ANALYSING ENERGY SUBSIDIES IN THE COUNTRIES OF EASTERN EUROPE, CAUCASUS AND CENTRAL ASIA

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This report is also available in Russian under the title:

МЕТОДЫ АНАЛИЗА ЭНЕРГЕТИЧЕСКИХ СУБСИДИЙ В СТРАНАХ ВОСТОЧНОЙ ЕВРОПЫ, КАВКАЗА И ЦЕНТРАЛЬНОЙ АЗИИ

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ABBREVIATIONS

APEC	Asia-Pacific Economic Cooperation
ASCM	(WTO) Agreement on Subsidies and Countervailing Measures
BOT	Budgetary and other transfers
BP	Border price
CCGT	Combined-cycle gas turbine (plant)
CFCs	Chlorofluorocarbons
CGE	Computable general equilibrium (model)
CO_2	Carbon dioxide
CSE	Consumer support estimate
DP	Domestic price
DSGE	Dynamic stochastic general equilibrium (model)
EC	European Commission
EECCA	Eastern Europe, Caucasus and Central Asia
EHS	Environmentally harmful subsidy
EU	European Union
GATT	General Agreement on Tariffs and Trade
GDP	Gross domestic product
GHG	Greenhouse gas
GSI	Global Subsidies Initiative
GSSE	General Services Support Estimate
IEA	International Energy Agency
IEEP	Institute for European Environmental Policy
IISD	International Institute for Sustainable Development
IMF	International Monetary Fund
IPR	Intellectual property rights
MPS	Market price support
OECD	Organisation for Economic Co-operation and Development
OTC	Other transfers from consumers of a commodity
PSE	Producer support estimate
PV	Produced volume of a good
TCT	Transfers from taxpayers to consumers of a commodity
TPC	Transfers to producers from consumers of a commodity
TSE	Total support estimate
USD	US Dollar
VAT	Value added tax
WTO	World Trade Organization
WWF	World Wide Fund for Nature

EXECUTIVE SUMMARY

The main objective of this report is to help launch and support scoping discussions, self-learning and actual country-level analytical work on identifying and quantifying environmentally harmful subsidies (EHS) in the countries of Eastern Europe, Caucasus and Central Asia (EECCA). The report provides an overview of both methodological and political economy aspects of EHS reform that can inform policy and technical debates. It focuses on subsidies in the energy sector in light of their particularly high fiscal costs and costs stemming from greenhouse gas (GHG) emissions and environmental degradation more broadly.

Energy subsidies are provided through a wide range of public support mechanisms and can relate to fossil fuels (coal, natural gas and oil products), electricity and heat generation based on such fuels, nuclear energy, renewable energy sources and biofuels. The report discusses mostly fossil fuel subsidies and support for the electricity and heat generation sectors. Given that the EECCA countries make limited use of alternative and cleaner energy sources, the present discussion excludes public support for such sources.

Background

Developing and developed countries alike need to phase out inefficient subsidies, particularly in the context of the current economic crisis. This potentially "quick win" approach can help governments achieve their economic and fiscal objectives, while simultaneously tackling environmental problems such as climate change. Energy subsidies in particular need to be rationalised, given that their reforming can yield significant environmental and welfare benefits. In theory, subsidies can be justified when they promote an overall increase in social welfare. Yet even in this case, subsidy schemes and support programmes may need to be time-bound, because restricting subsidy duration helps prevent rent-seeking behaviour and prolonged market distortions.

The expert consensus is that fossil fuel subsidies have a net negative effect, both in individual countries and on a global scale. Fossil fuel subsidies artificially lower fossil fuel prices, leading to market distortions whose consequences far exceed the specific policy objective for which the subsidy was intended. Such consequences include environmental, economic and social impacts. In particular, fossil fuel subsidies increase energy consumption and GHG emissions, strain government budgets, divert funding that could otherwise be spent on social priorities (such as healthcare or education) and reduce the profitability of alternative energy sources.

Energy subsidies are large, wide and diverse. A recent study (IEA, 2012) shows that in 2011, fossil fuel consumption subsidies in 37 developing and emerging economies amounted to USD 523 billion, with subsidies for oil products representing almost 50% of the total. That same year, in the EECCA region alone fossil fuel subsidies for consumers (oil, coal, gas and electricity) may have totalled about USD 2 billion in Azerbaijan (equivalent to about 3.1% of gross domestic product (GDP), USD 6 billion (3.3% of GDP) in Kazakhstan and USD 9 billion (6% of GDP) in Ukraine. Only 8% of the above-mentioned global amount of subsidies targeted the poorest 20% of the population, demonstrating the inefficiency of this mechanism to assist the poor. Furthermore, the IEA estimated that if all fossil fuel subsidies were completely phased out by 2020, global primary energy demand would be cut by nearly 5% and carbon dioxide (CO_2) emissions by 5.8%, compared to the "business as usual" scenario.

While there is ongoing debate in the OECD and in some developing countries – including within the Group of Twenty (G20) and Asia-Pacific Economic Cooperation (APEC) – the discussion rarely covers the need to reform specific energy subsidy schemes in the EECCA region. Despite some IEA assessment of the magnitude of fossil fuel consumption subsidies, comprehensive studies identifying, quantifying and measuring the impact of EHS in the EECCA countries are lacking. An exception to this rule is the Russian Federation, where a first inventory of subsidies to upstream oil and gas activities has been prepared. Thus, preparing analytically sound studies of possible EHS is a necessary first step in launching meaningful policy debate on their reform in the countries of the region.

What is a subsidy?

Although the term "subsidy" is widely used in economics and in national and international law, defining what *is* and what is *not* a subsidy is not a trivial issue. The concept of "subsidy" has evolved significantly over the years. Its simplest and narrowest definition is that of a direct budgetary payment by a government to a producer or consumer. However, subsidies exist in a variety of other, more complex forms – from direct budgetary transfers, through various tax concessions (known as tax expenditures), to price control mechanisms (including border measures such as tariffs and quotas). The definition of a subsidy has been further expanded to include environmental externalities (such as pollution or habitat damage), as well as under-collected government revenue (or foregone revenue) resulting, for example, from royalty relief associated with exploitation of publicly owned or managed resources. While subsidies are often perceived as direct cash payments to companies, they are often actually used to control and share the risks and rewards of economic activities. An operational definition of subsidies also needs to reflect the following feature: subsidies are government-provided goods or services, including risk-bearing, that would otherwise have to be purchased in the market. For these and other reasons, the OECD favours using the concept of support rather than subsidies as such.

Several international players in the field of subsidy reform, including the OECD, the World Trade Organization (WTO), the European Union (EU), the IEA, the World Bank, the International Monetary Fund (IMF) and the Global Subsidies Initiative (GSI), have contributed to defining subsidy boundaries. Despite some differences, their definitions largely reflect the essential elements of a subsidy as understood by economists today and constitute useful guidance for national governments. Of all these definitions, the WTO definition is most often adopted as the starting point in subsidy analysis due to its legally-binding character for its more than 150 member countries.

Determining the environmental harmfulness of subsidies is another major challenge. Currently, there is no common definition of an EHS, and analysts generally use the definition elaborated by the OECD. The OECD and other institutions have also developed various tools to help operationalise the identification and assessment of EHS schemes.

National legislation sometimes provides a subsidy definition that may or may not be aligned with internationally established definitions. In discussing specific subsidy schemes, these definitions are key, as they embed the discussion in the national context. At the same time, revealing differences in national and international definitions, and assessing the magnitude of subsidies based on internationally defined boundaries, may point to important gaps in the national-level evidence base for management and reform of subsidy schemes.

Approaches to subsidy identification, measurement and evaluation

If governments are to rationalise their energy subsidy schemes and implement difficult reforms, they first need to have a very good understanding of where such schemes are used, how much they cost to the public coffers and what the extent of their economic, social and environmental impacts is. Various methods and tools are applied to identify and measure subsidy magnitude and impacts. They serve different purposes and involve varying depths of detail.

A comprehensive approach to subsidy analysis involves three consecutive steps: 1) identification of a subsidy scheme, i.e. its description in qualitative terms; 2) measurement, i.e. its description in quantitative terms; and 3) evaluation, i.e. its description from the point of view of consequences that present interest for policy-makers. Accordingly, the methods and tools for the analysis of environmentally-harmful energy subsidies, which are addressed in this report, can be roughly divided into three main groups:

1. Methods to **identify energy** – and specifically **fossil fuel – subsidy schemes.** These include two main approaches to classifying and preparing subsidy inventories: a matrix of energy subsidy schemes – developed by the OECD – and a similar subsidy classification framework – developed by the Global Subsidies Initiative (GSI), hosted at the International Institute for Sustainable Development (IISD) in Geneva.

2. Methods to **measure** subsidy magnitude: two main methods are discussed here, namely: the price-gap approach and the PSE-CSE (Producer Support Estimate - Consumer Support Estimate) framework.

3. Methods to **identify EHS schemes and assess their impacts and effectiveness**. These methods analyse the impact of subsidies (and their removal) in terms of pollution emissions and poverty reduction, as well as broader economic and fiscal consequences. This group comprises several analytical frameworks – "decision trees" (such as the OECD Quick scan, Checklist and Integrated assessment models), as well as more quantitative models for estimating the impacts of subsidies and their removal on the economy and the environment (such as the OECD ENV-Linkages and other general equilibrium or econometric models).

Each of these methods and tools has its advantages and limitations, depending on the purpose for which it has been developed in the first place. It is important to note that social cost-benefit methods, which are essential to any policy evaluation, can equally be used in subsidy analysis. However, such methods are not discussed in this paper as they are best addressed separately.

Political economy of reform

Besides posing important analytical challenges, energy subsidy reform is a difficult policy choice. Energy subsidy reform is a much politicised issue requiring high-level support and concerted efforts on the part of the government which must demonstrate strong political will and a long-term vision to take tough decisions benefiting society as a whole. Investing time and resources in analysing the size and scope of environmentally harmful and economically wasteful subsidy schemes, and the potential effects of their removal, may help policy-makers to make better informed decisions. Such an analysis may also help politicians to explain subsidies to all stakeholders, and especially the segments of the population that may be most exposed and affected by subsidy reform. Transparency and stakeholder dialogue are the cornerstone of subsidy reform.

While OECD countries have widely recognised the potential benefits of EHS reform, opposition from affected groups such as farmers (in the case of agricultural subsidies), consumers and energy-intensive sectors and firms has often impeded progress. Thus, effective reform strategies need to identify ways in which the adverse effects of subsidy reforms (particularly on the poor and vulnerable groups) could be mitigated without undermining their environmental effectiveness. This report lists a number of factors that should be considered while preparing such strategies.

Organising energy subsidy work in the EECCA countries

Addressing the issue of energy subsidies involves resolving the question of definitions, measurement and evaluation techniques. Despite existing challenges measuring and assessing subsidies, subsidy tracking in the EECCA countries can clearly proceed from available analytical tools. The proposed approach for working on EHS in the energy sector in the EECCA region consists of the following major steps:

- Launch a country stakeholder dialogue to agree on the scope and focus of the work, including agreeing on the subsidy definition used in the analysis and identifying information sources;
- Recognise the subsidy scale by reviewing price-gap studies for a given EECCA country;
- Develop and use a questionnaire to support data collection at country level;
- Identify and perform initial screening of subsidy schemes supporting coal, oil, natural gas, electric energy and heat generation, using the OECD Matrix and GSI methodology;
- Select and agree on the fuels/commodities/sectors and specific energy subsidy schemes (coal, oil, gas, electricity or heat), based on assessment of their likely impact on GHG emissions, to undergo in-depth analysis;
- Measure levels of subsidies allocated to the selected fuel/commodity/sector, applying existing tools as appropriate (*e.g.* the price-gap approach, the PSE-CSE framework);
- Evaluate the effectiveness of the selected subsidy schemes;
- Develop/adapt an economic model to assess scenarios for CO_2 reductions resulting from support scheme reforms;
- Apply the model and evaluate the impacts of subsidy phase-out on GHG emissions, public budgets and the broader economy (*e.g.* demand reactions to changes in costs and prices of energy products as a result of subsidy removal, investment choices). To the extent possible and depending on availability of data and information, also consider the impact of subsidy removal on poor households and industries subject to international competition;
- Define barriers to subsidy reform, identifying drivers for reform in close cooperation with government officials, experts and stakeholder group representatives;
- Prepare an analytical report and policy recommendations on a possible reform path and launch discussions within the government and with key stakeholders.

Identification and measurement of subsidies in the EECCA countries will likely be limited by a lack of expertise and data; addressing these problems will require support from international partners. Moreover, while the above steps can generally be applied across countries, the methodology must be tailored to each country where this work is to be done (*e.g.* different countries will have different types of subsidy schemes, countries may be net energy exporters or net energy importers, etc.).

Implementing internationally supported pilot projects in the EECCA countries wishing to advance EHS reforms may yield benefits for the entire region. Such evidence-based analysis could help increase the transparency of existing subsidy schemes, as well as raise awareness among policy makers of the potential costs and benefits of subsidy reforms. It could also help generate political support for the adoption and implementation of energy subsidy reform plans.

INTRODUCTION

I. Report objectives and structure

This report provides guidance on the methodology and political economy of environmentally harmful subsidies (EHS) reform, thus supporting political and technical debates on these issues in the region of Eastern Europe, Caucasus and Central Asia (EECCA). It focuses on energy subsidy schemes with potential contribution to greenhouse gas (GHG) emissions, other environmental impacts and wasteful public budget spending. It considers energy subsidies to producers and consumers of fossil fuels (coal, oil and gas) and electricity and heat generation based on the use of such fossil fuels. It does not consider subsidies for nuclear energy, renewables or biofuels, as they are currently deemed irrelevant to the EECCA countries, either because of their negligible share in the region's energy mix (*e.g.* biofuels and nuclear energy) or because they are not necessarily environmentally harmful (*e.g.* renewables).

The report consists of three parts:

- Part I summarises different definitions and issues related to the concept of subsidies and discusses the implication of sometimes diverging understandings of these concepts in planning and conducting EHS reform. Such a definition is instrumental in defining the scope and priorities of such reforms;

- Part II includes a brief description of existing methods to identify and measure energy subsidies and assess the impacts of both their use and removal. The main tools and approaches covered in the report are: the OECD Quick scan, Checklist and Integrated assessment framework, the PSE-CSE (Producer Subsidy Estimate and Consumer Subsidy Estimate) framework and the price-gap approach used in calculating consumer subsidies. Part II also looks at some macroeconomic models used to quantify economic, social and environmental consequences of subsidy phase-out;

- Part III discusses issues related to the political economy of energy subsidy reform and describes the major benefits from, and barriers to, the reform process.

II. Target audience

This technical report is intended first and foremost for governmental and non-governmental analysts in the EECCA countries who need a better understanding of different tools and methods for identifying, measuring and evaluating various subsidy schemes. Whether working as government employees, researchers or consultants, they may be asked to provide solid analytical support to policy makers contemplating reforming various subsidy measures. The report may also interest those policy makers who wish to better understand the political intricacies of launching and organising the reform, besides possibly being interested to acquaint themselves with the subtleties of the analytical framework that serves to inform their decisions on subsidy reforms. While this report mostly reviews and analyses these tools from the vantage point of potential users in the EECCA countries, its audience can be broader and include analysts and government officials in both OECD and non-OECD countries.

III. Demand for supporting subsidy reforms

Governments have long relied on energy subsidies to advance specific development goals or address market failures. The most common argument for introducing and maintaining energy subsidies is that they support important domestic policy objectives, such as rural and industrial development, job creation, improved energy access, energy security and independence, and poverty alleviation. At the same time, the economic cost of energy subsidies can represent a significant burden on a country's finances, weaken its growth potential and encourage wasteful energy consumption. Furthermore, different studies show that energy subsidies tend to accrue not to the poorest, but rather to the largest and economically powerful recipients, thus increasing profits for well-connected private investors or industries. By encouraging use of fossil fuels and discouraging production of low-carbon fuels, energy subsidies can lead to increased emissions of carbon dioxide and other greenhouse gas emissions (GHG). Empirical studies suggest that removing subsidies that promote wasteful energy consumption could yield substantial emission reductions as well as major environmental, economic and social benefits.

The positive outcomes of subsidy reform can be multiple. Reducing subsidies can have a particularly beneficial fiscal impact at a time of financial and economic crisis. In some cases, phasing out a subsidy may have a direct budgetary impact through budgetary savings or increased tax revenues which can then be directed elsewhere and spent where they are most needed (such as various social, healthcare or education programmes). Hence, governments need to undertake systematic efforts to monitor energy subsidies and analyse the economic impacts of a possible reduction. Measuring the impacts of a subsidy on the economy and environment is highly challenging, and yet a good understanding of how a given subsidy scheme works helps determine the likely effects of subsidy reform. The long- or medium-term consequences of subsidy removal are usually different from short-term impacts and are difficult to predict, since multiple factors drive the decisions of economic agents facing subsidy removal. For example, government policy to phase out coal subsidies would influence the business choices of coal users (*e.g.* owners of power plants and heat plants). The degree of response depends on the availability of alternative fuels, the cost-effectiveness assessment and the economic life stage of the facilities.

In 2009, the Group of Twenty (G20) leaders committed to rationalising and phasing out, over the medium term, inefficient fossil fuel subsidies that encourage wasteful consumption. The call was directed not only to the G20 countries themselves, but to all nations that subsidise fossil fuels, taking into account each economy's specifics. Through its Green Growth Strategy, the OECD has made phasing out such subsidies a major policy objective for developed countries. Similarly, the issue of wasteful energy subsidies has been raised in discussions held at the Asia-Pacific Economic Cooperation (APEC) meetings. The European Union (EU)'s "Roadmap to a Resource Efficient Europe" calls on member states to phase out EHS by 2020, with due regard to the social impact of such reforms, particularly on the poor. Further, subsidies are an important issue in the framework of World Trade Organization (WTO) negotiations, as well as a particular concern for those EECCA countries that have chosen to join the WTO. These international processes combined are helping to raise the international profile of EHS in general and energy subsidies in particular.

IV. Research approach and authors

The report is based on a desk review of information available from international organisations that play a leading role in supporting subsidy reforms – most saliently information available from the OECD following extensive related work covering member countries. The report was co-authored by Nelly Petkova (OECD, Environment Directorate) and Rafal Stanek (SST-Consult, Poland). The authors are indebted to a number of analysts whose contributions are featured throughout. The report also benefited from expert input and review. Further, we owe special thanks to Ivetta Gerasimchuk (GSI) and Jehan Sauvage (OECD), who provided an in-depth review of the draft. In addition, the draft report was also

discussed at an expert meeting in March 2012 involving representatives from both OECD and EECCA countries. The discussion identified a number of challenges related to subsidy definition, measurement and evaluation. The report and related country-specific work were further discussed at a stakeholder meeting organised by the Task Force for the Implementation of the Environmental Action Programme (EAP Task Force) and held in Oslo, Norway, in September 2012. Angela Bularga's and Brendan Gillespie's comments (both from OECD) are very much appreciated. Romy de Courtay edited the report in English. Natalia Chumachenko translated the report into Russian. Irina Massovets's (OECD) assistance throughout the whole project was also extremely helpful.

The report was developed under the umbrella of the OECD/EAP Task Force. The mission of the EAP Task Force is to guide the improvement of environmental policies in the transition economies of the EECCA countries by promoting the integration of environmental considerations into the processes of economic, social and political reform. Its members comprise OECD and EECCA government officials. International organisations and financial institutions, business and civil society representatives actively participate in its work. The OECD/EAP Task Force work on subsidy reform is financially supported by the governments of Germany, Norway and Sweden.

We gratefully acknowledge the support and contribution of all these people and institutions.

CHAPTER I. DEFINITIONS AND BASIC CONCEPTS

Given the significance of subsidies as a public policy instrument, it is necessary to understand subsidy boundaries. A clear definition of subsidies has implications for the country's subsidy classification system. Not only does a clear definition help orient the statistical data collection process but, more importantly, it can be used to monitor subsidy programme implementation and conduct relevant reporting and policy analysis underpinning policy decision making – particularly with regard to developing subsidy reform plans. Although the term "subsidy" is widely used in economics and national and international law, it remains a very elusive concept. This chapter briefly presents the major subsidy definitions used by selected organisations. It also discusses subsidy classifications and types, with a particular emphasis on support for the energy sector.

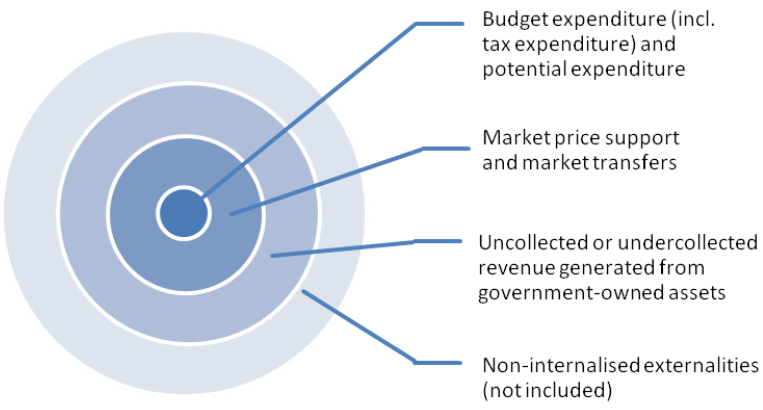
1. Subsidy definition

In practice, how a country chooses to define a subsidy is more a political decision reflecting domestic political, economic and legal frameworks and traditions. Because of the wide range of subsidy definitions that are used at the domestic level, a full understanding of the subsidisation scope in a country is not possible without their comparison with internationally-accepted definitions.

At the international level, a number of organisations have developed definitions which (despite certain differences) largely reflect the essential elements of a subsidy as accepted in economic theory. The major international organisations that have contributed to the development of a workable definition include the Organisation for Economic Co-operation and Development (OECD), the World Trade Organization (WTO), the European Union (EU), the International Energy Agency (IEA), the World Bank, the International Monetary Fund (IMF) and the International Institute for Sustainable Development's Global Subsidies Initiative (IISD-GSI).

Over the years, the concept of "subsidy" has significantly evolved. Figure 1 below presents its ever-widening definition. The traditional understanding of what constitutes a subsidy has expanded to include different support measures.

Figure 1. Ever-widening definition of subsidy or support



Source: OECD (2010c).

In its work on subsidies, the OECD prefers using the concept of support as this allows for a more comprehensive and neutral consideration of government policies that give rise to public resource transfers (including goods and services for which markets are missing). In general, though, a number of different terms are still used interchangeably to express the notion of "subsidy", including (public) support, (public) assistance, state aid and grants.

The original – simplest and narrowest – definition of a subsidy is a ***direct budgetary payment*** (also called "direct budget expenditure") by a government to a producer or consumer under the form of a grant, loan or loan guarantee (a type of potential liability for the budget). In the 20th century, analysts added ***tax expenditure*** (special deviations from standard tax rules under the form of tax deductions, reductions, credits or tax deferrals granted to selected groups or specific activities[1]) to this category. Today, tax expenditures are considered a more significant source of public support than direct budgetary expenditure. Thus, governments can provide support directly (through budgetary transfers and tax expenditures) or indirectly, through market interventions (in other words, policies that affect the prices of certain goods and services)[2].

Subsidies can be provided to both producers and consumers. When a subsidy is provided to producers through ***price mechanisms***, it is sometimes called market price support (MPS)[3]; when it is provided to consumers, it is called market transfer. From the government's viewpoint, a subsidy provided through a price mechanism may be preferable as it does not necessarily show up on government budgets and thus is much less transparent.

The market price support measure can be delivered in different ways, for example, by raising domestic prices artificially, setting a minimum price for a good above-market rate that will guarantee corporate rates for producers. This measure is usually supported by foreign trade barriers (such as tariffs or import quotas) that make imported goods more expensive relative to similar domestic goods, thus shielding national producers from competition. Such subsidies mean that domestic producers usually gain a significant market share, but consumers – who bear their real cost – lose out. The overall effect of MPS measures on the economy (including on the environment) can be negative. For this reason, economists consider such subsidies as some of the most market-distorting forms of support provided through government interventions. They are quite typical in the agricultural sector and less frequent in the energy field, with the notable exception of biofuels.

Market transfers – usually delivered as regulated prices for consumers set at below-market rates – are typically provided as a means to guarantee access to minimal volumes of consumption of a certain good or service, particularly for the poorest segments of the population. However, subsidised consumer prices usually have implications for the budget, as the government usually makes up the gap in one form or another. Overall, this kind of subsidy is more widespread in the energy sector, including in the EECCA countries.

Uncollected and under-collected revenue from state-owned assets (sometimes referred to as foregone revenue) is also sometimes considered a form of subsidy. This ***foregone revenue*** can result from royalty relief associated with exploiting publicly owned or managed resources. In the case of state-owned infrastructure and publicly provided services (*e.g.* water, electricity and heat), the government may lose revenue from non-payment of charges or access fees by service users.

[1] Most of the terms used are explained in more detail in the Glossary at the end of the report.

[2] For example, tax and subsidy programmes and trade barriers are policies that affect cost structures of producers and subsequent prices.

[3] In the energy sector, MPS refers to the monetary value of gross transfers from consumers and taxpayers to energy producers arising from policy measures that create a gap between domestic producer prices and reference prices of a specific energy commodity, measured at the mine-mouth or well-head.

