away from energy-intensive goods and services, and away from fuels that will have relatively high price increases toward those with relatively low increases. As consumers switch to goods that are less energy-intensive, the structure of production would shift in that direction, which could, in turn, have impacts on employment and wages in energy-intensive industries. The longer-term effects reflecting these adjustments would require the use of a general equilibrium model, such as a computable general equilibrium (CGE) model. (See [chapter 5](#) for an in-depth exploration of CGE modeling for assessing energy subsidy reforms.)
- *Analysis of energy subsidies as part of broader fiscal incidence assessments.* The analysis of the distributional implications of energy subsidies can be part of a broader assessment of fiscal and social transfers. The Commitment to Equity methodology (Lustig 2018) provides a way to assess the direct and indirect effects of energy subsidies in a broader context of fiscal incidence analysis of tax and social interventions. This methodology can be used to assess the incidence as well as the direct and indirect distributional impacts of fiscal and social policies, including subsidies for electricity and petroleum products, but also health and education spending. Under this approach, energy subsidies are differentiated from social in-kind transfers (for example, education and health expenditure), and the relative contributions of each element to poverty and inequality indexes can be assessed.

Qualitative analyses can complement quantitative analyses to reveal factors, vulnerabilities, and preferences that are relevant for energy subsidy reforms. Qualitative approaches can use public opinion surveys, targeted user questionnaires, focus group discussions, and in-depth interviews to gather information that will be useful for reform design but may not be available through standard quantitative analyses. In some cases, data constraints may limit the relevance or usefulness of quantitative approaches, while in others, political economy considerations may underscore the importance of understanding consumer attitudes, perceptions, and readiness for reform. Moreover, these approaches can help identify issues that go beyond the potential distributional impacts and offer insights into the vulnerability of specific groups to energy price increases, or the coping mechanisms different groups may resort to in response. (Canpolat and Georgieva 2018).



Qualitative approaches can complement quantitative analyses and help enhance understanding of impacts, by focusing on the perspectives of specific groups of households regarding energy services, transfers or subsidies.

Real-world examples from energy subsidy reform efforts in developing countries illustrate how different approaches to distributional analysis were deployed in diverse country contexts to help governments assess the potential impacts of reforms. A review of specific reform experiences in Guinea, Indonesia, Ukraine, and Uzbekistan that took place between 2010 and 2020, with technical assistance from the World Bank with ESMAP support, offers helpful practical insights. In each of these diverse contexts, different approaches to distributional analysis were deployed to help governments understand the incidence of existing energy subsidies and analyze the potential impacts of reform options on poverty, affordability, and inequality. In each case, methodologies were tailored to the country setting, reform objectives, and data constraints, providing insights into how standard approaches can be adapted to a specific reform context and how implementation challenges can be addressed. Box 7.1 summarizes these examples, which are discussed in greater detail in the accompanying technical report.

BOX 7.1

COUNTRY EXAMPLES OF APPLICATION OF DISTRIBUTIONAL ANALYSIS APPROACHES

In *Guinea*, the distributional implications of different electricity tariff increase scenarios faced substantial data availability constraints, and the modeling approach had to be adapted to the context, with transparent assumptions.

In *Indonesia*, distributional analysis of electricity and fuel subsidies was undertaken as part of a broader fiscal analysis using the Commitment to Equity framework. This approach highlighted the fiscal magnitude and distributional impact of energy subsidies relative to other, more effective, social programs. The case also demonstrates the usefulness of a limited general equilibrium approach to account for indirect effects of subsidies alongside direct effects.

In *Ukraine*, a standard distributional analysis drew on extensive data for a comprehensive assessment of potential reform options. It found that, before reform, poorer households spent a higher proportion of their income on energy bills compared with the rest of the population, and existing subsidies disproportionately benefited wealthier households with higher energy consumption. As a result of the reform, which sought to address these distributional impacts, the targeting of government support was improved and became gradually more progressive, with a larger share of benefits going to the poorest income quintile. The reform helped reduce energy expenditures by low-income households and limited the increase in poverty rates while strengthening the social protection system.

In *Uzbekistan*, in the early 2010s, at a time when there were data constraints (which have since been addressed through extensive government effort), quantitative approaches were complemented by qualitative analyses involving stakeholder surveys, focus group discussions, and in-depth interviews. These efforts allowed the analysis to reveal insights that would otherwise not have been captured through quantitative data and helped inform the government's reform efforts.

The What Next: Takeaways from the Review of Practical Applications

As governments contemplate energy subsidy reforms, well-designed and context-appropriate distributional analyses can strengthen reform design, especially at an early stage. Distributional analysis offers critical insights into who benefits from existing subsidies and how reform of these subsidies, through restructuring or removal, could affect households across the income distribution. Understanding how different reform options may affect various groups of households in general, and the poor and vulnerable in particular, is critical for informing the design of mitigation measures at an early stage. Some insights from the review of recent approaches are summarized below.

- The relevance and usefulness of distributional analyses can be enhanced by choosing context-appropriate methodologies, focusing on data availability and quality, allowing greater transparency, and deploying the right expertise.
- Each analytical approach has different strengths, weaknesses, and resource requirements that need to be considered to select the appropriate approach.
- Country and sector context, reform objectives, and systemic factors play a central role in influencing the feasibility and usefulness of approaches to distributional analysis. Therefore, it is critical to dedicate sufficient time to understanding the reform context, assessing the reform objectives, determining data availability, and choosing the analytical tool that best fits the reform context.
- The quality and completeness of distributional analysis is highly dependent on data availability and underlying assumptions. The work may not always be straightforward, and analysts may have to be creative in combining various sources of information and methods to overcome data constraints. Moreover, results are sensitive to the design and limitations of simulation models. Therefore, transparency about data sources, assumptions, and methodological limitations is critical to avoid over-interpretation of results by decision-makers and practitioners.

In addition to understanding the distributional incidence of energy subsidies, future analyses can consider additional indicators to capture the distributive impact of different options on households, especially when energy poverty and affordability issues are significant. Such indicators could focus on subsidy coverage or affordability of energy as a share of total expenditure.

Endnotes

- 1 It is worth noting that some energy subsidies cannot directly be converted into fiscal revenue or savings once eliminated, given that not all are fully government funded. In such cases their elimination does not immediately imply fiscal resources that can be freed up and redeployed for other purposes (Kojima 2017).
- 2 These approaches are explored in Olivier and Ruggeri Laderchi (2018).





EIGHT

Cash Transfers in the Context of Energy Subsidy Reforms



The Why: Background to the Analysis

Despite their significant wider costs, energy subsidies are used by governments for various reasons. These subsidies often are the outcome of a delicate balancing act that governments have sought to manage, sometimes over several decades. Broad-based price subsidies for gasoline, diesel, cooking gas, or electricity can provide *some* degree of benefit to the population at large, and to the poor. In resource-rich countries, energy subsidies can be thought of as sharing the benefits of national resources with the country's population as part of a “social contract.” In contexts where there are concerns about government service delivery, energy subsidies may be one of the few tangible benefits that accrue to citizens.

In many developing countries, the magnitude of energy subsidies often dwarfs social protection spending. Faced with external shocks, governments around the world must manage difficult tradeoffs between the need to protect their citizens from substantial increases in the cost of living on the one hand, and the fiscal risks that greater and continued subsidies impose, on the other. After the disruption of global economic activity by the COVID-19 (coronavirus) pandemic and the energy and food price shocks of late 2021 and 2022, the number of countries introducing, reintroducing, or scaling up broad-based energy subsidies—as opposed to targeted compensation—continued to rise.

Broad-based energy price subsidies tend to be regressive. The recent literature shows that generalized price subsidies are an inefficient way of reaching the poorest, given that such subsidies mostly benefit those who consume more, who often, but not always, tend to be higher income groups. On the other hand, targeted social assistance, particularly, cash transfers, allow the needs of the poor and vulnerable to be met at a lower fiscal cost and in a sustainable manner.

As governments attempt to reform energy subsidies, a critical consideration is how those reforms may affect consumers, in particular the poor and the vulnerable, and the extent to which select impacts should be mitigated and at what cost. In fact, in recent years, social protection in general and cash transfers in particular have come to play an important role in supporting energy subsidy reform efforts.

The What: A Global Stocktaking of Cash Transfers and Subsidy Reform

Over the past decades, governments have increasingly deployed cash transfers to support energy subsidy reforms. Recognizing the potential impacts of energy price increases on lower-income households, several governments chose gradual approaches to price increases and accompanied them with compensatory mechanisms, whether on a temporary or longer-term basis.

To better understand how cash transfer mechanisms can support energy subsidy reforms, an assessment of real-world reform efforts and a global stocktaking exercise were undertaken. The purpose of the review, carried out as part of a collaboration between the World Bank's Social Protection and Jobs Global Practice and ESMAP, was to draw practical insights and lessons from real-world experiences where cash transfers were deployed to support energy subsidy reforms. The global stocktaking covered the period from the mid-1990s to 2016 and included 24 energy subsidy reform episodes in which governments deployed cash transfers as part of their efforts. This chapter summarizes the main elements and key findings of the ESMAP Technical Report "[Cash Transfers in the Context of Energy Subsidy Reform: Insights from recent experience](#)," which explores how cash transfers can help mitigate key impacts and strengthen the effectiveness and sustainability of subsidy reform efforts.

