FOSSIL FUEL SUBSIDIES IN INDONESIA

TRENDS, IMPACTS, AND REFORMS

ASIAN DEVELOPMENT BANK

FOSSIL FUEL SUBSIDIES IN INDONESIA

TRENDS, IMPACTS, AND REFORMS

6 ADB Avenue, Mandaluyong City, 1550 Metro Manila, Philippines
Tel +63 2 632 4444; Fax +63 2 636 2444
www.adb.org; openaccess.adb.org

Printed in the Philippines.

ISBN 978-92-9257-151-1 (Print), 978-92-9257-152-8 (e-ISBN)
Publication Stock No.RPT157694-2

Cataloging-In-Publication Data

Asian Development Bank.
Fossil fuel subsidies in Indonesia: trends, impacts, and reforms.
Mandaluyong City, Philippines: Asian Development Bank, 2015.

1. Energy sector. 2. Fossil fuel subsidies. 3. Indonesia. I. Asian Development Bank.

Note: In this publication, "$" refers to US dollars.
Photos: All are ADB.

Contents

Tables and Figures

Tables

Figures

Foreword

Energy subsidy reform has emerged as one of the most important policy challenges for developing Asian economies. Government expenditure on fossil fuel subsidies, which covers the gap between global and domestic prices, exceeds public spending on education or health in some Asian countries. High fossil fuel subsidies can wreck government budgets. They accrue largely to the rich and reduce incentives for investment in renewables and energy efficiency. Moreover, fossil fuels (coal, oil, and gas) are major carbon emitters, and burning coal, the most carbon-intensive energy source, has serious climate-change implications.

In 2009, the Group of Twenty and Asia-Pacific Economic Cooperation committed to rationalizing and phasing out inefficient fossil fuel subsidies; unfortunately, there has been little progress. As people get used to low prices, subsidy reform becomes difficult: powerful beneficiaries oppose it and governments fear social unrest when prices rise due to reforms. But this mindset must change as the benefits of subsidy reform are potentially immense. The substantial drop in oil prices has opened a new window of opportunity to put an end to these harmful subsidies.

This study comes at a critical moment to shed new light on energy pricing. It offers guidelines for reforms and the formulation of long-term energy strategies. Based on an analysis of complex interactions between economic, social, energy, and environmental issues, the study shows that the initial rise in energy prices due to subsidy reforms will nudge households and businesses to shift to alternative fuels and to adopt energy-efficient appliances. Using the money freed up from subsidies to compensate poor households and to increase government budgets will cancel out the negative effects of the initial price rise. These changes should allay the fears of reform.

The study measures actual subsidies such as direct transfers, tax exemptions, subsidized credit, and losses of state enterprises by different fuel types. This information should help countries better sequence and prioritize reforms. The study contributes to the international and national effort to develop knowledge to ensure reforms are well-planned, sustainable, and politically acceptable. We hope the findings of this study will promote further discussion and sharing of knowledge on the best ways to anticipate the impacts of fossil fuel subsidy reform. This can help ensure that subsidies are not simply removed, but that the funds they release are put to best use in helping the poor cope with the changes.

Shang-Jin Wei
Chief Economist and Director General
Economic Research and Regional Cooperation Department
Asian Development Bank

Acknowledgments

This project was led by Shikha Jha of the Asian Development Bank's (ADB) Economic Research and Regional Cooperation Department. She prepared this publication with a team from the Global Subsidies Initiative of the International Institute for Sustainable Development (GSI) comprising Peter Wooders, Christopher Beaton, and Tara Laan of GSI; Andrea Bassi of KnowlEdge; and Kerryn Lang, formerly of GSI. This study draws on a report for ADB by GSI and related background material. Pilipinas Quising of the Economic Research and Regional Cooperation Department, supervised technical and research support and coordinated project administration.

This study draws on modeling exercises and background material prepared by Lucky Lontoh, independent consultant; Nataliawati Siahaan, Friga Siera Ragina, and Sukma Sepriana, Indonesian Institute for Energy Economics; Tri Widodo, Rimawan Pradiptyo, Adji Pratikto, and Timotius Hendrik Partohap, Faculty of Economics and Business, University of Gadjah Mada; Eva Alexandri, Alicia Higson, Hector Pollitt, and Phil Summerton of Cambridge Econometrics; and Deb Chattopadhyay of the World Bank. David Coady of the International Monetary Fund and Stephen Howes of the Australian National University provided insightful comments on previous drafts as external peer reviewers and enriched the quality of the publication. Special thanks for detailed comments are due to Masami Kojima and Denis Medvedev of the World Bank, and James Docherty of the Overseas Development Institute. The study team received helpful advice on identifying social safety net systems in Indonesia from Ari Perdana, National Team for the Acceleration of Poverty Reduction (TNP2K), Indonesia; and Ahya Ihsan and Matt Waipoi, Poverty Team, World Bank Jakarta Office. The publication also benefited from a discussion of its preliminary findings at international forums. In 2014, these were a mid-term project workshop in Indonesia and at the ADB Asia Clean Energy Forum in Manila; the Asia and the Pacific Policy Society Conference at Australian National University to inform Group of Twenty leaders, an event on the sidelines of the World Bank–International Monetary Fund fall meetings; and the International Atlantic Economic Society annual conference in Savannah, Georgia—and in 2015, at the International Energy Agency workshop on Fossil Fuel Subsidies Reform held in Indonesia.

Elenita Pura, with backing from Victoria Lacio and Emmanuel Alano, provided logistics support. Alastair McIndoe and Eric Van Zant did the manuscript editing, and layout and graphic design was by Edith Creus. The report would not have been possible without the cooperation of the Publishing Team of the Department of External Relations and the Logistics Management Unit of the Office of Administrative Services at ADB.

Abbreviations

ADB	–	Asian Development Bank
BAU	–	business as usual
BOE	–	barrel of oil equivalent
CO_2	–	carbon dioxide
E3MG	–	energy-environment-economy model at a global level
FY	–	fiscal year
GDP	–	gross domestic product
GWh	–	gigawatt-hour
LPG	–	liquefied petroleum gas
MARKAL	–	market allocation model
ODA	–	official development assistance
OECD	–	Organisation for Economic Co-operation and Development
RON	–	research octane number
Rp	–	rupiah
SAM	–	social accounting matrix
VA	–	volt-ampere

1 Introduction

Indonesia provides subsidized energy to its citizens as a public service obligation. The rationale is that citizens should benefit from domestic production of oil, coal, and other energy sources through their cheap prices. State-owned enterprises perform this function and the government reimburses them for the resulting losses. Fuel subsidies were more manageable when Indonesia was a net exporter of petroleum products and low domestic prices represented only an opportunity cost to the government rather than explicit fiscal expenditure. But because declining production and growing energy demands have necessitated imports, the subsidy burden has transferred to the budget.

Rising oil prices since the mid-2000s have added to the extreme budgetary pressure from fuel subsidies, which at times have risen to over 20% of total government expenditure in Indonesia (World Bank 2007). In 2013, the revised national budget allocated 17% of total government expenditure to fuel and electricity subsidies (Lontoh, Clarke, and Beaton 2014). Electricity prices are also capped, leading to major costs for the government and losses for state-owned electricity companies. In the months prior to the publication of this report, Indonesia has seen dramatic changes in its subsidy policy. Gasoline and diesel prices were increased by nearly 40% in November 2014, and as of January 2015, the government announced it would fully remove the subsidy on gasoline and introduce a “fixed” subsidy on diesel. Here, domestic diesel prices are allowed to fluctuate, with a fixed gap from international prices of 1,000 rupiah (Rp).

These policy changes are a tremendous step forward for Indonesia, eliminating and drastically reducing the two largest fossil fuel subsidies. But they do not necessarily spell the end of a subsidy problem that the country has been grappling with for over a decade. In recent subsidy reform, the government took advantage of a window of opportunity following elections in 2014 and world oil prices falling to their lowest level since 2009 to remove the subsidy on gasoline, and this actually resulted in lower domestic gasoline prices. In 2015, the revised February budget indicated total subsidy costs of under $8 billion. For 2016, energy subsidies included in the budget are less than $4 billion. The challenge for the future will be sustaining these reforms once political and market conditions change. Moreover, Indonesia still has significant subsidies for electricity and other petroleum fuels in place.

Fossil fuel subsidies are, of course, a prominent feature of many Asian economies and not just Indonesia. These can be categorized either as consumer subsidies, benefiting users such as transport and manufacturing industries and electricity generation; and producer subsidies to lower costs for producers involved in the exploration, extraction, or processing of energy products. The subsidies contribute to fiscal imbalances in many countries and increased operating losses for utilities. Fossil fuel subsidies have other unintended negative consequences. They restrict public expenditure on development priorities such as education, health, and infrastructure; are an expensive means of supporting low-income households; and encourage excessive consumption through low energy prices which increases air pollution and greenhouse gas emissions. The need to reform fossil fuel subsidies is increasingly recognized, with international and national commitments to phase out inefficient subsidies.

The objective of this study is to systematically assess the prevalence of different types of fossil fuel subsidies in Indonesia and analyze the potential impacts of their removal. It is hoped that this will provide detailed inputs for the ongoing efforts to reform the subsidies.

The following section provides an overview of the energy sector in Indonesia. Section 3 presents new estimates of fossil fuel subsidies. These go beyond the standard method of calculating the gap between a reference or cost price and final consumer price to an approach that allows quantification of different types of subsidy. Section 3 also presents the economic, energy, and environmental impacts of reforming fossil fuel subsidies. Section 4 discusses the need for shielding the poor against the potential rise in energy prices, and section 5 presents a summary of the findings.

2 Overview of the Energy Sector

Indonesia's primary energy demand almost doubled between 1990 and 2008 (Olz and Beerepoot 2010). Fossil fuels account for 71% of total primary energy consumption: petroleum (30%), coal (22%), and natural gas (19%) (US Energy Information Administration 2013). Traditional biomass and renewables comprise the remaining 29% of energy consumption. These are important fuels for the residential sector, particularly in remote communities that lack access to distribution networks. [1]

Resources and Market Structure

Indonesia is a major producer of fossil fuels. It is the world's largest exporter of coal by weight, a leading exporter of natural gas, and, until 2004, was an oil exporter. At current rates of extraction, Indonesia's oil reserves are expected to last about 11 years, coal 14 years, and natural gas 40 years (US Energy Information Administration 2013; LEMIGAS 2012).

State-owned enterprises play a major role in Indonesia's energy market. A separation of upstream and downstream activities was introduced in November 2001. Before 2001, state-owned petroleum company PT Pertamina had a monopoly in all areas of the oil and gas industry. Since the passage of the Oil and Gas Act of 2001, a legal entity cannot operate at both levels. PT Pertamina now has subsidiaries that operate in the upstream and downstream sectors. The upstream sector includes oil, gas, and geothermal exploration and production. PT Pertamina accounts for some 17% of domestic crude and condensate production and 12% of gas production (US Energy Information Administration 2013). Several international oil companies—in particular Chevron, Total, ConocoPhillips, ExxonMobil, and BP—account for the majority of oil and gas production. PT Pertamina's monopoly in the downstream sector was revoked in 2004, but it is still engaged in these activities, including refining, processing, shipping, marketing, and trading. A subsidiary manages PT Pertamina's retail segment.

State-owned PT Perusahaan Gas Negara dominates the transmission and distribution of natural gas. The company operates about 6,000 kilometers of transmission and distribution pipelines for natural gas, primarily connecting the main cities in Sumatra and Java, as well as Singapore (PT PLN 2012b). PT Perusahaan Gas Negara is working with PT Pertamina to build a floating storage and regasification terminal in West Java to supply liquefied natural gas from East Kalimantan (Ministry of Energy and Mineral Resources 2009). The government holds a 57% stake in PT Perusahaan Gas Negara (PT Perusahaan Gas Negara, n.d.). Approximately half of Indonesia's gas production is currently exported.

Domestically owned or majority state-owned companies account for the largest share of Indonesia's coal production (Lucarelli 2010). Two state-owned companies operate in coal, PT Bukit Asam and

[1] Annexes 1 and 2 provide detailed inventories of consumer and producer subsidies in Indonesia.