Whether the value of ***non-internalised externalities*** should be included in subsidy accounting is a bone of contention among those responsible for generating subsidy estimates and environmental economists. For example, the non-internalisation of external costs strongly contributes to making coal more competitive relative to low-carbon technologies. While environmental externalities (such as pollution or habitat damage) may constitute subsidies to industry, many studies choose not to analyse them, as the uncertainty regarding their value is higher than in the case of most direct subsidies. Hence, analysts often leave them out to focus on the many ways in which direct government subsidies help polluting industries.

One of the most common misconceptions about subsidies is that they are simply cash. In fact, a great deal of market activity involves controlling and sharing the risks and rewards of economic activity. While bearing less risk or obtaining a larger share of the rewards can greatly improve economic returns to a private company, the subsidies themselves may take the form of ***shifting the allocation of risks*** or rewards rather than providing direct payments to industries. An operational definition of subsidies also needs to reflect the following feature: subsidies are government-provided goods or services, including risk-bearing, that would otherwise have to be purchased in the market[4].

In contrast to direct payments, the public rarely learns about some of these "other" support benefits, and may not readily understand the issues when it does. Many of these mechanisms tend to be hidden in legislation. When they do come to the public's attention, they are usually cloaked in socially benign language that makes them more readily acceptable.

The broad definition of subsidies needs to take into account all these types of public support. Below we discuss the extent to which these support measures are reflected in the definitions developed by different international organisations.

1.1. WTO definition of a subsidy

The WTO Agreement on Subsidies and Countervailing Measures (ASCM) (1994) includes the following definition of a subsidy:

> Article 1, Definition of a Subsidy
>
> For the purpose of this Agreement, a subsidy shall be deemed to exist if:
>
> (a) (1) there is a financial contribution by a government or any public body within the territory of a Member (referred to in this Agreement as "government"), *i.e.* where:
>
> > (i) a government practice involves a direct transfer of funds (*e.g.* grants, loans and equity infusion), potential direct transfers of funds or liabilities (*e.g.* loan guarantees);
> >
> > (ii) government revenue, that is otherwise due, is foregone or not collected (*e.g.* fiscal incentives, such as tax credits);
> >
> > (iii) a government provides goods or services other than general infrastructure, or purchases of goods;
> >
> > (iv) a government makes payments to a funding mechanism, or entrusts or directs a private body to carry out one or more of the type of functions illustrated in (i) to (iii) above which would normally be vested in the government and the practice, in no real sense, differs from practices normally followed by governments;
>
> or

[4] Compliments of Earth Track, Inc. (www.earthtrack.net).

(a) (2) there is any form of income or price support in the sense of Article XVI of the General Agreement on Tariffs and Trade (GATT)[5] 1994;

and

(b) a benefit is thereby conferred.

The WTO definition thus excludes two forms of support:

- ***that part of market price support*** *(MPS) – i.e.* transfers from consumers and taxpayers to producers created as a result of one or more government interventions – provided through ***tariff and non-tariff barriers***; and
- ***subsidies for general infrastructure***.

The first support element is not included in the ASCM definition for institutional reasons: the WTO normally addresses tariffs and non-tariff barriers through disciplinary mechanisms other than subsidies. The second exclusion is consistent with the focus of the WTO on the trade-distorting effects of support measures. Subsidies to general infrastructure are presumed to have limited adverse effects on a country's trade (OECD, 2010c).

An important condition in the WTO[6] definition is that a subsidy exists only when its benefit is conferred to a **specific** party. Unlike some other definitions (*e.g.* IEA), there is no requirement to prove the explicit impact of subsidy on prices as some subsidies have little effect on prices (or proving such effects is difficult), though they nevertheless trigger choices that benefit economic agents. Some of these choices may be environmentally harmful. For instance, while risk transfer from producers to the government may have negligible impact on price levels, they may have important impacts on producer behaviour (*e.g.* in terms of technology choices).

1.2. OECD definition of government support

In its *Inventory of Estimated Budgetary Support and Tax Expenditures for Fossil Fuels (OECD, 2012),* the OECD, rather than using the term "subsidy", uses the broader concept of "support", which includes both direct budgetary expenditure and tax expenditure that in some way provide a benefit or advantage to fossil fuel production or consumption relative to alternatives.

Annex 1 of this report and Section 5.1 present and discuss the OECD classification matrix of public support measures (with a focus on the energy sector). Like the WTO definition, the OECD definition uses the notion of "conferring benefit". The OECD notion of support is further captured by the Producer Support Estimate (PSE) and the Consumer Support Estimate (CSE) indicators, which provide the framework for estimating support amounts. The PSE incorporates all types of subsidies covered by the ASCM, plus market price support in all its forms. The CSE, an analogous indicator, combines all transfers affecting consumption.

[5] GATT is a multilateral agreement regulating international trade. According to its preamble, its purpose is the "substantial reduction of tariffs and other trade barriers and the elimination of preferences, on a reciprocal and mutually advantageous basis." GATT was signed in 1947 and lasted until 1993. It was replaced by the WTO in 1995. The original GATT text (1947) is still in effect under the WTO framework, subject to the modifications of GATT 1994.

[6] The EECCA countries that are WTO members are: Armenia, Georgia, the Kyrgyz Republic, Moldova, the Russian Federation and Ukraine. The governments of Azerbaijan, Belarus, Kazakhstan, Tajikistan and Uzbekistan have an observer status.

1.3. Global Subsidies Initiative (GSI) definition of a subsidy

The GSI work is dedicated to analysing subsidies (transfers of public money to private interests) and how they support or undermine efforts to achieve sustainable development. Since its establishment in 2005 by the International Institute for Sustainable Development (IISD), the GSI has launched extensive research programmes for identifying and measuring subsidy schemes in different areas, including fossil fuel, biofuel, and irrigation. According to the broad GSI[7] definition, largely based on the WTO ASCM definition, a "subsidy" should cover preferential treatment in all forms – financial and otherwise – provided to consumers and producers. Preferential treatment for producers can be provided in three ways:

- To selected companies;
- To one sector or product when compared with other sectors; and
- To sectors or products in one country when compared internationally (*e.g.* government incentives to attract foreign investment).

For the purpose of Group of Twenty (G20)[8] work on energy subsidies, the GSI suggested adopting the WTO definition. In contrast to the WTO definition, the GSI definition of a subsidy does not require the benefits conferred to be specific to a company or industry. The GSI considers benefits to be a subsidy if they confer a considerable advantage to groups of market participants, even if some other groups may receive equal treatment (*e.g.* accelerated depreciation allowance is not specific to the oil and gas industry, but the GSI would still consider it a subsidy). This GSI definition is further supplemented by an illustrative list (presented in Annex 2) of subsidy types capturing some transfers not covered by the WTO definition.

1.4. EU definition of state aid

EU legislation provides an extensive regulatory framework for state aid that may be provided by the EU Member States following very strict rules. In general, state aid is prohibited under the Treaty on the Functioning of the European Union given that by favouring certain firms over their competitors, state aid is liable to distort competition. Nevertheless, some exceptions authorise aid. Therefore, terminological clarity is extremely important. The term "state aid", according to EU law, refers to forms of assistance from a public body or publicly funded body given to undertakings/enterprises engaged in economic commercial activity on a selective basis, with the potential to distort competition and affect trade between EU member states. In this context, state aid rules are designed to prevent market distortions by subsidy schemes. Article 87(1) of the European Community (EC) Treaty (1957) defines state aid as "…any aid granted by a Member State or through State resources in any form whatsoever which distorts or threatens to distort competition by favouring certain undertakings or the production of certain goods shall, in so far as it affects trade between Member States, be incompatible with the internal market..."

This definition translates into five tests or criteria, all of which must be met for state aid to be present:

1. Aid is granted by an EU member state or through state resources (*e.g.* lottery distributions and European funds);
2. Aid confers an advantage on the recipient;

[7] GSI of the IISD (2010).

[8] The G20 is a group of finance ministers and central bank governors from 20 major economies: 19 countries plus the European Union. Of all the EECCA countries, only the Russian Federation is a member of this group.

3. It favours certain commercial undertakings or the production of certain goods (*i.e.* it must be selective in its nature);

4. It distorts or has the potential to distort competition; and

5. The activity is tradable between member states and the aid has the potential to affect trade.

In order to be used, subsidy schemes (state aid) require notification to and prior approval by the European Commission that assesses them based on the above-listed criteria. Any subsidy scheme that infringes EU rules on state aid may be tried at the European Court of Justice.

2. IEA definition of an energy subsidy

The IEA definition focuses specifically on energy subsidies, which it describes as "any government action that concerns primarily the energy sector that lowers the cost of energy production, raises the price received by energy producers or lowers the price paid by energy consumers" (IEA, 2006). In other words, the IEA approach means that a subsidy exists whenever the price of energy on the domestic market is below the price on the global market, with adjustments for the costs of bringing these energy commodities to the world market (commonly known as the price-gap approach).

The IEA definition, however, does not include implicit subsidies resulting from the lack of full cost pricing of electricity and heat services, badly allocated environmental subsidies, or risk transfer mechanisms with non-visible impact on prices. Pieters (Pieters, 2002) proposed a slightly broader definition of subsidies as "deviations from full pricing". But this deviation is difficult to measure, since there is a need to know how to determine the externality exactly and where to draw the baseline for measuring the subsidy.

A useful way of considering energy subsidies is to recognise that "energy" actually involves several distinct goods and services: extraction of fossil fuels and their further processing and refining, energy generation, productive capacity for supplying and distributing the energy, actual use of energy and underlying knowledge affecting the performance of both energy supply and energy efficiency. To clarify distinctions, different subsidy concepts can then be considered for each of these components.

Some energy subsidies (such as grants and tax exemptions) have a direct impact on costs or prices. Others (such as regulations that skew the market in favour of a particular fuel or government-sponsored technology) affect them indirectly. How governments choose to subsidise energy depends on a number of factors, including the overall cost of the subsidy programme, transaction and administration costs, and how the subsidy cost affects different social groups (UNEP, 2008).

3. Comparison of definitions by international organisations

A comparison of the working definitions developed by major international organisations demonstrates their overall compatibility in reflecting the essential elements of a subsidy (see Table 1 below). Except for the GSI definition, most of existing definitions do not include the non-internalisation of externalities.

Table 1. Definitional coverage of a subsidy as developed by various international institutions

Essential mechanisms for transferring a subsidy	WTO	OECD	IEA	GSI
Direct transfer of funds and liabilities	√	√	covered partially or fully only if reflected in the domestic market price	√
Tax revenue foregone (tax expenditure)	√	√		√
Other government revenue foregone (provision of goods and services below market value)	partially (excludes subsidies for general infrastructure)	√		√
Induced transfers (income or price support)	partially (excludes support provided through tariffs and non-tariff barriers)	√		√
Transfer of risk to government	√	√		√
Non-internalisation of externalities	-	-		√*

Note: "√"- Yes, covered. "-"- No, not covered.
*The GSI actually includes in the subsidy definition support provided through lack of environmental and other law enforcement, which is nevertheless difficult to measure.

4. Definition of an environmentally harmful subsidy (EHS)

There is currently no common definition of an EHS. Analysts generally use the 2005 OECD definition, which describes it as "a result of a government action that confers an advantage on consumers or producers, in order to supplement their income or lower their costs, but in doing so, discriminates against sound environmental policies. All other things being equal, the EHS increases the level of waste, pollution and natural resource exploitation to those connected."

The definition alone is too generic and difficult to apply in practice (*e.g.* to determine what is a sound environmental policy and analyse the impacts of support measures). Hence, the OECD and other institutions have developed various tools to help operationalise this definition in their effort to identify EHS schemes. Chapter 3 discusses a number of such tools in more detail.

5. Classification of subsidies[9]

The mechanisms and design of government measures to provide support vary greatly, reflecting diverse domestic political and economic settings and, increasingly, obligations in the international economic arena. The various subsidy groupings are generally organised around one or more of the following characteristics and dimensions:

- *target*: *e.g.* consumers or producers, outputs, inputs, value-adding factors (land, labour, capital), type of energy commodity;
- *instrument*: *e.g.* budgetary expenditure, tax expenditure, market transfers, underpricing of publicly owned or managed assets;
- *pathway of benefit*: *e.g.* direct, indirect, explicit, implicit; and
- *purpose*: *e.g.* regional development, energy conservation.

[9] This section draws heavily from OECD (2010c) and OECD (2010e).

When governments provide subsidies for a particular purpose, they always impose some conditions; this conditionality can also serve as the basis for subsidy classification. Subsidies can be made conditional on a number of things, such as the recipient's income level and production (output) level, the use of particular inputs or the introduction of a particular technology. When the point of impact (or effect) of a subsidy is mainly its output, this measure increases sectoral revenue; when the point of impact is variable costs or intermediate product inputs, such as raw materials, it lowers the recipient's production costs. When the impact lands on profit and income, this type of support actually has no direct impact on the input or output market[10]. These main points of impact are generally called incidence, and more rarely subsidy conditionalities.

5.1. OECD Matrix of support measures

If we use as a starting point the OECD Matrix of support measures with examples from the energy sector (see Annex 1), we can see that the two broad classification lines are the **transfer mechanism** (the mechanism through which subsidies are channelled to recipients) and the **statutory** or **formal incidence** of the subsidy (in other words, who receives the subsidy). Alternatively, one can say that the support measures in the matrix are organised around targets and instruments.

When subsidies are classified as transfer mechanisms to producers and consumers, the OECD has divided them into five major groups: direct transfers of funds, tax expenditure (foregone revenue), other foregone government revenue, transfer of risk to government and induced transfers. We discuss each of these groups in more detail below.

5.1.1. Direct transfer of funds

Direct budgetary transfers are the most straightforward and visible subsidy type, since they appear in a country's annual budget and (normally) undergo parliamentary scrutiny. They can include grants to cover losses by state-owned enterprises, capital grants, interest rate subsidies, wage subsidies and direct consumer subsidies.

Direct budgetary transfers are relatively easy to observe and quantify. Data on direct budgetary transfers usually appear in national accounts and sectoral subsidy accounts (*i.e.* accounts related to a specific product, industry or sector), depending on how well they are reported in government budget documents. Experience shows that government accounts differ in their level of transparency and their accuracy in reporting actual expenditure, which can make data collection substantially more difficult.

When accounting for budgetary transfers specifically in the energy sector, it is important to capture all subsidy schemes, including those outside the direct responsibility of energy ministries (such as government expenditure on education, research and development, and infrastructure), as well as environmental expenditure (such as rehabilitation of coal mines), often implemented with support from environment ministries. It is also important to consider that in many countries, policy interventions are financed at multiple levels of government and with all types of public finance instruments (including environmental funds) that may not formally be included in the national budgets.

[10] Firms sell the goods and services they produce in product or output markets. The resources they purchase in order to make their outputs are bought in input or factor markets.

5.1.2. Tax expenditures

Public support may be provided not as actual budgetary transfers, but rather as revenue foregone by the government or other economic agents. In theory, tax expenditures[11] (*e.g.* tax exemptions or deductions, tax rate reductions, credits or deferrals to selected groups or specific activities that reduce the amount of tax that would otherwise be payable) can be approached in the same way as budgetary transfers.

Tax expenditures represent deviations from benchmark tax structures analogous to public expenditure, but delivered through the tax regime. Tax expenditures are less transparent and less visible though. Unlike direct budgetary support, tax expenditures are not always observed. Sometimes governments may publish separate tax expenditure reports or compile estimates of foregone revenue as part of budget drafting documents. When governments do not publish separate tax expenditure budgets, tax expenditures need to be estimated by analysts themselves. The "revenue foregone" method used by most OECD countries is here particularly helpful though imperfect. This method measures the amount by which revenues are reduced because of a particular tax concession assuming no behavioural changes on the part of taxpayers following the removal of the concession. It should also be noted that tax expenditures are often country-specific (since they are provided in the context of a country's own tax regime), complicating comparisons across countries.

Tax expenditures related to energy can be categorised into three broad areas:

- *Tax expenditures related to final consumption:* typically targeted at households and provided through lower rates, exemptions and rebates on two main types of consumption taxes – value added tax (VAT) on energy consumption and excise taxes for certain groups of users or types of fuels or electricity.

- *Tax expenditures related to energy as inputs to production:* such tax expenditures are targeted at fuels or electricity used as input to the final production of another good or service. They may include exemptions from excise taxes on fuels for certain types of households and businesses (*e.g.* agriculture, fishing or mining) and reductions in energy tax rates related to the energy intensity of a firm's production processes.

- *Tax expenditures related to energy production:* such tax expenditures are targeted at the actual extraction and production of energy, including refining and transport and are usually conveyed through the corporate income tax system and consist of targeted measures to support fossil fuels through accelerated depreciation allowances for capital equipment and investment tax credits or resource-rent taxes, royalties and other fiscal instruments applied to resource extraction.

Tax expenditures are estimates of how much revenue would have been collected under a different tax regime. The challenge with tax expenditures is to identify the **standard** or **benchmark** tax treatment that will establish the nature and extent of any tax concession; a number of different approaches are possible, with national variations. Many countries base their tax expenditure estimates on a conceptual view of what constitutes "normal" taxation of income and consumption, although they may often modify this for practical reasons. Even in a relatively straightforward case such as the VAT, different approaches can lead to different results. Thus, any tax rate lower than the standard VAT rate might be seen as generating tax "expenditures", while others might regard lower VAT rates as an inherent part of the tax system, which does not generate tax expenditures.

[11] Also known as tax relief or tax concession, both of which reflect the recipient's perspective.

Thus tax expenditures require estimating both the size of the tax break and the extent to which taxpayers take advantage of it. Since there is often no direct evidence of the latter, estimate quality will depend on what data the tax authorities collect on taxpayers and tax receipts and whether they are captured, prepared and made available for further statistical and economic analysis. Hence, tax expenditures are often under-reported in sectoral subsidy accounts. These practical considerations can have a big impact on the availability and quality of tax expenditure data and analysis.

5.1.3. Other government revenue foregone

Governments also forego revenue by offering the use of non-depletable (*e.g.* land) or depletable assets (*e.g.* fossil-fuel resources) under their control to a private company (or individuals) to exploit them for their own use or for sale. Through their policies, the government can reduce production or consumption costs and thereby encourage more production or consumption than would otherwise be the case (*e.g.* through reduced resource rent taxes or reduced royalty payments). In addition to providing the private sector with access to domestic fossil fuels resources on concessional terms, governments also provide access to government buildings or land and intermediate inputs (*e.g.* water or electricity) at below-market prices. Estimating the value of such transfers entails comparing the actual price charged for use of the assets with the price that would be charged on the open market (*e.g.* through competitive bidding), which is not an easy exercise.

5.1.4. Transfer of risk to government

Estimating the cost to government, or the value to beneficiaries, of government assumption of risk may be one of the most complex and controversial areas of subsidy analysis. Governments assume some of the risk taken by energy producers through all kinds of measures – most commonly by guaranteeing loans, becoming an equity participant in an energy company, acting as the insurer of last resort in case of an accident affecting workers or the general public, or providing extra military or police protection to key energy facilities or energy transport corridors.

In all of these cases, the actual cost to government of the risk-reducing measure depends on the probability that such a risk (*e.g.* a loan default, accident, or attack) will occur and that the government will be required to incur these costs. This probability may range from low to high in any given year. By contrast, what matters in terms of the effects on producer or consumer behaviour is the value of such assurance to the beneficiaries.

5.1.5. Induced transfers

Induced transfers are subsidies indirectly provided to consumers or producers, usually through some form of price support and control (price regulation) which, due to different policy measures, keeps the end price of a good or service lower or higher than its actual market price. Induced transfers include import tariffs and export subsidies, consumption mandates (*e.g.* mandates for blending biofuels with petroleum fuels), regulated electricity prices and cross-subsidies, and regulated wages and land prices.

Calculating induced transfers, and particularly market price support associated with border protection measures, presents a number of challenges. Determining deviation from the border price for any given good requires a benchmark (or reference) price. While for internationally traded commodities (*e.g.* oil and gas) this benchmark is often the international market price, it is more difficult to establish such a reference price for goods produced and traded domestically. Chapter 2 elaborates on this issue in the context of the price-gap approach used to measure market-price support.

Experience shows that energy subsidies are widespread and varied. As the OECD matrix shows, governments worldwide have designed and implemented numerous measures for transferring support – particularly producer subsidies – to recipients. The high number of transfer mechanisms does not necessarily mean that the largest subsidies (in absolute terms) go to producers, but rather that producer subsidies are more difficult to capture and quantify.

5.2. Other dimensions of subsidy classification[12]

Subsidies can be further distinguished according to their *pathway of benefit*: direct *vs.* indirect or cash (explicit) *vs.* implicit. They can also be classified as general or sector-specific and on-budget or off-budget.

Direct subsidies are generally provided through targeted (cash-based) payments, such as loans or tax preferences. These subsidies may be implemented per unit of output or per unit of input used into the activity, or per unit of output or input value. A fixed subsidy per unit is called a "specific subsidy", and a fixed subsidy per value is called "ad valorem".

Indirect subsidies are received indirectly by the recipient as a higher market price for output and/or a lower market price for input goods and services, purchased from an upstream industry that is able to discount its prices thanks to the subsidies it also receives (*e.g.* a reduced cost of diesel fuel sold to fishing vessels as a result of subsidies to oil refiners).

Cash (explicit) subsidies are paid out as a transfer to a recipient in the form of budgetary expenditure (most analysts also include tax expenditures in this category). **Implicit subsidies** are a specific category of input subsidy generally provided in kind by a government at a price that is below market value or insufficient to cover the costs of provision. These subsidies are often difficult to identify and measure as their amounts are not routinely reported in government documents.

One important variant of in-kind subsidy is privileged access to a government-owned or controlled natural resource. Primary industries benefit greatly from such access (*e.g.* to public lands for mining or grazing livestock, state forests for logging, rivers for irrigation, and foreign seas through so-called fishing "access agreements") for free or at below market prices. International disputes over the subsidy element of privileged access to natural resources have been among the most contentious and long-running (Steenblik, 2007).

On-budget subsidies are more easily identifiable, while **off-budget subsidies** are often hidden and elusive. Both on- and off-budget subsidies can be directed at both consumers and producers. Consumer subsidies are rather on-budget and take the form of quasi-fiscal instruments[13], such as electricity tariffs provided at a price lower than the full supply cost. Producer subsidies are often off-budget and less visible.

The problem with the existence of so many terms to analyse subsidies is that they are used very loosely and can have different (and even contradictory) meanings in different countries. Hence, interpreting them can be very confusing. Differences in classification systems partly explain why comparing subsidy schemes across countries can be so difficult – a difficulty compounded by differences in countries' methods of quantifying subsidies. To date, no systematic comparison has been made of these classification systems, methods and practices.

[12] This section is based on Bruce, N. (1990).

[13] Quasi-fiscal instruments refer to implicit subsidies to the utilities sector that are not accounted for in the budget as government expenditures.

6. Summary conclusions

The major conclusions that emerge from the above analysis include the following:

- The notion of subsidy has evolved significantly over time to include different support measures above and beyond direct budgetary expenditure. Given the wide range of government measures that can qualify as subsidies, organisations such as the OECD prefer to speak of "government support" rather than "subsidy".

- Various subsidy definition developed by different international organisations have many similarities and there is a shared understanding of the essential types of support that can constitute subsidies. However, there is no single agreed-upon definition of a subsidy – or, for that matter, an environmentally harmful subsidy. The starting point for defining and analysing subsidies should be national legislation. More generally, and to the extent possible, it may be better to use a broader definition of subsidies as this would allow for a more comprehensive picture of support measures in any given country.

- A wide range of mechanisms exists for transferring support to producers and consumers. The simplest and most straightforward subsidy type is direct budgetary transfers. When accounting for budgetary transfers in the energy sector, it is important to capture all subsidy schemes – including those outside the direct responsibility of energy ministries – and to study expenditure at all levels of government and all public finance mechanisms, since policy interventions in many countries are financed at multiple levels of government.

- A major difficulty in analysing tax expenditure lies in identifying the standard or benchmark tax treatment that can be used to establish the nature and extent of any tax concession. Unlike budgetary transfers, tax expenditures are not directly observed, and are instead estimated. Hence, tax expenditures are less transparent, and statistics are rather poor. Moreover, the country-specific character of tax regimes and tax exemptions limits the comparability of tax expenditure across countries. Despite these challenges, experience shows that tax expenditures are often a more important source of subsidies than direct budgetary support.

- Given that none of the other types of support measures can be observed, they all need to be estimated somehow. The data needed to construct and calculate indicators of support may however be massive, and lack of data and information may significantly hinder identifying and quantifying subsidy volumes and their effects on both the economy and the environment.

CHAPTER II. REVIEW OF APPROACHES TO SUBSIDY IDENTIFICATION, MEASUREMENT AND EVALUATION AND THEIR USE IN PRACTICE

If governments intend to rationalise their subsidy schemes and implement difficult subsidy reforms, they first need a very good understanding of what these schemes are, how much they cost the public purse and the extent of their economic, social and environmental impacts. A variety of methods and tools to identify and measure the nature and impacts of subsidies have been designed and applied by different governmental and non-governmental institutions. These methods serve different purposes and vary in their level of detail and analysis. This chapter presents several such methods.

The most important aspect of studying subsidy schemes is the logical path used in conducting the analysis. Figure 2 below outlines the comprehensive approach to analysing subsidy schemes. This approach consists of three major consecutive steps, from identifying then measuring a subsidy to quantifying and evaluating its economic, social and environmental impacts on public policy decision-making. While this algorithm is logical, its practical implementation (as discussed below) is neither easy nor straightforward. Hence, some researchers only manage to implement the first two steps. Some even skip the first step and go straight to the second one (e.g. as in the International Energy Agency (IEA) price-gap methodology (see the discussion further down). But the third step, evaluating subsidies, is impossible without the previous two.