The How: Review of Program Context, Design, and Implementation Approaches

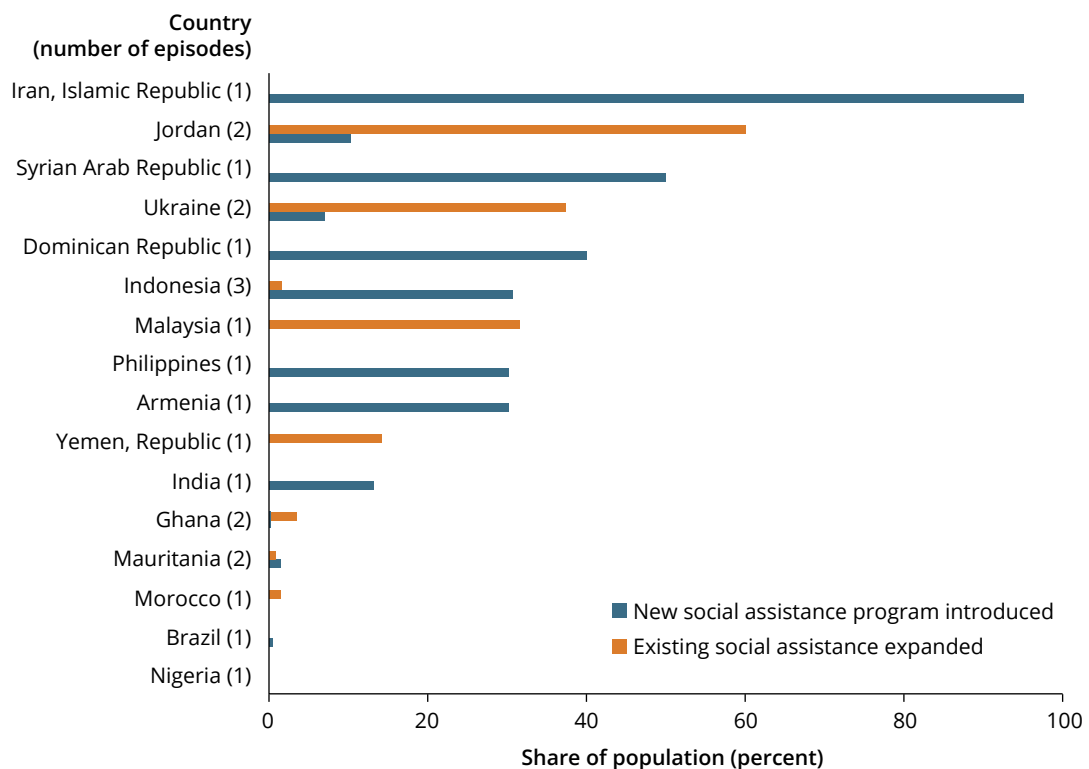
The global stocktaking found that a significant share of countries introduced energy subsidy reforms in the context of a macro-fiscal crisis. Of the 24 reform episodes reviewed, 10 took place between 2008 and 2012, a period marked by macroeconomic crises that put pressure on governments to rein in public spending. Of the countries included in the stocktaking, one-third spent more on energy subsidies than on social assistance.

The design, scope, sequencing, and timing of the cash transfers deployed in the context of energy subsidy reforms varied across countries. Coverage of cash transfers varied across countries and reform episodes, indicating differences in ambition, resources, and tradeoffs. The energy products or services targeted varied, with some focusing on electricity only, while others provided compensatory transfers alongside electricity, natural gas, and district heating subsidy reforms. The sequencing of price reform and targeted cash transfers also varied across countries. In some countries the cash transfers preceded the removal of generalized price subsidies, while others introduced them after revisions in prices. In several cases, program design was refined over time, with eligibility criteria, benefits structure, and coverage revised in succeeding phases.

Across the cases reviewed, coverage of cash transfers varied from minimal to quasi-universal, showing differences across countries and reforms in ambition, resources, and tradeoffs. As illustrated in figure 8.1, of 22 energy subsidy reforms in 16 countries, coverage of cash transfer programs ranged from 100 percent to less than 1 percent. In many cases where coverage was increased over time, the design of the mechanism was gradually modified.

FIGURE 8.1

Coverage and Type of Cash Transfers in Select Energy Subsidy Reforms



Source: Authors' compilation based on data from the International Monetary Fund, the World Bank Group, and the International Energy Agency.

Note: Based on 22 reform episodes in 16 countries for which cash transfer coverage data were available. Newly initiated programs are in blue, and expansions of existing programs are in orange.

In the majority of cases reviewed, cash transfers were introduced as new programs, with their own administrative, financing, and implementation systems. In others, depending on the government's objectives, existing programs were scaled up to better target vulnerable, poor, or near-poor households or to broaden their coverage to a near-universal transfer. In countries that went through multiple energy subsidy reform processes, there was a clear trend: the government first introduced compensatory cash transfers as new programs, and over time enhanced or expanded the existing programs by refining eligibility criteria, benefits structure, and coverage.

Similarly, institutional arrangements, delivery channels, and approaches varied based on reform objective and context. In several countries, implementation approaches evolved over time, often in pace with the increasing use and sophistication of social protection systems, delivery channels, and payment mechanisms that benefited from the increased use of mobile technologies and a variety of digital payment platforms.

Determining eligibility for cash transfers remains a major challenge in many places and directly affects program uptake and targeting performance. The design, targeting, and delivery largely depend on the availability and quality of data from different sources, including social registries. Strict income-based eligibility can still result in exclusion errors, given that people working informal jobs can lack documentation to prove income eligibility. Some countries used existing registries to identify and target beneficiaries, while others pragmatically used data from various administrative databases. The ability to share and consolidate beneficiary information across databases and platforms can help overcome targeting errors and allow identification of beneficiaries that may otherwise be excluded.

BOX 8.1

COUNTRY EXAMPLES FOR USE OF CASH TRANSFERS

The experience of the *Dominican Republic* with the Bonogas and Bonoluz programs shows how governments can leverage existing social protection systems to successfully design and deliver an energy subsidy reform. The earlier Solidaridad conditional cash transfer program provided a platform for the government to rapidly introduce and integrate the two new energy sector-specific programs and reach scale. This experience also highlights the central role of understanding who may be affected by reforms, introducing mitigation measures to address the most critical impacts, building trust, and creating supportive coalitions for reform.

Ukraine's 2014–16 reform of the Housing and Utility Subsidy (HUS) program amid internal and external pressures illustrates how an ambitious reform can be introduced when accompanied by carefully designed and clearly communicated social assistance. Alongside substantial increases in tariffs for gas, electricity, and district heating to bring them closer to cost-recovery levels, the government implemented a broad-based and inclusive cash transfer program. The program reached nearly half of all households in the country and was complemented with a well-designed communications and outreach campaign. Both cases show how the design, delivery, and implementation of cash transfers can be strengthened and refined over time.

The majority of the energy subsidy reform efforts that incorporated cash transfers ultimately generated net fiscal savings. It is important to recognize the tradeoffs between cash transfer coverage, generosity, and fiscal savings from subsidy reform. Depending on the macroeconomic, social, and political circumstances in a country at a given time, one consideration may feature more prominently than others. The review indicates that countries that implemented broad-based, relatively generous cash transfers covering a large share of the population experienced fewer implementation challenges or lesser stakeholder pushback than others during the early stages of reform.

Diving deeper into specific reform efforts offers useful insights to practitioners on how program designs, delivery, and implementation approaches can evolve over time. The accompanying technical report offers two in-depth case studies of program designs evolving amid changing government objectives and circumstances. These case studies are summarized in box 8.1 and presented in greater detail in the accompanying technical report.

The What Next: Key Takeaways from the Stocktaking

Cash transfers can facilitate energy subsidy reform implementation by mitigating the impact on key stakeholders, thereby building trust and enabling support. Some takeaways are summarized below and illustrated in figure 8.2.

- Cash transfer design and implementation arrangements require careful upfront work and fine-tuning over time to ensure continued alignment of the program approach with reform objectives, including costs and effectiveness.
- There are tradeoffs between the coverage and generosity of a cash transfer program and the fiscal savings obtained from energy subsidy reforms. It is important to be aware of the impact while designing the reform or determining coverage and scope.
- Systematic preparatory work and rollout efforts are needed to streamline the registration and delivery processes, which is critical for program uptake.
- Clear, effective, and targeted communication is key to any transition from general price subsidies to reformed prices complemented by targeted cash transfers.
- Social protection systems, registries, targeting approaches, and institutional capacity need to be strengthened and adjusted over time to enable their readiness and adaptability to evolving government priorities for reforming energy subsidies.

FIGURE 8.2

Key Insights on Cash Transfers from Global Stocktaking and Case Studies



Cash transfers can support energy subsidy reforms by helping mitigate impacts on stakeholders, building trust and enabling support.



Design and implementation arrangements require careful upfront work and fine-tuning over time to ensure continued alignment of program approach and reform objectives



There is a trade-off between the coverage and generosity of compensation measures and fiscal savings



Clear, effective, and targeted communication is key to any transition from universal price subsidies to reformed prices complemented by targeted cash transfers



Compensating households through cash transfers alone is not enough, and they should be accompanied by other measures to strengthen the resilience of households against shocks

- Critical success factors include political commitment, flexibility in design, improving the targeting over time, the use of practical delivery mechanisms, and the upgrading of technical and administrative capacity.
- Finally, compensating households through cash transfers is recommended but not sufficient; other measures should also be taken to strengthen the resilience of households against energy price and cost shocks. Such measures can include increasing social spending and increasing relevant structural investments.





NINE

Firm-Level Effects of Energy Price Increases

The Why: Background to the Review

Energy subsidies encourage firms to overuse energy by underpricing it. Along with labor, capital, and intermediate goods, energy is one of the fundamental production inputs firms use to produce output. From a mainstream economic point of view, firms generate output by choosing the optimal combination of inputs, and their relative prices influence this choice. Government subsidies of any specific input distort firms' decisions for determining the optimal mix of input factors, which can reduce economic efficiency: reducing the price of one particular input encourages the firm to use more of it per unit of output, distorting both the amount of a good produced and the way it is produced.¹

Reforming energy subsidies can help eliminate the distortions resulting from artificially low energy prices, but adapting to price changes may not be seamless for all firms. Allowing energy prices to reflect its efficient economic costs can correct the distortions and misplaced incentives to overuse energy, and in market-based systems, can encourage firms to allocate production inputs more efficiently. The impact of energy price increases on a firm depends on various factors, including the firm's energy dependence, the magnitude of the changes in price levels, and the availability of options for the firm to adapt and reduce energy consumption in response to price signals.

A growing body of academic literature explores how policy-induced energy price increases affect firms. The ESMAP Technical Report titled "[Firm-Level Effects of Energy Price Increases: Evidence and insights from recent research](#)" reviews the academic literature on firm-level impacts of energy price increases. This chapter summarizes the main findings of that review, which was carried out as part of the Energy Subsidy Reform Facility's global stocktaking exercise on energy subsidies, with a view to deepening the understanding of available research and evidence on the topic.