PT Aneka Tambang. The first specializes in coal; the second is a general mining company that has a coal subsidiary, PT Indonesia Coal Resources. According to Government Regulation No. 42/1980, PT Bukit Asam's main mission is to reduce oil consumption by increasing production and use of coal.

Electricity policy, regulation, supervision, and delivery are managed by the central and local governments. PT Perusahaan Listrik Negara, the state-owned national electricity company, manages the majority of electricity generation and distribution, but the Electricity Law of 2009 also provides for private firms, cooperatives, and self-reliant communities to participate in the electricity supply business.

Prices, Taxes, and Support Mechanisms

PT Pertamina and PT Perusahaan Listrik Negara perform a public service obligation to provide citizens with subsidized energy. Over the past decade, fuel and electricity prices have been highly regulated, with prices for households, the transport sector, and small businesses kept below market levels for electricity and selected petroleum products—namely, kerosene, automotive diesel for transport, premium gasoline (RON 88), and small liquefied petroleum gas (LPG) cylinders. The government determines the retail price of subsidized fuels, but price changes are ad hoc. The amount of subsidy provided to fuel distributors is subject to parliamentary approval. Following reforms in January 2015, the subsidies on RON 88 are supposed to be permanently removed, but with the government announcing new prices month by month. This implies the potential for subsidies to continue in months where world prices rise before domestic prices have been adjusted. It is also unclear whether the government would be willing to continue increasing prices if there is a sudden increase in world oil prices. The main distributor of subsidized fuels is PT Pertamina, although the private sector also distributes a small volume. Industrial consumers can no longer access subsidized fuels.

The main consumer subsidy for electricity is capped prices, provided through PT Perusahaan Listrik Negara and compensated from national budget allocations. PT Perusahaan Listrik Negara's business includes electricity generation, transmission, and distribution, as well as the provision of related infrastructure. Subsidies for the upstream electricity supply chain are provided by soft loans and loan guarantees to PT Perusahaan Listrik Negara, exemptions to the 15% import duty for capital equipment for electricity generation, and subsidized fuel for diesel-powered generators. Soft loans and loan guarantees provide valuable subsidies. The former carry a lower interest rate compared with commercial lending and frequently involve a grace period in which PT Perusahaan Listrik Negara only pays interest on the loan for the first part of the term. Loan guarantees, meanwhile, reduce risk for lenders and therefore result in lower interest rates. Government funding for research and development for PT Perusahaan Listrik Negara was announced in the 2010 budget, but no evidence could be found that the funds were dispersed.

Electricity generation companies do not receive preferential prices for fuel. Although supplied from other state-owned companies, PT Perusahaan Listrik Negara buys all fuels at going rates (which is subsidized in the case of diesel). Examples are the supply of diesel fuel from PT Pertamina, gas supply from PT Perusahaan Gas Negara, and the supply of coal from PT Bukit Asam. At times, PT Perusahaan Listrik Negara has been late in paying PT Pertamina for fuel. When this happened, the government paid PT Perusahaan Listrik Negara's liability to PT Pertamina and reduced the subsidy payment to PT Perusahaan Listrik Negara accordingly.

3 The Size of Fuel Subsidies and Impact of Their Reforms

Estimating Subsidies

Most governments do not systematically account for fossil fuel subsidies. Lack of publicly available data makes it hard to estimate subsidies accruing to energy producers. The available estimates of fossil fuel subsidies for developing countries, therefore, relate largely to subsidies on consumption. To develop a comprehensive inventory of subsidies in Indonesia, the scope of consumption subsidies in this study included all fossil fuels and electricity. The electricity system was selected to examine energy producer subsidies in the country as it is an important area of the upstream energy supply chain.

The standard method of estimating consumer subsidies is a top–down approach, which estimates the price-gap by comparing average domestic retail price to a benchmark price that reflects the full cost of supply. Such a price difference, however, produces only an aggregate estimate of overall subsidies for an energy product. It does not provide information useful for designing and implementing reforms on the ground. In contrast, this study employed a bottom–up approach, based on a World Trade Organization definition which captures transfers created by specific policies, such as the direct transfer of funds or liabilities; foregone revenue (for example, tax holidays and duty exemptions); losses from state-owned energy companies; below-market-price-provision by government; and credit support. This bottom–up approach is similar to that used by the Organisation for Economic Co-operation and Development (OECD) for its inventory of estimated budgetary support and tax expenditures relating to the production or use of fossil fuels in its member countries (OECD 2013).

Table 1 compares the various estimates of fossil fuel subsidies in Indonesia in 2012. Our estimates are slightly higher than government figures primarily because our inventory identified and quantified some subsidies, which are not reflected in the budget such as tax exemptions, loan guarantees, and credit subsidies. On a pretax basis, estimates by the International Energy Agency and the International Monetary Fund—which are based on the price-gap approach—are lower than the estimates produced by a bottom–up approach in the inventory or official government estimates.

Table 1: Comparison of Estimates of Fossil Fuel Consumer Subsidies ($ million)

Fuel	ADB (2012 data)	Government[a] (2012 data)	IEA (2012 data)	IMF[b] (2011 data)	
				Pretax	Posttax
Petroleum	24,595	22,683	21,000	21,879	32,782
Coal	0	0	0	0	3,951
Natural gas	373	374	0	480	2,500
Electricity	11,034	11,034	5,500	5,560	6,085
Total	**36,002**	**34,090**	**26,500**	**27,919**	**45,318**

ADB = Asian Development Bank, IEA = International Energy Agency, IMF = International Monetary Fund.

Note: Totals may not add up due to rounding.

[a] Includes all government estimates.

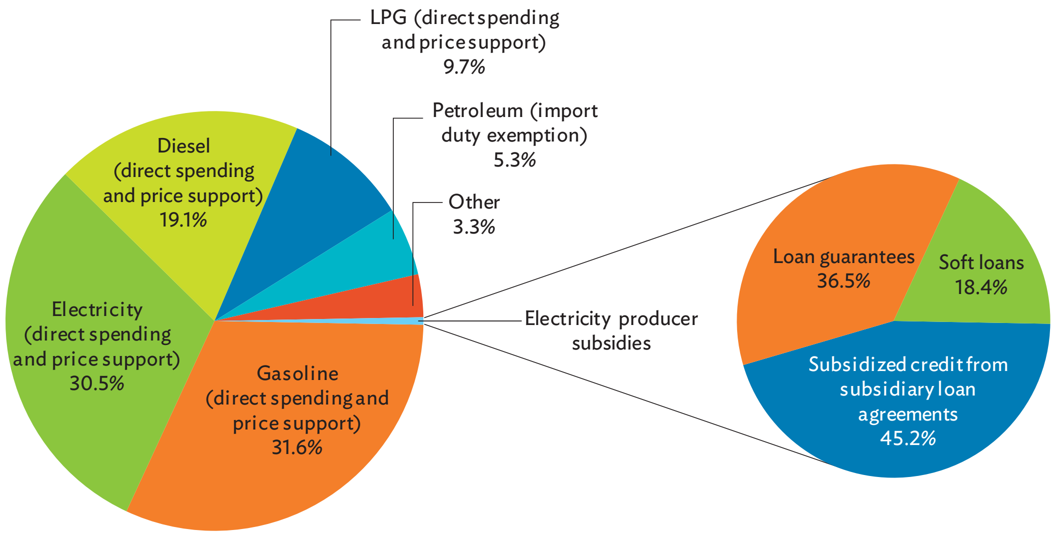
[b] The IMF distinguishes between pretax and posttax subsidies. A pretax subsidy is the difference between the cost of supplying energy and the price paid by users. Tax subsidies include efficient taxation to reflect both revenue needs and the cost of adverse effects caused by energy users such as the cost of roads and air pollution caused by vehicle users. A posttax subsidy is the sum of all pretax and tax subsidies.

Source: Authors.

The vast majority of the fossil fuel and electricity subsidies quantified in the inventory for Indonesia are consumer subsidies arising from price caps for petroleum products and electricity (Figure 1). Significant decline and variations in world oil prices may lead to lower subsidy estimates in 2015, but without policy change this would be expected to simply rise again when world oil prices rise. The amount of subsidies provided to fuel distributors and electricity suppliers (primarily government-owned enterprises) is subject to parliamentary approval. The subsidy budget is continually revised based on projected and actual costs, and, as a result, subsidies remain a constant fiscal and economic pressure for the administration.

Producer subsidies are notoriously difficult to quantify and Indonesia's upstream subsidies for electricity are no exception. The low rate of electrification is partly a problem of geography: many islands, seismically active mountains, and dispersed populations impede an interconnected electricity grid. Heavily subsidized electricity prices have discouraged private investment, resulting in poor electricity infrastructure and intermittent supply. Low access to electricity and weak infrastructure leads to poor service, including power outages, restrictions on usage, and fluctuations in quality (IEA 2008). The direct payments of consumer subsidies to PT Perusahaan Listrik Negara are well-documented. This study examined upstream subsidies for electricity because the sector was underperforming in grid coverage and quality of supply. The aim was to assess whether upstream subsidies for electricity were reducing or exacerbating this problem. Of the eight subsidies identified, only five could be quantified (and then only for some years). Quantified subsidies included low interest loans and loan guarantees, and the exemption of import duty on goods and materials used in power generation. Subsidies not quantified included tax breaks and domestic market obligations.

Figure 1: Major Quantified Fossil Fuel Subsidies to Producers and Consumers, 2012



LPG = liquefied petroleum gas.

Note: Total quantified subsidies in Indonesia were $36.2 billion in 2012. The larger of the two charts shows the major consumer subsidies, with the “other” category comprising three subsidies, each amounting to less than 2% of total subsidies. The smaller chart shows quantified subsidies to electricity producers.

Source: Authors.

Impacts of Fossil Fuel Subsidy Reforms

The choice of a model to assess the impacts of reforming fossil fuel subsidies is not obvious. No clear best model exists because the impacts are complex. Different models can offer more or less detail on how specific sectors and groups within an economy are affected. Models that are in regular use by governments are typically designed to study a simple set of reforms. Models that can capture a wider set of impacts at a higher level of disaggregation—such as system dynamics models like the Green Economy Model and the World Bank’s ENVISAGE computable general equilibrium (CGE) model—are not commonly used by most governments in Asia.

Since one of the goals of this study was to evaluate the strengths and weaknesses of readily available modeling tools, it adopted a multipronged approach using not one but three modeling frameworks that governments commonly use. This gave a fuller picture of subsidy reform impacts, drawing impacts from each model at the same time as experimenting with a greater range of models. For all models, it was assumed that only a limited degree of adaptation was possible, which reflected the real-world likelihood that the implications of an impending price increase are often commissioned at short notice.

A three-model approach was used to assess the impacts of reform: social accounting matrix (SAM) model to capture short-term impacts on the economy and households, a market allocation model (MARKAL) to capture short- to long-term impacts on the energy system and emissions, and a macroeconomic model to project long-term impacts. The macroeconomic model used in Indonesia was the energy-environment-economy model at a global level (E3MG) developed by Cambridge Econometrics (the macro model). Each model has its strengths and weaknesses, but together they provide a more comprehensive picture of the impacts of fossil fuel subsidy reform (Annex 3).

SAM allows large disaggregation of sectors but limited substitutability in production and consumption. MARKAL can handle detailed breakdowns of the energy system. The macroeconomic model incorporated behavioral responses of consumers and producers in more aggregated sectors than the social accounting matrix and projected long-term reform impacts.

For all these models, two main scenarios were explored: "business as usual," in which no policy change takes place; and "subsidy removal," in which all quantified subsidies are eliminated (Table 2). Two subscenarios were considered under the subsidy removal scenario: a "vulnerability scenario" and a "reallocation scenario." The vulnerability scenario assumes that subsidies are removed and the saved expenditure is entirely withdrawn from the economic system. This is clearly an unrealistic scenario, but it isolates which groups of households and businesses are most likely to be affected in the short term by a price shock before the impacts of reallocated savings are felt.