Figure 2. Three-stage process of analysing subsidy schemes

7. Identification of energy (and specifically fossil fuel) subsidy schemes: examples from practice

This section discusses the outcomes from the application in practice of two most widely used methods for **identifying energy** (and specifically **fossil fuel) subsidy schemes**: the OECD Matrix and inventory of support measures for fossil fuels and a similar subsidy classification framework developed by the Global Subsidies Initiative (GSI) hosted at the International Institute for Sustainable Development (IISD) in Geneva.

7.1. OECD inventory of estimated budgetary support and tax expenditures for fossil fuels

After publishing in 2011 its first inventory of measures supporting fossil fuels in a selection of 24 countries, the OECD has now updated and expanded this work to cover more than 550 measures in all 34 of its member countries, including many provided by state and provincial governments. The data in the inventory were collected from government documents and websites, complemented by information provided directly by government agencies themselves. The purpose of this inventory is to present information on the policies that provide some level of support, as a starting point for further analysis about the objectives of particular measures, their impacts (economically, environmentally and socially), and possible reforms and alternatives[14].

[14] OECD (2012) and www.oecd.org/iea-oecd-ffss .

Despite the many benefits of reforming fossil-fuel subsidies, efforts to implement such reforms in the OECD countries have long been hampered by a crucial lack of information regarding the amount and type of support measures in place. This inventory has been undertaken to fill in this critical data gap, as an exercise in transparency but also with the purpose of informing the international dialogue on fossil-fuel subsidy reform.

Table 2 below presents an example of producer and consumer support estimates for coal in Spain. The classification of these schemes is based on the OECD Matrix (as shown in Annex 1). Table 2 shows that there is a variety of schemes and that support is generally conditional on producers' output, inputs and income. In addition, a distinction is made between those support measures that are provided to individual or specific groups of producers, and those that benefit Spain's coal-mining sector as a whole.

Table 2. Summary of fossil fuel support to coal – Spain (million euros, nominal)

Support element	Jurisdiction	2005	2006	2007	2008	2009	2010	2011p*
Producer support								
Support to unit returns								
Operating aid to coal producers	Central	296	284	284	267	253	250	231
Subsidy for the inter-basin transport of coal	Central	4	7	7	11	14	13	0
Operating aid to HUNOSA**	Central	89	85	85	85	80	76	72
Income support								
Adjustment aid to coal producers	Central	42	20	35	40	40	10	6
Consumer support								
Funding for coal stockpiles	Central	8	3	3	3	6	13	0
General services support								
Inherited liabilities due to coal mining	Central	258	275	290	303	328	336	327

Notes:

Tax expenditures for any given country are measured with reference to a benchmark tax treatment that is generally specific to that country. Consequently, the estimates contained in the table above are not necessarily comparable with estimates for other countries. In addition, because of the potential interaction between them, the summation of individual measures for a specific country may be problematic. The allocation of particular measures across fuel types was done by the OECD Secretariat based on the IEA's Energy Balances.

*p – stands for provisional.

**HUNOSA is a major state-owned producer of hard coal in the Asturian basin.

Source: OECD (2012).

7.2. Lessons learned from applying the GSI subsidy identification methodology in the Russian Federation

In 2012, World Wide Fund for Nature (WWF) Russia and the Global Subsidies Initiative (GSI) of the International Institute for Sustainable Development (IISD) issued the first comprehensive study on public support to oil and gas production in Russia, "*Fossil Fuels – At What Cost? Government support for upstream oil and gas activities in Russia*". The WWF Russia/GSI initiative was intended to initiate a broad debate on the reform of fossil fuel subsidies in Russia. The GSI methodology[15] was used to prepare the report.

[15] The GSI methodology for estimating producer subsidies was first described in two policy briefs in 2010: http://www.iisd.org/gsi/sites/default/files/pb5_defining.pdf; and http://www.iisd.org/gsi/sites/default/files/pb7_ffs_measuring.pdf.

The WWF Russia/GSI study adopted a four-step approach: 1) identification of programmes providing government support to upstream oil and gas activities in Russia, 2) categorisation of the identified subsidy programmes, 3) quantification of the subsidies where possible and 4) brief discussion of the identified subsidies in a broader economic, social and environmental context. Data was collected mainly from open sources of information, including public accounts and official documents related to subsidy monitoring and budget planning and reporting, academic literature and media items. This resulted in the identification of the 10 most sizeable federal subsidy schemes (Box 1) supporting upstream oil and gas activities in Russia.

Box 1. The WWF Russia/IISD-GSI study

At the federal level, the study identified 30 schemes conferring subsidies to oil and gas producers in 2009 and 2010. Without diminishing the value of future investigations in this area, this list likely covers all major channels of providing government support to upstream oil and gas activities[16] in Russia. Some of the identified government support schemes serve as umbrella categories for several subsidy programmes. Out of the 30 identified, the study was able to quantify the value of 17 subsidy schemes totalling USD 8.1 billion in 2009 and USD 14.4 billion in 2010. The top 10 most sizeable federal subsidy schemes supporting upstream oil and gas activities in Russia were (in order of their diminishing value in 2010):

- The export duty exemption for East Siberian oil (approx. USD 4 billion);
- Tax holidays[17] with respect to the mineral extraction tax on East Siberian oil (approx. USD 2 billion);
- The property-tax exemption for trunk oil and gas pipelines (approx. USD 1.9 billion);
- Tax holidays with respect to the mineral extraction tax on oil produced at new on-shore fields in the Nenets Autonomous Okrug and the Yamal Peninsula in the Yamalo-Nenets Autonomous Okrug (approx. USD 1.5 billion);
- The reduced tariff for transportation of oil through the East Siberia-Pacific Ocean pipeline (approx. USD 1.1 billion);
- The reduced rate of the mineral extraction tax on oil from mature fields (approx. USD 1 billion);
- The export customs duty exemption for natural gas exported through the Blue Stream pipeline to Turkey (approx. USD 0.8 billion);
- The deduction of research and development and exploration costs from taxable profits (at least USD 0.6 billion);
- The accelerated depreciation allowance (at least USD 0.6 billion); and
- Federal budget spending on oil and gas exploration (USD 284 million).

Source: Gerasimchuk (2012).

[16] Oil and gas companies can generally be divided into three segments: upstream, midstream and downstream. Upstream field activities involve exploring for crude oil and natural gas, drilling and completing wells, and bringing the resources to the surface. Midstream activities involve gathering, refining, processing, storing and transporting crude oil and natural gas. Downstream activities bring oil and gas products to the consumer, *e.g.* by selling and distributing fuels like gasoline, natural gas and propane, as well as products made from oil and gas.

[17] A tax holiday is a temporary reduction or elimination of a tax.

Table 3 provides more detailed information on one of the specific subsidy measures discussed in the report: Tax holidays with respect to the extraction tax levied on newly developed onshore oilfields in East Siberia. As Table 3 demonstrates, a single measure can be classified in different categories.

Table 3. Example of an upstream oil subsidy identified in the WWF Russia/IISD-GSI study

Tax holidays with respect to the extraction tax levied on newly developed onshore oilfields in East Siberia	
Subsidy category	Provision of goods or services below market value ➔ Government-owned energy minerals ➔ Royalty relief or reduction in other taxes due on extraction.
Stimulated activity	Development, production, export through the East Siberia-Pacific Ocean pipeline.
Subsidy name	Tax holidays with respect to the extraction tax levied on newly developed onshore oilfields in East Siberia.
Jurisdiction	Federal.
Legislation/Endorsing organisation	Tax Code of the Russian Federation (Article 342, p.1.8) passed by the Russian Federal Assembly (Parliament).
Policy objective(s) of subsidy	To encourage capital investment in and development of new onshore oilfields in the harsh conditions of East Siberia that supply oil to the East Siberia-Pacific Ocean pipeline bound for China and other consumers in the Far East.
End recipient(s) of subsidy	Oil-extracting companies: primarily Rosneft, Surgutnetegaz and TNK-BP.
Time period	From 1 January 2007 until specified production levels are reached.
Background	Temporary exemption from the extraction tax applies to oil deposits wholly or partially situated within the boundaries of the Republic of Sakha (Yakutia), Irkutsk region and Krasnoyarsk Territory until cumulative production from a particular field reaches 25 million tonnes. Tax holidays are granted for the period of 10 years from the start of the field's exploitation in the case of the licence for exploration and production and for 15 years in the case of the licence for simultaneous geological survey (prospecting and exploration) and production. The subsidy applies to 13 oil fields, the exploitation of which began both before and after its introduction (1 January 2007): Vankorskoe, Yurubchenko-Takhomskoe, Talakanskoe, Alinskoe, Srednebotuobinskoe, Dulisminskoe, Verchnechonskoe, Kuyumbinskoe, Severo-Talakanskoe, Vostochno-Alinskoe, Verchnepeleduiskoe, Pilyudinskoe and Stakhanskoe. As of 1 September 2011, the Vankorskoe oilfield, developed by the state-owned company Rosneft, is the only oilfield in East Siberia for which the tax holidays have been terminated due to its cumulative production exceeding the threshold of 25 million tonnes on 1 May 2011. In accordance with the Russian Ministry of Finance approach, the subsidy estimates below have been obtained using the maximum rate of the extraction tax as a benchmark.
Amount of subsidy conferred	2008 (1.3 million tonnes) = USD 180 million.
	2009 (7.5 million tonnes) = USD 630 million.
	2010 (20 million tonnes) = USD 2 billion.
Information sources	Tax Code of the Russian Federation (Article 342, p. 1.8); Geltishchev (2009); Ministry of Finance of the Russian Federation (undated).

Source: Gerasimchuk (2012).

The most pertinent lesson from this study is that energy subsidy inventories constitute a good starting point for analysing and debating subsidy reforms. Such inventories can help measure the scale and change of subsidies over time in a given country. However, inventories only collect part of the information required at the next stage to measure the environmental, social or economic impacts of subsidies. The preparation of such inventories is based on detailed verification of budgetary documents (budgetary codes, tax regulations, etc.). In some cases quantifying the identified measures may prove impossible.

Using and distributing structured questionnaires among experts and government officials makes sense when inventorying major subsidy measures for particular fuels/sectors in a country because it helps focus discussions and allows all participants to develop the same understanding of specific issues. However, such a questionnaire will only be useful if the subsidy definition is clarified before circulating the questionnaire across the government.

8. Quantification of the subsidy level

Economists recommend that subsidies in principle be measured relative to a counterfactual situation in which they do not exist, rather than as a deviation of the subsidy from its optimal value (Bruce, 1990). For a number of reasons, however, this approach may not always be applicable; hence, other more practical approaches have been developed to quantify subsidies. This section discusses three of the main ones: the price-gap approach, the Producer Support Estimate (PSE) and the Consumer Support Estimate (CSE).

8.1. Price-gap approach

Price gap is a generic term referring to a family of indicators based on calculating the gap between domestic energy/fuel price and world reference prices. In principle, the price gap may be used to calculate both consumer and producer support. This method has been widely used by the OECD, the IEA and the World Bank to determine the magnitude of energy subsidies. The IEA database on subsidies contains (as of 2009) estimates for 37 emerging and developing countries. The method has been also used by the IEA in some EECCA countries[18].

The price-gap approach is the most commonly applied methodology for quantifying consumption subsidies. The IEA, for example, estimates subsidies to fossil fuels that are consumed directly by end users or as inputs to electricity generation. It compares average end-user prices paid by consumers with reference prices that reflect the full cost of supply. The price gap is the amount by which an end-use price falls short of the reference price; its existence indicates the presence of a subsidy. Box 2 shows (in simplified terms) how a price gap can be calculated.

Box 2. Price-gap approach formula

Price gap = Reference price – End-user price

The most difficult aspect of the price-gap approach is establishing the reference price. There are different ways for doing so, depending on whether a commodity is internationally traded or not. We discuss this issue in more detail below.

8.1.1. Determining and calculating the reference (world) price[19]

The concept of a world price against which domestic prices can be compared is alluring, though not so simple to calculate in practice. The common approach to calculating the price gap for an **internationally traded commodity** is to measure the difference between a **domestic market price** (or end-user price) (when there are policies known to distort domestic prices) and a border price representing the opportunity or **reference price** (cost) for domestic market participants.

[18] Azerbaijan, Kazakhstan, the Russian Federation, Turkmenistan, Ukraine and Uzbekistan, namely those EECCA countries that provide data on fossil fuel prices.

[19] This discussion largely draws from OECD (2010c).

When making price comparisons for exported or competing imported products, the standard practice in the energy sector is to measure the **domestic price** of a product at the point where it leaves the producer's property. For energy products, this point would be: (i) for bituminous coal and anthracite – at the mine mouth; (ii) for crude petroleum – at the well head; and (iii) for petroleum products – at the refinery gate. When producer prices are not available, analysts make comparisons based on wholesale or consumer prices. If no other method appears feasible, the import tariff is generally used as a proxy for estimating the price gap for traded fossil fuels (such as coal and petroleum fuels).

The **reference price** for traded goods (like oil) is usually the international or border price, which needs to be adjusted for a number of factors, including market exchange rates, transport and distribution costs and country-specific taxes. Moreover, the domestic market and border prices used to estimate the price gap should represent products of similar quality. In the case of fossil fuels, quality relates to such product attributes as impurities (*e.g.* ash and sulphur), moisture level and heating value. Differences in these attributes can cause price differentials independent of government policies. Where such differences exist, the reference price needs to be adjusted to eliminate that element of the price differential arising from differences in a product's quality characteristics.

The reference price also needs to be adjusted for differences arising from the ways in which energy commodities are traded on the market. For example, petroleum products are sold either on exchange or spot markets[20]; and providing there are no government interventions in price formation over the course of a year, end-user prices will closely follow the movements in spot markets. In the case of coal, however, most transactions take place within the framework of long-term contracts, with periodic adjustments to reflect changing market prices. Hence, published domestic prices for coal need to be adjusted to the extent possible for the actual prices paid when purchasing coal. Box 3 below presents the rules applied by the OECD in calculating reference prices for oil, gas and coal (*i.e.* internationally traded goods).

Box 3. OECD rules for calculating reference prices for oil, gas and coal

For an *importing country*, the reference price:

- Includes the price of a product at the nearest international hub, adjusted for quality differences, **plus**:
- The costs of freight and insurance to the importing country, **plus**:
- The costs of internal distribution and marketing, **plus**:
- Value added tax (VAT).

For an *exporting country*, the reference price:

- Includes the price of a product at the nearest international hub, adjusted for quality differences, **minus**:
- The costs of freight and insurance to the importing country, **plus**:
- The costs of internal distribution and marketing, **plus**:
- Value added tax (VAT).

Source: IEA, OECD and World Bank (2010).

[20] A spot market is a public financial market in which financial instruments or commodities are traded for immediate delivery. It contrasts with a futures market, in which delivery is made at a later date.

With **non-traded energy commodities** (such as electricity or sometimes even coal), the reference price is based on the cost of domestic supply (Box 4). In contrast to traded goods, there is no need to adjust the reference price for quality differences. Practices differ in the choice of the reference price: while the IEA has based it on the estimated long-run marginal cost[21] of delivering electricity to end users, the World Bank and the International Monetary Fund (IMF) base it on the estimated average cost of production[22] (including necessary maintenance and replacement of depreciated capital), which is generally a lower benchmark for a pricing policy than the long-run marginal cost.

Box 4. Reference prices for electricity

A different procedure applies to setting electricity reference prices, since electricity is not extensively traded over national borders. For electricity, the reference prices:

- Are based on annual average-cost pricing for electricity in a country (weighted according to output levels from each generating option);
- Take into account costs of production, transmission and distribution;
- Are determined using reference prices for fossil fuels and annual average fuel efficiencies for power generation;
- Are capped at the levelised cost[23] of a combined-cycle gas turbine (CCGT)[24] plant to avoid over-estimation.

Source: IEA, OECD and World Bank (2010).

Figure 3 below presents the calculation of coal consumption subsidies for China, Thailand and Kazakhstan in 2010 using the price-gap approach. The "rate of subsidisation" is the subsidy expressed as a percentage of the full economic price. In monetary terms, China has the biggest (around USD 2 billion) coal consumption subsidies (measured as the differences between actual prices and the full economic cost of supply), even though the subsidisation rate (measured as a percentage of the full economic price) is less than 5%. In Kazakhstan, the estimated coal subsidy was about USD 400 million, which translates into a much higher subsidisation rate of slightly above 60%.

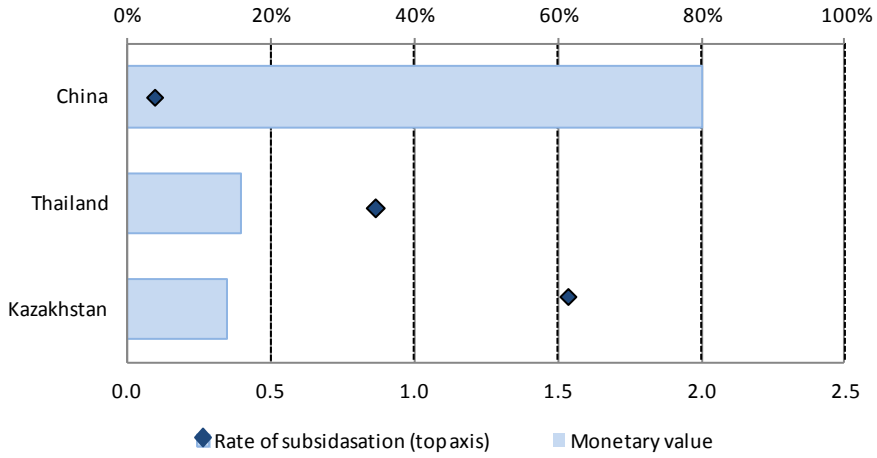
[21] Long-run marginal cost (LRMC) is the added cost of providing an additional unit of service or commodity from changing capacity level to reach the lowest cost associated with that extra output.

[22] In economics, average cost or unit cost is equal to total cost divided by the number of goods produced.

[23] Levelised cost is often cited as a convenient summary measure of the overall competiveness of different energy generating technologies. It represents the per-kilowatt-hour cost (in real terms) of building and operating a generating plant over an assumed financial life cycle. Key inputs to calculating levelised costs include overnight capital costs, fuel costs, fixed and variable operations and maintenance costs, financing costs and an assumed utilisation rate for each plant type. Based on US Energy Information Administration (2012).

[24] CCGT is a form of highly efficient energy generation technology that combines a gas-fired turbine with a steam turbine.

Figure 3. Coal consumption subsidies for selected countries, 2010



Source: IEA (2011).

The price-gap approach is designed to capture the net effect of all subsidies that reduce final prices below those that would prevail in a competitive market. For countries that import a given product, subsidy estimates derived through the price-gap approach are explicit – in other words, they represent net expenditures resulting from the domestic sale of imported energy (purchased at world prices in hard currency) at lower (regulated) prices. For countries that export a given product (and therefore do not pay world prices) subsidy estimates, in contrast, are implicit and generally have no direct budgetary impact. Rather, they represent the opportunity cost of pricing domestic energy below market levels, *i.e.* the rent that would be recovered if consumers paid world prices. For countries (such as Iran) that produce a portion of their consumptions themselves and import the remainder, the estimates represent a combination of opportunity costs and direct government expenditures[25].

According to certain critics of the price-gap approach, international prices do not constitute a good reference price (*i.e.* they do not reflect true opportunity costs) when it comes to large importers, since:

(i) these prices would change as a result of in-country demand reactions arising from subsidy reform, and

(ii) international prices are frequently volatile and determined by other external factors.

Koplow (2009) describes some of the advantages of this model as follows:

- The primary benefit of the price-gap approach is its relative simplicity compared with other subsidy valuation methods. Rather than analysing hundreds of individual energy-related policies in specific countries, analysts can focus on market-clearing prices and a handful of adjustments to improve the comparability of pricing data. This simplification is particularly important in countries that lack the capability or will to provide accurate information on energy-related government activities.

[25] IEA, OECD and World Bank (2010).

- By looking into information on subsidies that alter end-user prices only, price-gap data provide insights into the factors most likely to affect short-term energy supply and demand decisions. The format of price-gap outputs can be fed fairly easily into global macroeconomic models. This enables broader testing of how subsidy reforms might affect energy markets (including inter-fuel substitution), consumer welfare and trade flows.

Box 5 below summarises some of the main challenges and limitations of the price-gap method.

Box 5. Major challenges and limitations of the price-gap method

It should be recognised that the price-gap method relies on a number of assumptions:

1) **Identifying the appropriate cost**: Many different measures of cost exist, including average cost, marginal cost and opportunity cost. Exporting countries with large energy endowments prefer to use cost of production as a benchmark. Furthermore, energy costs are highly variable, since not all commodities are widely traded.

2) **Identifying the appropriate price**: Although the price quoted in global markets is typically used as a measure of opportunity cost, international prices may be distorted by a variety of factors and can experience a high degree of volatility.

3) **Price-gap estimates do not capture producer subsidies**: Therefore, subsidy estimates based only on price-gap measurements tend to underestimate the level of subsidies in countries.

Other caveats include exercising caution when interpreting or explaining market transfers (to consumers) and market price support (to producers) in any given year. In recent decades, U.S. dollar prices (especially for crude oil and petroleum products) have been highly volatile in international markets, as has the value of the U.S. dollar against other currencies. Combined, these two elements result in highly variable estimates of market transfers from one year to the next.

Source: IEA, OECD and World Bank (2010).

Consequently, part of the work on environmentally harmful energy subsidies in the EECCA countries will entail reviewing their existing price-gap studies and using the results as complementary information for selecting fuels/sectors in which more detailed evaluations will be conducted. In countries where such studies exist, repeating price-gap calculations will not be necessary.

8.2. The PSE-CSE framework

The price gap approach does not capture the subsidy schemes that do not affect final prices. The Producer Support Estimate (PSE) and the Consumer Support Estimate (CSE) framework integrates price-gap calculations with subsidy measurements based on transfers from governments to producers and consumers. [26]

8.2.1. Producer Support Estimate

The PSE is an OECD indicator that measures the annual monetary value of gross transfers from consumers and taxpayers to producers, measured at the producer property, arising from policy measures that support producers by creating a gap between domestic market prices and border prices of the specific commodities. Box 6 below provides the formula and the method of detailed calculation of the PSE.

[26] Initially, this measurement framework was developed by the OECD and applied to the agriculture sector. For a detailed discussion of all possible measurement indicators, see the OECD publication "*Producer support estimate and related indicators of agricultural support - Concepts, Calculations, Interpretation and Use (The PSE Manual), September 2010*". This section is based on the analysis developed in the PSE Manual.

Box 6. PSE formula

PSE = MPS + BOT

Where,

PSE – Producer support estimate;

MPS – Market price support [to producers];

BOT – Budgetary and other transfers.

MPS is a price-gap indicator measured as:

MPS = (DP – BP)*PV

Where,

DP – Domestic price (usually measured at the factory gate, *i.e.* mine mouth, well head, refinery gate);

BP – Border price (reference price);

PV – Produced volume of good.

The PSE comprises both price-gap method indicators (measuring market price support to producers, MPS) as well as other transfers (such as actual budgetary transfers and revenue foregone by the government and other economic entities).

8.2.2. Consumer Support Estimate

The CSE is an OECD indicator that measures the annual monetary value of transfers from taxpayers to consumers arising from policy measures that support consumers. Box 7 below provides the formula and the method of detailed calculation of the CSE.

Box 7. CSE formula

CSE = TCT – (TPC + OTC)

Where,

TCT – Transfers from taxpayers to consumers of a commodity;

TPC – Transfers from consumers to producers of a commodity (mirror image of MPS);

OTC – Other transfers from consumers of a commodity.

TCT are budgetary payments to consumers (including tax concessions) designed to reduce the effective price they pay for energy (*e.g.* to compensate them for the higher energy prices they pay resulting from policies that support producer prices to favour a particular industry or to address energy poverty). TCT are obtained from information on budgetary or tax expenditure. The sum of the other two components (TPC + OTC) corresponds to price transfers from consumers that include transfers to both domestic producers and the government (providing some of the energy demand is met through imports subject to an import tariff).

8.2.3. Other support indicators

In addition to the PSE and the CSE, other support indicators can be used in the policy analysis of support transfers. The two major ones are the General Services Support Estimate (GSSE) and the Total Support Estimate (TSE):

- The General Services Support Estimate (GSSE) measures the value of transfers provided through policies that support energy producers or consumers collectively rather than as individuals. Possible measures targeted at general services include support for research, development, training, inspection, marketing and sectoral promotion;
- The Total Support Estimate (TSE) gives the annual monetary value of all gross transfers from taxpayers and consumers arising from policy measures that support the energy sector, net of associated budgetary receipts and regardless of their objectives and impacts on production and income or actual consumption of energy products.

Two methods exist to calculate a country's TSE, both of which can help ensure that all indicators of support are correctly calculated. The first method sums up transfers distinguished by recipient (*i.e.* transfers to producers, PSE), transfers to general services (GSSE) and transfers to consumers from taxpayers (*i.e.* consumer subsidies, TCT). The second method sums up transfers distinguished by source, *i.e.* transfers from consumers and transfers from taxpayers. Both methods follow the assumption that the total value of transfers from consumers to others is received as budget revenue (*e.g.* as import duties).