The What: Review of Recent Literature on Energy Price Impacts on Firms

The review focused on literature analyzing the effect of changes on firms' energy input prices using firm-level microdata in different contexts. The review aimed to identify and distill emerging evidence on how energy price increases affect firms. The review focused on empirical, firm-level studies in developing and developed countries published after 2010. The reviewed papers were sorted using a framework categorizing firm-level response mechanisms to policy-induced energy price increases. The framework was derived by combining different conceptualizations in the field. In addition to providing an empirical synthesis of firm-level response mechanisms, the review focused on heterogeneities in firm-level response patterns to energy price increases. The review also discusses

considerations for future empirical work, in terms of both country setting and type of analysis, based on the findings in the field.

Empirical research on the effects of energy price changes on firm performance has so far been limited to a small set of countries. Because of extensive data requirements, assessing the effects of input price variation on firm-level outcomes has been challenging. As a result, much of the research has been conducted at the individual country level, focusing on large and high-income countries. To overcome this limitation, the review included work on energy price increases resulting from not only energy subsidy reforms but also various other policy drivers. Accordingly, the scope also incorporated price effects of environmental and fiscal policies, including carbon pricing or energy taxes. The use of a larger sample makes available more data and analysis from which insights can be drawn.

The How: Review of Evidence and Insights from Recent Research on Firms

The review explored the scope, analytical approach, findings, and conclusions of the studies identified. The studies involving empirical analysis of firms' responses to energy price increases typically used official firm-level data, focusing on production-related economic activities. Relevant articles were identified in peer-reviewed journals and well-established working paper series published after 2010 with an empirical, typically firm-level, foundation. Analytically, the studies evaluated a largely converging set of indicators related to variables such as firm productivity, employment, efficiency, and production technology. Although the studies broadly acknowledge the potential heterogeneous impacts energy price increases may have on firms, most analyses are limited to characteristics such as firm size or sector-level energy intensity.

Recent research captures the main sets of firm responses and coping strategies associated with energy price increases. Although the responses vary by study, analytical approach, and factors considered, four major sets of firm responses are identified: (1) passing energy price increases on to customers, (2) absorbing the price increases, (3) substituting more expensive energy inputs with cheaper options, and (4) using firm-level capacity that drives innovation, and possibly, productivity and competitiveness. These responses are not mutually exclusive, given that a firm can deploy multiple responses simultaneously or stagger them over time. A firm's strategy may evolve as it is continuously affected by price and nonprice policies, along with structural and macroeconomic factors. At the same time, some potential responses may be more immediate than others. For example, changing the energy mix involved in production may require some investment, while increasing sales prices is more immediate. The main categories covered in recent research are explored below.

- *Pass-through.* One of the easiest and fastest ways for firms to respond to energy price increases is by increasing the sales price of their output, thus passing the cost increases on to their customers. The degree to which firms can use this response depends on the firm's position in its production chain, its market power, and its exposure to domestic or foreign competitors, as well as on the price elasticity of demand. In the most extreme case, energy price increases may be fully passed through to consumers, resulting in potential welfare losses with no environmental impact. Empirical studies find evidence of substantial cost pass-through by firms in response to energy price increases.
- *Absorption.* If firms cannot pass cost increases on to their customers, another option is to absorb the energy price increase. Similar to pass-through, this option is immediately available to the firm and does not require any changes in its production processes: the firm can decide to absorb the price increases without changing (now more expensive) energy consumption. Although absorption may be a tenable option, it is viable mainly for firms with strong financials and in the short run. The extent of firms' absorption of higher energy prices tends to vary depending on firm characteristics and sector. Unsurprisingly, firms in energy-intensive sectors typically respond more strongly. The literature does not offer conclusive evidence of a negative impact on firm profitability, exit, or significant job loss due to energy price increases. However, evidence does point to potential within-sector labor reallocation, underscoring the importance of mitigation measures focused on jobs and employment.
- *Substitution between inputs.* If inputs are perfectly substitutable, the firm's adjustment cost is minimal. Some energy sources may more easily be replaced by others, provided the equipment allows that substitution, while some interfuel substitution options can be complex and expensive. Conceptually, a broader option would be to replace energy with other production inputs, such as labor or capital, and shift production processes to other countries where the relative input prices have remained unchanged. Overall, the literature suggests that substitution occurs widely between inputs, particularly between energy and labor, and among energy carriers, and the extent of substitution varies by context. Given the particular type of data needed to quantify interfuel substitution, empirical evidence from firms is relatively scarce, but literature does offer evidence of notable differences in the substitutability of fuels (especially from coal to gas) and electricity.
- *Innovation and competitiveness.* The literature offers robust evidence that policy-led energy price increases can contribute to innovation and investments leading to significant efficiency increases, while it finds limited evidence that energy price increases erode firm performance. This finding generally holds and is not specific to a particular country or sector, thereby supporting the weak Porter hypothesis in which policy reforms spur innovation.² The evidence supporting the strong version of the hypothesis, in which policy reforms lead to increases in firm competitiveness, is more ambiguous. Most notably, ample evidence indicates that the outcome may be dependent on firm- and sector-specific characteristics, and on available technology. For example, the impact of fuel price increases on firm productivity is found to be less detrimental than the impact of electricity price increases.

Overall, evidence and analyses from recent research into the firm-level impacts of energy price increases find that these changes are not necessarily detrimental to firms, and firms have multiple response mechanisms at their disposal with which to navigate them. Policy-wise, some of these responses may be more desirable than others. For example, if firms can pass on all energy price increases to households, the environmental and socioeconomic outcomes from such policy changes may require further consideration than when firms resort to cleaner and more modern production processes. Similarly, not all firms may be affected in the same way by policy-induced price changes, given that smaller firms and more energy-intensive sectors have been found to be disproportionately affected by such policy changes. Some studies show that the impact on firms can be reduced if the price increases are accompanied by government spending on measures that support productivity or that are favorable to the private sector. For example, some of the revenues saved by eliminating subsidies could be recycled back through measures such as lowering taxes on the output of firms' production, providing vouchers to consumers for the firms' output, providing cash transfers that increase demand, or improving the provision of public goods used by firms (infrastructure, security, judiciary, and so on). Adequately navigating these challenges requires careful consideration of circumstances and specific market conditions, as well as further research based on firm-level microdata evidence.

The What Next: Areas for Future Work

Based on the literature reviewed, the following topics could benefit from future work.

- *More granular analysis of firm responses.* Given the various ways firms respond to energy price increases, a more extensive and granular analysis of the heterogeneity of firm response patterns is valuable and can inform the design of better policies.
- *Connecting the missing dots.* Firm-level surveys are not necessarily designed to capture firms' various coping mechanisms in response to energy price increases. Novel or more sophisticated data, such as balance sheet or payment transaction data, as well as employer-employee-linked data, can help deepen the understanding of how firms navigate energy price changes and detect hidden vulnerabilities.
- *Broadening the scope.* To ensure the sustainability and inclusiveness of green policies, a more extensive analysis of the nexus between energy price increases and firm-level outcomes in the developing world is needed.
- *Exploration of policy incentives and targeted mitigation measures.* The recent literature points to the importance of well-designed and targeted complementary policy measures to moderate and mitigate the firm-level impacts of energy price increases caused by energy subsidy reforms as well as by energy sector, climate, and environmental policy. The importance of assessing the quality and incentive structure of planned policy

interventions has been highlighted in recent work and should be a key consideration during the development of reforms.

- *Emphasis on use of fiscal resources.* How fiscal resources saved or freed by energy subsidy reform are used can affect the ultimate impact on firms and sectoral outcomes. Although these impacts have been explored at the macroeconomic level, literature that isolates firm-level effects of energy subsidy reform based on how governments have used the revenues is relatively scarce. This topic can benefit from future modeling work and evidence-based analysis, going beyond estimation of impacts of prices to being explicit about uses of revenues.

Endnotes

- 1 Energy subsidies are input subsidies and tend to be more distortionary than output subsidies. Output subsidies encourage firms to produce more of their outputs by using any combination of inputs that the firm chooses and will only distort the amount produced. Sometimes the two categories can be combined; output subsidies for upstream producers in the supply chain for a specific good can become input subsidies for downstream producers.
- 2 The literature loosely distinguishes between three prominent forms of the Porter hypothesis. Under the "weak" form of the Porter hypothesis, environmental regulations spur innovation (Arlinghaus 2015; Dechezleprêtre and Kruse 2018; Dechezleprêtre, Nachtigall, and Stadler 2020; Joltreau and Sommerfeld 2019). Under the "strong" version of the Porter hypothesis, environmental regulations will lead to increases in firm competitiveness. Finally, as the third and final variant, the "narrow" version of the Porter hypothesis states that more flexible regulations may be better at providing the preferable incentive structures to firms than more prescriptive forms; see (Ambec et al. 2013) for further discussion.



TEN

Technical Assistance for Political Economy Analysis and Communications



The Why: Background to the Analysis

Understanding the political economy context and communicating effectively can contribute to the implementation and sustainability of energy subsidy reforms. The recent literature recognizes and emphasizes the importance of political economy and communications in the context of energy subsidy reforms. Experience shows that, for governments interested in reforming costly energy subsidies, developing a comprehensive understanding of the political economy context for the reform, along with finding an effective way to engage with and communicate with the public, can be critical for delivering an effective reform effort.

Political economy analyses (PEAs) and communications strategies can contribute to the design of sustainable energy subsidy reforms. For governments interested in reforming costly energy subsidies, building a solid understanding of the political economy context, and using that understanding to develop a communications approach that explains the reform's rationale, benefits, and scope, can contribute to the effectiveness of reforms. The way the government engages and communicates with the general public and stakeholders about a proposed energy subsidy reform can have a strong impact on the government's ability to build acceptance for reform. Targeted technical support to developing country governments in undertaking PEAs and devising communications strategies can help them to design and implement sustainable reforms.