The reallocation scenario is again split into several subscenarios that explore how subsidy savings could be redistributed across households and general government expenditure, as outlined in Table 2. Under the subsidy reallocation scenario, three alternative uses of the fiscal resources freed up from subsidy reduction were examined. In scenario 2B(a) in Table 2, for the social accounting matrix, the bottom 40% of households by income distribution were fully compensated through cash transfers for the increased cost of living caused by subsidy reform. The remaining savings were reallocated or transferred to the government budget to increase expenditure across sectors in the same proportion as in the existing budget. The macroeconomic model was not structured to project any impacts from increased government expenditure, so it was assumed in this model that the remaining savings were used to pay down deficits. Scenario 2B(b), for the subsidy reallocation scenario, differs from scenario 2B(a) in that all households are fully compensated, instead of just the bottom 40% by income distribution. The third scenario 2B(c), for the subsidy reallocation scenario, is the same as scenario 2B(b) except that instead of increasing the government budget, all subsidy savings are reallocated back to households in the form of lower tax. This scenario was conducted for the macroeconomic model only. Due to the different structures of the various models, not every subscenario could be explored by every model.

These scenarios were intended to identify vulnerable groups and potential impacts on households, the economy, and the environment once all fossil fuel subsidies were eliminated and the saved funds reallocated. Assumptions about future economic and social trends were based on outlooks for economic growth, population, and energy prices.

The future baseline growth of gross domestic product (GDP) is based on the projections included in the International Monetary Fund's *World Economic Outlook*, national development plans, and economic growth expectations. Population projections are based on data from the United Nations Department of Economic and Social Affairs using medium-variant estimates. Assumptions on the projected growth of fossil fuel prices are based on the International Energy Agency's *World Energy Outlook 2012* and

Table 2: Scenarios of Removing Fossil Fuel Subsidies

		Models
1. Business as usual	BAU: Existing subsidies are maintained; no policy change takes place	All
2. Full removal of all subsidies	A. Vulnerability scenario: Savings from subsidy are withdrawn from the system and not reallocated.	All
	B. Reallocation scenarios: Savings from subsidy are reallocated or injected back into the economy.	
	a) Bottom 40% of households fully compensated; government expenditure increased	SAM
	b) All households fully compensated; government expenditure increased	SAM, Macro
	c) All subsidy savings reallocated to all households through tax reduction	Macro

BAU = business as usual.
Source: Authors.

Current Policies Scenario. For Indonesia, assumptions used in projections include: GDP growth (5.0%), population growth (0.8% average), and fossil fuel price growth (2.2% average).[2]

Assumptions were also made about the nature of subsidies to simplify the analysis: all subsidies were taken to be "on budget" and, as such, subsidy reform was assumed to increase government budgets by the amount of the quantified subsidies, which in 2012 were estimated to be Rp339.1 trillion ($36.2 billion).[3] [4] It was also assumed that consumers paid official prices before reforms took place. This kind of complex relationship was not captured in the models. Changes to the supply of energy after reform were not taken into account in the macroeconomic projections. Annex 4 summarizes the main characteristics of the models and scenarios used to assess the impacts of the removal of energy subsidies.

All impacts are measured as a percentage change from scenario 1 (business as usual). Generally, the removal of large consumer subsidies for widely used energy sources can be expected to have a significant impact across areas as varied as government finances, the economy, consuming sectors (households, businesses, and industry), energy supply, the environment, and governance.

The following subsections present the impacts estimated from the models. The results were highly dependent on model assumptions and methodologies. Both the social accounting matrix and macroeconomic models concluded that reallocating a greater proportion of savings to households would deliver more positive results than allocating a greater proportion to government budgets. These results are due to structural assumptions in these models on the important role played by wealthier

2 Indonesia has a law preventing the budget deficit from exceeding 3% of GDP. For the sake of simplicity and comparability between scenarios, this law was not taken into account in the business-as-usual scenario.

3 In reality, some subsidies would not be fully returned to the government budget, such as losses by state-owned energy companies or opportunity costs. Market-based pricing would benefit government budgets by removing the need to compensate for such losses or under-recoveries and by dividends flowing from profit-making entities. But these benefits might not equal the size of the original losses or opportunity costs, as state-owned companies would be expected to keep some returns to reinvest. For partially privatized state-owned enterprises, profits would be distributed to other shareholders.

4 To conduct the modeling, the 2012 value of the subsidies was converted to a sum that was the same proportion of GDP for the baseline year of each model (see Annex 5). For example, if total quantified subsidies were equal to 3% of GDP in 2012 but the baseline year of the model was 2010, then the model estimated the removal of subsidies equal to 3% of 2010 GDP.

households in stimulating economic demand, and the relative effectiveness of household expenditure in stimulating economic growth, compared to government expenditure or debt reduction. In particular, the structure of the macroeconomic model included no relationship between increasing government expenditure or reducing debt and impacts on GDP or welfare.

On Government Finances

The results for all the scenarios are presented as differences from business as usual. As Table 3 shows, compensation to households in the SAM model analysis redistributed between 7% (bottom 40% of households only) to 49% of subsidy savings (all households).[5]

Table 3: Subsidy Savings and Reallocation to Households in the SAM Model

Scenario *	Subsidy reduction (Rp trillion)	% Share of subsidy savings reallocated to households	% Share of subsidy savings reallocated to government expenditure
2A. Vulnerability scenario: No reallocation	339.1	0	0
2Ba. Bottom 40% of households compensated; government expenditure increased	339.1	7	93
2Bb. All households compensated; government expenditure increased	339.1	49	51
2Bc. All subsidy savings reallocated to all households through their tax reduction	339.1	100	0

SAM = social accounting matrix.

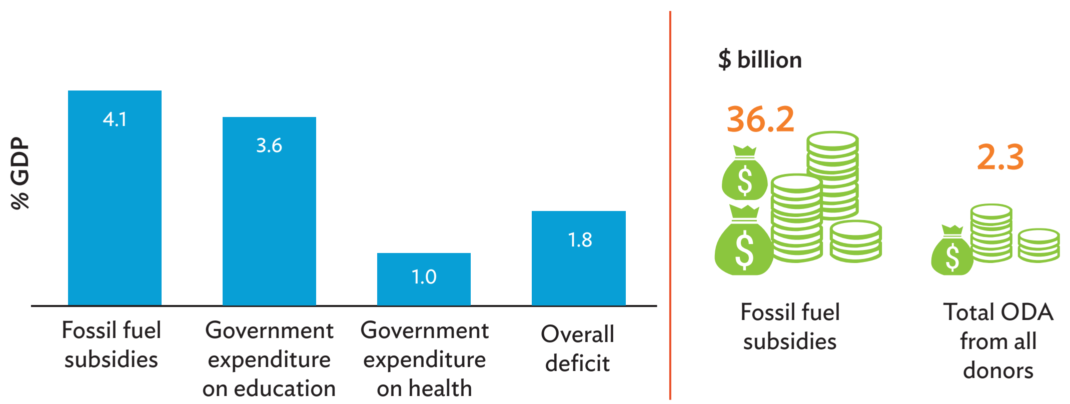
* See Table 2.

Source: Authors.

Compared with other items of expenditure, the scale of funds that would be liberated is significant, exceeding public expenditure on education and health. The sum is more than twice Indonesia's 2012 budget deficit and represents an enormous potential flow of funds for development, greater than 15 times the value of official development assistance in 2012 (Figure 2).

5 All rupiah–dollar conversions for 2012 are made at a rate of Rp9,365 per $1.

Figure 2: Fossil Fuel Subsidies Compared to Other Expenditure and ODA, 2012



GDP = gross domestic product, ODA = official development assistance.

Sources: ADB, Statistical Database System; OECD, International Development Statistics; World Bank, Data.

On the Economy

In the SAM model, the oil and gas sector is responsible for a significant share of Indonesia's GDP in the model's 2008 baseline year. To illustrate its impacts, a special scenario was run for the SAM model. Here, savings that remained after household compensation were transferred directly to economic sectors in a share proportionate to each sector's contribution to GDP instead of to government expenditure. This resulted in net positive impacts on GDP of 0.7% when all households received transfers and 1.0% when transfers were only provided for the bottom 40% of households (Table 4). This scenario was not considered representative of a specific realistic policy intervention, but rather was used to illustrate the potential scale of impact that could result from stimulating economic sectors at the same time as household consumption.

Table 4: Key Projected Macroeconomic Impacts

	SAM model (2012)		macro model (2020)	
	2B. Special scenario: Reallocation to all households, remainder to economic sectors	2B. Special scenario: Reallocation to bottom 40%, remainder to economic sectors	2Bb. All households compensated; government expenditure increased	2Bc. All subsidy savings reallocated to all households through their tax reduction
GDP	0.7	1.0	-0.09	0.27
Consumer price inflation	–	–	3.15	3.18
Exports	–	–	0.02	0.03
Imports	–	–	-0.41	-0.17

– = not estimated, GDP = gross domestic product.

Source: Authors.

The macro model projected a very modest impact of reforms on GDP, projecting marginally negative impacts of 0.09% when all households were compensated only for direct impacts and a positive GDP impact of 0.27% when all households were fully compensated.

Consumer price inflation was projected to be about 3.2% higher than in the business-as-usual scenario by 2020 and 2.7% higher by 2030 (not shown in Table 4). This translates into a relatively small increase to year-on-year inflation as a result of reform.

The trade balance was expected to improve slightly in all the scenarios due to reduced imports of fossil fuels. Exports are expected to increase slightly in 2020 compared to the baseline, but projected to decline and realign with the business-as-usual scenario over the longer term due to a loss of competitiveness in energy-intensive sectors.

The results of this analysis are generally consistent with the literature. Most of the studies reviewed project positive economic impacts from the removal of fuel subsidies when savings are reallocated to compensate for negative impacts. In particular, the net gains are forecast to range between 0.1% and 2.0% of GDP under different scenarios and time frames (Anand et al. 2013; Benitez and Chisari 2010; IEA 1999; CSIS 2011; Ellis 2010).

Some studies project a decline in GDP, mostly driven by a decrease in private consumption, imports, and overall economic performance, especially when the reallocation of all subsidy savings is not considered (Dartanto 2013; Widodo et al. 2012; Clements, Jung, and Gupta 2007).

On the other hand, contrary to other studies, the reallocation scenarios simulated by the macro model (compensating only for the direct impact of subsidy removal on households) do not seem to fully offset the impacts of subsidy removal, unless all subsidy savings are reallocated to households as compensation and tax reductions. The relatively large share of savings required to stimulate economic growth via household consumption suggests that cash transfers may not be the most effective way to invest in long-term macroeconomic growth and its consequent returns for household welfare. Analyzing the case of Yemen, Breisinger, Engelke, and Ecker (2011) projected that the most favorable impacts on GDP and household welfare could be achieved by combining cash transfers with investments in economic drivers such as trade, transport, and telecommunication infrastructure.

Burniaux et al. (2009) adopt an interesting analytical perspective on the economic impacts of subsidy removal. The authors simulate two alternative scenarios: multilateral removal, under which fuel subsidies are removed worldwide; and unilateral removal, under which countries decide to remove subsidies individually. The study concludes that oil-producing countries, including Indonesia, would derive economic benefits amounting to 0.5% of GDP by 2050 from the unilateral removal of fossil fuel subsidies, primarily due to higher exports. Under the second scenario, countries would experience a GDP reduction of 4.2% by 2050 from the multilateral removal of the subsidies from the fall in international fuel prices, reducing their earnings from crude exports. Similarly, real income in oil-producing countries would increase by 21.0% by 2050 under the unilateral removal scenario, but decline 4.5% by 2050 under a multilateral subsidy removal scenario. Indonesia's domestic production of crude has declined significantly since this study was conducted, so it is not clear if this finding would still hold today.

On Households

The vulnerability analysis—identifying the groups most affected by subsidy reform before any savings were reallocated—found that increased prices could reduce households' effective incomes by between 4.38% (SAM model) and 0.77% (the macro model) (Table 5). The SAM model projected that transferring a share of savings to households and a share of savings to government expenditure would more than offset these impacts for all household groups. Surprisingly, all households were projected to be better off under the scenario in which cash transfers were made to only the bottom 40%. This was because multipliers in the model associated significant benefits to household income from increased government expenditure.