When budgetary transfers and revenue foregone are measured as part of these indicators, a few issues need to be carefully considered. With respect to **budgetary transfers**, when measuring the PSE, particular care needs to be taken to avoid double counting of support in MPS and BOT indicators. Further, it should be determined whether treatment of ministries' administrative expenditure (*e.g.* salaries, materials and buildings) associated with the design, implementation and evaluation of subsidy policies should be included in the PSE-CSE estimation. As a general rule, these costs should be excluded on the rationale that such expenditures are common to any public structure and do not constitute policy transfers as such.

With respect to **tax expenditure**, some issues specific to the calculation of fossil fuel subsidies require special attention. The first relates to excise duties on fossil fuel consumption. Excise duties may be significant in many countries. Most countries, however, do not publish analysis of their tax expenditure associated with excise taxes (and many do not publish tax expenditure reports at all, as exemplified by the EECCA countries). Some of these problems may result from conceptual difficulties. In the case of tax expenditure for primary energy development industries, some complications may arise due to the government's failure to accurately measure and capture natural resource rents. For instance, the development of some oil and gas fields can generate supernormal profits, which can be taxed at significantly higher rates than the standard rate of corporate income tax without distorting production decisions. For other smaller and more marginal fields where exploration and production decisions may be distorted by very high tax rates, governments may provide some tax breaks compared to the standard tax regime. Nevertheless, the overall corporate tax payments to government budgets may remain very high. Whether this can be considered tax expenditure requires detailed analysis and strongly hinges tax expenditure values on the tax's chosen benchmark rate. This is an area where detailed knowledge of the country's tax regime is needed to establish 1) if there is indeed a tax expenditure and 2) if so, how it should be quantified.

Although the PSE and CSE are relatively easy to calculate and the PSE-CSE framework may provide a more accurate picture of subsidies in a given country, it requires much more significant data collection compared with simple price-gap methods (see the next section on data requirements). Hence, it may have limited application in countries where access to the necessary data for measuring the magnitude of particular transfers is not easily available.

In general, the PSE-CSE approach is not recommended at the launch stage of work on environmentally harmful energy subsidies in the EECCA region due to the probable lack of necessary data allowing accurate calculations under the PSE-CSE framework. At the initial analysis stage, the price-gap and programmatic measurement approaches (based on evaluating clear-cut budgetary support programmes) may be more appropriate. If, however, there is a possibility of collecting relevant data – at least for specific subsidy schemes – it is preferable to apply the PSE/CSE framework to subsidy quantification.

8.2.4. Data and information requirements for calculating support indicators[27]

Aggregating detailed data into composite indicators makes the information more readily understandable. No single indicator, however, can serve all purposes equally well.

The aggregated support indicators can be calculated on an annual basis. Accordingly, the time scale (*i.e.* the number of years) over which the indicators are calculated will increase the magnitude of information required.

Requirements for calculating price transfers and price gaps

Information required on the domestic market:

- Value and volume of production information for individual commodities and (if of interest) total energy at the producer level.
- Producer prices, clearly indicating the unit they are based on. For consistency in transfer calculation, either the value of production is found by multiplying quantity by price, or the total value is divided by quantity to derive a producer price.
- Consumption data, which can be obtained directly or as a result of adding the volumes of production and imports and subtracting exports.

Trade data include:

- Values and volumes for both exports and imports of energy commodities and products.
- Tariff schedule for the country – to understand the profile of tariffs imposed on imports.
- Export subsidy budgetary information (if applicable).
- Exchange rates – information on official exchange rates, on an annual basis, and, if relevant, on a monthly basis to allow seasonal calculations.

Sources that can be used to obtain the above mentioned information include:

- Estimates published by national authorities; however, such data are relatively rare as this information is often commercially sensitive.
- Estimates obtained on a regular (but often *ad hoc*) basis from national authorities, industry organisations or major private companies.
- Estimates of marketing margins available from other countries if no domestic information is available.

[27] Adapted from OECD (2010e).

Requirements for calculating budgetary and other transfers

Data on budgetary transfers related to the implementation of energy policies can typically be found in government reports on the execution of national budgets and reports by relevant agencies. This information is generally publicly available on the websites of national ministries of finance, energy and economic development. Administrative databases also provide detailed information on current expenditures broken down by government programme, but this information is often not available publicly.

While it is generally preferable to use a single source of budgetary information, it often does not provide sufficient detail, making it necessary to use several sources and to understand the composition of the budgetary data reported therein. When budgetary information is compiled from several sources, care should be exercised to avoid double counting. For instance, some subnational expenditures may be reported both independently and as part of expenditures at higher administrative levels. Further, public spending can be reported by both agencies and specific programmes/activities.

Estimating support based on revenue foregone requires using official documents describing the relevant mechanisms. For example, estimating transfers related to preferential lending requires official documents (regulations) describing the lending conditions, including loan duration, repayment schedules and interest rates applied.

In general, using public domain data makes the analysis outcomes less controversial. Other potential sources of information include official fiscal planning materials, such as national budget laws, budget execution reports, clarification notes prepared by ministries of finance as part of the budget drafting process, parliamentary budget committee materials, tax expenditure reports (covering, for example, corporate and personal income taxes, VAT and excise taxes), and tax policy, tariff and customs policy guidelines. Other possible sources include official subsidy monitoring reports of accounting chambers/auditors general, academic papers and media reports. Where appropriate, production-sharing agreements may also be worth a look. As data will often be disaggregated, discussion and close communication with government experts will be required to better understand how different subsidies should be classified and calculated.

9. Approaches to identifying environmentally harmful subsidy (EHS) schemes, assessing subsidy impacts and evaluating subsidy effectiveness

As noted earlier, the definition of EHS is rather generic. To operationalise identifying EHS and assessing EHS impacts on the environment and the economy, the OECD and other international institutions have developed various analytical tools, such as the OECD Quick scan model, Checklist and Integrated assessment model. In addition, different models, such as the OECD Environment-Linkages model and other general equilibrium or regression models, are used to estimate the impact of subsidy removal on the economy and the environment.

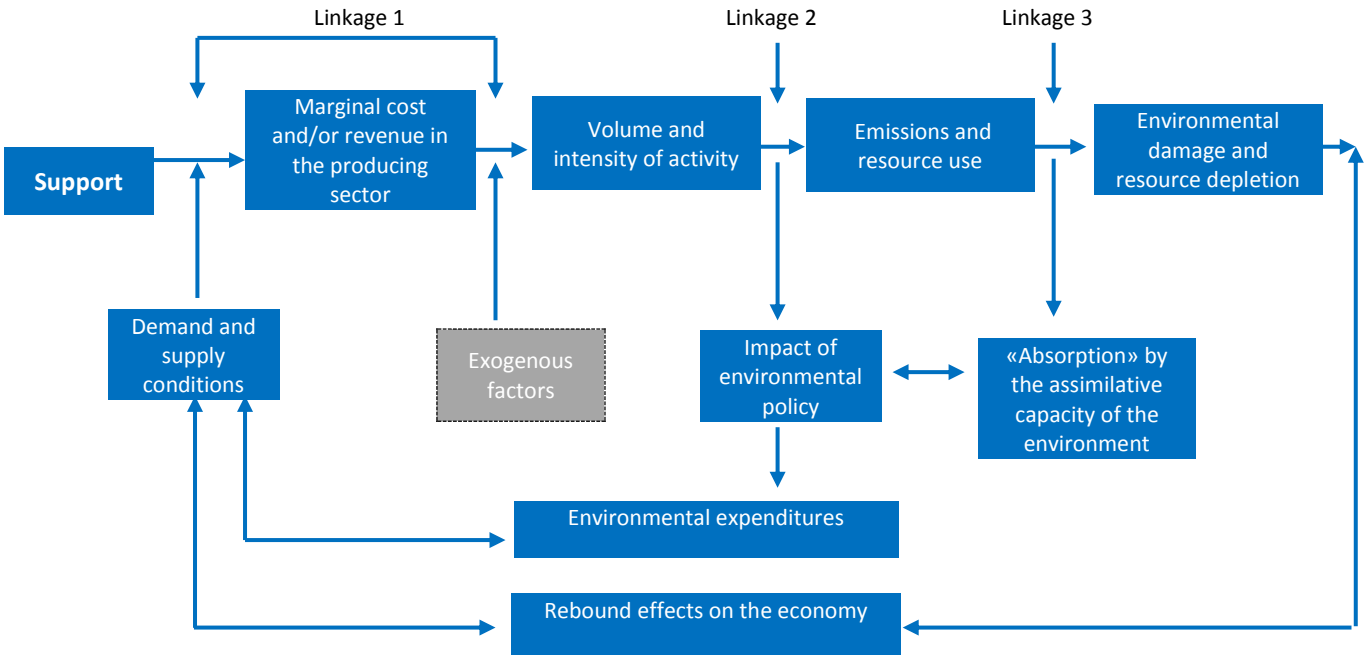
9.1. Quick scan

The OECD has developed a "Quick scan" model to enable governments to evaluate the environmental impacts of subsidies and prioritise the support measures that need to be eliminated or reformed. The Quick scan describes the relationship between a support measure and the resulting environmental impact by examining three partial linkages (visualised in the flowchart in Figure 4 below):

- Linkage 1: the impact of the support on the volume and composition of output in the economy;
- Linkage 2: the mitigation of environmental policies in place; and,
- Linkage 3: the assimilative capacity of the affected environment.

Among other things, the model shows that there is not necessarily a direct link between the volume and nature of the subsidy and its environmental impact, which depends not only on the subsidy but also on other conditions, *i.e.* other environmental policies in place (in the model, these environmental policies are called "environmental filters").

Figure 4. Linkages assessed in the Quick scan model



Source: OECD (2005).

Linkage 1 is the extent to which a support measure affects the composition of production in the economy. It identifies the type of relationship between a given measure, its (input or output) point of impact (also called conditions of support), the price elasticity of demand and supply associated with the subsidised activity and, ultimately, the impact of the subsidy on production and consumption levels, which in turn creates pressure on the environment. The size of the subsidy determines the subsidy's distortionary impact on the recipient's marginal costs and revenues. Price elasticities of demand and supply of the subsidised activity determine the magnitude of volume responses to price changes and the proportion that leaks away to other non-targeted sectors. **Linkage 2** measures the emissions resulting from a certain volume of activity, excluding the impact of environmental policies and their impact on the industry's environmental expenditure. **Linkage 3** is a dose-response relationship describing the assimilative capacity of the environment and showing the extent to which the increased emission levels or resource depletion lead to actual environmental damages. Analysing this specific linkage will require dedicated studies of some emissions' highly site-specific effects. However, with global effects, such as carbon dioxide (CO_2) emissions that are not site-specific, the assimilative capacity issue is no longer relevant.

Table 4 provides some guidance on applying the Quick scan tool.

Table 4. Applying the Quick scan tool

Steps in the analysis	Definitions and guidance
Linkage 1: Support – output in the economy	The impact of the support measure on the volume and composition of output in the economy. This part of the analysis examines the link between the **type of subsidy**, its **point of impact** (input, output, profit or income), the **price elasticity of supply and demand** associated with the subsidised activity and finally **subsidy impacts on the levels of production and consumption**. This factor, in turn, ultimately exerts pressure on the environment.
Step 1: Describe the type of subsidy	Subsidy types: Support that increases the marginal revenue of a sector through market price regulation; Support that is conditional on the purchase of a product or the use of a production process; Support that is non-conditional on input or production.
Step 2: The point of impact (conditionality) of the subsidy	Subsidies are always conditional on something, *e.g.* the level of production, use of particular inputs, introduction of a mandated technology, etc. The main points of impact within the firm are on output, input use, profit and income, while the main point of impact outside the firm are on demand. These main points of impact are also called conditionalities. Different conditionalities or points of impact of the subsidy will cause different responses from producers and consumers in terms of their modes of production and levels of production and consumption, as well as differences in levels of pollution and rates of exploitation. It is important to identify all conditionalities of a subsidy in order to explore the differences in potential responses of firms to removal of the subsidy.
Step 3: Intended and unintended recipients of the subsidy	Who are the intended subsidy recipients – input producer, finished product producer, input consumer, or finished product consumer? Who are the unintended subsidy recipients?
Step 4: Describe the intended recipient sector, including demand and supply conditions, exogenous factors acting on the sector and the degree of market openness	It is important to understand how different forces in the sector interact and the choices open to the affected sectors, including the possibilities for substitution. In describing the sector, describe the type of industry being subsidised, as well as the upstream and downstream markets and how these are linked to the levels of input and output of the recipient sector. *Upstream markets* are the preceding stages of production that supply inputs. *While downstream markets* are the subsequent stages of production or the market for the finished product. *Demand and supply conditions* take into account the choices open to the affected sectors and the possibility for substitution. *Exogenous factors* are external factors affecting the sector such as competition and trade.
Step 5: Price elasticity of demand and supply of the input and output markets	In principle what is needed to assess the effects of a support measure or its removal is data on the price elasticities of demand and supply for the relevant markets. This information gives an indication of the support's effectiveness in changing the entire economy's production composition and can help identify the support measures that are a priority for reform. *Price elasticity of demand and supply* is the sensitivity of supply and demand to changes in price. Elasticities determine the magnitude of volume responses to price changes and the proportion of the support that leaks away from the intended recipients to other sectors.

Step 6: Size of the subsidy	The monetary value of the financial subsidy; also, its share relative to turnover or product price.
Linkage 2: Output – emissions and/or resource depletion	This part of the analysis is concerned with the emissions or environmental impacts that result from a volume of activity, excluding those "filtered" by environmental policies.
Step 7: Environmental policies in place or emission abatement techniques that mitigate the impacts of the support	Environmental policies may be established to attempt to reduce the negative impact on the environment of a particular support measure. However, these policies' specific aims may not encompass all possible environmental impacts of the support. Moreover, implementing certain environmental policies could be more expensive than reducing the underlying causes of negative impacts on the environment.
Step 8: Impacts of the environmental policies in place on emissions and volume of activity	Environmental policies in place may not be as effective as intended. It is important not to assume that introduction of an environmental policy will address all possible environmental impacts of the support.
Step 9: Describe the impact of environmental policies in place on environmental expenditures by the industry, if possible	Environmental expenditure can have a rebound/multiplier effect on the economy.
Linkage 3: Emissions/ Depletion – actual environmental damage	This part of the analysis examines the extent to which increased emission levels or resource depletion lead to actual environmental damage ("dose-response" relationship). This is often highly site-specific, particularly when the emissions have predominantly local or regional effects and must therefore be evaluated through dedicated studies. However, in the case of pollutants that have global effects (like CO_2 emissions or chlorofluorocarbons), effects are not site-specific and general conclusions can be drawn.
Step 10: Describe the size of the environmental damage	Environmental damage refers to the increased emissions, waste, pollution and resource depletion resulting from the support measure.
Step 11: Provide insights on the assimilative capacity of the environment to these impacts	*Assimilative capacity* refers to the capacity of the environment to absorb a certain amount of emissions, depletion or damage, without suffering (irreversible) degradation. The actual environmental damage caused by changes in levels of pollution and resource depletion resulting from the support depends on the environment's assimilative capacity. If this capacity is high, the environment can tolerate more damage before this becomes a significant problem.

Source: Adapted from IEEP, IVM, Ecologic, *et al*. (2009).

While the Quick scan can help identify which subsidies should be removed first, a partial or general equilibrium model should ideally be required to consider all linkages and effects on the economy. Although the Quick scan was sometimes used to identify EHS schemes slated for removal in selected EU countries, it was mainly used to produce qualitative assessments and identify gaps where additional in-depth analysis was needed. If applied properly, this tool is very resource-consuming and, despite its name, demanding. A simplified Checklist was therefore developed that built on the main linkages identified in the Quick scan.

9.2. Decision trees for identifying EHS

Decision trees are decision support tools that use a tree-like graph or model of decisions and their possible consequences. Decision trees provide analytical frameworks that facilitate discussion and decision making on the subject of subsidy reform. These frameworks are helpful in understanding whether a subsidy scheme effectively reaches its objectives.

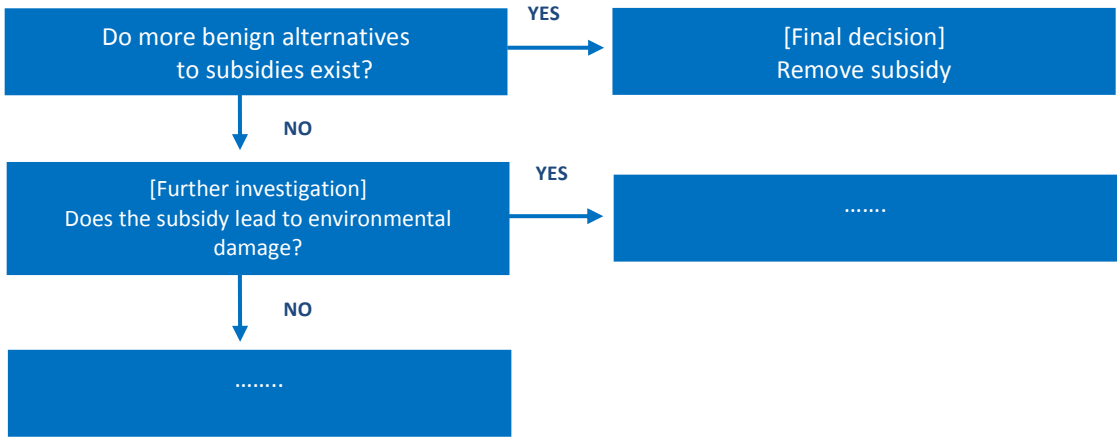
While decision trees help shape the discussion on a given subsidy scheme, they do not measure the subsidy's scale or impacts. This process, based on a decision tree, may require using additional techniques (*e.g.* cost-benefit or cost-effectiveness analysis) to answer the questions to be considered in decision making.

Various institutions have developed decision trees to shape the discussion on EHS. The main ones, which we briefly discuss here, are:

- OECD Checklist (Pieters, 2002) based on the OECD Quick scan;
- World Bank Checklist (World Bank, 2010a);
- OECD Integrated assessment framework (OECD, current).

In a decision tree, each answer triggers a chain of consequences until a final decision is reached, as with the Quick scan model schematically presented in Figure 5 below.

Figure 5. Example of a decision tree



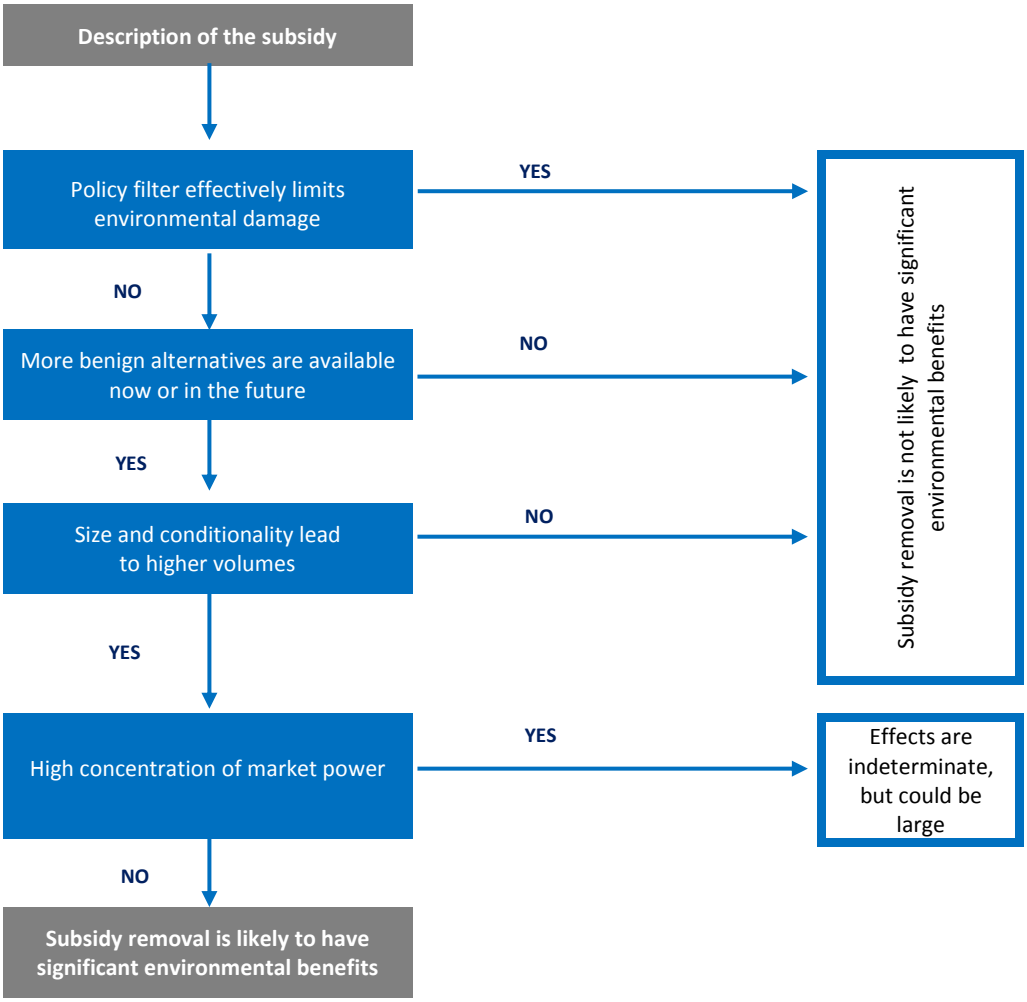
9.2.1. OECD Checklist

Considered difficult to apply, the Quick scan morphed into the Checklist, a tool enabling governments to assess whether the removal of a subsidy would benefit the environment (IEEP, 2007). The OECD Checklist served two main purposes:

1. Pointing out the conditions under which subsidy removal could have significant beneficial environmental effects; and
2. Ranking subsidies by their environmental impact in order to help governments decide which subsidies should be eliminated first.

The Checklist procedure (see Figure 6 below) starts with a subsidy description, including information on the programme name and objectives, the subsidy design scheme and the scale. Next, the analyst needs to investigate whether existing policies (*i.e.* policy filters) effectively mitigate the subsidy's environmental impact. If the answer is "yes", subsidy removal is not likely to have a significant environmental effect. The next step is to determine whether more benign (short-term and long-term) alternatives to subsidy exist. If the answer is "no", then again, subsidy removal is not likely to have a significant environmental effect. The next step requires assessing the response to subsidy removal (*i.e.* how recipients react when a subsidy scheme is removed). The analyst then investigates whether the subsidised sector is exposed to significant market power of suppliers or consumers. If suppliers, customers, or both wield much market power, the outcomes of removing any type of subsidy will be hard to predict (Pieters, 2002).

Figure 6. OECD Checklist procedure



Source: Pieters, J. (2002).

The Checklist usually describes the economic characteristics of subsidies that may help predict first-order effects on industries directly affected by the removal of a specific subsidy. For example, the environmental impact of a subsidised activity can be assessed using an environmental impact assessment. It is beyond the scope of the Checklist to estimate the effects of subsidy removal without using general or partial equilibrium models taking into account the responses of other sectors. However, the Checklist can provide reference for a more detailed analysis, eventually leading to deploying economic modelling.

The Checklist basically provides a qualitative analysis. The Checklist rests on the idea that decision makers already have access to the relevant data and information in order to assess each linkage. The Checklist has been applied to and tested in several EU and OECD countries.

The Checklist does not include analysis of the social impacts or implications of subsidy removal. It also excludes considerations of the political economy of subsidies (such as lobbying by interest groups, leadership and communication). To address these concerns, the OECD has developed the Integrated assessment framework, a more detailed approach integrating the social, economic and environmental dimensions of subsidy removal.

9.2.2. Integrated assessment framework

The Integrated assessment framework (OECD, 2005) is the most recent OECD tool. It is meant to represent an "advancement" in the methodology that builds on the belief that considering social and environmental aspects separately leads to trade-offs and fails to highlight synergies (IEEP, 2009).