The What: A Review of Recent PEA and Communication Technical Assistance

A select set of ESMAP-funded technical assistance activities were reviewed to understand how PEA and communications tools were applied in practice. Given the significant impact that political economy conditions and the way in which the government communicates, or does not, can have on the realization and sustainability of reform, the review attempted to consolidate information and draw practical insights from real-world technical assistance activities that were deployed to address these two dimensions. The review explored how energy subsidy reform effort-related technical assistance activities were designed to support governments in strengthening their understanding of the political economy context of specific reforms and communications capabilities. The qualitative review of the recent body of technical assistance activities supported by ESMAP explored activity designs, implementation approaches, and experiences. The main findings and takeaways from the review are presented in the ESMAP Technical Report titled [“Political Economy Analysis and Communications for Energy Subsidy Reforms: Approaches and Insights from Recent Technical Assistance,”](#) as part of the Energy Subsidy Reform in Action series. This chapter summarizes that report's findings.

The review of a set of ESMAP-funded technical assistance activities supporting the energy subsidy reform efforts of developing country governments found that 77 percent of activities between 2014 and 2020 involved support for the preparation of PEA and communication strategies. Out of the 52 activities funded through ESRF during that period, 32 (62 percent) involved research and analysis on political economy dimensions, 33 (63 percent) involved support for communications, while 25 (48 percent) included both. This represents a marked improvement over the levels reported by Inchauste and Victor (2017, 2), that an “internal stocktaking of analytical reports on energy subsidies by Bank teams over the past 10 years found that only a quarter of them undertake some analysis of the political economy of reforms.”

The How: Activity Designs, Findings and Insights

Design of PEA and communications support

The review explored the design, scope and implementation approaches of technical assistance activities. Some insights on the design of technical assistance for PEA and communications in the context of energy subsidy reforms are summarized below.

- PEAs often used evidence-based approaches. The PEAs included a combination of research, public opinion surveys, focus group discussions, in-depth interviews, and stakeholder analyses. Several involved the development of stakeholder influence-interest matrixes for visualization of the assessment and its findings.
- Advancing beyond traditional sectoral or macro assessments, some activities adopted problem-driven PEA approaches to conduct deeper assessments. They took in-depth looks at reform-specific questions, governance and institutional challenges, the influence and interests of stakeholders, foreseeable implementation challenges, and previous attempts to implement such or similar reforms.
- While technical assistance from the World Bank and ESMAP focused on the research and support for development of communications strategies, implementing communication campaigns was the governments’ responsibility.
- Technical assistance on communications strategies involved work on audience segmentation, communication methods, messaging, messengers, and trusted channels of communication. Media reviews were used for a few activities.
- Several activities supported governments in creating communication committees, bringing together key ministries and other decision-makers to support the implementation of communication efforts and strengthen coordination.
- Two-thirds of communications support activities focused on strengthening the capacity of key communication staff within the government, the utility, or both.

- Most communications activities involved strong government demand and ownership.
- Over the years, the use of gender-focused analyses became more prevalent.
- Evidence on the use and impacts of communications support being built into the design of activities was limited.

Substance of PEA and communications outputs

The review of the substance of the PEA and communications outputs yielded useful findings and insights into energy subsidy reforms. As part of the review, a qualitative analysis of outputs in 33 activities was carried out. In addition, activities in six countries were subjected to in-depth assessments, output reviews, and interviews with World Bank task teams. Overall, the insights from this review were consistent with the established literature on this topic (Foster and Rana 2020; Fritz, Levy, and Ort 2014; Inchauste and Victor 2017; Moerenhout 2022; Skovgaard and van Asselt 2018), which indicates that various stakeholders can affect reform implementation and sustainability. Main insights are summarized below.

- Several PEAs found small consumers and politically connected vested interests to be among the key political stakeholders for energy subsidy reforms.
- In many cases, consumers were not aware that they were receiving subsidies.
- Consumers in different contexts expressed concern about the potential impacts of energy price increases on their livelihoods, directly and via inflation, particularly among lower-income, female-headed, or single elderly households.
- Some opinion surveys reported distrust among stakeholders or toward authorities. Where present, this distrust also translated into skepticism toward messaging about energy subsidy reforms and the role of the government.
- One of the most noteworthy and common findings in different countries was that stakeholders across highly varied contexts were not uniformly or invariably opposed to subsidy reform or tariff increases for energy services.
- Multiple PEAs conducted in different contexts with varied challenges found that energy subsidy reforms could be more acceptable to consumers if the price changes were accompanied by tangible benefits. According to the surveys, stakeholders could be willing to accept price increases if energy service reliability or quality improved, and if social assistance mitigated the impact of price increases.
- The analyses indicated that clear, informative, and trustworthy communication on reform objectives and outcomes could help improve acceptability of reforms.
- Trustworthiness of the individuals delivering the messages was important for stakeholders. Communicators need to come across as honest, accessible, and easy to understand to help overcome perceived or real trust deficits.

To illustrate how political economy analyses and communications technical assistance can support governments' reform efforts, box 10.1 summarizes a country example. The accompanying technical report provides additional examples and further detail.

BOX 10.1

ILLUSTRATION OF HOW PEA AND COMMUNICATIONS WORK TOGETHER

In one country where ESMAP-funded technical assistance included support to the government on political economy analysis (PEA) and communications alongside technical analysis on the energy sector, the PEA found that many stakeholders were relatively unaware of the size, opportunity cost, and inequitable distribution of the benefits from energy subsidies, which accrued mostly to rich urban households. The PEA highlighted the importance of linking tariff reforms to an improvement in the performance of electricity and fuel sectors as issues that stood out for poor and middle-income households. In view of the findings of the PEA, the government developed a communications strategy to directly address these issues. The messaging focused on delivering estimates of the scale of the energy subsidy burden, its opportunity costs in terms of services the government could deliver using those funds, and the distribution of benefits among different income groups in the country. In view of concerns about cost of living identified during the stakeholder engagement, the reform design was strengthened to incorporate mitigation measures, such as cash transfers, and an overall improvement in system reliability. In addition, the communications strategy focused on sharing information about the various mitigation measures that would be made available by the government, and how they could be accessed. The technical assistance helped strengthen governments' understanding of citizen perspectives, improve policy design, and communicate on how the reform would meet citizens' needs.

The What Next: Strengthening PEA and Communications Support

The review of recent technical assistance activities indicates that targeted analytical and advisory support for PEA and communications can help governments better understand diverse public perspectives and strengthen reform designs. Insights on good practice approaches are summarized below.

- Activity sequencing matters. In good practice cases, PEAs were carried out first, and their findings informed reform designs and communications strategies.
- The timing of the PEA, and its use to answer the right policy questions, can strongly affect its utility. Carrying out a PEA early on in a process can contribute to a reform design that anticipates risks and communicates well on critical issues.
- Comprehensive PEAs combining multiple methods are essential for understanding the perspectives and influence of different stakeholders.
- The level of detail and coverage of the PEA appeared to contribute to the comprehensiveness and depth of the communications strategy that followed.
- The ability to engage the right mix of expertise, combining technical skills and country knowledge, can influence the quality of communications strategies.
- Communications strategies that recommended practical, actionable steps and that produced usable outputs appeared to be viewed as more effective.
- Strong ownership and steady involvement by government counterparts was important. The involvement of key decision-makers and reform champions in the development and delivery of communications can help demonstrate ownership.
- The relevance and timeliness of communications support were facilitated by the availability of resources to mobilize expertise and by continued engagement.

The review also identified potential areas for improvement and new approaches that can be considered under future technical assistance. These are summarized below.

- It is important to complement detailed technical and analytical work with a focus on better understanding the political and sectoral context for reforms.
- There may be opportunities to explore the use of problem-driven PEAs, especially in more sensitive and complex reform processes.
- Where appropriate, revisiting and periodically updating PEAs can allow recent developments to be captured and stakeholder positions to be reevaluated for the continued relevance and usefulness of the analysis. This can be germane to multiyear reform efforts and dynamic environments with evolving perspectives.

- The importance of having adequate local understanding, expertise, and capacity in developing communications campaigns cannot be overemphasized.
- Early assessment of institutional readiness and communications capabilities can help governments identify and address capacity needs. Technical assistance can help them strengthen their own capacity to design and deliver communications.
- Activities can benefit from incorporating into their design, from the outset, plans for evaluation of the use and impact of key PEA and communications outputs. Tracking whether PEA and communications strategy outputs were used, or whether a particular approach had impact, can be helpful for future efforts.
- Government ownership is critical. Although technical assistance on PEAs and communications can strengthen reform designs, the focus is on supporting governments in advancing their own reform agendas. The execution of the communications strategy, much like the reforms themselves, remains a decision that lies within the exclusive remit of the government. It is up to the government to decide whether to prioritize and dedicate the required resources to their implementation.
- Development partners could explore the feasibility of and options for supporting government agencies during the implementation of communications strategies.
- Making available a set of sample documents and curated knowledge could be helpful for practitioners supporting governments in their reform efforts.





ELEVEN

Conclusions, Takeaways and Future Work Areas



As the final output of the stocktaking study, this report consolidates and synthesizes the main findings and insights from the extensive background work leading up to it.

The detailed technical work and assessment of activities supported by the Energy Subsidy Reform Facility (ESRF) offered insights not only into the substance of energy subsidy reforms, but also into the different ways in which the reform efforts of developing country governments can be supported through technical assistance and advisory support provided by their development partners. The study builds on the available knowledge base on energy subsidy reforms, and offers additional insights gained through reviews of recent research, emerging approaches, and real-world reform efforts. Main themes and insights from this exercise are summarized below, and are explored in greater depth in the technical background reports and in the Energy Subsidy Reform Assessment Framework (ESRAF) Good Practice Notes developed by ESMAP.

This concluding chapter is divided into three parts. The first part distills and reflects on takeaways related to the substance of energy subsidy reforms. The second part discusses insights on the preparatory work required for the design and delivery of sound subsidy reform initiatives, and the related support needed, which can be provided by developing country governments' partners. The final part presents potential areas for future analytical work based on areas identified in the background research and the review of ESRF-funded activities.