Table 5: Impacts on Household Welfare in the Vulnerability and Reallocation Scenarios
(% change from the business-as-usual scenario)

Variable	SAM model (2012)			Macro model (2020)		
	2A. Vulnerability scenario	2Ba. Bottom 40% of households compensated; government expenditure increased	2Bb. All households compensated; government expenditure increased	2A. Vulnerability scenario	2Bb. All households compensated; government expenditure increased	2Bc. All subsidy savings reallocated to all households through their tax reduction
Household consumption	-4.38	4.76	2.11	-0.77	-0.49	0.37
Real disposable income	...	...	...	-2.51	-1.71	0.90
Employment	...	...	...	-0.10	-0.03	0.15

... = no data available.
Source: Authors.

The macro model analysis projected that compensating all households for only the direct effects of higher fuel prices would not be sufficient to completely reverse the negative impact of reform on consumption, real disposable income, or employment unless all savings were reallocated to households. The impact of subsidy removal on employment was projected to be negative at the macro level, but reallocation of subsidy savings was projected to reduce such impacts and contain employment reduction (or reverse it in the case of reallocation of all subsidy savings to households).

An analysis of distributional impacts from the SAM model projected that urban households would be hit harder than rural households, and that richer urban households and those headed by self-employed, highly skilled persons would experience the highest absolute impact on income (Table 6). In the vulnerability scenario, increased prices would decrease incomes of the poorest—an aggregate group of households intended to approximate the bottom 40%—by 1.6%. This is probably because the poorest consumers cannot afford to purchase much fossil energy.

Table 6: Projected Distributional Impacts of Subsidy Reform and Compensation on Household Real Incomes, Macro Model (% change from baseline by 2020)

Sectors			2A. Vulnerability scenario	2Ba. Bottom 40% of households compensated; government expenditure increased	2Bc. All subsidy savings reallocated to all households through their tax reduction
Agriculture		1. Workers	0.0	2.5	1.6
		2. Self-employed	0.0	3.4	1.5
Nonagriculture	Rural	3. Self-employed, low-skilled occupations[a]	-0.2	2.5	1.2
		4. Active labor force, not self-employed and other	-0.3	4.0	1.9
		5. Self-employed, skilled occupations[b]	-3.0	6.7	2.9
	Urban	6. Self-employed, low-skilled occupations[a]	-0.5	3.5	1.6
		7. Active labor force, not self-employed and other	-0.1	4.7	2.1
		8. Self-employed, skilled occupations[b]	-1.8	7.9	3.4
All rural			-3.8	3.9	1.8
All urban			-5.7	5.2	2.3
Bottom 40%[c]			-1.6	3.0	1.5

[a] The self-employed, low-skilled occupation group includes households whose heads are in positions such as administrative personnel, itinerant traders, and self-employed sectors of transport, personal services, and unskilled laborers.
[b] The self-employed, skilled occupation group includes households whose heads are employers, managers, in the military, professionals, technicians, teachers, administrative workers, and high-income entrepreneurs.
[c] The bottom 40% was approximated by taking aggregate impacts on groups 1, 3, and 6.

Source: Authors.

The distributional impacts of subsidy reform were also estimated based on a combination of the macro model and more detailed information on consumer expenditure and income patterns by household group taken from the SAM model analysis. The detailed SAM model data allowed for further disaggregation of the impact of subsidy reform by looking at expenditure patterns and, in particular, the proportion of expenditure each household group spends on energy and energy-related goods.

Table 7 summarizes the impacts of subsidy reform and compensation methods on household real incomes. It compares the outcomes of the vulnerability analysis and reallocation to households. The vulnerability analysis shows that the largest impact would be on the active labor force (groups 4 and 7), with slightly stronger effects on the urban group. Rural households headed by nonagricultural, self-employed individuals were also projected to suffer a fall in real disposable income of about 5%. These results reflect the relatively large share of energy in total household expenditure among these groups compared to others. The removal of subsidies was expected to have a limited impact on households headed by agricultural workers and the self-employed (groups 1 and 2), as these two groups dedicate the smallest share of total household expenditure to energy.

Table 7: Impact of Subsidy Reform and Compensation Methods on Household Real Incomes in 2020 (%)

Scenario	Agriculture		Rural			Urban		
	Group 1: Workers	Group 2: Self-employed	Group 3: Self-employed, low-skilled	Group 4: Active labor force, not self-employed and other	Group 5: Self-employed, skilled	Group 6: Self-employed, low-skilled	Group 7: Active labor force, not self-employed and other	Group 8: Self-employed, skilled
2A. Vulnerability scenario	1.6[a]	-1.1	-3.1	-5.5	-5.2	-1.6	-6.6	-3.2
2Ba. Bottom 40% of households compensated; government expenditure increased	-1.1[b]	-1.1	-1.12[b]	-5.5	-5.2	-1.1[b]	-6.5	-3.2
2Bb. All households compensated; government expenditure increased	4.8	0.2	-2.0	-4.4	-4.8	-0.8	-5.8	-2.8

[a] Agricultural workers are projected to experience a net increase in disposable income even without reallocation as the impacts of reform are expected to increase nominal wages to an extent that outweighs the increase in prices.

[b] The bottom 40% is made up of groups 1, 3, and 6. In the scenario that only compensated these groups, a single impact was projected for this group as a whole (-1.1%).

Source: Authors.

Where all households were compensated for the direct impact of higher prices, rural agricultural households were expected to benefit the most. For most groups, the level of compensation was not enough to mitigate the impacts of the subsidy removal. The inclusion of indirect impacts would have further ameliorated the impact of reform on households.

Although the results show a slight improvement of real income for the bottom 40%, this group would likely be better off under the general compensation scheme. This is mainly a result of the distribution of fuel dependency experienced by households headed by nonagricultural rural self-employed persons in low-skilled jobs (group 3) relative to the low-fuel dependency of agricultural workers (group 1). When all households are compensated, the economy grows more due to higher demand, primarily pushed by middle-income household groups. With higher demand, the sectors in which the bottom 40% will gain more than in the scenario in which they are the only ones to be compensated.

Almost all other studies that model the effect of fossil fuel subsidy reform in Indonesia agree on the need to reallocate subsidies to households, especially to the most vulnerable segments of the population. Similarly, most studies warn that subsidy removal without any compensation for the poor would lead to an increase in poverty compared with the business-as-usual scenario (World Bank 2012c, 2013a; Yusuf and Ramayandi 2008; Del Granado, Coady, and Gillingham 2010; Agusta 2007). Most studies conclude that subsidy reallocation programs would reduce poverty in

Indonesia compared to the business-as-usual scenario, though with point estimates within a large range of between 1% and 15%, depending upon the assumptions of the exercise conducted (Chung 2013; Yusuf 2013; Widjaja 2009).

For the options available to reallocate subsidy savings, Pradiptyo and Sahadewo (2012) conducted a survey in low-income households in Yogyakarta and found that the majority of respondents preferred gradual removal of subsidies and reallocation to targeted government programs (for example, immunization and public transportation) rather than instant removal and reallocation to general government expenditure. Preferences for a reallocation via a cash transfer were not considered.

Some studies argue that the social impacts of removing fossil fuel subsidies largely depend on the type of fuel covered, as well as on the different policy implementation options. Yusuf and Ramayandi (2008) and Vagliasindi (2012a) conclude that the impact on both rural and urban poverty is significantly lower if subsidy removal does not include kerosene, as many poor still heavily rely on kerosene for their basic energy needs.

On Businesses and Industry

The vulnerability analysis of businesses and industry in the SAM model indicated that the energy sector would be significantly affected in the short term. The withdrawal of subsidies for liquid petroleum fuels was responsible for most of the projected 24% decline in oil and gas production; and the reform of subsidies related to electricity was responsible for most of the projected 43% loss of output in the sector covering electricity, gas, and water (Table 8). The large share of oil and gas sector in the economy (7% of GDP in 2008 [Badan Pusan Statistik 2013], the base year of the model) was responsible for the majority of overall negative GDP impacts caused by subsidy reform in the vulnerability scenario. In the reallocation scenarios, most other sectors saw increased output, presumably as a result of increased consumer demand.

The macro model used the MARKAL results for Indonesia to project impacts across economic sectors by 2020 and 2030. Energy and energy-intensive sectors were expected to be the most affected by

Table 8: SAM Model Sectoral Impacts

	Change in output after the shock (%)		
Sector	**2A. Vulnerability scenario**	**2Ba. Bottom 40% of households compensated; government expenditure increased**	**2Bb. All households compensated; government expenditure increased**
Petroleum refining	–24.2	–22.5	–23.7
Construction	–0.1	1.3	0.2
Mining and quarrying	–0.1	1.3	0.2
Administration and defense, public services	–0.0	2.3	0.5
Electricity, gas, and water supply	–43.2	–41.4	–42.7
Total	**–4.2**	**–3.4**	**–4.0**

SAM = social accounting matrix.

Source: Authors.

the removal of the subsidies (Table 9), but other industry sectors were not so heavily affected. This is because of the high potential for fuel switching to coal; its share of final energy consumption by fuel type is projected to be 17.6% higher than the business-as-usual scenario in 2030 (see Table A6.1 in Annex 6 for full projections of energy systems impacts). Less energy-intensive sectors are expected to benefit as households switch away from energy goods to other consumer products and as export demand increases over the short term.

Table 9: Projections of Output by the Macro Model (% change from baseline by 2020)

Sector	2A. Vulnerability scenario	2Bb. All households compensated; government expenditure increased	2Bc. All subsidy savings reallocated to all households through their tax reduction
Agriculture and forestry	0.71	0.80	0.95
Industry	–0.98	–0.96	–0.91
Energy related Industry*	–9.09	–9.08	–9.07
Nonenergy	0.07	0.10	0.15
Market services	0.00	0.06	0.17
Nonmarket services	–0.09	–0.05	0.02
Total	**–0.58**	**–0.53**	**–0.46**

* Includes energy extraction, manufactured fuels, electricity, and gas supply.

Source: Authors.

On the Energy Sector

The projections for energy demand originating from MARKAL and the macro model show marked differences. The latter analysis projected larger changes in energy demand relative to the baseline and declines in energy demand proportional to the increases in energy price. MARKAL, on the other hand, projected that consumers would switch from subsidized fuels to other energy sources rather than reduce overall demand.

The MARKAL analysis projected that subsidy reform would reduce final energy consumption by 0.85% per year by 2030 (Table 10). The largest impact was projected for the agriculture, industry, and transport sectors. Other sectors were marginally affected by subsidy reform, and were only expected to switch their use of fuels. In particular, the following sectoral impacts were observed:

- **Agriculture.** A 20% reduction in electricity use starting from 2015. Biomass use increases to offset the reduction in electricity use, reaching a 2% growth rate in 2015 and 6% in 2030. Oil and petroleum use drops by 3% to 5% by 2030.
- **Commercial and services sector.** A decline in the use of subsidized fuels (electricity, natural gas, and oil products) in the order of 20% starting from 2015, with biomass growing by 22% to 36% relative to the reference scenario.
- **Construction.** No net change in energy consumption. A 20% reduction in electricity use from 2015 is offset by a small increase in oil and petroleum consumption.
- **Industry.** An increase in coal use (approximately 20% in 2015), due to switching from formerly subsidized fuels. Electricity and natural gas use decline by 20% and 7%, respectively, as well as oil product consumption (ranging from –19.0% to –12.5%).

- **Transport.** An increase in the use of natural gas partly offsets the decline in oil product consumption, driven by higher prices.
- **Residential.** A reduction in oil and natural gas consumption (20% in 2015). Biomass use increases by 10%, while electricity is unaffected by the subsidy removal.