The aims of the Integrated assessment framework are:

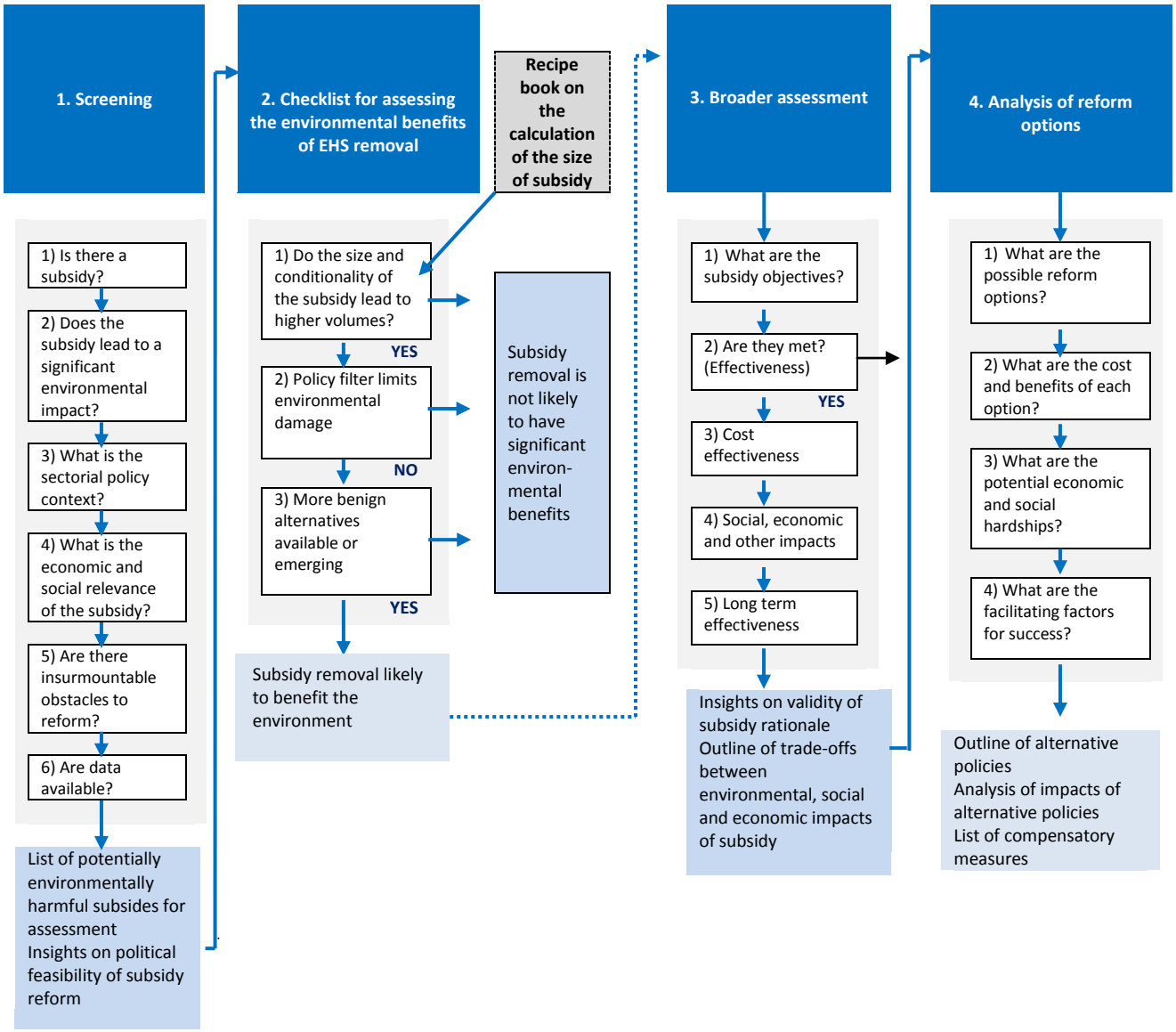
- To highlight the costs and benefits, winners and losers, intended and unintended effects of a subsidy in the environmental, economic and social spheres, and any associated trade-offs; and
- To provide information that is understandable to the general public, since widespread communication is considered essential for successful reform.

The framework is intended to be broad enough for application to subsidies of any type (excluding uncompensated externalities) and both in *ex ante* and *ex post* analyses. The framework works as a checklist (see Figure 7) of information that policy makers need to gather in order to make an informed assessment of the environmental, social and economic impacts of subsidies.

Testing the applicability of the OECD tools in practice (IEEP, 2009) has shown that generally, these tools:

- Are effective initial screening tools;
- Avoid the resource intensiveness/rigidities of general equilibrium models or cost-benefit analysis (CBA);
- Can be applied at different levels of detail;
- Can help identify and unbundle linkages;
- Highlight areas where further detailed empirical analysis is required;
- Prioritise EHS reform on the basis of benefits of removal;
- Are applicable to all sectors and all subsidy types.

Figure 7. Integrated assessment framework

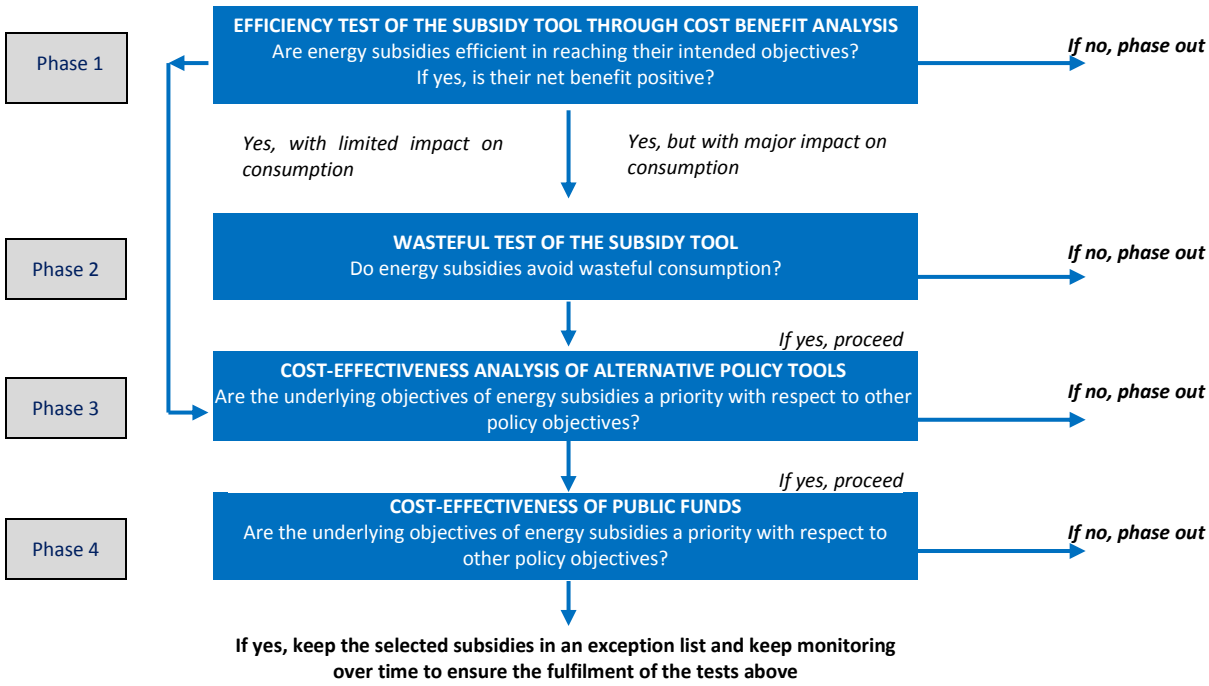


Source: IEEP, IVM, Ecologic *et al.* (2009).

9.2.3. World Bank Checklist

The World Bank Checklist is yet another flowchart model specifically designed to identify and assess wasteful energy subsidies. The stepwise approach allows for a transparent assessment and decision making process. Like similar models, however, the World Bank Checklist is also very data intensive and requires major analytical efforts, such as using cost-effectiveness and cost-benefit analyses for each individual subsidy scheme (see Figure 8 below). Both are time- and resource-consuming exercises.

Figure 8. World Bank decision tree



Source: World Bank (2010a).

Decision trees provide useful conceptual frameworks to shape discussions on the effects of subsidies. Despite limitations and difficulties with application, the OECD checklists are well placed to help identify and assess (at least qualitatively) the likely impacts of specific subsidy schemes in the EECCA countries, particularly on greenhouse gas (GHG) emissions and fuel switch.

Proper evaluation of subsidy schemes often requires reviewing the social costs and benefits of such programmes. This implies using (social) Cost-Benefit Analysis (CBA). The purpose of conducting a CBA is to assess the economic, social and environmental impacts of a public policy/programme in a consistent manner and to check whether the programme objectives could have been achieved at less cost to the public budget. Given that many other papers discuss CBA and that EECCA environmental authorities, at least, are generally familiar with this analytical tool, we have chosen not to cover it in this paper. As with other tools, properly applying CBA requires significant effort and resources in terms of time, money, data and information collection.

Experience shows that where large subsidies with significant indirect impacts exist, economic models and micro/macroeconomic studies should be used to help quantify the impacts of subsidy reforms. However, since even the best models cannot capture all effects of subsidy removal, expert judgement is required. A discussion of some issues related to modelling the effects of subsidy removal follows.

9.3. Using economic models to quantify the impacts of subsidy removal

In recent years, sophisticated economic tools have been brought into service to help understand the effects of subsidies on the environment, economy and welfare, both at the global and regional levels. Most of the large-scale efforts to date – by the World Bank, the OECD, the Institut national de la recherche agronomique (INRA, French National Institute for Agricultural Research), the Carnegie Endowment and a few independent analysts – have relied on computable general equilibrium (CGE) models.

At their core, fossil fuel subsidies have an economic impact by distorting prices, therefore affecting production and consumption decisions. Increases in coal, oil and natural gas prices ripple through other sectors of the economy, affecting the costs of production and therefore the prices of other (particularly energy-intensive) goods. This, in turn, may affect the competitiveness of goods from certain sectors and countries in the global economy and cause changes in trade flows. All of these changes have effects on global emissions from fossil fuel combustion.

It should not be assumed that removing all fossil fuel subsidies would necessarily have positive economic, environmental and social effects across the board. The results of such a move are highly complex and some groups within certain countries would be negatively affected. To quantify the effects of subsidy removal on the economy and the environment, analysts have designed different economic and econometric models (see Box 8).

Modelling the economic, environmental and social impact of fossil fuel subsidies removal essentially boils down to calculating the elasticity of demand for, and supply of, energy with respect to prices and income, as influenced by the subsidy. One of the problems with subsidy reform modelling is that models use some average elasticity values based on empirical research from OECD countries, which they then try to apply to non-OECD countries that may have totally different energy mixes or demand structures. Elasticities for such countries are most likely different, yet their values are not known because there is a lack of empirical research (which is largely the case in the EECCA countries).

9.3.1. OECD ENV-linkages and other general equilibrium models

OECD ENV-Linkages is a recursive[28] dynamic neo-classical general equilibrium model developed by the OECD Environment Directorate. It is a global economic model, built primarily on a database of national economies. In its most recent version, the world economy is divided into 12 countries/regions, each with 25 economic sectors, including 5 different electricity-producing technologies. Each of the 12 regions is underpinned by an economic input-output table, usually sourced from national statistical agencies (OECD, 2010c).

The ENV-Linkages model has been used to quantify impacts of the subsidy reform, relying on price gaps estimated for 2007 by the IEA in simulations of subsidy reforms. These price gaps are gradually phased out over 2013-20 (OECD, 2010d).

CGE models use actual economic data to estimate how an economy might react to changes in policy, technology or other external factors. These models are useful in modelling the impact of policies on the economy, and especially on consumption. From this perspective, a CGE model could help determine the possible impact of subsidy reform on GHG emission reduction. On the other hand, it does not distinguish between general and environmentally harmful subsidies – nor, in fact, does it identify subsidy schemes or their scale. Moreover, the OECD ENV-Linkages model is designed to be used at a regional and global level and cannot be easily applied at a country level.

Economic models can show that in the long run, fossil fuel reform is good for countries and reduces GHG emissions and other pollutants. But the models also demonstrate that reform leads to structural change in the economy, making some industries uncompetitive and depriving some people of jobs, as exemplified by the United Nations Development Programme (UNDP) modelling of fossil fuel subsidy reform in Viet Nam (see Box 9). Thus, while models can support decision making, they cannot, taken alone, suggest the right decisions, and need to be supported by a political process and expert judgement.

[28] Models which are recursive are hierarchical in nature. All causal effects in the model are "unidirectional" in nature, *i.e.* no two variables in the model are reciprocally related, either directly or indirectly. Hence, the first endogenous variable is affected only by the exogenous variables. The second endogenous variable is affected only by the exogenous variables and the first endogenous variable; and so on.

Box 8. Partial and general equilibrium models used in quantifying the impacts of energy subsidy removal

Partial equilibrium models consider *only the product market in which subsidy reform is occurring* (in this case, the energy market) and estimate price, demand and production changes in fossil fuels as a result of subsidy removal based on simple supply-and-demand curves and economic assumptions.

Partial equilibrium models can provide some useful insights into the impacts of subsidy reform. However, they cannot address questions related to economic sectors that use energy as a significant input. Raising energy prices will result in higher production costs in other sectors, resulting in higher prices of many goods in addition to energy. Partial equilibrium models also do not address macroeconomic questions relating to international competitiveness effects. General equilibrium models are required to answer these kinds of questions.

Computable general equilibrium (CGE) models simulate markets for production factors and goods using sets of equations that specify supply-and-demand behaviour across a multitude of markets. In theory, general equilibrium analysis is supposed to look at the economy as a whole and take into account linkages among all markets, including labour markets and markets for all goods requiring energy as an input. Numerous CGE models are currently in use, each containing a set of complex non-linear equations that must be solved based on assumptions regarding economic behaviour, including price elasticities of supply and demand. The models are first run using values with the subsidy in place, and then again with the subsidy removed to estimate the overall net benefits and costs associated with subsidy removal.

The data requirements for general equilibrium modelling are massive. Although CGE models provide a wider scope of numerical results than partial equilibrium models, the accuracy of the results depends on the accuracy of the assumptions and data. Since energy is a fairly ubiquitous input to the production of most goods in the market, changes in energy prices will affect almost all goods. Some key industries, particularly energy-intensive ones, should be included in the model in a disaggregated manner. In practice, however, most CGE models used to simulate fossil fuel subsidy reform require the modeller to decide what is modelled in detail and what is left in aggregated form and markets are not always disaggregated.

CGE models can be static or dynamic. Static CGE models look at the economy at only one point in time, in response to some policy change. The results are usually reported as a percentage difference in each variable between the base case and the reform case for some set future year, *e.g.* 2015 or 2020. Dynamic CGE models trace what happens to each variable from the base year through the forecast year, usually at annual intervals.

Most CGE models forecast changes in various factors such as gross domestic product (GDP), GHG emissions and real income over a set period of time, such as 20-50 years into the future. In order to provide comparable data, the baseline "business as usual" scenario must also be modelled out 20-50 years into the future. The resulting additional uncertainty thus created must also be addressed.

However, a wide range of decisions is associated with calculating price wedges, such as whether to include or exclude taxes, which prices to use as the reference price, whether to incorporate positive as well as negative price distortions and whether to use market exchange rates or exchange rates adjusted for purchasing power parities.

Elasticities are critical for determining demand and supply responses to price changes. Demand for a product is inelastic if consumers are willing to pay almost any price for the product. Demand is very elastic if consumers will only pay a narrow price range and will consume markedly less if the price rises. While elasticities are a key component in models, their values are highly uncertain. This clearly adds uncertainty to the modelling results.

The **environmental impacts** of fossil fuel subsidy reform are generally analysed through an environmental add-on to an economic model. Changes in fuel consumption are used to calculate potential changes in GHG emission levels, requiring projected consumption and carbon-emission factors for each fuel. As a result, most economic models of subsidy reform include estimates of changes in CO_2 or GHG emission levels.

If other environmental impacts (such as local air pollution levels) are to be considered, other models in addition to partial or general equilibrium analysis are required. Local air pollution assessments generally need to account for the geographic generation and dispersion of pollutants. The results of the dispersion model are then used to provide information on the impacts of local air pollution on human health, ecosystems and buildings. A monetary value is sometimes placed on these impacts, estimated through various approaches: valuing productivity losses, expenditures on preventing damage, people's willingness to pay for less damage, or people's willingness to accept compensation for damage.

While local air pollution and resource depletion impacts provide interesting information on the overall environmental impact of fossil fuel subsidies, due to the huge data collection needs, studies of fossil fuel subsidy reform generally only consider changes in CO_2 or GHG emissions.

Although many fossil fuel subsidies are regressive, reform could have negative **impacts on the poor**. The ripple-through effects of higher fossil fuel prices throughout the economy (*e.g.* in terms of higher production costs) might increase the prices of other goods and decrease incomes. Moreover, while the poor may benefit from fossil fuel subsidy reform in aggregate, certain sectors of the population may suffer negative impacts. Notwithstanding, if redistribution of the budgetary surplus from subsidy removal is well targeted to these affected groups, they could still gain from the reform.

Source: Adapted from Ellis, J. (2010).

Box 9. Modelling the impacts of fossil fuel subsidy reform in Viet Nam

UNDP Viet Nam recently supported a study on fossil fuel fiscal policies and GHG emissions in Viet Nam. The study modelled and analysed the potential economic, social and environmental effects of fossil fuel subsidy reform, demonstrating the actual application of fossil fuel subsidy reform at the country level.

The study used a CGE model of the economy and an emissions accounting model with a range of parameters to assess future economic and GHG emission trends, comparing two scenarios with "business as usual" (BAU): one where estimated subsidies are removed, and one where fossil fuel taxes are introduced in addition to subsidy cuts. Different options were also analysed for re-investing additional government revenue into the most economically productive investments – low carbon investments – or returning it to customers as "rebates" or tax reductions. The impacts of these reforms were considered over the period 2007-2030.

As a result of fossil fuel subsidy removal and environmental tax imposition, the assumed energy prices increase significantly. It was assumed that these reforms will be introduced over a three-year period from 2013 to 2015. The way in which demand for fossil fuels is influenced by changes in the price of fossil fuels is central to the functioning of the model.

The modelling results are not predictions; rather, they demonstrate trends under sets of reasonable assumptions. Confirming international experience, the study found that cutting subsidies and imposing a carbon tax could have several positive effects. Following are some of the major results generated by the two models:

- The CGE modelling of both scenarios indicated real GDP could be about 1% higher in the subsidy cut scenario than in the BAU scenario and about 1.5% higher in the subsidy cut and carbon tax scenario, compared to the BAU scenario until 2020; gross investment rates would be considerably higher. GDP growth is initially lower due to lower consumption and higher production costs, but growth rebounds strongly after the economy has adjusted to the change in energy prices.
- The increase in fossil fuel prices would lead to lower household consumption growth relative to the BAU scenario, although overall consumption growth would remain robust. Imports and exports would be slightly lower, and if additional revenue is mainly used for low-carbon investment, overall imports will decline due to less reliance on energy imports.
- Rural households experience lower impacts on consumption growth than urban households. The poorest rural households lose the least as a proportion of consumption growth under both scenarios. But while low-income households may feel small changes more acutely than wealthier ones, the modelling does not allow for analysis of effects on specific social groups.
- If the additional government revenue is used for household transfers or tax cuts instead, a small improvement in investment may still occur, but average annual GDP would be slightly below BAU. Further, despite the "rebates" to consumers in this model run consumption is lower than in the "low-carbon investment" case.
- Compared to BAU, the economic structure will change, with reduced growth in energy-intensive sectors and increased growth in light manufacturing. The energy-intensive sectors that will see slower growth (*e.g.* metals and fisheries) employ mainly men, while low-energy sectors that will see accelerated growth (*e.g.* light manufacturing, textiles and footwear) employ mainly women.
- The emissions modelling for the energy sector shows that both cuts in fuel subsidies and the imposition of a tax on fossil fuels could result in significantly reduced emissions, since demand is moderated in response to higher fossil fuel prices – and in particular as a combination of the two.
- The power sector is the largest consumer of fossil fuels and the largest emitter of GHGs. It also accounts for the largest decline in emissions due to price changes under both scenarios. In both scenarios, coal emissions decline with the significant increase in coal prices, even though model assumptions are conservative in this regard. An assumed significant increase in the price of coal would result in a switch of power generators towards gas.
- Elasticities are relatively low for products such as petrol and diesel; hence, price increases do not reduce demand by much. Reducing consumption and emissions from refined petroleum fuels will require investing in new technology development and transfer.

Source: UNDP (2012).

9.3.2. Other models

Some criticisms of CGE models can be found in the literature. CGE models pay no attention to time-series data. Per Grassini (2007), "They include explicit specification of the behaviour of several economic actors (*i.e.* they are general). Typically, they represent households as utility maximisers and firms as profit maximisers or cost minimisers. Through the use of such optimisation assumptions, they emphasise the role of commodity and factor prices in influencing consumption and production decisions by households and firms, which may not always be the case".

Some sectors of the economy (especially electricity production) already use other models, especially those based on stochastic methods (see Box 10 below). An interesting example thereof is forecasting electricity prices using data mining[29], which may yield better results than regression models (Fijorek *et al*, 2010). Theoretically, dynamic stochastic general equilibrium (DSGE) models could be used instead of CGE models. However, the stochastic model requires collecting far more data and hence may have limited usefulness for the EECCA countries.

Box 10. DSGE models

Like other general equilibrium models, DSGE models aim to describe the behaviour of the economy as a whole by analysing the interaction of many microeconomic decisions. The decisions considered in such models correspond to some of the main quantities studied in macroeconomics, such as consumption, saving, investment, labour supply and labour demand. The decision makers in the model, often called "agents", may include households, business firms and possibly others, such as governments or central banks. The DSGE models are dynamic, studying how the economy evolves over time. They are also stochastic, meaning they take into account the fact that the economy is affected by random shocks such as technological change, fluctuations in the price of oil, or changes in macroeconomic policy making.

The main conclusion that can be drawn is that despite limitations and difficulties in using economic models, the quantitative relationships between subsidy removal and environmental or welfare volume effects can only be established using some kind of partial or (preferably) general equilibrium models. For this reason, when working on the EECCA countries a model focusing at least on GHG emissions effects from subsidy removal will need to be developed and applied.

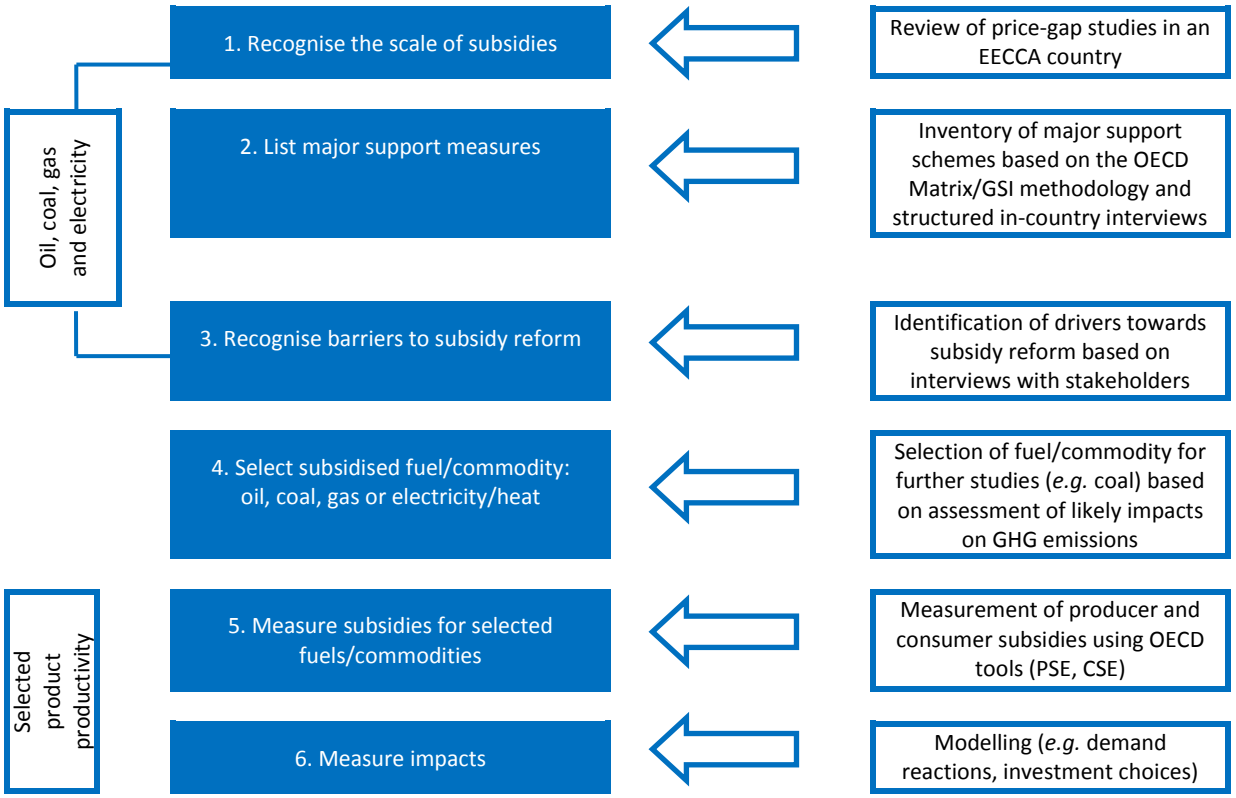
It should also be noted that modelling the impact of phasing out fossil fuel subsidies (regardless of their nature) makes sense at a national level only if the model is recognised by national government experts. If this is not the case, the model may remain an academic exercise, which does not account for local specifics. Evidence shows that existing economic models in the EECCA countries are often based on shaky local data, disregarding the share of the grey economy, energy leakages and actual social stratification. It follows that the selection of the modelling approach needs to be approved by the country's government before actual work begins.

10. Possible approaches to organising analytical work in the EECCA region

Following the logic of the analysis carried out for this project, a possible framework for launching and organising the work on energy subsidies and climate change in the EECCA countries has been developed. It consists of six major steps, presented in Figure 9 below.

[29] Data mining refers to the extraction of hidden predictive information from large databases.

Figure 9. Procedure for launching work on EHS in the EECCA countries



Step 1 consists of reviewing the results of existing price-gap studies carried out by different international institutions (IEA, IMF) in selected EECCA countries. It is intended to provide initial information on the magnitude of subsidies in a given country. Since official published documents often do not contain sufficient detail, more information underlying the assumptions, methodologies and data need to be obtained from the institutions that have made such calculations.

Step 2 consists of obtaining data on major subsidy schemes related to the production and consumption of oil, coal, gas, electricity and heat. It is based on structured in-depth interviews with energy experts and public servants in the EECCA countries. Questionnaires are drafted based on the OECD Matrix and the IISD-GSI list of subsidies. The intended outcome is an inventory of major subsidy schemes.

Step 3 identifies key barriers to energy subsidy reform in a selected EECCA country.

Step 4 selects fuels/commodities for further analysis (*e.g.* electricity, heat, or coal).