Insights into the Substance of Reforms

Over the past few decades, available empirical evidence, practical experience, knowledge and analysis related to energy subsidy reforms has continued to grow. A robust body of literature on energy subsidy reforms has emerged over the years, as summarized in [chapter 2](#) and [chapter 4](#) of this report, and in the technical background reports. A wide range of articles and reports have become available, covering diverse aspects, documenting real-world experiences, and deploying established and novel analytical approaches to assessing reform designs and outcomes. This growing body of literature has added value by extracting good practice examples and offering strategic and practical insights into reforms.

Review of international experience indicates that energy subsidy reforms are challenging; success is hard to define, achieve, and maintain. Too often, after reforms are introduced and even implemented, they are reversed when circumstances or the authorizing environment change. Unfortunately, this can hold true even for cases initially celebrated as "successes." Tracking of reform implementation experiences and performance in developing countries over longer periods, as done in the series of papers by Kojima (2009, 2013, 2016) and others, has been particularly useful in providing insights and perspectives on the evolution of reforms, and yielded a better understanding of the drivers of reform outcomes, as described below.

Reform efforts in diverse contexts point to factors and common-sense approaches that affect outcomes, which can help strengthen the design and of future reforms, when coupled them with solid context-appropriate analytical work. Outcomes of energy subsidy reform efforts are influenced by multiple factors, including reform objectives, design, and implementation approach; sector dynamics; political economy constraints; macroeconomic and fiscal circumstances; global commodity price movements; and various external shocks. Good practice cases highlighted in literature tend to have several characteristics in common, as discussed in [chapter 2](#) and explored in detail in technical background reports. These characteristics include strong government ownership, attention to political economy and stakeholder engagement, incorporation of mitigation measures into reform design, careful timing and sequencing of measures, and strengthening the accompanying policy and institutional framework. The common-sense steps for practitioners, as outlined in the [executive summary](#) and summarized in box ES.1 draw on these approaches, and insights from the background work, which are presented in the subsequent paragraphs.

An essential starting point in any subsidy reform effort is to gain a solid understanding of energy sector financial and operational performance, drivers and impacts of energy subsidies, as well as their interactions with different policies. Understanding the energy sector's financial performance and the ability of utilities to recover costs and finance operations, maintenance, and investments, along with the associated fiscal impacts of subsidies, is an important step in any energy subsidy reform effort. Gaining deeper insights into factors affecting the sector's financial status requires several steps, including a review of utility and sector operational performance and analysis of the interaction between price and nonprice policies that may affect sector financial viability and sustainability. For example, cost-of-service studies can offer a deeper understanding of the utility's costs and the design of efficient tariff structures, and financial analyses are helpful for understanding performance and its drivers. The benefit of those studies are enhanced when they are complemented by analysis of government policies and goals that affect the energy sector, such as policies on access, renewable energy, or affordability. The government's approach to financing those policy goals can impact the utility's and the sector's financial sustainability.

It is important to keep in mind the difference between one-off reform actions and longer-term changes. Given the risk of reform reversal amid change in the authorizing environment, policy makers need to recognize that not all price or tariff reform actions are equal. For instance, one-off actions, such as one-time price increases, provide only a short-term improvement, while longer-lasting changes, such as revision of a tariff methodology, automatic price adjustment mechanisms, and removal of political control over pricing decisions, improve the sustainability of subsidy reform. The first type of action, for instance, *"electricity or gas tariffs will increase by X percent in year Y,"* is helpful in addressing the sector's immediate revenue shortfall or reducing transfers from the government budget to the utility in a given year (hence relieving the fiscal burden at that time). But efforts to maintain cost-reflective tariffs or prices to phase out subsidies may be halted or reversed when political circumstances change unless there is an effective regulatory instrument that requires price or tariff adjustments. The introduction of automatic

adjustment mechanisms, where electricity, gas, or heating tariffs or fuel prices are periodically adjusted using a transparent procedure and a formula based on parameters for which data are publicly available, facilitates the continued alignment of tariffs or prices with costs, and therefore revenues. In summary, the sustainability of reforms requires actions that help the sector and its performance become less susceptible to political cycles, thereby making it harder to reverse the desired trajectory. Therefore, there is value in focusing on systematic approaches that gradually reduce the need for political involvement in pricing decisions in the sector.

Understanding who will be affected by the reform, how, and to what extent is critical for reform design. A helpful starting point in this regard would be a high level assessment of the potential impacts on different economic actors, and this can enable reforms designs that anticipate and address the most critical impacts. Macroeconomic modeling can provide useful insights into potential impacts from energy subsidy reforms on the economy, households, and firms. Among different modeling tools, in recent years computable general equilibrium (CGE) models have been increasingly used in academia and by development practitioners for understanding and assessing the potential impacts from energy subsidy reforms. These models, explored in greater detail in [chapter 5](#) and the accompanying technical report, allow a comprehensive assessment to be made of alternative policy choices, interdependencies, and long-term effects.

Understanding how households and communities are affected by existing subsidies and how they could be affected by reforms is essential. Well-designed and context-appropriate distributional analyses play a central role in understanding the distributional and poverty impacts on households and communities caused by energy subsidy reform. As discussed in [chapter 7](#), distributional analyses can help identify how different subsidy reform options could affect households across the income distribution, the poor and vulnerable in particular, and inform the design of potential mitigation measures. In addition, distributional analysis can provide transparency about who benefits from existing energy subsidies. For instance, the analysis may show that existing universal gasoline price subsidies in a low-income country may be benefiting well-off urban households rather than the poor. Better understanding who benefits from existing subsidies, and who stands to gain or lose from their reform, can reveal political economy constraints that need to be addressed through targeted support measures and strategic communications and messaging.

Social protection in general, and cash transfers in particular, offer a vital tool for mitigating the potential impacts of energy price or tariff increases on households, in particular on the poor and the vulnerable. International experience indicates that allowing energy commodities to be sold at market prices or at levels corresponding to recovery of efficient costs, identifying those affected by such changes, and offering cash transfers to those who need them most, is a significant improvement over universal price subsidies. A recent global stocktaking as summarized in [chapter 8](#) and presented in greater detail in the relevant ESMAP Technical Report, finds that providing cash transfers—especially those based on careful distributional analyses—can facilitate the delivery of the reform and help build credibility and trust in the government. The review of experiences

over two decades finds that in countries that have complemented energy subsidy reform with cash transfers, the reform objectives, design, and implementation approaches evolved over time, often in line with the increasing use and sophistication of social protection delivery instruments. In this context, digital technologies, which have been increasingly deployed in recent years, have facilitated the delivery and uptake of cash transfers. The analysis finds that, even after cash transfers were introduced or enhanced, the majority of reforms resulted in net fiscal savings, while the magnitude of net fiscal savings was influenced by the generosity and coverage of the cash transfers, along with the baseline expenditure before the reform, highlighting important trade-offs.

Understanding the political economy context and periodically revisiting the assessment can facilitate adapting reform and communications to align with realities on the ground, thereby contributing to the achievement of reform objectives and reducing the risk of reversals. There are real-world examples where carefully developed subsidy reforms failed to secure political approval at the end of a long preparation effort and thus did not reach the implementation stage or were reversed shortly after being introduced because of public reaction or political pressure. As practitioners can attest, designing workable and sustainable energy subsidy reforms is both a science and an art—reform context, objectives, and timing are crucial factors that should be considered when assessing and determining the design and implementation approach of the reform. There may be situations where the first-best or optimal solutions are not immediately implementable, for example, because strong vested interests, public perspectives, resource constraints, or institutional or capacity limitations need to be addressed first. In such cases, a gradual approach, with initially moderate price increases while measures to mitigate the most critical impacts and strengthen capacity are broadened, can be designed and implemented to make sustainable gradual progress toward the desired outcomes. This approach needs to be accompanied by communications campaigns that clearly publicize the rationale and indicative timeline for next steps. In other cases, an external shock or a macroeconomic crisis can create a limited window of opportunity during which ambitious and swift actions should be taken, otherwise risking missing the opportunity for meaningful reform for several years. Therefore, in each reform effort the essential technical and analytical work would need to be complemented by an understanding of the political and sectoral context to determine the reform design and implementation approach suitable for the circumstances, as discussed in [chapter 10](#).

Recent research indicates that energy price increases are not necessarily detrimental to all firms. Firms have multiple response mechanisms at their disposal with which to navigate energy price increases, whether driven by policy-based or market-based factors. As discussed in [chapter 9](#), research offers evidence that firms can respond to energy price increases by passing them on to their customers; absorbing them; substituting more expensive alternatives with cheaper inputs; or by innovating, increasing productivity, and enhancing competitiveness. These responses are not mutually exclusive, given that a firm can deploy multiple responses simultaneously or stagger them over time. A firm's strategy may evolve, as it is continuously affected by price and nonprice policies along with structural and macroeconomic factors. Studies show that the impact on firms will vary based on sector

and firm characteristics such as firm size, trade exposure, and the energy intensity of production, among others.

How fiscal savings from reform are used matters in achieving outcomes. The background analytical work indicates that the use of fiscal savings or additional revenues resulting from reforming energy subsidies has a strong bearing on reform outcomes such as impacts on economic growth, household welfare, and poverty and distributional aspects, which in turn can all affect political economy dimensions and public support for the reform. If the reform results in fiscal savings, those savings can become part of general government revenue or can be repurposed for measures to mitigate the impact of subsidy reforms (such as cash transfers), or to reduce taxes or fund fiscal incentives related to other policy priorities (for example, lowering labor taxes or providing employment vouchers or energy efficiency grants to firms and households), or to finance other development priorities such as investment in infrastructure (electricity service improvements, decarbonization, renewable energy scale-up, or roads) or human development (schools, hospitals). The question of the use of fiscal savings from reform is a theme identified and covered in the different technical background reports on macroeconomic modeling ([chapter 5](#)), cash transfers ([chapter 8](#)), firm-level effects ([chapter 9](#)), and political economy analysis and communications ([chapter 10](#)). Exercises using CGE models find that choices about the use of fiscal resources set aside for energy subsidies (or fiscal savings from their reform), including whether redirected to other development priorities, have a strong bearing on the outcomes of the model related to impacts on growth and welfare. Moreover, recent research on firms (see [chapter 9](#)) indicates that the impacts of energy price increases on firms can be mitigated if they are accompanied by government measures that support productivity (for example, lowering taxes on firms' outputs or providing grants for energy efficient technology adoption), encourage substitution away from energy toward other inputs, lower labor taxes, provide employment-based incentives, or provide public goods used by firms (infrastructure, security, judiciary, and others).