Table 10: Projected Impacts by the MARKAL Model for Energy Consumption, 2030

	Share of total (%)	% change to business as usual
Final energy consumption by fuel		
Biomass	25.1	8.6
Coal	17.4	17.6
Electricity	11.9	–11.9
Natural gas	11.8	–0.8
Oil and petroleum products	32.4	–10.4
Total	**98.6***	**–0.8**
Final energy consumption by sector		
Agriculture	1.4	–1.9
Commercial	5.2	0.0
Construction	0.2	0.0
Industry	42.0	–1.4
Mining	2.6	0.0
Residential	28.2	0.0
Transportation	20.4	–1.1
Total	**100.0**	**–0.8**

* Figures in this column do not sum up because figures on heat are not included.

Note: Numbers have been rounded. As a partial equilibrium model, MARKAL was not capable of modeling the reallocation, so in both scenarios it was assumed no savings were reallocated.

Source: Authors.

The removal of subsidies also led to a reduction in electricity consumption and hence generation relative to the business-as-usual scenario. Reductions are seen across the board and, consequently, electric plant capacity is projected to be 10% lower than in the reference case in 2030, generating capital-cost savings (mostly for coal and geothermal capacity). On the other hand, despite the impact of subsidy removal, coal and geothermal power plants maintain the strongest growth of all energy carriers; and biomass, hydro, diesel, and fuel oil power generation capacity are hardly affected (Table 11).

Table 11: Projected Impacts on Power Generation by the MARKAL Model
(% change from baseline)

Fuel	2015	2030
Biomass	0.0	0.0
Coal	-16.2	-13.8
Natural gas	-8.7	0.7
Diesel and fuel oil	-14.1	-14.9
Hydro	-18.6	-1.8
Geothermal	0.02	-33.5
Total	**-13.7**	**-11.8**

MARKAL = MARKet ALlocation

Note: Numbers have been rounded.

Source: Authors.

Energy demand for Indonesia was also estimated using the macro model. It considered energy demand to be more elastic than the MARKAL model, primarily because the constraints included in MARKAL (on the supply side) are not considered in an econometric analysis. For this reason, in an attempt to couple the models and make use of their respective strengths, the analysis carried out with the macro model combines the endogenously estimated demand with the potential for fuel switching estimated with MARKAL. Detailed MARKAL results on energy consumption and power generation and capacity are in Annex 6.

Energy demand was projected to remain unchanged in the macro model. This is because it was used as an exogenous input to retain the estimations generated by MARKAL. This is also reasonable for Indonesia because of the small impact the subsidy removal scenarios have on GDP in the macroeconomic assessment.

The combined macro model and MARKAL projections indicated that energy demand in 2020 and 2030 as a result of subsidy removal would be considerably lower than the business-as-usual level (Table 12). The reduction in final energy demand after removing the subsidies reflected which fuels are subsidized most, with the biggest impacts projected for gasoline and diesel, which accounted for 68% of total subsidies in 2012, and electricity (12%). Most of the reduction came from transport, households, and agriculture and other final use.

The macro and MARKAL models projected large falls in the consumption of oil and petroleum products, which would improve energy security given that Indonesia is a net importer of oil. The offsetting increase in coal and natural gas consumption would not affect national energy security, as both are produced domestically. However, faster depletion of these resources would reduce energy security in the longer term.

Table 12: Final Projected Energy Demand by Fuel and Sector (% difference from baseline)

	2020	2030
Final energy consumption by fuel		
Coal	15	12
Oil	-20	-20
Gas	18	32
Electricity	-21	-23
Final energy consumption by sector		
Industry	-6	-7
Transport	-17	-16
Households	-11	-15
Agriculture and other final use	-12	-18
Total	**-11**	**-13**

Note: Numbers have been rounded.

Source: Authors.

On the Environment

The MARKAL model projected the impact of fossil fuel subsidy removal on CO_2 emissions would be noticeable, reaching a 5%–7% reduction already in 2015. The macro model projected an almost 9% reduction by 2030, primarily based on a larger decline in energy consumption as well as fuel switching.

The combined macro model and MARKAL analysis found that the greatest emission reductions would occur in the household and agriculture sectors in 2020, but emissions from households would be above the business-as-usual scenario by 2030, while emissions from agriculture would remain well below the business-as-usual scenario (Table 13). This was due to the relative potential for fuel switching in different sectors, low in the case of agriculture (which is mostly oil-based) and high for the residential sector, which is projected to increase its consumption of increasingly coal-fueled power generation.

Table 13: Final Projected CO_2 Emissions by Fuel User (% change relative to baseline)

Fuel user	2020	2030
Industry	3.1	1.2
Transport	-17.4	-16.4
Households	-31.3	2.4
Agriculture and other final use	-20.2	-23.8
Total	**-8.9**	**-9.3**

Source: Authors.

4 Fuel Subsidy Reforms and the Need to Protect the Poor

The government sets and adjusts domestic fuel and electricity prices in an ad hoc way, with price changes generally driven by fiscal pressures. The fuel subsidy is one of the largest fiscal expenditures, comprising 12.8% of central government expenditure in 2012 and 16.8% in 2013.

Recent Reform Initiatives

Indonesia has been reforming its fuel subsidy policy by

- prohibiting industrial consumers from using subsidized diesel or gasoline,
- introducing the kerosene to LPG conversion program,
- increasing the electricity tariff,
- increasing prices for gasoline and diesel,
- encouraging diversification such as through biofuel blends.

Since 2005, RON 88 and high-speed diesel prices have been increased six times (Table 14). In 2007, a kerosene-to-LPG-conversion program was introduced to reduce subsidies to encourage greater use of LPG, a more efficient fuel for cooking. In June 2013, the price for key subsidized fuels was adjusted, with RON 88 increased from Rp5,500 per liter to Rp6,500 per liter and automotive diesel from Rp4,500 per liter to Rp5,500 per liter. This was the first fuel price adjustment since January 2009. The price increase was accompanied by social and economic mitigation programs aimed at the most vulnerable segments of the population, through cash transfers, food aid, educational assistance, and infrastructure support. The total cost of those programs was Rp24.9 trillion ($2.7 billion). The State Budget Proposal 2014 showed an increase in volume of subsidized gasoline and diesel, but major reforms have taken place since. In November 2014, RON 88 and diesel prices were both increased by Rp2,000 per liter. In January 2015, subsidies were removed on RON 88 and a “fixed” subsidy was introduced on diesel.

The electricity subsidy allocation has trended upward in recent years (Figure 3) due to increased sales, escalating prices for fossil fuel inputs, and exchange rate variations (Government of Indonesia 2011). In an effort to control subsidies, the government increased the tariff for most consumers each quarter of 2013 until a total increase of 15% was reached. The new electricity tariff applies to the 1,300 volt-ampere (VA) segment or higher. Meanwhile, customers of 450–900 VA were not subject to increased electricity tariffs.

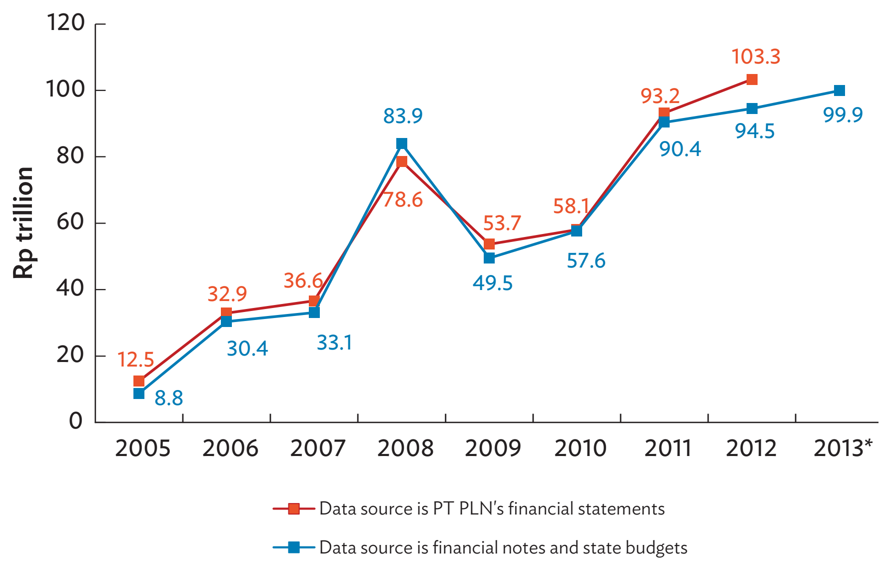
Table 14: Timeline of Fossil Fuel Subsidy Reforms since 2005

Date	Fuel	Pricing reform
2005	Gasoline and diesel	Price increases of 29% in March and 114% in October. Industry no longer eligible to access subsidized diesel.
2006	LPG	Price increase for industrial users.
2007	LPG and kerosene	Introduction of the kerosene-to-LPG-conversion program to encourage LPG use.
2008	Gasoline, diesel, and kerosene	Price increases in May of 33% for gasoline, 28% for diesel, and 25% for kerosene. Gasoline and diesel prices were lowered in December by 20% and 15%, respectively, as international oil prices eased.
2009	Gasoline and diesel	Prices lowered in January by 11% and 7%, respectively, leaving gasoline prices the same as diesel prices (that is, close to 2005 levels).
2013	Gasoline and diesel	One-off price increases averaging 40%.
2013	Electricity	Base tariff increased 15% over 2013 (households consuming 450–900 volt-amperes not included).
January 2014	LPG	Attempt to raise prices of 12-kg cylinders, but the price increase was rolled back.
November 2014	Gasoline and diesel	Price increases of 31% and 36%, respectively.
January 2015	Gasoline and diesel	Subsidies for gasoline entirely removed, but low oil prices see this result in a price decline of about 12%. Diesel subsidies reduced to Rp1,000 per liter.

kg = kilogram, LPG = liquefied petroleum gas, Rp = rupiah.

Source: Beaton and Lontoh (2010); Ministry of Finance (2014).

Figure 3: Annual Direct Electricity Subsidies to PT PLN



Rp = rupiah.

Note: Subsidies recorded in PT PLN's financial statements are slightly different than those in the federal budget, because PT PLN uses accrual-basis accounting and a calendar year, while the government budget is based on annual allocations and a financial year.

* From the draft 2013 revised state budget.

Sources: Developed by authors based on data from Government of Indonesia (2004, 2005, 2006, 2007, 2008, 2009, 2010, 2011, 2012); PT PLN (2006, 2007, 2008, 2009, 2010, 2011, 2012a, 2013).

The electricity tariff adjustments were predicted to result in increased inflation of between 0.3% and 0.5%, which was not expected to affect the economy significantly, and especially people's purchasing power (Ministry of Energy and Mineral Resources 2013).

Effect of Reforms on the Poor

In recent years, public expenditure on fossil fuel subsidies far exceeded all its social assistance programs combined (Table 15). This section examines the likely impact of fossil fuel subsidy reform on the poor and near-poor in Indonesia and assesses options for using subsidy savings to mitigate negative impacts from the removal of subsidies and for using these savings for pursuing poverty reduction.

Table 15: Poverty, Subsidies, and Social Spending (latest year)

Share of population below poverty line	Near poor (1.5x national 2013 poverty line)	Annual spending on fossil fuel subsidies (2012)		Approximate annual spending on social assistance[b]	
		$ billion	% of GDP	$ billion	% GDP
11%[a] (2013); 16.2% below international poverty line of $1.25 per day (2010)	38%	36.2	4.1	3.3	0.4

GDP = gross domestic product.

[a] The national poverty line is Rp271,626 per person per month.

[b] Budget data are mostly for 2012 or 2013, but where these were not available, the most recent year was used.

Sources: ADB, Social Protection Index, accessed November 2013; ADB (2012); World Bank (2012d, 2013c); Badan Pusat Statistik (2013).

Indonesia's overall poverty rate fell from 23% in 1999 to 11% in 2013. Yet despite the drop, many households remain poor, particularly in rural areas and some underdeveloped regions, and many other households are highly vulnerable to falling into poverty. In 2013, 38% of the population was near-poor, living below 1.5 times the poverty line (World Bank 2012b). Thus, over one-third of Indonesians are highly vulnerable to shocks that can push them deeper into poverty. Around half of all households below the poverty line were chronically poor (remaining in this category for 3 years or more). The other half moved in and out of poverty, mostly from the group living at or below 1.5 times the poverty line. In recent years, the basket of goods used by the poor has seen higher inflation than headline and core inflation (World Bank 2013b).