Step 5 measures transfers to producers and consumers using the PSE-CSE framework. It requires a detailed review of budgetary documents and tax codes, in close co-operation with public administrations.

Step 6 assesses the likely impacts of subsidy removal on public finance, GHG emissions and resource use. Likely reactions to subsidy removal will be subject to discussion during focus group meetings with energy experts and civil servants.

Assessing the response to phasing out a given subsidy involves recognising:

- The impacts of subsidy removal on production costs, *e.g.* coal, electricity and heat (in the case of producer support measures);
- The likely impacts on prices (for both producer and consumer support measures);
- The likely change in the energy mix (*e.g.* less emission-intensive processes are feasible and more cost-efficient);
- The likely impact on resource use;
- The likely impacts on emissions; and
- Impacts on budgets, other environmental effects and social consequences.

In many cases, subsidy removal may not be a sufficient incentive to reduce GHG emissions, which may occur when alternatives to emission-intensive processes are not easily available. In this context, the change in GHG emissions may result from:

- Changes in the energy mix (*e.g.* a gradual shift from coal to gas and renewables);
- The application of cleaner or more efficient technologies (*e.g.* building more efficient units or introducing carbon capture and storage equipment at coal-fired plants); and
- The demand response as a result of price changes (*e.g.* higher electricity prices trigger demand-side[30] response).

Step 6 will focus on the likely impacts of subsidy removal on the energy demand and energy mix using the decision tree approach analysing both consumer support and producer support measures.

10.1. Determination of impacts of subsidy removal

This paper focuses on EHS, particularly energy subsidies that support producers and consumers, and more particularly public support for fossil fuels. It also considers subsidies to electricity and heat generation based on fossil fuels. It does not include nuclear power and biofuel subsidies.

We propose that the following major economic, social and environmental impacts of energy subsidies be considered in the initial work in the EECCA countries:

- Impact on wasteful production and consumption practices;
- Impact on GHG emissions;
- Impact on environmental quality (ambient air, water pollution, etc.);
- Impact on (energy) poverty alleviation; and
- Impact on public budgets.

[30] Energy demand management, also known as demand side management, is the modification of consumer demand for energy through various methods, including financial incentives and education.

10.1.1. Wasteful practices and consumption

In the concluding statement to the G20 summit held in 2009 in Pittsburgh, Pennsylvania, G20 leaders noted: "Inefficient fossil fuel subsidies encourage **wasteful consumption**, distort markets, impede investment in clean energy sources and undermine efforts to deal with climate change."

Yet the definition of wasteful consumption is not straightforward. As noted in the IEA, OECD and World Bank report (2010), consumption used to satisfy basic human needs (such as basic heating in cold seasons) surely cannot be treated as wasteful. If subsidies lead to increased consumption unrelated to such basic needs, then they are considered wasteful. The example provided in Box 11 below shows that under certain conditions, a lack of proper regulation can also translate into supporting wasteful energy activities.

Box 11. Example of wasteful practices in the Russian Federation

Wasteful practices of burning natural gas at domestic thermal power stations results in losses of 40-50 billion cubic meters of gas per year, which is more than the annual gas needs (30 billion cubic metres) of the Moscow megacity. Another conspicuous and widely discussed inefficiency is flaring associated gas. Due to deficiencies in the technological processes and insufficiencies in Russia's gas processing and transportation infrastructure, oil companies mainly dispose of gas associated with oil as a by-product, rather than using it as a valuable raw material. As a result, despite their obligations to utilise 90-95% of the extracted associated gas under their oilfield licences, 25-30% of it (12-16 billion cubic metres) is flared.

According to IEA estimates, if in 2008 Russia had used energy as efficiently as Canada, Sweden, Norway and some other comparable northern OECD countries, it could have saved more than 200 million tonnes of oil equivalent from its primary energy demand, equal to 30% of its consumption that year and an amount similar to the total primary energy used by the United Kingdom. With these savings, Russia's energy intensity would still have been about 60% higher than the OECD average (or 85% higher than the European Union), due to Russia's more energy-intensive industrial structure and the large share of its population living in areas with high heating requirements.

Flaring associated gas and the problems related to it is not Russia specific. Other countries in the EECCA region, particularly the countries of the Caspian Sea group, such as Azerbaijan, Kazakhstan, Turkmenistan and Uzbekistan, face similar issues with disposing of associated gas.

Source: IEA (2011).

The example in Box 11 provides a good picture of the thin border between subsidies and more general government support schemes, *i.e.* where government inaction supports environmentally harmful activities. When launching work on EHS in the EECCA countries, inaction (*e.g.* lack of proper regulation) needs to be considered in line with other subsidy schemes with impacts on wasteful practices.

10.1.2. Impacts on GHG emissions

Subsidies may lead to higher GHG emissions or other environmental pollution than a situation without subsidies, with two main consequences:

- Lower (subsidised) prices lead to an increase in consumption of fuels (*e.g.* oil, coal and gas), which translates into higher GHG emissions; and

- Subsidies to certain fuels (*e.g.* coal) or their producers influence the country's energy mix.

Assessing the impact of subsidies on GHG emissions necessitates evaluating both the impact of a given subsidy on the prices offered to consumers as well as consumers' possible short-, medium- and long-term response to price changes (if the subsidy was removed).

Predicting demand reactions is straightforward. For example, rising oil prices (due to a subsidy removal) in an oil-producing country may result in larger quantities of oil available for international markets. This may lower international oil prices and raise consumption in oil-importing countries. Such reactions have been studied within the OECD ENV-Linkages model discussed in the previous chapter.

10.1.3. Budgetary impacts

The budgetary impacts of some subsidy schemes may include:

- direct budgetary impacts (*e.g.* transfer from the state budget to producers);
- indirect budgetary impacts (*e.g.* revenue foregone, *i.e.* the government revenue that would normally be generated if the subsidy scheme was phased out); and
- potential budgetary impacts (*e.g.* when the government takes risks related to certain activities undertaken by individual producers).

Such budgetary impacts also need to be considered as part of the subsidy analysis in the EECCA countries.

11. Summary conclusions

The following major conclusions may be drawn from the above analysis:

- A mix of tools is required to conduct the analysis properly. Different tools and approaches to identifying and measuring subsidies in general, and EHS in particular, exist. No single method is ideal, nor can it cover all aspects of all subsidy types. Hence, these analytical tools need to be used in a targeted manner depending on the subsidy scheme being analysed.
- Conducting inventories based on open sources can help with the initial identification of major energy subsidy schemes. These could be coupled with detailed questionnaires to be discussed with government officials.
- The three major approaches to measuring subsidies are the Price-gap approach, the PSE and the CSE. Each of these methods has its advantages and limitations.
- The Price-gap approach, which is designed to capture the net effect of all subsidies (*i.e.* market price support and market transfers) that reduce the final prices below those that would prevail in a competitive market, is best applied when measuring energy consumption subsidies. However, special care needs to be taken in calculating the reference price that is key to the process. One of the main advantages of this approach is its relatively simple application, which can be used in cross-country comparisons. For this reason, the price-gap approach is recommended in initial subsidy calculations in the EECCA countries.
- The PSE-CSE aggregate indicators have the advantage of integrating price-gap calculations with subsidy measurements based on transfers from governments to producers and consumers (or direct budgetary transfers and tax expenditure). As such, the PSE-CSE framework provides a more accurate picture of subsidies in any given country. But the data requirements to construct these indicators are significant and data are often not readily available. Nevertheless, should there be a chance of collecting relevant data (at least for specific subsidy schemes) then the PSE-CSE framework should be used to quantify subsidies.

- The decision trees and other analytical tools (such as the OECD Checklist and Integrated assessment approach) used to assess the environmental harmfulness of selected subsidy schemes are effective initial screening tools that provide a useful conceptual framework for shaping national discussions on subsidy effects. Despite their limitations and application difficulties, they are well placed to assess (at least qualitatively) the likely impacts of specific subsidy schemes (particularly on GHG emissions and fuel switch) in the EECCA countries.

- Accounting properly for the environmental, economic and social welfare effects of subsidy removal requires economic modelling, but quantifying the costs and benefits of subsidy removal is extremely difficult and judgemental. Because energy is so vital to economic activity, the removal of energy subsidies has complex general equilibrium effects that are hard to predict or measure. A number of sophisticated economic tools involving computable partial or general equilibrium models can be used to this effect. Despite their inherent challenges, such models can provide some useful insights into the impacts of subsidy reform that will inform policy makers.

- These models are the only ones that can establish some quantitative relationships between subsidy removal and environmental or welfare volume effects. Hence, some kind of partial equilibrium model (*i.e.* a model that will focus at least on GHG emissions effects) must be used to quantify the broader effects of subsidy reforms in the EECCA countries. However, since even the best models cannot capture all effects of subsidy removal, securing expert judgement is absolutely crucial.

- Modelling the impact of phasing out fossil fuel subsidies, regardless of their nature, makes sense at a national level only if the model is recognised by national government experts. If not, the model may remain an academic exercise, which does not account for the local context. For this reason, the modelling approach needs to be approved by the country's government before actual work begins.

- The debate on energy subsidy reforms in the EECCA countries should be supported by robust analytical studies making the best use of available tools and approaches – and indeed, by a mix of tools according to the types of subsidies under study. However, when conducting in-country work (and in order to better understand specific subsidy schemes) the political economy of providing subsidies may be as important as the measurement and quantification methods applied.

CHAPTER III. POLITICAL ECONOMY OF ENERGY SUBSIDY REFORM

Most government interventions, including subsidy policies, have multiple effects on the economy. While subsidy reform is typically beneficial to the overall economy in the long term, it may have negative effects on some stakeholders – including the poor and vulnerable social groups – in the short term. Hence, political barriers hold up reform plans. This chapter looks into issues related to the political economy of energy subsidy reforms and discusses the major benefits and challenges of reform efforts.

12. Benefits from energy subsidy reform

In the context of the current economic and financial crisis, countries that want to tackle reducing greenhouse gas (GHG) emissions and embark on a greener development path must sooner or later examine environmentally harmful subsidies (EHS) and make some hard choices regarding where to invest taxpayer money. Communicating to the public the overall economic and social benefits of the reform and consulting with stakeholders in formulating reform measures are crucial to the success of the reform plans. As analysts often point out, reforming energy subsidies can help:

- ***In relation to environmental policy goals:*** reduce the use of resource intensive inputs/activities (such as extraction, production, distribution, transformation and use), thus saving resources (*e.g.* water or energy) and causing less pollution (hence saving on policy measures).

- ***In relation to economic goals:*** increase competitiveness by exposing subsidised sectors to competition; support future competitiveness through improved resource efficiency; fix market distortions by making resource prices reflect resource value and making polluters pay for their pollution; and overcome technological "lock-in" whereby more environmentally friendly technologies/practices are unable to compete on an equal basis with the subsidised sector;

- ***In relation to fiscal goals:*** improve the cost-effectiveness of meeting objectives (including social objectives) and release public funding, thus enabling governments to re-allocate budget to other areas (*e.g.* education, energy saving and/or debt reduction).

Where the environmental benefits – such as reduced GHG emissions – are global, the public may not care much, especially in cases of widespread poverty. Proponents of the subsidy usually find it easier to speak of the social advantages it provides, such as the number of jobs supported or financial savings to poor people; benefits that involve mainly indirect gains in economic efficiency are rather abstract and more difficult to explain. Similarly, it is often difficult to demonstrate the economic cost of a subsidy in a way that the public can understand. For these and other reasons, policy makers need not only robust, but also well-presented analytical arguments in support to subsidies removal. Experience shows that politicians are more willing to present the case for subsidy reform and launch such reforms immediately after elections in the hope that opposition to reform will have diminished by the time new elections come around (Morgan, 2007).

13. Challenges to energy subsidy reform[31]

Subsidies create or maintain economic activity on which people become dependent. A subsidy reform changes income distribution among individuals, as well as their broader economic opportunities. Those who stand to gain from the *status quo* or to lose from the reform have a significant incentive to lobby to retain the existing regime. Experience shows that subsidy programmes, once established, long outlast the emergency or other needs that that fostered them. Vested interests quickly develop and vigorously fight proposals that would adversely affect them. Such interests tend to develop inside as well as outside the government, so that a mutually supporting bureaucracy and industrial establishment may command a great deal of political power. Energy subsidy reform faces a number of challenges – whether technical, institutional or political – but it is generally agreed that the main barrier to more rational energy subsidy policies is not economics, but politics.

Political and economic barriers

Energy subsidies may be highly politicised, and therefore difficult to remove. Different studies show that energy subsidies tend to gravitate to the largest, most economically powerful recipients as opposed to the poorest, thus reducing risks and increasing profits for well-connected private investors or industries. While not unique to EHS, the key political and economic obstacles to energy subsidy reform may be summarised as follows:

- ***Strength of special interests and rent-seeking behaviour***[32]**.** Resistance in parliament and, more generally, the lack of political will to reform energy subsidies often stem from the strength of special interests and their rent-seeking behaviour in gaining and retaining subsidies. Powerful industries obtain the subsidies and re-invest in the political process to retain them. The lobby's objective is not only to receive immediate cash, but to ensure a future increase in expected returns for the industry. A number of special loans, tax breaks or opportunities to shift risks to the government and taxpayers can be more attractive, more lucrative and less transparent than direct cash.

- ***Divergence in concentration of benefits and costs of energy subsidies***. Subsidy benefits tend to be highly concentrated in the hands of smaller (but well organised) groups, while their costs are spread widely across (less organised) taxpayers and consumers, making it much harder for them to form coalitions and organise meaningful opposition to environmentally harmful energy schemes. Further, the divergence in concentration of benefits and costs heightens incentives for powerful industries to lobby for obtaining and retaining subsidies. The less visible and transparent the subsidy scheme, the fewer the possibilities to oppose it. Empirical evidence also suggests that older and declining industries (which are more environmentally damaging, *e.g.* the coal industry) secure the most support and trade protection.

- ***Fear of change and social disruption.*** Politicians often fear that unpopular subsidy reforms will disrupt social peace, and indeed, social unrest has occurred in several countries (*e.g.* India, Iran, Malaysia, Nigeria) after governments announced a reduction in energy subsidies. Governments may be concerned that subsidy removal will lead to higher prices of essential goods, such as

[31] Adapted from OECD (2005) and a presentation by D. Koplow.

[32] In economics, rent-seeking is an attempt to obtain economic rent by manipulating the social or political environment in which economic activities occur (for example, by spending money on political lobbying in order to be given a share of wealth already created) rather than creating new wealth. Many current studies of rent-seeking focus on efforts to capture various monopoly privileges stemming from government regulation of free competition.

drinking water, electricity and heat. However, they can mitigate these risks with appropriate policies to minimise social impacts (*e.g.* transitional assistance programmes, progressive energy tariffs that allow low charges for low usage and thus address the needs of lower-income households). Inflation (which skyrocketed in Iran after the subsidy reform) is also a concern.

- ***Private and social costs of subsidy reform*.** When reforming large subsidy schemes, politicians need to consider private and social costs. The private costs of adjustment for firms and workers, as reform forces some industries to downsize or close to allow others to expand, can be significant. The social costs include social safety net provisions (*e.g.* unemployment payments, plus training grants to build up new skills so that displaced workers may earn the same wage as previously) and perhaps the increased costs of crime fighting (as the crime rate may increase with transitional unemployment reform). Politicians need to carefully estimate all of these costs and benefits before launching a reform. The longer the phase-in period or the smaller the tariff or subsidy cut per year, the smaller the private and social costs of adjustment and the smoother the transition period will be.

- ***Competitiveness and distributional concerns, particularly related to regional interests***. Despite demonstrable benefits, policy makers are often reluctant to undertake unilateral subsidy reform unless forced to by an economic or environmental crisis or external pressures (*e.g*. stemming from new multilateral or regional trade agreements). They fear a loss of competitiveness (particularly in energy-intensive industries such as metals, transport and manufacturing). Similarly, distributional concerns (including over regional interests) can also hamper reform efforts. Experiences with other policy reforms (such as higher environmental taxes, privatisation of state-owned enterprises or tariff reform) provide scope for learning in this regard.

- ***Establishment of a culture of "entitlement" to subsidies***. Long-term provision of subsidies generates perceptions of "entitlement" that may be hard to break once they are capitalised into the prices of production factors (*e.g.* the value of land or low energy prices). Producers and consumers may have the embedded expectation that subsidy programmes will continue almost forever, leading them to resist change and lobby to retain subsidy programmes.

- ***Corruption concerns***. When governance is poor, people may oppose reform because they harbour serious corruption concerns and do not trust the government to make good use of the support it takes away.

- ***Subsidy reforms in net energy exporters and importers.*** Net energy exporters and net energy importers, including the countries of Eastern Europe, Caucasus and Central Asia (EECCA), have different political economies. In energy-producing countries, people believe they are entitled to low energy prices simply because their country has large fossil fuel reserves. Since it is easier to reform fossil fuel subsidies in energy-importing countries, a distinction must be made between the two.

Technical and institutional barriers

- ***Institutional constraints***. Unsurprisingly, institutions and bureaucracies that manage subsidy schemes will rarely push for their removal, either because they have vested interests or lack the vision to do things differently. The sheer number of players at both the national and subnational level can also create barriers. The challenges to mapping subsidy schemes significantly impede the reform process. Information on all sources of energy subsidies is often so fragmented and dispersed across many government agencies that no one in the government actually has a full picture of all support schemes in the energy sector. Improved coordination across various government agencies is key to overcoming such obstacles.

- ***Complexity of interactions between subsidy schemes and other policy instruments.*** Interactions between different subsidy schemes and other policy tools are often complex. Sometimes, subsidy impacts are mitigated by tax policies or other complementary measures. Careful assessment is needed to disentangle the complexities arising from multiple policy goals and instruments, quantify the current costs and potential benefits of selected subsidies and identify priorities and opportunities for reform.

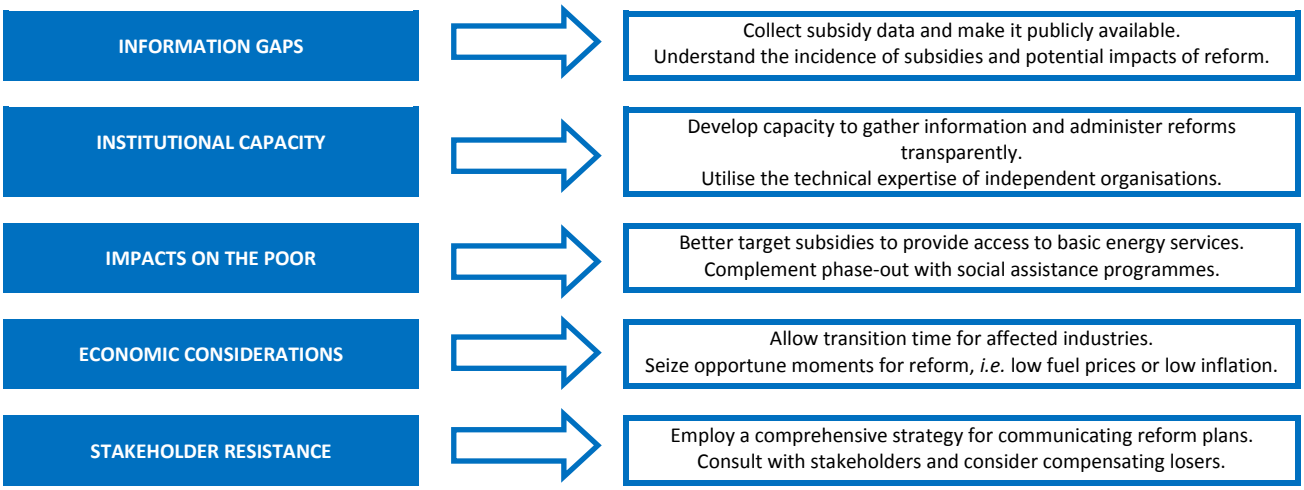
- ***Lack of transparency.*** The lack of transparency regarding the size, beneficiaries and economic, environmental and social effects of subsidy programmes can stem from two factors: 1) the government's incapacity to report subsidies due to institutional constraints or the complexity of interactions, and 2) the government's unwillingness to report and reform subsidies. Asymmetries in the review process for environmental and economic measures can further reduce transparency: in most cases, new environmental measures are subject to a "regulatory impact assessment", whereas in many countries existing subsidy programmes are not subject to such an evaluation. Moreover, while this is true for direct budgetary transfers, indirect and less visible subsidy programmes – which are not even monitored or reported – basically lack any such analysis. Poorly defined subsidy estimation methods and imprecise classification systems also significantly compound the lack of transparency. As a result, different studies analysing the same type of subsidy schemes may generate large variances in their estimates of subsidy impacts and potential reform benefits, thus significantly undermining their credibility in the eyes of politicians and the public. All this shows the need for further work to improve in-country subsidy valuation methodologies and practices.

- ***Information and data gaps***. The lack of relevant data constitutes a major technical barrier to subsidy analysis and subsequent reforms. Even for the most straightforward subsidy schemes (such as direct budgetary transfers), budget data cannot be easily sorted by topic and subsidy type; for other types of subsidies, most data (if at all) exist only in aggregate form. Existing data are therefore inadequate and cannot support meaningful subsidy analysis to inform policy makers' judgements on needed subsidy reforms. On the other hand, data collected by international organisations (such as the International Energy Agency, IEA) are usually based on reports by their member countries and also presented in highly aggregated form, which does not help detailed subsidy analysis either. Thus, improving data collection and making data publicly available should be a major objective for those governments interested in undertaking subsidy reform measures.

Overcoming these factors requires a multi-pronged strategy. Recognising that apart from subsidies, there is a range of other policy options available to meet societal objectives is important, as it contributes to the understanding that subsidies are generally inefficient tools for achieving policy goals. Other ingredients of successful reforms include better targeting existing subsidies to improve their cost-effectiveness and reduce any harmful environmental impact and improving subsidy design to heighten the efficiency of subsidies granted to correct environmental problems.

Figure 10 below identifies some of the main barriers (particularly to fossil fuel subsidy reform) and possible strategies for successful implementation.

Figure 10. Summary of common barriers to fossil fuel subsidy reform and strategies for successful implementation



Source: IEA (2011).

14. Building political support for subsidy reform domestically and internationally

Political economy considerations are crucial for successful reform; governments should seize windows of opportunity to undertake reform whenever they materialise. In some countries, reform has been driven by the need to respond to a fiscal crisis (*e.g.* fossil fuel subsidy reform in Indonesia) or to an environmental disaster (*e.g.* reform of the fisheries sector in Canada). In others, it has been part of wider economic reforms (*e.g.* reform of agricultural subsidies in New Zealand). Yet in others (*e.g.* Sweden), energy policy reform has been driven by converging political forces agreeing on the need for change.

Domestically, a major factor in pushing for EHS reform (including in the energy sector) is increased transparency, which can stimulate voter opposition to subsidies and make subsidy reform less politically damaging for governments. Identifying who benefits from subsidies, and highlighting their relative "bargaining power", can provide powerful motivation for change. Structural impediments and rigidities in the legal and administrative framework should also be addressed. This requires a holistic approach to policy making, since legal impediments may not always be apparent when designing reform packages.

Transitional measures may be required when phasing out or reducing subsidies. Such measures involve not only payment or compensation to affected workers and businesses to assist in structural change, but also provision of information, advice and retraining. The appropriate speed of adjustment will depend on the community's resilience to change and external pressures and on the availability of alternative sources of employment and income. Care needs to be taken to ensure that transitional measures do not become entrenched in the beneficiaries' expectations.

Subsidy reform should also be considered within the overall economic context. For example, increased competition and the opening up of economies to international forces may reduce interest groups' lobbying power and create opportunities for EHS reform. Most importantly, it is every country's sovereign right to decide whether to keep or dismantle subsidies, depending on its economic and social circumstances. There is no "one size fits all" solution – the rule of thumb is that each country must decide energy subsidy policy for itself.

Building political support for subsidy reform also depends on the existence of grassroots and citizens' organisations which can participate in the debate on EHS reform. Different policy think tanks have been set up in different countries to monitor energy subsidies independently from the government agencies responsible for policy assessment.

Box 12. International EHS watchdogs

A number of non-governmental organisations (NGOs) around the world have started examining and monitoring those government energy subsidy schemes that have a particular impact on the environment. Some of the NGOs playing the role of subsidy watchdogs are Greenpeace, Friends of the Earth, WWF, IISD-GSI, the World Resources Institute, 350.org, Avaaz, Oil Change International and Earth Track.

Friends of Fossil Fuel Subsidy Reform is a group of non-G20 countries formed in June 2010 to support reform of inefficient fossil fuel subsidies. Among the current members are Costa Rica, Denmark, Ethiopia, Finland, New Zealand, Norway, Sweden and Switzerland. The Friends group encourages the G20 and APEC to implement their phase-out initiative as soon as possible, with maximum ambition and transparency.

The USA-based Earth Track, mentioned several times in this report, is one of the oldest NGOs working on energy subsidies and has served as a model for similar organisations in other countries. Other USA-based NGOs working on similar issues include Taxpayers for Common Sense, Corporate Subsidy Watch and Public Citizen.