It is important to recognize the interaction between energy, climate, and fiscal policies and to understand the aggregate signals and incentives from the combination of different policy instruments. Governments make various decisions that directly and indirectly affect the price of carbon. In addition to decisions such as stipulating emissions trading or carbon taxes, governments make other decisions that influence the price of the fuels that generate emissions, whether by directly setting retail prices, providing energy consumption subsidies, or levying energy taxes. Understanding the price signals sent by the combination of direct and indirect carbon pricing instruments can support policy makers in making informed decisions about the policy tools that provide the desired economic incentives. Illustrative calculations carried out applying the total carbon price metric using best-available global data sets, as summarized in [chapter 6](#), show that at an aggregate global level, a large share of carbon price signals is delivered by indirect carbon pricing instruments, namely energy taxes and subsidies. The significant role that energy subsidies play in influencing the total carbon price highlights the importance of understanding the full set of economic incentives sent by different policy instruments and ramping up efforts to tackle energy subsidies as a priority climate action.

In particular, understanding how energy pricing policies interact with the broader policy and institutional framework across multiple domains and taking coordinated action can lead to greater impact. It is clear that energy subsidy reforms cannot be thought of in isolation from the energy sector policy and regulatory framework, nor from macroeconomic, fiscal, climate, environmental, or social protection policies. From an energy sector perspective, if subsidy reforms are not accompanied by efforts to reduce energy supply costs, strengthen competition, and enhance transparency, or are not coordinated with policies to expand access, decarbonize the energy sector, and scale up renewable energy and energy efficiency, the impacts of those reforms are likely to be limited.

Given the synergies between different policy instruments, they may achieve a stronger impact together, compared to the sum of what each instrument can achieve on its own. International experience indicates that energy subsidy reforms can have a stronger impact when they are accompanied by a package of policies and measures, such as improvements in the quality and reliability of energy services, strengthening of social protection systems, leveraging of digital technologies in targeting and delivery of social assistance, along with energy efficiency support mechanisms that enhance households' and firms' ability to respond and adapt to energy price changes. In the medium term, these measures would need to be part of broader enhancements to macroeconomic, fiscal, social protection, and labor policies that support the energy transition and enable resilience to future shocks. As an example, when fossil fuel subsidy reforms are combined with direct carbon pricing, technology development incentives, and renewable energy support mechanisms, the resulting scale-up of clean energy investment and cost reduction could be greater than the sum of what each of these measures would be able to achieve on their own. While the set of policy choices appropriate for each country will vary based on the specific economic, social, and political conditions, understanding the interaction of the different policies and deliberately seeking out opportunities and mechanisms for coordination across domains is vital.

Insights into Key Analyses and Technical Assistance

With aggregate global energy consumption subsidies continuing to divert significant fiscal resources, the magnitude, and urgency of subsidy reform is growing, and the challenges facing developing countries are becoming greater and increasingly complex. Governments in developing countries work to meet energy demand to support economic growth, expand households' access to modern energy services, and enhance resilience and sustainability. Meeting these policy objectives can require significant fiscal resources, for which multiple development priorities compete and, if not complemented by additional revenue mobilization, which may contribute to public debt sustainability risks.

As discussed in [chapter 1](#), since the establishment of ESRF in 2013, there has been growing demand for energy subsidy reform-related technical assistance and advisory support from World Bank client country governments. The number of activities and volume of funding for technical assistance grants provided by ESMAP through ESRF has grown gradually, with total grant funding nearing US\$28 million as of June 2024.

Going forward, the demand for technical assistance on energy subsidy reforms is expected to continue to grow. McCulloch (2022) contrasts the scale of the challenge that needs to be addressed with the resources dedicated to tackle it, as summarized in box 11.1, and argues that the aggregate technical assistance and financing available for government efforts to reform energy subsidies is relatively small.

BOX 11.1

A PERSPECTIVE ON STRENGTHENING MULTILATERAL SUPPORT FOR ENERGY SUBSIDY REFORMS

In his 2022 book on the political economy of fuel subsidy reforms, Neil McCulloch argues that the fundamental challenge to reform is often political rather than technical, and explores political economy challenges to energy subsidy reforms. The book presents information contrasting the scale of energy subsidies with government social spending and development aid that developing countries receive, pointing out that subsidies tend to be larger in most contexts. In the assessment of the international community's efforts toward fossil fuel subsidy reform, McCulloch characterizes the current approach as *"tiny, technical, and timid,"* comparing the size of the problem (that is, aggregate government spending on subsidies in the range of billions of dollars) with the relatively modest funding devoted to international efforts that involve high-level commitments, research and technical studies, and multilateral and bilateral efforts to support governments interested in reforms (pointing to ESMAP ESRF as a key channel for technical assistance). The book makes the case for strengthening the support offered to governments, and recommends an amended approach that is more *"serious, political, and brave"* and that adequately considers political economy issues. The author argues for extensive research into the political side of reforms and advocates a bigger role for bilateral donors.

Given the scale of the challenge and the complexity of the topic, developing country governments are likely to continue to demand increasingly sophisticated technical assistance and advisory support from their development partners. To prepare and implement workable and sustainable energy subsidy reforms, support may be needed for the required technical and analytical work, as described in the previous section and explored in greater detail in ESRAF Good Practice Notes. Governments may also need capacity-building support to strengthen their ability to design, communicate, implement, and monitor reforms. In addition, governments may benefit from support while implementing those reforms. The technical background reports, summarized in different chapters of this stocktaking report, provide useful insights for guiding the design of main analyses and implementation approaches for technical assistance, in particular the importance of country context, reform objectives, and data availability. Some of these insights, which may be useful to development practitioners, are summarized below.

Development of energy subsidy reforms requires comprehensive analysis and preparatory work in multiple areas. Reflecting the complexity of the topics that need to be understood and analyzed and for which solutions need to be developed, energy subsidy reform technical assistance may involve in-depth analytical work on multiple aspects. These areas include analyses of the energy sector, accompanied by assessments of the macroeconomic, fiscal, distributional, or environmental impacts of reform options; review of social protection options and systems; and political economy assessment and communications dimensions, all of which are explored in greater detail in ESRAF Good Practice Notes. Good practice technical assistance examples reviewed for this study covered work on multiple dimensions, and the scope of tasks varied based on the specific country and reform context and on demand from government counterparts. In fact, as discussed in [chapter 1](#), [chapter 3](#), and [chapter 8](#), in the majority of the activities funded by ESMAF through ESRF since 2013, detailed work on the energy sector was complemented by analyses of other important dimensions, including economywide impacts, fiscal impacts, distributional aspects, and social protection. As discussed in [chapter 10](#), the detailed technical and analytical work was often complemented by efforts to better understand the political and sectoral context within which reforms were pursued.

The alignment of technical analyses with government objectives and reform context is important for ensuring their relevance and usefulness in informing reform efforts.

A key principle highlighted by the technical background reports was the importance of the alignment of the design of activities with government reform and policy-making priorities. The different analytical efforts summarized in [chapter 3](#), [chapter 5](#) and [chapter 10](#) find that the choice of analytical tool and approach should be guided by the reform context. [Chapter 7](#) highlights that country and sector context, reform objectives, and systemic factors significantly influence the feasibility and usefulness of distributional analysis. [Chapter 5](#) also notes that CGE modeling is useful when the reform context is conducive to its use and the modeling approach is aligned with government objectives. [Chapter 3](#) highlights that although energy sector-related analyses offer indispensable knowledge that can inform the design of subsidy reforms, other more specialized analyses, such as

cost-of-service studies, may also be chosen when the reform context, timeline, and objectives require them.

Government ownership is essential for the relevance, usefulness, and effectiveness of technical assistance. A takeaway shared in the technical background work is the importance of government demand, ownership, and continuous involvement. With different dimensions highlighted in chapters 3, 5, 7, 8, and 10, the central role of government counterpart ownership and commitment throughout is vital for all the technical work needed in support of energy subsidy reform efforts. The focus of technical assistance is to support governments in advancing their own reform agendas. It is up to the government to decide to prioritize and dedicate the required time and resources to reform implementation, especially implementation of their communications strategies.

For key technical studies, the choice of methodology and approach should be guided by data availability, and the resulting analyses should be transparent about data limitations and assumptions. As described in [chapter 3](#), although there are various approaches to quantifying energy subsidies, in practice, the choice of approach should be guided by sector conditions and the available data. For instance, for macroeconomic modeling, as discussed in [chapter 5](#), the choice of approach should be driven by reform context and data availability, along with transparency about assumptions that need to be made in the absence of reliable data. [Chapter 7](#) shows that the relevance and usefulness of distributional analyses can be enhanced by choosing context-appropriate methodologies, focusing on good-quality, available data, and ensuring transparency regarding data limitations and assumptions. [Chapter 6](#) also highlights that an analysis is only as good as the underlying data and makes the case for strengthening analytical studies through the collection of good-quality data validated at the country level. [Chapter 9](#) similarly recognizes that the ways in which firms respond to energy price increases depend on the sector, market structure, competitive dynamics, and trade exposure, and makes the case for more extensive and granular data and analysis of heterogeneous effects in firm responses to enable better-informed policies.

Sequencing and coordination across the main analytical elements matter. In good practice examples, the data, analysis, and insights gained in various components of the technical assistance were used to inform other components of the broader energy subsidy reform technical assistance. As discussed in [chapter 7](#), distributional analyses can provide important insights into how groups of households across the income distribution stand to gain or lose from different reform options, and, by doing so, can contribute to improving the understanding of the political economy dimensions of reform. Efforts to understand potential impacts of reforms, and the political economy around them, would ideally combine quantitative and qualitative approaches. Moreover, a careful analysis of potential distributional impacts of reform is imperative for the development of mitigation measures, in particular social protection measures, and also to provide advice to governments on options for the use of fiscal savings from reform. As pointed out in [chapter 5](#), decisions about the use of fiscal savings from reform have a strong bearing on reform outcomes and impacts, and the inclusion of potential mitigation measures in macroeconomic modeling

exercises can help generate alternatives that can strengthen reform design while considering factors such as growth, employment, and welfare. Furthermore, as discussed in [chapter 10](#), in good practice examples, work on political economy analysis (PEA) and communications strategies was timed so that the information gained in the PEA could inform the communications and engagement strategy. In several examples, information moved in both directions, with the PEA informing the communications and engagement strategy, and the insights from stakeholder engagement and communications efforts used to enhance the PEA work. All of these examples highlight the importance of paying attention to the sequencing, timing, and interaction of different activities under technical assistance for comprehensive energy subsidy reforms.