In Indonesia, the poorest income groups predominantly consume biomass for cooking (particularly in rural areas) and kerosene and electricity for lighting (Table 16). As household income increases, biomass and kerosene consumption drop off and are replaced by increasing quantities of LPG, electricity, gasoline, and diesel (Bacon, Bhattacharya, and Kojima 2010; Vagliasindi 2012b). The poorest groups, however, do not use gasoline at all, but 40% of the direct benefits of the gasoline subsidy to households go to the richest 10% of households (World Bank 2012d). Diesel is not consumed in large quantity by the poor, but is an important input to transport and commodity prices that do impact the poor. The poorest are thus most likely to be directly impacted by higher kerosene and electricity prices, and indirectly by inflationary rises in food and transport prices.

Table 16: Share of Household Expenditure on Energy Sources, Food, and Transport, 2005 (%)

Quintile	Kerosene	LPG*	Gasoline and diesel	Electricity	Natural gas	Biomass	Food	Transport
1	2.1	0.0	0.2	2.4	0	3.7	70	1.2
2	2.3	0.0	0.6	2.9	0	2.9	68	1.7
3	2.3	0.1	0.9	3.4	0	2.2	66	2.2
4	2.4	0.1	1.3	3.5	0	1.6	64	2.2
5	1.8	0.3	1.6	3.0	0	1.0	61	2.2

LPG = liquefied petroleum gas.

* LPG use by households is likely to be significantly higher since the kerosene-LPG-conversion programs commenced in 2007.

Source: Bacon, Bhattacharya, and Kojima (2010).

The results for the SAM model and macro model varied in the intensity of projected impacts on the poor and the effects of reallocation on households and macroeconomic indicators. Even so, it is clear the elimination of all subsidies would cause inflation in the basket of goods used by the poor due to the direct and indirect impacts of higher energy prices. This is precisely the kind of pressure that, if uncompensated, could see vulnerable groups clustered above the poverty line pushed into poverty (World Bank 2012b). The modeling exercise found that compensation was instrumental in reducing the negative impacts on the poor and, more broadly, on economic growth.

Policy Instruments Available

Based on the modeling exercise and literature review, this section aims to illustrate the types of programs available and challenges faced without being prescriptive about the programs that Indonesia should adopt. An inventory was developed of past, current, and planned measures to help the poor cope with fuel subsidy reform, and of major national-level social assistance programs. The basis for the inventory of the latter major national-level social programs was the Asian Development Bank's Social Protection Index country reports. These were updated drawing on financial statements and other relevant literature. Any available evaluation data of these programs were also collected, particularly on their effectiveness in targeting the poor and vulnerable. A qualitative analysis of the gaps of current safety nets was then undertaken, drawing on the aforementioned inventory and the results from the modeling on the projected impact of reform on the poor.

Effectiveness of Past and Current Programs Associated with Fuel Subsidy Reform

Indonesia has significant experience in using social safety net programs to reduce the impact of fuel price increases on the poor (Table 17). Price increases since 2005 have been accompanied by dedicated cash transfer schemes as well as supplementary funding for existing programs for food, health, and education. Funding for infrastructure was also provided in 2005 and 2013, and low-interest loans for small businesses were funded in 2008.

Table 17: Social Assistance Associated with Fuel Subsidy Reform

Policy Name	Description	Beneficiaries	Budget
2005 reforms			
Direct Cash Assistance (Bantuan Langsung Tunai)	Unconditional cash transfers of Rp1,200,000 delivered in four instalments	19 million, about 35% of the total population	Rp23.0 trillion (25% of subsidy savings)
School Operational Assistance (Bantuan Operational Sekolah)	Rp25,000 to primary schools and Rp35,000 to junior high schools on the basis that they reduce fees accordingly		Rp12.0 trillion
Healthcare for the Poor	Cards entitling holders to free health care at public clinics and hospitals	16 million households	Rp2.9 trillion
Rural Infrastructure Support Project (Infrastruktur Perdesaan)	Rehabilitation and renewal of infrastructure in low-income and often remote villages in poor provinces	1,840 villages	Rp569.0 billion
2008 reforms			
Direct Cash Assistance (Bantuan Langsung Tunai)	Unconditional cash transfers of Rp900,000 divided into three payments	18.4 million households	Rp14.1 trillion
Rice Subsidy for the Poor (Raskin), supplementary allocation	Subsidized rice program		Rp4.2 trillion
Loan-interest subsidy for small enterprises			Rp1.0 trillion
2013 reforms			
Temporary Community Direct Assistance (Bantuan Langsung Sementara Masyarakat)	Unconditional cash transfers of Rp600,000 per household delivered over 4 months	15.5 million households	Rp9.3 trillion
Hopeful Family Program (Program Keluarga Harapan), supplementation	Average benefit level will increase from Rp1.4 million to Rp1.8 million per year per household	Expanded from the 2012 level of 1.5 million households to 2.4 million households in 2013 and 3.2 million households in 2014.	Rp0.7 trillion
Scholarships for the Poor (Bantuan Siswa Miskin), supplementation	Benefits increase for a primary school student from Rp360,000 per year to Rp450,000 and for a junior secondary student from Rp550,000 per year to Rp750,000	Increase from 8.7 million to 16.6 million beneficiaries	Rp7.5 trillion

continued on next page

Table 17 *continued*

Policy Name	Description	Beneficiaries	Budget
Rice Subsidy for the Poor, Raskin supplementation	Additional 15 kilograms of subsidized rice per month for 3 months to households eligible for Bantuan Langsung Sementara Masyarakat		Rp4.3 trillion
Infrastructure funding	Infrastructure for communities including potable and irrigation water		Rp7.5 trillion

Sources: Bacon and Kojima (2006); Beaton and Lontoh (2010); World Bank (2013c).

Fuel subsidies are universal in Indonesia. The only targeting measures were a 2005 reform to make industry ineligible for accessing subsidized diesel and a price increase for industrial LPG consumers in 2007 (Beaton and Lontoh 2010). All other consumers can access fuel subsidies regardless of income level.

Broader Social Assistance Programs and Problems in Implementation

Indonesia's broader poverty reduction strategy includes programs that target households, communities, and small and medium-sized businesses (TNP2K 2013). About 90% of social assistance is delivered by the central government (World Bank 2012b). Total spending was estimated to be almost $1 billion per year. Annex 7 provides a list of major national social assistance programs, recipients, and budgets.

Key challenges for the existing social assistance system include inadequate coordination, coverage, targeting, and public communication (World Bank 2012b). Programs have been developed independently to meet specific areas of disadvantage or adverse events, including programs for food, health, education, and energy pricing reform. But these programs are administered by different agencies and have different eligibility criteria, and registers of recipients. A comprehensive social safety net would also include assistance for the elderly, people living with disabilities, out-of-school children, and unemployment and nutrition (Perdana 2014).

Socialization—the process of making stakeholders aware of a program and its intended beneficiaries—has not been done well for most social assistance programs in Indonesia (World Bank 2012a). Without proper communication, potential recipients remain unaware of programs and cannot self-nominate.

Because of poor targeting and coordination, not all citizens receive their entitlements. For example, three major social assistance programs—Bantuan Langsung Tunai (direct cash assistance), Jamkesmas (public health insurance), and Raskin (rice subsidy)—are aimed at the poorest 30% of households, but less than a third of them received all three programs in 2010 (World Bank 2012a). Only about 50% of Bantuan Langsung Tunai payments reached target recipients, with the remainder going to wealthier households (World Bank 2012b). Despite this high level of exclusion, the program nevertheless represented a significant advancement in the accuracy of targeted welfare assistance, having performed better in targeting than any other Indonesian social assistance programs (World Bank 2012a).

The government has made significant advances in reforming its social safety net system. A unified register has been developed that captures more households with lower errors of inclusion and exclusion. The unified database includes 96 million households in the bottom 40% of the population (Perdana 2014). The data were collected in 2011 and updated in 2015. Since 2012, it is required that the unified database be used for targeting all social assistance programs.

A number of advanced social assistance programs have been launched or proposed. These include expansion of the Program Keluarga Harapan conditional cash transfer scheme and the gradual introduction of the new national social security system, Sistem Jaminan Sosial Nasional. The latter was expected to eventually expand and supplement the existing regime to provide pensions, health coverage, old-age savings, death benefits, and work accident prevention to all citizens (World Bank 2013c).

Improving Social Assistance Programs for the Poor

Indonesia's experience in using social safety nets to reduce the impact of fuel price increases has improved public acceptance of fossil fuel subsidy reform and, at the same time, built the capacity of its social assistance system. The new unified database of the poor is expected to improve targeting of both the poor and near poor, and new programs like the conditional cash transfer pilot scheme are benefiting more Indonesians. It would be useful to prioritize programs according to their short-term and long-term impacts.

In the Short Term

- Remove gasoline subsidies, which provide limited assistance to the poor; this will create fiscal space.
- Cap the number of LPG cylinders available to households per year. The cap should be set at a level that would be sufficient to meet the annual fuel consumption needs of poor and near poor households.
- Improve targeting for the provision of social assistance based on the 2014 update of the unified register. Household surveys would be useful to assess whether targeting has improved compared to 2005, 2008, and 2013 dispersals.
- Implement mechanisms allowing potential recipients to self-nominate for benefits if they feel they have been wrongly excluded.
- Use savings from fossil fuel subsidy reform to fund an increase in social assistance spending to about 1% of GDP, which is more in line with spending by Latin American countries with large and successful cash transfer programs (World Bank 2012b).

In the Longer Term

- Improve financial inclusion and banking access to support more sophisticated payment mechanisms for social payments.
- Target government spending in areas that stimulate development. The World Bank (2012d) estimates that effective spending on education and infrastructure, with measures to improve the business climate, could boost the growth rate to 7% or higher.
- Provide the means for the poor and near-poor to cope with price volatility when price caps for consumer fuels are removed. They can be made more resilient to price shocks by providing them with the resources they need to respond, such as cash transfers linked to inflation in a basket of goods typically used by the poor, which can be heavily weighted toward energy products.

5 Summary of Findings

Indonesia has made significant progress toward the reform of fuel subsidies, reducing their budgeted cost to below $8 billion in 2015 and less than $4 billion in 2016. Eliminating subsidies completely would free up further fiscal space for other priorities—such as health, education, social protection, and infrastructure. These areas, unlike fuel subsidies, represent long-term investments in economic growth and development.

The largest quantified subsidies in the country are government expenditure for below-market retail prices of petroleum products (gasoline, diesel, LPG, and kerosene) and electricity. Import duty exemptions on petroleum products—not included in official government estimates—are also found to provide a significant subsidy. Subsidies for electricity production were largely in the form of credit support in 2012, and in earlier years included exemption of import duty on goods and materials used in power generation.

The removal of all fossil fuel subsidies in Indonesia is projected to have a significant impact on GDP and the energy sector. If the subsidy savings were used to compensate all households for the direct impacts of reform, GDP would remain similar to business as usual in the medium to long term. As a proportion of their income, rural (nonagriculture) and urban households, and in particular those in middle-income groups, are expected to be the most affected. Reallocating savings to the bottom 40% of households is expected to create a less favorable outcome than reallocating savings to all households.

With fuel subsidy reform, final energy consumption is projected to decline by over 10% in 2030 relative to the base case, with coal and biomass usage markedly increasing to offset the decrease in electricity and oil use. The country shows high potential for fuel switching, especially a shift in consumption from subsidized fuels to other energy sources such as coal and biomass. The combined effect of a decline in energy consumption and fuel switching is estimated to reduce CO_2 emissions by over 9% relative to the baseline in 2030.

In 2012, Indonesia spent $36 billion on fossil fuel subsidies, but it only spent $3 billion on social assistance programs. It has already had some success using social safety nets to reduce the impact of fuel price increases on the poor. However, the current system is not sufficiently well targeted to accurately compensate all affected poor households if fossil fuel subsidies were to be rapidly reformed. Almost 40% of Indonesia's population is near poor, living at or below 1.5 times the poverty line, and these households are highly vulnerable to the direct and indirect impacts of higher energy prices.