Source: http://www.iisd.org/gsi/sites/default/files/sw42_feb_11.pdf

The efforts of the NGO sector are now being supplemented by a major push on the **international political stage**. The debate on rationalising and phasing out fossil fuel subsidies has particularly intensified in the context of climate change negotiations and G20 discussions. The call to phase out fossil fuel consumption subsidies was directed not only at the G20 countries themselves, but at all nations that subsidise fossil fuels, taking into account the specific circumstances of each economy. Through its Green Growth Strategy, the OECD has made the phase-out of such subsidies a major policy objective for developed countries. Similarly, the issue of wasteful energy subsidies has come up in discussions held at Asia-Pacific Economic Cooperation (APEC) meetings.[33] In the European Union (EU) context, the "Roadmap for a resource efficient Europe" calls on member states to phase out EHS by 2020, with due regard for the social impact of such reforms, particularly on the poor. As part of this process, EU member states should identify the most significant EHS, prepare plans and timetables for phasing them out, and report on progress by 2013. In addition, subsidies are also discussed in the framework of World Trade Organization (WTO) negotiations and are a particular concern for the EECCA countries that have chosen to join the WTO. All these processes are helping to raise the profile of EHS in general, and energy subsidies in particular.

While there is ongoing debate on the subject in the OECD countries as well as in some developing countries, there is generally little discussion on the need to reform specific energy subsidy schemes in the EECCA countries. Despite some assessment by the IEA (using the price-gap approach) of the magnitude of energy consumption subsidies (and except for the Russian Federation, where a first inventory of subsidies to upstream oil and gas activities has been prepared) there are no comprehensive studies identifying, measuring and quantifying the impact of EHS in the EECCA countries. More consistent subsidy analysis is therefore required to support meaningful policy debate on energy reform in these countries.

[33] APEC is a forum for 21 Pacific Rim countries that seeks to promote free trade and economic cooperation throughout the Asia-Pacific region. APEC was established in 1989 in response to the growing interdependence of Asia-Pacific economies and the advent of regional trade blocs in other parts of the world. Of all EECCA countries, only the Russian Federation is a member of APEC.

15. Summary conclusions

Conducting energy subsidy reform has historically proven difficult, despite a consensus that energy subsidies need to be phased out as energy-efficient strategies are being implemented. Experience shows that the political economy of subsidy support is as important as the technical analysis of EHS schemes. Following are the main conclusions that can be drawn from the above analysis:

- Subsidy reform is typically beneficial to the economy as a whole, but political barriers hold up reform plans. Due to their highly politicised nature and the uneven distribution of costs and benefits across economic agents, energy subsidies are often difficult to remove. Nevertheless, reforming EHS can help relieve pressures on public budgets and reduce GHG and other pollutants that may harm public health. Each country must decide whether to pursue these objectives based on its own priorities.

- Reforming EHS presents numerous challenges – especially in the energy sector, due to its key position in the economy. These challenges range from purely technical to institutional, economic and political. It is generally understood that that the main barrier to more rational energy subsidy policies is not economics, but politics. Faced with the vested interests embedded in energy subsidy schemes and a culture of "entitlement" to subsidies, as well as concerns about the loss of competitiveness in certain key sectors (particularly energy-intensive industries), politicians are reluctant to undertake such reforms.

- The fear that a phase-out of energy subsidy programmes will raise prices of essential goods (such as heat and electricity), which in turn may disrupt social peace, is among the most powerful arguments against subsidy reforms. These fears may be mitigated by appropriate policies to minimise social impacts (*e.g.* transitional assistance programmes, progressive energy tariffs that allow low charges for low usage and thus address the needs of lower-income households).

- A well-designed strategy is needed to overcome these barriers. There is no "one size fits all" solution and each country will have to decide on the instruments and strategies it will use. However, it is important to recognise that in addition to subsidies, a range of other policy options is available to meet societal objectives and that subsidies are generally inefficient tools for achieving policy goals.

- Such a strategy should also take into consideration different "windows of opportunity", both nationally and internationally. Overcoming fiscal deficits, increased competition to domestic producers from increased international trade, or the need to deal with environmental catastrophes may drive the reform process at the national level. Processes such as the G20 debates on fossil fuel subsidy phase-out or the development of the OECD Green Growth Strategy can help raise the profile of energy subsidy reform at the international level.

Reforming energy subsidies is a difficult policy choice. To be successful, reform measures require strong political support and the concerted efforts of the whole government.

MAJOR ISSUES IN ANALYSING ENERGY SUBSIDIES IN THE EECCA COUNTRIES

Following are the main conclusions and recommendations that have emerged from this review of existing tools and approaches for identifying, measuring and evaluating environmentally harmful energy subsidies (EHS), and their current and possible application in the context of Eastern Europe, Caucasus and Central Asia (EECCA) countries:

- ***A policy consensus needs to be reached on the subsidy definition that will be used in analysing environmentally damaging energy subsidy schemes.*** Achieving policy consensus on the subsidy definition before launching actual country analysis will play a decisive role in understanding economic, social and environmental conundrums related to ill-conceived subsidy schemes. Using internationally recognised definitions that have gradually evolved to comprise subsidisation beyond direct cash payments will be necessary. Capacity and consensus building within the government on what constitutes a subsidy is necessary as a first step towards effective subsidy reform. Agreeing domestically on what constitutes an efficient or inefficient form of government subsidy is even more important.

- ***A mix of analytical tools is required to properly guide policy analysis and subsidy reform.*** Identification and quantification of a subsidy programme need to be separated from assessment of its social or environmental impacts. Combining the bottom-up (technical and expert analysis) and top-down (policy analysis) approaches is obviously required: in other words, preparing inventories (such as those carried out by the Organisation for Economic Co-operation and Development and Global Subsidies Initiative) in combination with price-gap estimates (like those prepared by the International Energy Agency) followed by policy advice that will focus on the effects of subsidy (removal). Given that no approach is perfect, the limitations of the model used in the analysis should be clearly spelled out.

- ***The complexity of subsidy programmes is an important impediment to improved transparency in reporting and measuring subsidies disbursed at the local, national and regional levels.*** Achieving transparency is complicated not only by the existence of many mechanisms for transferring funds, ranging from direct spending programmes to more opaque instruments (*e.g.* special taxation rules and credit subsidies), but also by the large number of institutions involved in providing subsidy support (*e.g.* ministries responsible for resource extraction, public finance and taxation, economic development, energy, environment and commerce). The complexity of subsidy measures is also often rooted in their multiple (and sometimes incompatible) policy objectives and in the fact that the reform process generally depends on other domestic policy tools to achieve a specific policy goal. All this complicates even further properly assessing the size and effectiveness of subsidies.

- ***Evaluating subsidy effectiveness and efficiency poses challenges but can provide valuable insights during public debate on EHS reforms.*** Different evaluation approaches can be used, including social cost-benefit analysis, macro modelling (through a general equilibrium model), micro modelling (calculating the Net present value of the subsidy level) or "soft" evaluation. Each has its advantages and disadvantages and is generally time- and resource-consuming. Macro modelling, for example, presents the challenge of having "no ideal definition – no ideal measurement – no ideal modelling". The "soft" evaluation approach, on the other hand, can be used to encourage public debate on EHS reforms by providing systematised information on the existence and size of such subsidies.

- ***Modelling the impact of phasing out fossil fuel subsidies, regardless of their nature, makes sense at a national level only if national government experts recognise the model.*** Should this not be the case, the modelling analysis could remain an academic exercise that does not account for local specifics. Evidence shows that existing economic models in the EECCA countries are often based on poor local data that disregard the share of the grey economy, energy leakages and actual social stratification. Price elasticity of demand for energy also requires much more research, since it depends on the individual country.

- ***Using public domain data makes the analysis outcomes less controversial.*** Data sources can include national accounts and tax expenditure reports (covering corporate and personal income taxes, VAT, excise taxes, etc.) and official fiscal planning materials (such as national budget laws, reports on budget execution, clarification notes prepared by ministries of finance as part of the budget drafting process, materials of parliamentary budget committees, tax policy guidelines, and tariff and customs policy guidelines). Official subsidy monitoring reports of accounting chambers (auditor generals), academic papers and media reports can also be possible sources. Where appropriate, production-sharing agreements may also be worth a look. As data are often disaggregated, discussion and close communication with government experts, and monitoring of media reports, will be required.

- ***Existence of alternative technologies is crucial for EHS reforms.*** One particular issue in subsidy reform is the existence of alternative technologies. There is no point in wasting "political capital" to launch reforms if benign alternatives are not viable.

- ***Subsidy reform plans need to be developed in order to guide a process that is intrinsically complex.*** The work carried out in the context of the European Union (EU)'s "Roadmap for a resource efficient Europe" (which calls on member states to phase out EHS by 2020) may provide useful insights into how such plans might be developed. As part of this process, EU member states should identify the most significant EHS, prepare plans and timetables to phase them out, and report on progress by 2013.

- ***The political economy of subsidy support is as important as the technical analysis of EHS schemes.*** It is worth investing time to understand the politics behind energy subsidies, particularly if the government is willing to cooperate. Conversations with policy makers should stress the benefits and opportunities of subsidy reforms rather than the negative effects of their phase-out. The key rationale behind subsidy phase-out may be saving public money and eliminating market distortions (*e.g.* making energy efficient technologies more efficient), rather than achieving environmental objectives. As with any reform, there may be winners and losers. Therefore, designing compensation measures for those negatively affected by the reform should be an integral part of the reform package.

REFERENCES

Aldy, J. E. (2011), *Fossil Fuel Subsidies in Developing Countries: Economic, Energy, and Environmental Impacts*, Harvard Kennedy School, Cambridge, Mass.

Auty, R. M. (2008), *Resource Depletion, Oil Dependence and Kazakhstan's Development Prospects*, Lancaster University.

Bruce, N. (1990), *Measuring Industrial Subsidies: Some Conceptual Issues*, OECD Economics Department Working papers, No. 75, OECD Publishing, Paris.

Beers, C. van (2011), *World Bank's Work on the Removal of Energy Subsidies*, Delft University of Technology, Delft.

Cox, A. (2005), *An Overview of the OECD Work on Environmentally Harmful Subsidies*, OECD, Paris.

Dansie, G., M. Lanteigne and I. Overland (2010), "Reducing Energy Subsidies in China, India and Russia: Dilemmas for Decision Makers*", Sustainability 2,* No. 2, pp. 475-493.

Dellink, R., *et al.* (2012), "The ENV-Linkages Model: Applications and Directions", OECD Internal Launch Seminar, Paris.

Ellis, J. (2010), "The Effects of Fossil-Fuel Subsidy Reform: A review of modelling and empirical studies", *Untold Billions: Fossil-Fuel Subsidies, their Impacts and the Path to Reform*, IISD-GSI, Geneva.

European Commission (2011), *Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions – Roadmap to a resource efficient Europe*, COM(2011) 571 final, European Commission, Brussels.

Fijorek, K., *et al*. (2010), *Rynek Energii – 12/2010, Prognozowanie cen energii elektrycznej na rynku dnia następnego metodami "data mining*", Warsaw (in Polish).

Franz, P. (2005), *Outline of the German Case Study on Subsidy Reform Experiences on Energy*, Federal Ministry for the Environment, Nature Conservation and Nuclear Safety, Berlin.

Gerasimchuk, I (2012), *Fossil Fuels – At what Cost? Government Support for Upstream Oil and Gas Activities in Russia*, WWF Russia & IISD-GSI, Moscow-Geneva.

Grassini, M. (2007), "Rowing along the Computable General Equilibrium Modelling Mainstream", *Studi e Note di Economia*, Anno XII, n. 3-2007, Rome.

Jones, D. and R. Steenblik (2010), eds., "Subsidy Estimation: A Survey of Current Practice", *Fossil Fuel Resources*, IISD-GSI, Geneva, http://www.iisd.org/gsi/subsidy-estimation-survey-current-practice.

International Institute for Sustainable Development-Global Subsidies Initiative (IISD-GSI) (2010), *Defining Fossil Fuel Subsidies for the G20: Which Approach is Best?*, GSI Policy Brief, Geneva.

International Energy Agency (IEA) (1999), *World Energy Outlook 1999: Looking at Energy Subsidies: Getting the Prices Right*, OECD Publishing, Paris, doi: 10.1787/weo-1999-en.

IEA (2006), *Taxing and Subsidising Energy*, IEA, Paris, http://www.iea.org/papers/2006/oil_subsidies.pdf

IEA (2011), *World Energy Outlook 2011*, OECD Publishing, Paris, doi: 10.1787/weo-2011-en.

IEA (2012), *World Energy Outlook 2012*, IEA, Paris.

IEA, OECD and World Bank (2010), *The Scope of Fossil-Fuel Subsidies in 2009 and a Roadmap for Phasing Out Fossil-Fuel Subsidies*.

IEA, OECD, OPEC and World Bank (2011), *Joint Report by IEA, OPEC, OECD and World Bank on Fossil Fuel and Other Energy Subsidies: An Update of the G20 Pittsburgh and Toronto Commitments*.

Institute for European Environmental Policy (IEEP), *Ecologic, FEEM and IVM* (2007), *Reforming environmentally harmful subsidies*. Final report by Valsecchi C., ten Brink P., Fergusson M., Bassi S., Pallemaerts, M., Best A., Blobel, D., Berglund, M., Markandya, A., Sgobbi, A., Longo, C., and, Oosterhuis F. for the European Commission's DG Environment, March 2007, Brussels.

IEEP, IVM, Ecologic et al. (2009), *Environmentally harmful subsidies: Identification and assessment*, Final report by Valsecchi C., Bassi S., Best A., Dias Soares C., Kaphengst T., Lewis M., Oosterhuis F., Rogers-Ganter H., ten Brink P., and Withana S. for the European Commission's DG Environment, November 2009, Brussels.

International Monetary Fund (IMF) (2012), *Petroleum Product Subsidies: Costly, Inequitable, and Rising*, IMF Staff Position Note, IMF, Washington DC.

Kjellingbro, P. M. and M. Skotte (2005), *Environmentally Harmful Subsidies: Linkages Between Subsidies, the Environment and the Economy*, Environmental Assessment Institute, Herning.

Koplow D. (Earth Track, Inc.) (2009), *Measuring Energy Subsidies Using the Price-Gap Approach: What does it leave out?*, International Institute for Sustainable Development, Winnipeg.

Koplow, D. (2010), "*Quantifying Support to Energy – Why Is It Needed*?", Expert Workshop on Estimating Support to Fossil Fuels, 18-19 November 2010, OECD, Paris.

Morgan, T. (2007), *Energy Subsidies: Their Magnitude, How they Affect Energy Investment and Greenhouse Gas Emissions, and Prospects for Reform*, UNFCCC Secretariat, Bonn.

OECD (Organisation for Economic Co-operation and Development) (1996), *Subsidies and the Environment: Exploring the Linkages*, OECD, Paris.

OECD (2002), *Subsidy Measurement and Classification: Developing a Common Framework*, OECD Workshop on Environmentally Harmful Subsidies, OECD, Paris.

OECD (2005), *Environmentally Harmful Subsidies (EHS): Identification and Assessment. Challenges for Reform*, OECD Publishing, Paris, doi: 10.1787/9789264012059-en.

OECD (2010a), *Background Report: An Overview of the OECD ENV-Linkages Model*, by Jean-Marc Burniaux and Jean Chateau, OECD, Paris.

OECD (2010b), *Macroeconomic and Environmental Impacts of Eliminating Consumer Subsidies to Fossil Fuels: OECD Modelling Work on Phasing Out Fossil Fuel Subsidies for a G20 Report*, OECD, Paris.

OECD (2010c), *Measuring Support to Energy*, Version 1.0, OECD, Paris.

OECD (2010d), *Mitigation Potential of Removing Fossil Fuel Subsidies: A General Equilibrium Assessment*, by Jean-Marc Burniaux and Jean Chateau, OECD, Paris.

OECD (2010e), *OECD's Producer Support Estimate and Related Indicators of Agricultural Support - Concepts, Calculations, Interpretation and Use (The PSE Manual)*, Trade and Agriculture Directorate, OECD, Paris.

OECD (2012), *Inventory of Estimated Budgetary Support and Tax Expenditures for Fossil Fuels 2013*, OECD, Paris.

Parry, I.W.H. and F. Day (eds.) (2010), *Issues of the Day: 100 Commentaries on Climate, Energy, the Environment, Transportation and Public Health*, Resources for the Future, Washington DC.

Pieters, J. (2002), *What Makes a Subsidy Environmentally Harmful: Developing a Checklist Based on the Conditionality of Subsidies*, OECD Workshop on Environmentally Harmful Subsidies, 7-8 November 2002, OECD, Paris.

Steenblik, R. (2007), *A Subsidy Primer*, IISD-GSI, Geneva.

United Nations Development Programme (UNDP) (2012), *Fossil Fuel Fiscal Policies and Greenhouse Gas Emissions in Viet Nam. Subsidies and Taxes in Viet Nam's Energy Sector, and their Effects on Economic Development and Income Distribution in the Context of Responding to Climate Change*, UNDP, Ha Noi.

United Nations Environment Programme (UNEP) (2008), *Reforming Energy Subsidies - Opportunities to Contribute to the Climate Change Agenda*, Division of Technology, Industry and Economics, UNEP, Paris.

United States Energy Information Agency (2012), *Annual Energy Outlook 2012 with Projections to 2035*, US Energy Information Agency, Office of Integrated and International Energy Analysis, U.S. Department of Energy, Washington, DC.

World Bank (2010a), *Phasing Out Energy Subsidies: A Decision Tree and Evidence from Case Studies*, World Bank, Washington, DC.

World Bank (2008), Climate Change and the World Bank Group: Phase I: An Evaluation of World Bank Win-Win Energy Policy Reforms, World Bank, Washington DC.

World Bank (2010b), *Subsidies in the Energy Sector: An Overview*, Background paper for the World Bank Group Energy Sector Strategy, July 2010, World Bank, Washington, DC.

World Trade Organization (WTO), *Agreement on Subsidies and Countervailing Measures*, WTO, Geneva.

ANNEX I. OECD MATRIX OF SUPPORT MEASURES, WITH EXAMPLES

		STATUTORY OR FORMAL INCIDENCE (to whom and for what a transfer is given)								
		Production							Direct consumption	
		Output returns	Enterprise income	Cost of intermediate inputs	Cost of production factors				Unit cost of consumption	Household or enterprise income
					Labour	Land	Capital	Knowledge		
TRANSFER MECHANISM (how a transfer is created)	**Direct transfer of funds**	Output bounty or deficiency payment	Operating grant	Input-price subsidy	Wage subsidy	Capital grant linked to acquisition of land	Capital grant linked to capital	Government R&D	Unit subsidy	Government-subsidised lifeline electricity rate
	Tax revenue foregone	Production tax credit	Reduced rate of income tax	Reduction in excise tax on output	Reduction in social charges (payroll taxes)	Property tax reduction or exemption	Investment tax credit	Tax credit for private R&D	VAT or excise tax concession on fuel	Tax deduction related to energy purchases that exceed given share of income
	Other government revenue foregone			Underpricing of a government good or service		Underpricing of access to government land or natural resources; Reduction of resource royalty or extraction tax		Government transfer of intellectual property right (IPR)	Underpricing of access to a natural resource harvested by final consumer	
	Transfer of risk to government	Government buffer stock	Third-party liability limit for producers	Provision of security (*e.g.* military protection of supply lines)	Assumption of occupational health and accident liabilities	Credit guarantee linked to acquisition of land	Credit guarantee linked to capital		Price-triggered subsidy	Means-tested cold-weather grant
	Induced transfers	Import tariff or export subsidy	Monopoly concession	Monopsony concession; export restriction	Wage control	Land-use control	Credit control (sector-specific)	Deviations from standard IPR rules	Regulated price; cross-subsidy	Mandated lifeline electricity rate

ANNEX II. GSI ILLUSTRATIVE LIST OF SUBSIDY TYPES

Direct transfer or potential direct transfer of funds	Government revenue foregone
• Direct payments linked to production volumes or sales • Deficiency payments (the difference between target price and actual price) • Grants for acquisition of capital or land • Subsidies to intermediate inputs • Wage subsidies to assist individuals in preparing for and maintaining employment (*e.g.* training) • Government loans: provided at below-market rates, low collateral requirements, lengthy repayment periods or deferred repayments* • Government spending on research and development • Guarantees for loans, security or credit* • Government-provided insurance or indemnification* • Assumption of occupational health and accident liabilities • Assumption of liabilities for closure and post-closure risks (*e.g.* site cleanup) • Caps on commercial liability • Government use of tax-free bonds to fund private investments • Government expenditure on creating and maintaining stockpiles	• Tax expenditure: reduced tax rates, tax credits, exemptions or deferrals (*e.g.* on income tax, VAT, excise tax, property tax) • Accelerated depreciation allowances • Reduced royalty payments • Reduced resource rents

Government-provided or government-purchased goods or services	Income or price support, or relief from normal costs or procedures
• Underpricing of government-provided goods or services • Government procurement at above-market rates • Government-provided infrastructure specific to the sector (*e.g.* private roads, storage facilities) • Access to government-owned natural resources or land • Government transfer of intellectual property rights	• Prices set at below-market rates for consumers (including where there is no financial contribution by government) • Above-market rate prices for producers via government regulations or import barriers (*e.g.* tariffs) • Mandated feed-in tariffs • Consumption mandates • Export taxes or restrictions • Relief from costs enterprises normally bear in the normal course of business (*e.g.* labour, environmental, health and safety) • Exemption from government procedures normally followed by enterprises

*Government-provided loans, loan guarantees and investment insurance are referred to as “export credits” when granted for exports or foreign investment.

Source: IISD-GSI (2010).

ANNEX III. GENERALISED FRAMEWORK FOR PRODUCTION SIDE OF SUBSIDY ACCOUNTS

The table below shows how a generalised system of subsidy accounts might be constructed on the production side. It is offered as an illustration and is not meant to be definitive or comprehensive.

The main purpose of aggregating detailed data into composite indicators is to provide information that is more readily understandable than in detailed form. No single indicator can serve equally well all purposes and the different indicators in the table generate different numbers of subsidy volumes. Which of these indicators a government decides to use is a matter of a political choice. At minimum, these indicators need to be applied and calculated consistently.

	Variable	Units	Hypothetical example	
A	Production volume	tonnes		1 000 000
B	Value of output	USDm**		100
C	Expenditure on intermediate inputs	USDm		45
D	*Value added**	USDm		55
E	Assistance to value-adding factors (= 1 + 2 + 3)	USDm		5
	1. Land	USDm	1	
	2. Labour	USDm	2	
	3. Capital	USDm	2	
F	*Assisted value added = D + E*	USDm		60
G	Assistance to outputs (= 1 + 2)	USDm		15
	1. Market price support	USDm	15	
	2. Payments based on outputs	USDm	0	
H	Assistance intermediate inputs	USDm		4
I	Miscellaneous payments	USDm		1
J	Unassisted value added = F – (G + H + I)	USDm		40
K	General services	USDm		
L	Producer support estimate (PSE) = E + G + H + I	USDm		25
M	Percentage PSE = (L/ ([B – G2] + [L – G1]) x 100	%		23
N	Net subsidy equivalent = F - J	USDm		20
O	Effective rate of assistance = (N / J) x 100	%		50
P	Nominal rate of assistance = (G / [B-G]) x 100	%		18

Source: OECD (2002).

Note: *Value added: In economics, the difference between the sale price and the production cost of a product is the value added per unit. Summing value added per unit over all units sold is total value added. Total value added is equivalent to revenue less outside purchases (of materials and services).
** - "m" – stands for million.

ANNEX IV. OUTLINE OF THE ECONOMIC, ENVIRONMENTAL AND SOCIAL IMPACTS OF FOSSIL FUEL SUBSIDIES

Economic impacts

Subsidies distort prices, fail to reflect the true costs of supply and therefore affect resource allocation decisions, production and consumption. The precise economic impacts of fossil fuel subsidies are partly related to their form: a) producer supports that lower prices for consumers by lowering production costs for producers; b) consumer supports that lower prices for consumers, but also reduce returns for producers; or c) price supports that increase revenues for producers, but increase prices for consumers.

The main *economic impacts* of fuel subsidies are:

- **Subsidies can increase energy consumption and reduce incentives for energy efficiency.** Subsidies that reduce prices for consumers promote higher consumption of energy and reduce incentives to use energy efficiently. Subsidies that reduce production costs for producers reduce producer incentives to minimise costs and increase efficiency.

- **Subsidies can decrease foreign exchange revenues**. Subsidies that encourage greater consumption reduce export opportunities for fossil-fuel-producing nations, as well as revenues from those (lost) exports.

- **Subsidies are a drain on government finances** through direct financial transfers from government budgets, government expenditures on infrastructure or research and development, or reduced government income from taxation. This can lead to fiscal deficits and debt accumulation.

- **Subsidies can increase a country's dependence on imports**. Subsidies that increase fossil fuel consumption in countries that do not produce fossil fuel increase their dependence on imports.

- **Subsidies undermine investment in alternative energy sources and technologies**. By increasing consumer demand for fossil fuels or decreasing production costs for producers, subsidies distort the market and reduce investment in alternative energy sources or energy technologies that are potentially more efficient or less environmentally harmful.

- **Subsidies encourage energy-intensive production at the expense of labour**. Subsidies that lower consumer prices can result in a concentration of economic activity on energy-intensive production, perhaps at the expense of labour-intensive production.

- **Subsidised fuels are used for unintended purposes**. By lowering prices for certain fuels, subsidies can result in misusing those fuels for unintended purposes. In India and Indonesia, for example, subsidised kerosene intended for household cooking has been used illegally or as a cheap addition to transport fuel.

- **Subsidies can lead to shortages or costly rationing schemes**. Subsidies that lower prices for consumers, as well as returns to producers, can lead the latter to produce less or export more, resulting in shortages or rationing systems. Likewise, merely lowering prices and increasing consumer demand will result in shortages and rationing.