Where needed, there is value in updating select analyses, especially when supporting governments in multiyear reform efforts. Support to updating studies can include tariff or cost recovery analysis and distributional or political economy assessments. The update can be particularly useful in the presence of events that may affect the authorizing environment, or when there are external shocks that may affect the findings of the analyses and hence affect the feasibility of the reforms as designed. For example, as discussed in [chapter 10](#), political economy analyses may be worth updating to assess the continued relevance and usefulness of findings over time, particularly in dynamic environments in which stakeholder perspectives can evolve fairly rapidly.

Technical assistance can also strengthen governments' capacity and enhance decision-making and implementation related to reform. Another theme highlighted across the technical background reports was the importance of governments' own capacity, skills, and systems, and the support needed for their strengthening. Early assessment of institutional capabilities can help governments identify and address capacity needs and gaps that can be met through technical assistance. Technical assistance for energy subsidy reforms can include targeted capacity-building activities, for example, through hands-on involvement of key government staff in the technical analyses, as was done for energy sector technical analyses, macroeconomic modeling exercises, and development of mitigation measures. A related point is the importance of involving the right set of counterparts, with the relevant skill mix, local understanding, and decision-making authority.

Flexibility and responsiveness of technical assistance design to the evolving needs of government counterparts are essential. Policy makers are operating in complex environments with dynamic interactions across policy and economy domains. Flexibility can enable technical assistance to adapt to the government's evolving needs and adjust the intensity of support in specific areas over different periods. The need to maintain flexibility in the activity to adapt to the evolving objectives and needs of government counterparts was evident from various multiyear technical assistance activities reviewed. The experience under those activities illustrates that reform efforts sometimes lost momentum in times of leadership transition or change in government priorities, requiring support to be ramped down. But at other times, engagement needed to be accelerated and deepened in very specific areas. Maintaining continuity of collaboration at the working level and continuing the flow of information in both directions is crucial during times of change.

Continued delivery of technical assistance to support governments that are pursuing subsidy reform efforts requires adequate availability of resources. Taking into consideration the complexity, scale, and sensitivity of energy subsidy reforms, it is necessary to provide intensive involvement and continued support to government counterparts on a diverse set of topics with varied technical skills, and to maintain frequent interaction and engagement with counterparts.

Areas for Future Analytical and Knowledge Work

Future global knowledge and analytical work on several topics could be useful to fill remaining knowledge gaps, deepen understanding, and develop potential enhancements. The review of recent literature on energy subsidy reforms, which was undertaken at the outset of the stocktaking study and updated two years later, identified several areas for which additional analysis and research could be useful. As discussed in [chapter 2](#), some of these topics were the focus of the technical background reports by ESMAP and formed the basis of this stocktaking report.

Complementing the additional ground covered in this report, there are various areas where further global knowledge and analytical work on several topics could be useful. These topics range from continuing to document developing country experiences, to recording how fiscal savings were allocated, comparing how ex ante predictions on reform impacts compared with ex post reform outcomes, to gathering more evidence on firm-level responses to energy price increase, and the role of energy efficiency in enhancing the ability of households and firms to respond to price shocks. Some of these areas for potential future work that were identified through this stocktaking exercise and could be of interest to practitioners and researchers are summarized below.

On lessons learned from experience

- Continued tracking of reforms in developing countries over longer periods
- Analysis of the fiscal costs of energy measures taken by developing country governments in response to the 2022 energy price shocks, including assessment of how they were financed (such as budgetary allocation, price stabilization fund drawdown, new public borrowing, windfall taxes, and so on)¹
- Consolidation of examples on rapid response and transitional measures as a resource for practitioners

On macroeconomic impacts of subsidy reforms

- Ex post evaluation of the performance of ex ante analyses and modeling of reforms and their impacts
- Comparison of findings of different macroeconomic models in the same country
- Comparison of the findings of macroeconomic models with actual results on specific reform efforts
- Strengthening the understanding of use of fiscal savings or additional revenue from energy subsidy reforms, exploring approaches to tracking of subsequent action by governments

On economic incentives and interaction of policy domains

- Quantitative analyses of how energy subsidies affect the energy transition
- Application of the total carbon price metric at the country level
- Review of approaches to quantitative analysis of environmental impacts (both stand-alone and concurrent with other impacts) of energy subsidies and their reform
- Further exploration of the interaction of energy subsidies with sectoral policies at the nexus of multiple sectors, including transport, trade, agriculture, and water

On energy subsidy reform impacts on firms

- In-depth investigation of the relation between energy costs and competitiveness of firms throughout the economy
- More granular analysis of heterogeneity in firm response patterns to energy prices
- Exploration of novel sources of firm data and approaches for their use to deepen the understanding of firm responses
- A comprehensive review of mitigation options for firms, focusing on technology, innovation, and energy efficiency measures

On energy subsidy reform impacts on households

- Exploration of dimensions of vertical and horizontal distribution of benefits and impacts of energy subsidy reforms on households
- Analysis of price elasticity of demand and assessment of indirect impact relative to direct price effects across a wide range of countries
- Analysis of the two-way interaction between energy efficiency and energy subsidies in supporting households' adaptation and resilience to price shocks

On social protection

- Review of approaches to supporting energy subsidy reforms and the energy transition, going beyond short-term social assistance, to strengthen the resilience of households, communities, and systems against future energy price shocks or macroeconomic crises
- Continued data collection on government measures in response to shocks, and comparison with alternatives such as social spending and public investment in productivity and job creation

On political economy and communications

- Exploration of different approaches to building support for reform
- Assessment of the impact of real-world communications efforts on reform perspectives and potential impact on reform outcomes.

Energy subsidies, whether for households or for firms in the agriculture, transport, or manufacturing sectors, are at the nexus of multiple domains. The challenges facing developing countries are hardly ever constrained to a single sector or under the authority of one government agency. Moreover, accompanying policy frameworks and infrastructure in the macroeconomic, fiscal, social protection, labor, climate, environment, energy, water, and agricultural domains constantly evolve, interact, and influence each other. Therefore, it is critical to recognize the role of energy subsidies at the intersection of multiple sectors, moving away from a single-sector perspective and increasingly taking a broad approach that involves coordination across sectors, as well as across relevant government agencies and development partners. [Appendix B](#) illustrates the multidimensionality of energy subsidies and presents an innovative approach that was explored in the context of the energy-water-agriculture nexus in India.

To assist developing country governments in their efforts to reform energy subsidies, it is worth exploring the feasibility of complementing support for preparation of reforms with support during reform implementation. The primary focus of technical assistance on energy subsidy reform provided by the World Bank and funded by ESMAP has been to support the government in the development of reforms. During the reviews of ESMAP-funded energy subsidy reform technical assistance activities, in addition to highlighting the importance of the availability of support for preparation of critical reform actions, the question has been how to support government counterparts beyond preparation and into implementation. Providing technical advisory assistance and resources from planning to implementation and to monitoring and evaluation could be worth exploring.

Going forward, other resources and instruments available to World Bank and other development partners could be considered to support governments in the delivery of their reform efforts. These could be recipient-executed technical assistance, such as for the implementation of stakeholder engagement and communications campaigns on subsidy reform, strengthening of social protection systems, and periodic reassessment of political economy and stakeholder perspectives. If there is demand from governments, specific implementation actions could be supported and provided through lending instruments. Possible options that could be considered for financing could include (1) the capitalization or funding of targeted social protection measures delivered through existing systems with proper coverage, targeting, and delivery approaches; (2) financing and risk-mitigation mechanisms to support firms that may be affected by reforms to identify and implement energy efficiency measures and investments, switch processes and energy sources to cleaner alternatives, and engage in institutional strengthening; and (3) where phaseout of fossil fuel production subsidies is involved, supporting the transition of local communities and work forces that would be affected.

Endnote

- 1 The World Bank's Energy and Extractives Global Practice is currently working on a report that examines recently implemented price mechanisms and subsidies for liquid fuels, accompanied by two new global data bases. The report and the data sets are expected be made publicly available in late 2024.

Appendix A.

Overview of World Bank Support to Energy Subsidy Reforms as Part of Development Policy Financing

This appendix summarizes a background review that was undertaken for this study, exploring energy subsidy reform-related policy actions that were supported through Development Policy Financing (DPFs) as a key World Bank lending instrument for supporting policy reforms.

A select set of World Bank Development Policy Financing (DPF) operations that supported macrofiscal and energy sector reforms were reviewed in order to understand how energy subsidy reforms have been supported through policy-based financing. The review, carried out as part of the stocktaking on energy subsidy reforms, covered DPF operations that were approved between 2005 and 2020 and that included at least one policy action related to reforming or reducing energy subsidies. During the focus period, 839 DPF operations were approved by the World Bank Board of Executive Directors. Out of these, 96 operations (11 percent) included policy actions related to energy subsidy reform. The total volume of financing provided through these DPFs amounted to US\$22.7 billion. Of these 96 DPFs that included energy subsidy reform-related policy actions, 27 included Project Development Objective-level indicators related to subsidy reform.