Reforming fossil fuel subsidies would create an opportunity to invest in social welfare. Removing subsidies for the most regressive fuels (gasoline) and capping access to LPG cylinders would provide fiscal space without affecting the poor much. To further shield the poor, subsidy savings could be used to supplement and reform existing social assistance programs, including cash transfers. In the longer term, Indonesia could move toward a stronger social assistance regime and better overall development support.

ANNEXES

ANNEX 1
Inventory of Subsidies for the Consumption of Fossil Fuels

Fuel	Support element	Subsidy type
Oil	Below-market pricing of premium gasoline (RON 88)	Direct spending or market price support
	Below-market pricing of kerosene	Direct spending or market price support
	Below-market pricing of "Solar" automotive diesel oil	Direct spending or market price support
	Below-market pricing of 3 kilogram LPG cylinders	Direct spending or market price support
	Kerosene to LPG conversion program	Direct spending
	Reduced income tax on fuel product sales for PT Pertamina retail stations	Tax breaks
	Import duty exemption for crude oil and fuel products	Tax breaks
	Domestic Market Obligation for Oil	Market price support
	TOTAL (Oil: Consumer)	
Natural gas	Compressed natural gas conversion kit distribution	Direct spending
	Subsidies for infrastructure for automotive gas fuel	Direct and indirect transfer of funds and liabilities
	Capped prices for automotive gas fuel	Market price support
	Domestic market obligation for natural gas	Market price support
	Domestic market obligation for natural gas in the transport sector	Market price support
	TOTAL (Natural Gas: Consumer)	
Coal	Domestic market obligation for coal	Market price support
	TOTAL (Coal: Consumer)	
Electricity	Below-market pricing of electricity	Market price support
	TOTAL (Electricity: Consumer)	
	TOTAL (Consumer)	

LPG = liquefied petroleum gas, nq = not quantified, Rp = rupiah, -- = subsidy not provided in that year.

Note: 2012 provides the most complete data. * 2013 is incomplete; all figures for 2013 are state budget estimates, except import duty exemption for crude oil and products, which is January–August data.

Source: Authors.

	Subsidy estimates (Rp)						Subsidy estimates ($ million)					
Fuel	**2008**	**2009**	**2010**	**2011**	**2012**	**2013***	**2008**	**2009**	**2010**	**2011**	**2012**	**2013***
Oil	43,600	15,200	38,100	79,800	107,200	87,200	4,507	1,460	4,191	9,101	11,447	8,832
	47,600	11,500	7,500	9,400	7,100	8,040	4,921	1,105	825	1,072	758	814
	44,100	10,400	21,900	53,300	64,700	51,232	4,559	999	2,409	6,079	6,909	5,189
	3900	7,900	14,900	22,600	32,800	26,452	403	759	1,639	2,578	3,502	2,679
	2,020	5,080	4,710	1,485	621	459	209	488	518	169	66	46
	nq	nq	nq	nq	nq	nq	nq	nq	nq	nq	nq	nq
	nq	nq	12,067	17,217	17,906	13,767	nq	nq	1,327	1,964	1,912	1,394
	nq	nq	nq	nq	nq	nq	nq	nq	nq	nq	nq	nq
	141,220	**50,080**	**99,177**	**183,802**	**230,327**	**187,150**	**14,599**	**4,812**	**10,911**	**20,963**	**24,595**	**18,956**
Natural gas	--	--	--	--	--	100	--	--	--	--	--	10
	--	--	--	--	3,500	475	--	--	--	--	374	48
	--	--	nq	nq	nq	nq	--	--	nq	nq	nq	nq
	nq	nq	nq	nq	nq	nq	nq	nq	nq	nq	nq	nq
	--	--	nq	nq	nq	nq	--	--	nq	nq	nq	nq
	0	**0**	**0**	**0**	**3,500**	**575**	**0**	**0**	**0**	**0**	**374**	**58**
Coal	--	--	nq	nq	nq	nq	--	--	nq	nq	nq	nq
	0	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Electricity	78,580	53,720	58,110	93,180	103,330	80,938	8,123	5,161	6,393	10,628	11,034	8,198
	78,580	53,720	58,110	93,180	103,330	80,938	8,123	5,161	6,393	10,628	11,034	8,198
	219,800	**103,800**	**157,287**	**276,982**	**337,157**	**268,663**	**22,722**	**9,973**	**17,303**	**31,591**	**36,002**	**27,212**

ANNEX 2
Inventory of Subsidies for the Production of Electricity

Support element	Subsidy type	Subsidy estimates (Rp billion)						Subsidy estimates ($ million)					
		2008	2009	2010	2011	2012	2013*	2008	2009	2010	2011	2012	2013
Research and development support	Direct spending	--	--	nq	nq	nq	nq	--	--	nq	nq	nq	nq
Soft loans for the national electricity company (Perusahaan Listrik Negara [PLN])	Credit support	nq	nq	nq	nq	358	nq	nq	nq	nq	nq	38.19	nq
Loan guarantees to PLN	Credit support	352	352	352	352	710	710	36	34	39	40	76	72
Subsidized credit for PLN from subsidiary loan agreements	Credit support	681	1,166	1,449	1,105	879	nq	70	112	159	126	94	nq
Exemption of import duty for capital goods for private power producers	Tax breaks	nq	nq	nq	nq	nq	--	nq	nq	nq	nq	nq	--
Exemption of import duty for goods and materials to make steam power plant components	Tax breaks	1	14	5	nq	nq	nq	0.10	1.35	0.55	nq	nq	nq
Exemption of import duty for goods and materials for the manufacture of boilers and transformers for electricity plants	Tax breaks	--	--	--	3.4	--	--	--	--	--	0.39	--	--
Exemption of import duty on capital goods imported by private companies for power projects (2005–2008)	Tax breaks	--	--	--	--	--	--	--	--	--	--	--	--
TOTAL (Electricity: Producer)		**1,033**	**1,532**	**1,806**	**1,461**	**1,947**	**710**	**107**	**147**	**199**	**167**	**208**	**72**
TOTAL FOSSIL FUEL SUBSIDIES		**220,833**	**105,332**	**159,092**	**278,443**	**339,104**	**269,372**	**22,829**	**10,120**	**17,502**	**31,757**	**36,210**	**27,283**

nq = not quantified, Rp = rupiah, -- = subsidy not provided in that year.

Note: 2012 provides the most complete data. * 2013 is incomplete; all figures for 2013 are state budget estimates except import duty exemption for crude oil and products, which is January to August data.

Source: Authors.

ANNEX 3
Strengths and Weaknesses of Economic and Energy Models Used for the Analysis

Focus	Model	Strengths	Weaknesses
Households and the economy	Social Accounting Matrix-based (SAM)	Provides highly disaggregated impacts on households and economic sectors, plus some macroeconomic indicators. Indicates a first-cut estimate of the effects of a policy shock. Foundation of much government analysis.	Over estimates scale of reform impacts because it is static and gives only short-term consequences of shocks before full demand and supply responses have played out. Allows limited or no substitution between energy inputs. Disaggregation of households or energy may not be ideally suited to analysis, and adapting SAM may be time- and resource- intensive.
Energy system	Market Allocation Model (MARKAL)	Detailed representation of technical relations in energy system that can project medium- and longer-term trends for consumption and supply but no price effects. Allows for estimation of fuel switching and long-term CO_2 impacts.	Energy system only. Does not allow for reallocation of subsidy savings back into the economy. May not account for subsidies in original design, requiring adaptation.
Macro-economic indicators, energy, environment, and households	Energy–Environment–Economy (E3MG)	Projections up to 2030 for GDP, inflation, production, investment and trade, and GHG emissions.	Projections based entirely on historical trends.

GDP = gross domestic product, GHG = greenhouse gas.

Source: Authors.

ANNEX 4
Main Characteristics of the Reform Impact Models Used

Model	Base year	Household and sectoral disaggregation	Energy sources	Impacts modeled	Reallocation assumptions
Social accounting matrix	2008 with subsidy adjustment	4 rural and 4 urban (employment-based) household groups; 25 economic sectors	Liquefied petroleum gas, natural gas for vehicles, gasoline, diesel, kerosene, and electricity.	Direct and indirect	Compensation to households and reallocation to government budget
MARKAL	2010	Agriculture, construction, and households; commercial, industrial (with energy-intensive manufacturing sectors), and transport, with four regions: Java, Kalimantan, Sumatra, and other islands.	Detailed primary and secondary energy supply	Direct	No reallocation
E3MG	2011	42 economic sectors, 5 rural and 4 urban (employment-based) household groups	Primary and secondary energy supply (22 different users of 12 different fuel types)	Direct	Compensation to households and budget/deficit reduction

E3MG = energy-environment-economy model at a global level, MARKAL = market allocation model.
Source: Authors.

ANNEX 5
Calculations to Adapt Recent Year Subsidies to the Social Accounting Matrices

Table A5.1 shows the calculations used to adapt subsidies from most recent year for which complete data are available from the inventories (2012) to the base year for the social accounting matrix (SAM) model in Indonesia. The results presented in the last row of the table show the relative change in prices that was modeled, taking into account recent-year subsidies and base-year consumption in the SAM model. As such, the absolute price increase simulated in the matrix was higher than used in the market allocation (MARKAL) model and the energy-environment-economy model at a global level analysis, since both of these models use more recent baseline data.

Table A5.1: Equivalent Fuel Subsidies and Price Changes in 2008 for SAM Model

		Petroleum fuels	Electricity
1.	Consumption quantities ('000 kiloliter, GWh, '000 BOE)	58,048	160,254
2.	Energy subsidies (Rp billion)		
	BAU: Initial subsidy	116,132	19,504
	Subsidy removal	116,132	19,504
3.	Energy price changes (Rp million per '000 kiloliter, GWh, '000 BOE)		
	• BAU: Initial subsidy	0	0
	• Subsidy removal	2.00	0.12
4.	Economic value of energy consumption from SAM model in FY 2008 (Rp billion)	520,874	206,012
5.	Initial BAU subsidized energy prices (Rp million per '000 kiloliters, GWh, '000 BOE)	8.97	1.29
6.	Postreform energy prices (Rp million per '000 kiloliters, GWh, '000 BOE)		
	• Subsidy removal	10.97	1.41
7.	Relative change in prices: , (6)/(5)		
	• BAU: Initial subsidy	1	1
	• Subsidy removal	1.22	1.09

BAU = business as usual, BOE = barrel of oil equivalent, GWh = gigawatt-hour, Rp = rupiah.

Note: Presented are 2008 prices, calculated based on data from the national accounts (economic value of energy consumption divided by energy consumption). Subsidies are allocated across all consumption of the given fuel and therefore prices in the table will be lower than subsidized prices available to selected consumers.

Source: Authors.

ANNEX 6
Market Allocation Model Results

Table A6.1: Projections for Energy Consumption by Sector and Energy Supply by Source

	2015			2020			2030		
	PJ	% share of total	% change to BAU	PJ	% share of total	% change to BAU	PJ	% share of total	% change to BAU
Final energy consumption by sector									
Agriculture	106.2	1.8	-3.2	121.3	1.6	-3.0	163.8	1.4	-1.9
Commercial	304.9	5.2	0.0	383.8	5.2	0.0	613.1	5.2	0.0
Construction	12.2	0.2	0.0	15.6	0.2	0.0	25.5	0.2	0.0
Industry	2,443.0	41.9	-1.5	3,111.4	42.1	-1.6	4,981.3	42.0	-1.4
Mining	157.3	2.7	0.0	196.9	2.7	0.0	312.2	2.6	0.0
Residential	1,794.2	30.7	0.0	2,186.7	29.6	0.0	3,344.4	28.2	0.0
Transportation	1,020.1	17.5	-1.0	1,382.2	18.7	-1.2	2,417.3	20.4	-1.1
Total	**5,837.7**	**100.0**	**-0.8**	**7,397.9**	**100.0**	**-0.94**	**11,857.6**	**100.0**	**-0.8**
Final energy consumption by fuel									
Biomass	1,812.3	31.1	6.9	2,052.3	27.7	8.5	2,971.8	25.1	8.6
Coal	826.6	14.2	19.4	1,063.6	14.4	19.2	2,067.8	17.4	17.6
Electricity	562.9	9.6	-14.2	809.2	10.9	-13.8	1,408.6	11.9	-11.9
Natural gas	670.5	11.5	0.1	925.3	12.5	1.1	1,401.4	11.8	-0.8
Oil and petroleum Products	1,821.7	31.2	-10.3	2,397.8	32.4	-10.6	3,840.5	32.4	-10.4
Total	**5,837.7**	**97.5***	**-0.8**	**7,397.9**	**97.8***	**-0.9**	**11,857.6**	**98.6***	**-0.8**

BAU = business as usual, PJ = petajoules.