- **Subsidies can reduce producers' ability to invest in cleaner or more efficient technology**. Subsidies that lower prices for consumers, as well as returns to producers, can limit the latter's ability to invest in cleaner or more efficient technology, resulting in greater production costs and environmental impacts.

- **Subsidies can promote smuggling and corruption**. Subsidies that lower prices for consumers, as well as returns to producers, can encourage the smuggling of fuels to countries (*e.g.* in Africa and Asia (*e.g.* in Indonesia) where prices are higher. This benefits the sellers, but has negative economic impacts for the country as a whole. When liquefied petroleum gas (also known as propane) and kerosene are subsidised and scarce, corruption commonly occurs as attempts are made to control distribution channels.

Environmental impacts

Although the impacts of subsidies are complex and subsidies may in some cases have positive environmental impacts (such as reducing pressure on forests by reducing biomass fuel use), there is little doubt that overall, fossil fuel subsidies result in greater fossil fuel consumption.

The main environmental impacts of fossil fuel production and consumption are:

- **Greenhouse gas emissions (GHG)**. Fossil fuel consumption is a key contributor to global GHG emissions. Fossil fuel production and consumption (primarily consumption) contribute an estimated 97% of all man-made carbon dioxide emissions in OECD countries. In 2007, coal was responsible for 42% of global emissions from fuel combustion (International Energy Agency Online Energy Statistics, 2009).

- **Local air pollution**. Fossil fuel combustion produces pollutants, including sulphur dioxide, nitrogen oxides and particulates, which are released into the atmosphere and can cause long- and short-term health impacts, as well as damage to structures, agriculture and natural environments.

- **Water pollution**. Fossil fuel production and consumption can lead to water pollution through many avenues, including tanker accidents and oil spills, water pollution from runoff and leaching from tailings and coal washers, and groundwater contamination from flooding of closed mines.

- **Landscape destruction**. Fossil fuel extraction – particularly coal mining – often contributes to landscape destruction.

- **Depletion of non-renewable fossil fuel stocks**. Subsidies that accelerate fossil fuel consumption accelerate the depletion of non-renewable resources.

Social impacts

Countries that are not members of the Organisation for Economic Co-operation and Development (called non-OECD countries) often justify fossil fuel subsidies – particularly those that keep down the price of liquid fuels, natural gas or electricity – on the basis that they benefit the poor and reduce the cost of living. There is an argument to be made for such subsidies, particularly with respect to electricity, which is considered key to reducing poverty and indoor air pollution. However, subsidies do not always accomplish, and may not be the most efficient mechanism to achieve, poverty alleviation. They may on the contrary be regressive, benefiting middle- and upper-income groups rather than lower-income groups. Direct transfers to target groups may reduce poverty more effectively than general subsidies provided to all users.

The main social impacts of fossil fuel subsidies are:

- **Subsidies may mostly benefit the rich, who spend more money on energy and have greater access to energy than the poor**. The World Bank study *Climate Change and the World Bank Group: Phase I: An Evaluation of World Bank Win-Win Energy Policy Reforms* (World Bank, 2008) found that the bottom 40% of the income distribution receive only 15-20% of fossil fuel subsidies. Even when the rate of energy consumption by the poorest quintiles increases as a result of subsidies, the wealthy derive larger absolute benefits from lower energy prices.

- **Subsidies may reduce energy available to the poor** because in an artificially low-price environment, producers may have little incentive to produce or supply more and the rich may consume a higher percentage of production.

- **Subsidies often do not target the types of energy that would be more beneficial to the poor**. Subsidies may favour larger capital-intensive projects, such as dams or power plants, at the expense of local labour-intensive means of providing energy services. Power plant and dam construction can displace or create negative environmental impacts that affect primarily poor communities without improving their access to energy.

- **Subsidies may divert government money that could be directed more effectively to social programmes** such as healthcare, free education, food coupons and targeted cash transfers.

- **Fossil fuel consumption and production produce local emissions, whose many negative health effects particularly affect the poor**, who have more limited choices regarding their place of residence.

Source: Elllis (2010).

GLOSSARY

Accelerated depreciation	Any one of several methods by which a company, for "financial accounting" or tax purposes, depreciates a fixed asset in such a way that the amount of depreciation taken each year is higher during the earlier years of an asset's life (unlike with the straight-line depreciation, where the amount of depreciation is equal to each year of an asset's life). The biggest benefit of this method is the tax benefit. By writing off more assets against revenue, companies report lower income and thus pay less tax.
Ad valorem subsidy	A subsidy fixed per unit of output or input value.
Administered or regulated prices	Prices set by the government in order to determine, directly or indirectly, domestic market or producer prices.
Asia-Pacific Economic Cooperation (APEC)	A forum for 21 Pacific Rim countries that seeks to promote free trade and economic cooperation throughout the Asia-Pacific region. APEC was established in 1989 in response to the growing interdependence of Asia-Pacific economies and the advent of regional trade blocs in other parts of the world. Of all EECCA countries, only the Russian Federation is a member of APEC.
Assimilative capacity of the environment	The capacity of the environment to absorb a certain amount of emissions, depletion or damage, without suffering (irreversible) degradation.
Average cost of production	Average cost or unit cost is equal to total cost of production divided by the number of goods produced (the output quantity). It is also equal to the sum of average variable costs (total variable costs divided by output quantity) plus average fixed costs (total fixed costs divided by output quantity).
Bond	A formal contract to repay borrowed money with interest at fixed intervals (semi-annual, annual, or sometimes monthly). Bonds provide the borrower with external funds to finance long-term investments or, in the case of government bonds, to finance current expenditure.
Border tax adjustment	The application of a domestic tax on imported goods while exempting exported goods from the tax in an effort to make the exported goods' price competitive both nationally and internationally.
Bounty	A direct payment linked to the volume of production or sales (*e.g.* in the USA, companies producing liquid biofuels receive direct subsidies for every gallon of ethanol they produce).
Cap on commercial liability	Commercial liability is a form of liability insurance. In many countries, liability insurance is a compulsory form of insurance for those at risk of being sued for negligence (*e.g.* in the case of injury or property damage) by third parties. A company that owns an industrial facility, for instance, may buy pollution insurance to cover lawsuits resulting from environmental accidents. In legislation, liability may be capped (limited) to a certain proportion of the damage incurred. Standard general liability policies typically contain some general aggregate liability limits. These general aggregate limits place caps on the policy's obligation to pay claims.
Capital grant	Provides support to private sector entities for the acquisition of long-term fixed assets (*e.g.* purchase of property, construction of a facility, expansion of a facility or purchase of equipment).
Combined-cycle gas turbines (CCGT)	A form of highly efficient energy-generation technology combining a gas-fired turbine with a steam turbine. The design uses a gas turbine to create electricity and then captures the resulting waste heat to create steam, which in turn drives a steam turbine, significantly increasing the system's power output without any increase in fuel. While the technology is typically powered using natural gas, it can also be fuelled using coal, biomass and even solar power as part of solar combined-cycle plants.

Consumer support estimate (CSE)	Measures the annual monetary value of transfers from taxpayers to consumers arising from policy measures that support consumers.
Countervailing measures	Actions taken by the importing country, usually in the form of increased duties, to offset subsidies given to producers or exporters in the exporting country.
Credit guarantee linked to capital	Commitment by a government to reimburse a lender if the borrower fails to repay a loan. The lender pays a guarantee fee.
Credit market	A marketplace for the exchange of debt securities and short-term commercial paper. Companies and the government are able to raise funds by allowing investors to purchase these debt securities.
Cross-subsidy	A market transfer induced by discriminatory pricing practices within the scope of the same enterprise or agency. Typically, a cross-subsidy exists when a government-owned enterprise, such as a public utility, uses revenues collected in one market segment to reduce prices charged for goods in another.
Debt forgiveness/debt relief /debt concession	Any of these implies the partial or total forgiveness of debt, or the slowing or stopping of debt growth, owed by individuals, corporations, or nations.
Debt rescheduling	A practice that involves revising the terms of an existing loan in order to extend the repayment period.
Debt restructuring	A process that allows a private or public company – or a sovereign entity – facing cash flow problems and financial distress to reduce and renegotiate its delinquent debts in order to improve or restore liquidity and rehabilitate so that it can continue its operations.
Deficiency payment	A cash payment to producers linked to prices. The deficiency payment makes up the difference between a target (administered) price for a good (typically an agricultural commodity) and the actual price received in the market.
Depreciation	A noncash expense that reduces the value of an asset as a result of wear and tear, age, or obsolescence. Most assets lose their value over time (in other words, they depreciate) and must be replaced once they reach the end of their useful life. Several accounting methods are used to write off an asset's depreciation cost over the period of its useful life. Because it is a non-cash expense, depreciation lowers the company's reported earnings while increasing free cash flow. Several standard methods of computing depreciation expense (specified in a country's accounting and/or tax rules) may be used, including fixed percentage, straight line and accelerated depreciation.
Direct subsidy	A subsidy provided through targeted cash-based payments, such as loans or tax preferences.
Downstream industry	Industrial firms that process the output of other firms (at the previous level of material processing) into a finished or different product, for example, plastic manufacturers whose inputs come from petroleum processors and agro processors whose inputs come from farmers or growers.
Duty (= customs duty)	A tax imposed on imports or exports at the border. Duties can be "ad valorem" (applied as a percentage of value), "specific" (applied on a quantitative basis, such as dollars per tonne), or "compound" (a combination of both).
Electricity generation	Defined as the total amount of electricity generated by power only or by combined heat and power plants, including generation required for own use. Also referred to as gross generation.
Excise tax	A special tax levied on a specific kind of goods, typically alcoholic beverages, tobacco and fuels; may be imposed at any stage of production or distribution and is usually assessed by reference to the product weight, strength or quantity. An excise is considered an indirect tax, meaning that the producer or seller who pays the tax to the government is expected to try to recover the tax by raising the price paid by the buyer (shifting or passing on the tax).

	Excises are typically imposed in addition to another indirect tax, such as a sales tax or value added tax (VAT), to raise additional revenue for the budget since demand for excisable goods is inelastic with respect to the price.
Export/import restriction/quota	Export/import restrictions are limitations on the quantity of goods exported to/imported into a specific country or countries by a government. A quota set under an international commodity agreement determines the volume that a producing country can sell abroad. Export quotas may also be set by governments on domestic producers of commodities or goods to combat shortages or high prices in domestic markets.
Export/import tariff	Tariffs are a tax or duty levied upon goods exported from or imported into a country. Tariffs raise the overall prices of goods, limiting their production and sale. Governments use tariffs to create economic barriers to trade, and as a form of protectionism. Export tariffs raise the price for domestic companies to export their goods. Because they are perceived as hurting domestic business, such tariffs are very unpopular. Import tariffs raise the price for foreign companies to import their goods.
Export subsidy	Any form of government payment or other benefit provided to domestic producers of goods destined for sale in foreign markets. Examples include preferential government financing, income tax holidays and rebates of direct taxes on exported products. Export subsidies are thought to distort significantly normal trading patterns.
Externalities	Spillover benefits or costs arising from an economic activity that are not taken into account by producers, resulting in production levels that are inappropriate from the standpoint of the economy as a whole. Negative externalities (sometimes called "diseconomies") imply overproduction, unless the activity is appropriately taxed or otherwise constrained by governmental authorities. Unchecked pollution by manufacturers is a commonly cited example of negative externalities.
Feed-in tariff	A policy mechanism designed to accelerate investment in renewable energy technologies by offering long-term contracts to renewable energy producers, typically based on the cost of generation of each technology. Feed-in tariffs often include "tariff digression", a mechanism by which the price (or tariff) ratchets down over time in order to track and encourage technological cost reductions. The goal of feed-in tariffs is to offer cost-based compensation to renewable energy producers, thus providing the price certainty and long-term contracts that help finance renewable energy investments.
Fossil fuel	A fuel derived from the remains of ancient plant and animal life. Fossil fuels include peat, lignite, bituminous and sub-bituminous coal, petroleum (derived from conventional geological formations, oil sands or oil shale) and natural gas (derived from conventional geological formations, coal seams, natural-gas shale, or methane clathrate).
G20	The Group of Twenty is an informal group of finance ministers and central bank governors from 19 major economies: Argentina, Australia, Brazil, Canada, China, France, Germany, India, Indonesia, Italy, Japan, Korea, Mexico, the Russian Federation, Saudi Arabia, South Africa, Turkey, the United Kingdom and the United States plus the European Union, with representatives from the International Monetary Fund and the World Bank.
Gas	Gas includes natural gas (both associated and non-associated with petroleum deposits, but excluding natural gas liquids) and gasworks gas.
General agreement on tariffs and trade (GATT)	A multilateral agreement regulating international trade. According to its preamble, its purpose is the "substantial reduction of tariffs and other trade barriers and the elimination of preferences, on a reciprocal and mutually advantageous basis." GATT was signed in 1947 and lasted until 1993; it was replaced by the World Trade Organization (WTO) in 1995. The original GATT text (1947) is still in effect under the WTO framework, subject to the modifications of GATT 1994.

General services support estimate (GSSE)	Measures the value of transfers provided through policies that support energy producers or consumers collectively rather than as individuals. Possible measures targeted at general services include support for research, development, training, inspection, marketing and sectoral promotion.
Government buffer stock	The buffer stock scheme (commonly implemented as intervention storage) is an attempt by the government to use commodity storage for the purposes of stabilising prices in an entire economy or, more commonly, in an individual (commodity) market. Specifically, commodities are bought when there is a surplus in the economy, stored, and then sold from these stores when the economy is experiencing economic shortages. Their usefulness is debated by economists.
Grant	A time-limited payment, either connected to a specific investment or enabling an individual, company or organisation to cover some or all of its general costs (operating grant), investment costs (capital grant), or costs of undertaking a specific activity (such as research).
Heat energy	Heat is obtained from fuel combustion, nuclear reactors, geothermal reservoirs, capture of sunlight, exothermic chemical processes and heat pumps that can extract it from ambient air and liquids. It may be used for heating or cooling, or converted into mechanical energy for transport vehicles or electricity generation. Commercial heat sold is reported under total final consumption, with the fuel inputs allocated under power generation.
Indirect subsidy	A subsidy received indirectly by a recipient in the form of a higher market price charged for its output, or a lower market price charged for input goods and services purchased from an upstream industry that is able to discount its prices because of the subsidies it itself receives.
Input subsidies	May be implemented in a variety of ways, all of which essentially result in reducing the unit cost that producers face when using intermediate inputs. They allow producers to produce more with a given amount of financial resources than would be the case without such subsidies.
Intellectual property rights (IPRs)	The general term for the assignment of property rights through patents, copyrights and trademarks. These property rights allow the holder to exercise a monopoly on the use of the item for a specified period.
Interest rate subsidy	A special form of direct grant used to reduce the effective interest rate on a loan. Its value may be stipulated as a fixed amount (*e.g.* as a percentage of an investment or as an absolute amount), or more typically as the difference between total interest payments over the life of the loan at prevailing commercial interest rates minus interest payments for a lower subsidised rate. In some cases, the interest rate subsidy is pegged to a particular target interest rate (*e.g.* 5% or 10%) or specified as a percentage reduction, such as 2% or 5% below the commercial rate.
Investment tax credit	Tax incentive that permits companies or individuals to deduct from their tax liability a specified percentage of certain investment costs in addition to normal depreciation allowances. Investment credits are similar to investment allowances, which permit investors or businesses to deduct a specified percentage of certain capital costs from taxable income. Both investment credits and investment allowances differ from accelerated depreciation by offering a percentage deduction at the time an asset is purchased. In effect, the credits are subsidies for investment.
Levelised cost of energy generation	Levelised cost is often cited as a convenient summary measure of the overall competiveness of different energy-generating technologies. It represents the per-kilowatt-hour cost (in real terms) of building and operating a generating plant over an assumed financial life cycle. Key inputs to calculating levelised costs include overnight capital costs, fuel costs, fixed and variable operations and maintenance (O&M) costs, financing costs and an assumed utilisation rate for each plant type. Based on US Energy Information Administration (2012).

Lifeline electricity rate	A subsidised electricity charge given to low-income residential power customers who are not able to pay the full cost of electricity. Lifeline rates are targeted subsidies based on households' consumption level, *i.e.* subsidised rates for a first block of consumption sufficient to cover basic needs. Anything above is charged at a commercial rate, *i.e.* based on the marginal cost of service provision. The appeal of the lifeline rate is that it provides for the basic needs of low-income customers at affordable prices and encourages conservation of electric power among all customers.
Loan guarantee	A mechanism by which a third party assumes legal responsibility to compensate a lender if the borrower defaults on a loan. Theoretically, loan guarantees can be provided by any legal entity with financial resources the lender deems acceptable. Depending on the credit risk associated with the proposed loan, the guarantor may be required to reserve or hold only a portion of the loan amount.
Low-carbon technologies	Technologies that produce low or zero GHG emissions while operating. In the power sector, this includes fossil fuel plants fitted with carbon capture and storage, nuclear plants and renewable-based generation technologies.
Marginal cost	The change in total cost that arises when the quantity produced changes by one unit.
Marginal revenue	The additional revenue that will be generated by increasing product sales by one unit.
Market price support (to energy producers)	An indicator of the monetary value of gross transfers from consumers and taxpayers to energy producers arising from policy measures that create a gap between the domestic producer prices and reference (world) prices of a specific energy commodity, measured at the mine mouth or well head.
Means-tested (grant)	A means test is a determination of whether an individual or family is eligible for help from the government (as with "welfare" programmes making direct transfer payments to individuals to combat poverty).
Monopoly and monopsony	Monopoly refers to a market condition where there is only one producer in a particular industry and the consumers really have no option but to buy that producer's products or service. This is an ideal condition for the producer, who can dictate the terms and set the prices. The opposite condition is monopsony, where there are many sellers but a single buyer (*e.g.* in the defence industry, where the government may be the only buyer of certain products or services), which is also an imperfect market condition.
Non-tariff barriers (NTBs)	NTBs include all the rules, regulations and bureaucratic delays that help keep foreign goods out of the domestic market. There are different types of NTBs, such as quotas, embargos, import licensing systems, sanitary regulations, testing and certification of the products, prohibitions, etc.
Oil	A collective term that refers to crude oil, condensates, natural gas liquids, refinery feedstocks and additives, other hydrocarbons (including emulsified oils, synthetic crude oil, mineral oils extracted from bituminous minerals such as oil shale and bituminous sand) and petroleum products (refinery gas, ethane, liquefied petroleum gas, aviation gasoline, motor gasoline, jet fuels, kerosene, gas or diesel oil, heavy fuel oil, naphtha, white spirit, lubricants, bitumen, paraffin waxes and petroleum coke).
Opportunity cost	The cost of an alternative that must be foregone in order to pursue a certain action. Put another way, the benefits that could have been received by taking an alternative action.
Price control	Government restrictions on the prices that can be charged for goods and services in a market. The intent behind these controls can stem from the desire to maintain affordability of staple foods and goods, prevent the overpricing of goods during shortages, and slow inflation – or alternatively, insure a minimum income for providers of certain goods. There are two primary forms of price control: a *price ceiling* – the maximum price that can be charged – and a *price floo*r – the minimum price that can be charged.
Price elasticity of demand	A measure used to show the responsiveness, or elasticity, of the quantity demanded of a good or service to a change in its price. More precisely, it gives the percentage change in quantity demanded in response to a 1% change in price (holding constant all the other determinants of demand, such as income).

Price elasticity of supply	A measure used to show the responsiveness, or elasticity, of the quantity supplied of a good or service to a change in its price.
Producer support estimate (PSE)	An OECD indicator that measures the annual monetary value of gross transfers from consumers and taxpayers to producers (measured at the producer property), arising from policy measures that support producers by creating a gap between domestic market prices and border prices of the specific commodities.
Quasi-fiscal instruments	Implicit subsidies to the utilities sector that are not accounted for in the budget as government expenditures.
Quota	A limit on the number of units that can be imported or the market share that can be held by foreign producers. Deliberately slow processing of import permits under a quota system acts as a further barrier to trade.
Rebate	An amount paid by way of reduction, return, or refund on what has already been paid or contributed. A rebate is a type of sales promotion that marketers use primarily as an incentive or supplement to product sales.
Reference price	For a price-gap estimate, the reference price is most often defined as the price that would prevail in an undistorted market in the absence of subsidies. For traded forms of energy (such as oil products) the reference price corresponds to the export or import border price (depending on whether the country is an exporter or importer), plus internal distribution. For non-traded energy (such as electricity) the reference price is the estimated long-run marginal cost. The reference price is used in calculating the price gap.
Regressive/progressive tax	A regressive tax is a tax imposed in such a manner that the tax rate decreases as the amount subject to taxation increases. A progressive tax is a tax by which the tax rate increases as the taxable base amount increases.
Rent-seeking	An attempt to obtain economic rent by manipulating the social or political environment in which economic activities occur rather than creating new wealth, for example by spending money on political lobbying in order to be given a share of the wealth already created. If profit-seeking is the creation of wealth, rent-seeking is the use of social institutions, such as the power of government, to redistribute wealth among different groups without creating new wealth. An example of rent-seeking is when a company lobbies the government for loan subsidies, grants or tariff protection. These activities do not create any benefit for society; they just redistribute resources from the taxpayers to the special-interest group.
Resource rent	Rent is a surplus value after all costs and normal returns have been accounted for, *i.e.* the difference between the price at which an output from a resource can be sold and its respective extraction and production costs, including normal return. This concept is usually termed economic rent, but is commonly called resource rent when referring to rent in natural resources, such as minerals. It can also be described as abnormal or supernormal profit. In practice, identifying and measuring (or collecting) resource rent is not straightforward. At any point in time, rent depends on the properties of individual natural resource sites, the availability of information, market conditions, technology and the system of property rights used to govern access to and management of resources.
Royalty	Regular payments made by the lessees of subsoil assets to the owners of the assets. The royalty is similar to a resource rent tax levied on the "super profits" obtained from the use of the asset (*e.g.* mineral resources). Royalties are typically agreed upon as a percentage of gross or net revenues derived from the use of an asset, or as a fixed price per unit sold of an item of such asset.
Specific subsidy	A subsidy fixed per unit of output or unit of input into an activity.
Spot market	A public financial market in which financial instruments or commodities are traded for immediate delivery. It contrasts with a futures market, in which delivery is done at a later date.

Tariff	A tax imposed on a good imported into a country. A tariff may be specific (when levied as a fixed sum per unit of the imported good) or ad valorem (when applied at a percentage rate with reference to the value of the import).
Tax break	A slang term referring to any item which reduces tax, including any tax exemption, tax deduction, or tax credit.
Tax credit	A sum deducted from the total amount a taxpayer owes to the state. A tax credit may be granted for various types of taxes, such as an income tax, property tax, or VAT.
Tax deferral	Refers to instances where a taxpayer can delay paying taxes until some future period. In theory, the net taxes paid should be the same. Taxes can sometimes be deferred indefinitely, or taxed at a lower rate in the future (particularly with regard to income taxes). Corporations (or other enterprises) may often be allowed to defer taxes by using accelerated depreciation.
Tax exemption	Occurs when a company is allowed not to pay a certain tax, resulting in a lower tax burden for the company.
Tax expenditure	Government spending through the tax code. Tax expenditures alter the horizontal and vertical equity of the basic tax system by allowing exemptions, deductions, tax rate reductions, credits or deferrals to selected groups, or specific activities that reduce the amount of tax that would otherwise be payable (*e.g.* income tax, VAT, excise tax, property tax).
Tax holiday	A temporary reduction or elimination of tax, similar to tax abatements or tax reductions. Governments usually create tax holidays as incentives for business investment. In developing countries, they sometimes reduce or eliminate corporate taxes for the purpose of attracting foreign direct investment (FDI) or stimulating growth in selected industries.
Tax relief	Refers to tax breaks and write-offs that reduce the amount of tax due.
Total support estimate (TSE) (to the energy sector)	The TSE gives the annual monetary value of all gross transfers from taxpayers and consumers arising from policy measures that support the energy sector, net of associated budgetary receipts, regardless of their objectives and impacts on production and income or consumption of energy products.
Upstream industry	Industrial firms that process the basic or raw material into an intermediary product which is converted into finished product by the downstream industries. The upstream oil sector commonly refers to the search for, recovery and production of crude oil and natural gas. The upstream oil sector is also known as the exploration and production (E&P) sector.
Value added tax (VAT)	A form of consumption tax. From the buyer's perspective, the VAT is a tax on the purchase price. From the seller's perspective, it is a tax only on the value added to a product, material, or service. The VAT is assessed on increments in the value of a product, from the raw-material stage through the production process to the final sale. At each stage, the tax is levied on the amount by which inputs purchased from the preceding stage have grown in value. The final sale price incorporates all of the VAT payments made along the production chain.
Wage subsidy	A direct payment by the government used to assist individuals to prepare for, obtain and maintain employment. Many countries provide grants to encourage people who are out of work to undergo training in new skills or to relocate.

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Phasing out environmentally harmful energy subsidies is an effective way for governments to meet economic, environmental and social goals: it reduces incentives to consume energy and generate pollution, enhances the efficiency of resource allocation in the economy, and allows public finance to be reallocated to other priorities, including social protection. However, despite the potential benefits, there is a lack of information in most countries about the scale and impacts of these subsidies. This report aims to help fill this gap by providing a comprehensive overview of different tools and approaches that can be used to analyse subsidies and their impacts. While the report draws widely on international experience, issues related to applying the approaches reviewed in the countries of Eastern Europe, Caucasus and Central Asia are also discussed.