A closer review offered insights into the types of measures and policy actions that support developing country governments' efforts to strengthen sector financial viability, limit the fiscal burden due to subsidies, and protect the poorest and most vulnerable consumers. To strengthen or enable energy sector financial viability, policy actions tended to focus on the following two main themes: reducing costs and enabling recovery of efficient costs. For cost reduction, the operations included policy actions to improve the performance and efficiency of utilities; to reduce the costs of producing, procuring, or delivering energy; or to facilitate the fair allocation of such costs. The inclusion of these actions in the DPF appears to signal the recognition of the importance of cost reduction as a key principle of enhancing the affordability of energy services, which in turn can enable the reduction of energy subsidies. Related to cost recovery, the policy actions focused on (1) developing or updating methodologies for setting and periodically adjusting electricity tariffs and energy prices based on cost reflectivity and efficiency principles, and (2) setting a path toward cost-recovery tariffs or energy prices to enable the financial viability and sustainability of utilities required for investment and quality of services. Actions to limit, or even reduce, the fiscal burden on the government caused by policy-based subsidies or by the government having to step in to meet sector financial shortfalls is another main theme found in the set of policy actions. Frequently, actions focusing on improving cost recovery and limiting fiscal cost were accompanied by actions that

involved the introduction of targeted social assistance measures for the poor and vulnerable populations and development of new, or strengthening of existing, social protection mechanisms.

The review organized the supported policy actions into categories under each theme.

These themes and categories are intended to serve as an illustrative tool to help give a sense of the main policy issues addressed through the DPF operations in the context of reforming energy subsidies. As such, they are not meant to be a systematic and exhaustive treatment of World Bank activities around this topic, which may be the focus of future, more in-depth work. The review organized the actions by main themes introduced above, namely strengthening financial viability, limiting fiscal burden from subsidies, and social protection. Under each theme, the actions were organized into more distinct categories that reflect the scope of the different actions. Table A1.1 summarizes the findings of this analysis and ranks the categories of policy actions by frequency of use, in descending order. Some of the policy actions, as formulated, may fall into multiple categories, and the review grouped them into one category using subjective judgment. The majority of policy actions in the sample focused on tariff or price adjustments, followed by actions to limit the fiscal burden due to energy subsidies and sector financial performance, and actions to strengthen social protection.

The review of DPF operations led to observations that could be explored further.

First, it appears from the preliminary analysis that years with emergencies or financial crises tended to be followed by an increase in the number and funding of DPF operations. This is intuitive, given that macroeconomic crises can accentuate the urgency of addressing fiscal pressures, including those due to energy subsidies, and create a window of opportunity for introducing substantive reforms. Second, the review indicates that over the years there was an increase in the number of DPFs that included energy subsidy reform-related policy actions. Third, the review reveals variation between policy actions across regions, which naturally reflects the different policy priorities and country contexts. In the Europe and Central Asia region, most policy actions focused on electricity price adjustments and increases, while in the Latin America and the Caribbean region and the Middle East and North Africa region policy actions tended to focus on the adoption or strengthening of cost-reflective tariff methodologies. Not surprisingly, policy actions related to fuel price adjustments were more commonly encountered in fuel-exporting countries, while in Sub-Saharan Africa, there were actions focusing on the financial and operational strengthening of utilities and addressing affordability concerns and the financing of energy subsidies. Finally, it appears that programmatic DPFs that involve a series of operations were used to support multiyear reform engagements, where feasible.

TABLE A1.1**Policy Actions by Energy Subsidy Reform Theme and Category**

THEME	CATEGORY	POLICY ACTION SCOPE	NUMBER OF ACTIONS IN DPFS REVIEWED
FV	Electricity or district heating price adjustment for cost recovery ^a	• Adopting tariff methodologies or tariff adjustment mechanisms • Adopting plans for a future tariff path toward controlling or phasing out subsidies • Actions focused on utility financial viability (such as approval of a utility financial recovery plan) <i>Of the total number of actions in this category about one-third (20) stated specifically that tariffs would increase.</i>	59
FB	Limiting or reducing subsidies	• Actions that refer explicitly to subsidy reduction or elimination by setting a target in absolute terms or as a percentage of budget or GDP • Caps in the budget for funding of subsidies • Limiting the volume of subsidies to be provided • Approval of tariff or price increases justified in reducing subsidies or in eliminating subsidies to a consumer class (including using cost-of-service studies)	32
SP	Social protection mechanisms	• Improved targeting of subsidies • Design of compensation mechanisms for consumers to mitigate the impact of subsidy reform • Adequate allocation of resources for social protection • Actions may use results of distributional impact analysis of subsidies	19
FB	Funding of subsidies	• Budgetary support to social protection mechanisms • Compensation for subsidies to the utility or energy provider • Quantification of arrears built up due to subsidies • Adoption of mechanisms for the timely payment of subsidies to the utility or energy provider	12
FV	Fuel pricing and adjustment mechanism	• Fuel pricing methodologies, and fuel price adjustment mechanisms. <i>Of the total actions in this category almost one-third (5) refer specifically to a price increase.</i>	16
FB	Tax adjustments	• Changes in excise, import, and value added taxes on energy products • Adoption of environmental taxes • Removal of tax exemptions	10
Others	Communicating subsidies and subsidy reform	• Communication campaigns • Transparency of subsidies	3
Total		All policy actions relevant for energy subsidy reforms	151

Note: DPF = Development Policy Financing; FB = fiscal burden; FV = financial viability; SP = social protection.

a. Because of significant differences in production, transportation and distribution, and delivery, network-supplied energy carriers (electricity, gas, and district heating) are grouped separately from fuels.

Appendix B.

Innovation at the Energy-Agriculture-Water Nexus in Punjab, India

This appendix summarizes the “Save Water Earn Money” Direct Benefit Transfer of Electricity initiative piloted in Punjab, India, which offers a good example of innovative approaches to reforming energy subsidies. ESMAP support contributed to the development and piloting of this approach.

The challenge. With a comprehensive package of government policies, accompanied by the expansion of rural electricity networks and irrigation infrastructure, agricultural productivity in India rose significantly in the 1960s, strengthening food security and improving the standards of living for the rural poor. Government support to agriculture included for many years free or heavily subsidized electricity. The negligible or zero cost faced by agricultural consumers encouraged excessive electricity consumption and irrigation, which, in turn, led to accelerating groundwater depletion. The situation also imposed a heavy fiscal burden on state governments and negatively affected the financial performance of utilities with large agricultural loads. Some utilities were not able to fully recover the cost of serving agricultural feeders when subsidies were not paid in full or on time or when consumption exceeded the estimated levels based on which subsidies were provided. These utilities were, in turn, unable to invest in, maintain, or upgrade rural infrastructure, and farmers had to endure supply quality and reliability issues, and even power rationing. In the case of Punjab, in 2019, the electricity subsidy to agriculture amounted to US\$808 million (almost 36 percent of the state’s fiscal deficit¹), while as of 2017, more than 80 percent of Punjab’s groundwater blocks had been overexploited (Ministry of Jal Shakti 2019).

The response. The government of Punjab decided to implement the innovative Direct Benefit Transfer for Electricity approach as a potential solution to the problem, starting with a learning-by-doing pilot initiative, Paani Bachao, Paise Kamao, or Save Water, Earn Money, between 2018 and 2021. The pilot, which was designed by the government and informed by analytical work supported by ESMAP and SE4ALL (Gulati and Pahuja 2015), provided cash incentives to farmers for using less electricity while keeping the free electricity policy for groundwater irrigation and the existing cropping pattern of wheat-rice cultivation.

Pilot design and implementation approach. The pilot was introduced on six 11 kV electricity feeders serving about 970 farmers. With ESMAP funding, a team of World Bank staff, international consultants, and local institutes provided implementation support on three feeders from June 2018 to June 2021. Key features of the pilot included voluntary enrollment, setting of seasonally adjusted electricity allocations, payment of cash incentives if farmers used less electricity than their allocated energy, direct payments to farmer bank accounts to share the benefits of subsidy savings, metering of consumption via automated meter reading or smart metering, provision of reliable daytime power supply to participating feeders, and

priority access to other support schemes provided by the government. An information and communication campaign was developed based on discussions with farmers about their perceptions and agricultural practices. The intensive outreach campaign included farmer enrollment camps and visits to individual farmers by electric utility staff and agricultural experts to share information on the pilot, as well as on water-efficient irrigation methods, cropping systems, and available government programs. Communication materials were in the local language. In addition, small demonstration farms were set up on the three feeders to demonstrate resource conservation technologies and water-efficient agriculture practices and to encourage farmers to adopt them over a larger area. Throughout, the pilot was implemented as a multisectoral effort with clear roles and processes for interagency coordination, with sustained high-level government commitment.

Outcomes and impact. The Save Water, Earn Money pilot achieved strong results in combining policy innovation with advanced energy technology and modern agricultural and irrigation technologies. About 33 percent of farmers in three feeders participated in the initiative, which resulted in electricity savings of 0.72 million kWh between June 2018 and February 2021 overall, representing about 12–25 percent of their baseline consumption. As part of the benefit sharing, the enrolled farmers earned 2.87 million rupees and conserved approximately 5.5 million kiloliters of water. In addition to helping identify various roadblocks during implementation, the pilot was successful in creating stronger awareness of groundwater depletion and showing that farmers were open to adopting new solutions if they could maintain their earnings without increasing risks.

Insights and lessons. The lessons from this experience can be useful for future efforts that adopt the concept of benefits-sharing and direct delivery of targeted support for addressing complex issues at the nexus of the energy, agriculture, and water policy domains. These lessons for reforming electricity subsidies for agricultural water pumping include that (1) benefits-sharing schemes can provide incentives for conservation of energy and water while allowing farmers to maintain and even increase earnings through new revenue or improved productivity, especially when combined with support for sustainable agriculture practices and alternative cropping and irrigation approaches; (2) digital technologies, including remote pump-set operation technology or automated meter reading, can facilitate the implementation of novel approaches while building support through greater transparency and addressing stakeholder concerns; (3) on-time delivery of benefit transfers to farmer accounts can help build and maintain trust; (4) intensive, regular, and sustained communication is essential for increasing awareness, engagement, and continued interest in such initiatives; and (5) interagency coordination on the government side is critical—high-level support across organizations, along with training of key technical staff in energy, water, and agriculture sector agencies, is important for the success of such initiatives.

Endnote

PSERC – PSPCL Tariff Order for FY 2021-22 (<http://pserc.gov.in/pages/PSPCL-Tariff-Order-FY-2021-22-chapter2.pdf>).

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