* Figures in this column do not sum because figures on heat are not included.

Source: Authors.

Table A6.2: Projections for Power Capacity, Supply, and Cost

	2015			2020			2030		
	Total generation or capacity	% share of total	% change to BAU	Total generation or capacity	% share of total	% change to BAU	Total generation or capacity	% share of total	% change to BAU
Power generation (GWh)									
Biomass	2,542.3	1.4	0.0	2,368.1	0.9	0.0	2,197.5	0.5	0.0
Coal	90,511.8	49.0	-16.2	16,4581.9	62.8	-15.0	32,9639.1	73.1	-13.8
Cogeneration	9,931.9	5.4	0.0	10,640.4	4.1	0.0	12,304.9	2.7	0.0
Diesel and fuel oil	15,541.0	8.4	-14.1	15,254.8	5.8	-10.1	5,786.7	1.3	-14.9
Geothermal	3,922.4	2.1	0.0	5,973.2	2.3	0.0	10,896.4	2.4	-33.5
Hydro	25,614.1	13.9	-18.6	47,406.6	18.1	-9.7	65,255.4	14.5	-1.8
Natural gas	36,750.3	19.9	-8.7	16,051.6	6.1	-23.2	24,721.3	5.5	0.7
Total	18,4813.9	100.0	-13.7	262,276.6	100.0	-13.5	450,801.3	100.0	-11.8
Power capacity (GW)									
Biomass	0.4681	1.1	0.0	0.4360	0.8	0.0	0.4046	0.5	0.0
Coal	15.0026	35.8	-16.1	27.1580	48.6	-15.1	57.1417	65.0	-12.3
Cogeneration	1.8287	4.4	0.0	1.9591	3.5	0.0	2.2656	2.6	0.0
Diesel and fuel oil	10.4306	24.9	0.0	9.8612	17.7	0.0	2.3477	2.7	-5.4
Geothermal	0.5365	1.3	0.0	0.8170	1.5	0.0	1.8300	2.1	-40.7
Hydro	6.2590	15.0	-16.3	10.7843	19.3	-9.0	14.1725	16.1	-1.3
Natural gas	7.3397	17.5	0.0	4.8267	8.6	-3.0	9.7984	11.1	-5.2
Total	**41.8652**	**100.0**	**-8.9**	**55.8423**	**100.0**	**-9.8**	**87.9605**	**100.0**	**-10.3**
Power generation costs ($ million, base year 2000)									
Biomass	236.83	2.1	0.1	275.69	1.6	0.1	259.25	0.8	1.9
Coal	3,566.14	31.1	-21.9	8,615.00	48.5	-17.3	21426.02	64.6	-12.3
Cogeneration	1,271.23	11.1	0.9	1,550.51	8.7	-0.3	1,994.90	6.0	2.0
Diesel and fuel oil	2921.31	25.5	2.7	3,073.38	17.3	9.5	1,458.13	4.4	18.3
Geothermal	162.09	1.4	0.3	310.01	1.7	0.2	731.04	2.2	-40.0
Hydro	963.54	8.4	-29.0	2,490.94	14.0	-12.8	3,975.21	12.0	-2.7
Natural gas	2,351.34	20.5	-7.1	1,458.25	8.2	-17.6	3,299.88	10.0	-2.8
Total	**11,472.48**	**100.0**	**-11.4**	**17,773.78**	**100.0**	**-11.1**	**33,144.43**	**100.0**	**-9.4**

BAU = business as usual, GW = gigawatt, GWh = gigawatt-hour.

Source: Authors.

ANNEX 7
Major National Social Assistance Programs

Key programs and initiatives (year commenced)	Benefits	Target recipients	Budget (Rp)	Source
Food				
Raskin (1998)	14 kilograms subsidized rice per month per household	17.5 million households	5.7 trillion (2012)	International Labour Organization
Education				
Bantuan Siswa Miskin (2008)	Cash assistance to poor students	9.5 million students (2012)	6.2 trillion (2012)	Ministry of Finance (2014)
Health				
Jaminan Kesehatan Masyarakat, Jamkesmas (1998)	Health service fee waivers	76.4 million individuals or 18 million households	7.2 trillion (2012)	Ministry of Finance (2014); World Bank (2012a, 2012b)
Children				
Program Kesejahteraan Sosial Anak	Cash transfers with facilitated services for at-risk children	5 groups of children, covering ~155,000 individuals (2011)	287.1 billion (2011)	Satriana and Schmitt (2012)
Disability				
Jaminan Social Penyandang Cacat Berat	Cash transfers with facilitated services for the disabled	19,500 individuals (2011)	~86 billion (2010)	Satriana and Schmitt (2012)
Elderly				
Jaminan Sosial Lanjut Usia	Cash transfers with facilitated services for vulnerable elderly	13,250 vulnerable elderly (2011)	~48 billion (2011)	Satriana and Schmitt (2012)
Conditional cash transfer (pilot)				
Program Keluarga Harapan (2007)	Cash transfers (Rp1,287,000 per year, average) on condition of attendance at health clinics and school	1.5 million households (2012)	1.6 trillion (2012)	Ministry of Finance (2014)

Rp = rupiah.

Source: Global Subsidies Initiative (2014a).

List of Background Papers

Chattopadhyay, D. 2014. Energy Subsidies in Southeast Asia: Impact on Power Sector. Report submitted to the Asian Development Bank Technical Assistance Project on Assessment and Implications of Rationalizing and Phasing Out Fossil Fuel Subsidies.

Global Subsidies Intiative (GSI). 2014a. Assessment and Implications of Rationalizing and Phasing Out Fossil Fuel Subsidies. Report submitted to the Asian Development Bank Technical Assistance Project on Assessment and Implications of Rationalizing and Phasing Out Fossil Fuel Subsidies.

Reports prepared for the GSI study:

Alexandri, E., A. Higson, H. Pollitt, and P. Summerton. 2014. Assessing the Impact of Subsidy Reform in India and Indonesia.

Hassler, J.R., J. Kurbatsch, S. Goteti, G. Goldstein, and L. Taylor. 2014. Modeling of Subsidy Removal in the Energy Sector of Indonesia for GSI Phase 3.

Lontoh, L. 2014. Inventory of Consumer Subsidies for Fossil Fuels.

Siahaan, N., F.S. Ragina, and S. Sepriana. 2014. Indonesian Inventory of Subsidies for Electricity.

Widodo, T., R. Pradiptyo, A. Pratikto, and T.H. Partohap. 2014. Final Report: Modeling Social and Economic Impacts.

References

Agusta, I. 2007. Desa Tertinggal di Indonesia. *Solidarity Journal*. 1 (2). pp. 233–52.

Anand, R., D. Coady, A. Mohammad, V. Thakoor, and J. P. Walsh, J. P. 2013. *The Fiscal and Welfare Impacts of Reforming Fuel Subsidies in India*. Washington, DC: International Monetary Fund.

Asian Development Bank (ADB). 2012. Country Reports from ADB Social Protection Index. http://spi.adb.org/spidmz/index.jsp (accessed November 2013).

———. Statistical Data Base System. https://sdbs.adb.org/sdbs/index.jsp

Bacon, R., and M. Kojima. 2006. *Coping with Higher Oil Prices*. Washington, DC: World Bank.

Bacon, R., S. Bhattacharya, and M. Kojima. 2010. *Expenditure of Low-Income Households on Energy*. Extractive Industries for Development Series No 16. Washington, DC: World Bank.

Badan Pusat Statistik. 2013. Profil Kemiskinan di Indonesia Maret 2013. http://www.bps.go.id/brs_file/kemiskinan_01jul13.pdf

Beaton, C., and L. Lontoh. 2010. *Lessons Learned from Indonesia's Attempts to Reform Fossil-Fuel Subsidies*. Geneva: Global Subsidies Initiative.

Benitez, D., and O. Chisari. 2010. *Recycling Universal Energy Subsidies on Residential Consumers Alternative Fiscal Policies to Help the Poorest*. Washington, DC: World Bank.

Breisinger, C., W. Engelke, and O. Ecker. 2011. *Petroleum Subsidies in Yemen: Leveraging Reform for Development*. Washington, DC: World Bank.

Burniaux, J., and J. Chateau. 2011. *Mitigation Potential of Removing Fossil Fuel Subsidies: A General Equilibrium Assessment*. Paris: Organisation of Economic Co-operation and Development.

Burniaux, J., J. Chateau, R. Dellink, R., Duval, and S. Jamet. (2009). *The Economics of Climate Change Mitigation: How to Build the Necessary Global Action in a Cost-Effective Manner.* Paris: Organisation of Economic Co-operation and Development.

Chung, R. 2013. Fuel Subsidy Reform in Indonesia. Paper presented at a workshop on Innovative Development Case Studies. KDI School and World Bank Institute, Seoul, 21–22 November.

Centre for Strategic and International Studies (CSIS). 2011. Penyesuaian Subsidi BBM Pilihan Rasional Penyelamatan Ekonomi. Working paper. Jakarta: CSIS. http://www.csis.or.id/post/penyesuaian-subsidi-bbm-pilihan-rasional-penyelamatan-ekonomi

Clements, B., H. Jung, and S. Gupta. 2007. Real and Distributive Effects of Petroleum Price Liberalization: The Case of Indonesia. *Developing Economies*. 45 (2). pp. 220–37.

Dartanto, T. 2013. Fuel Subsidies and the Implication on Fiscal Balance and Poverty in Indonesia: A Simulation Analysis. *Energy Policy*. 58 (July). pp. 117–134.

Del Granado, J., D. Coady, and R. Gillingham. 2010. The Unequal Benefits of Fuel Subsidies: A Review of Evidence for Developing Countries. Working Paper WP/10/202. Washington, DC: International Monetary Fund.

Ellis, J. 2010. *The Effects of Fossil-Fuel Subsidy Reform: A Review of Modeling and Empirical Studies*. Winnipeg: International Institute for Sustainable Development.

Global Subsidies Initiative. 2014b. Interactive Maps. http://www.iisd.org/gsi/interactive-maps (accessed May 2014).

Government of Indonesia. Various years, 2004–2012. *Financial Notes and State Budget*. Jakarta.

International Labour Organization. Indonesia: Overview of Schemes. http://www.ilo.org/dyn/ilossi/ssimain.schemes?p_lang=en&p_geoaid=360

International Energy Agency (IEA). 1999. *World Energy Outlook 1999*. Paris: IEA.

———. 2008. *Energy Policy Review of Indonesia.* Paris: IEA.

LEMIGAS. 2012. Laju Eksplorasi Cadangan Minyak Indonesia Sangat Tinggi [The Pace of Exploration of Oil Reserves in Indonesia is Very High]. http://www.lemigas.esdm.go.id/id/berita-325-laju-eksplorasi-cadangan-minyak-indonesia-sangat-tinggi.html (accessed June 2013).

Lontoh, L., K. Clarke, and C. Beaton. 2014. Recent trends in fossil-fuel pricing policy. *Indonesia Energy Subsidy Review*. 1 (1). pp. 4-15.

Lucarelli, B. 2010. The History and Future of Indonesia’s Coal Industry: Impact of Politics and Regulatory Framework on Industry Structure and Performance. Working paper. Palo Alto Stanford University, Program on Energy and Sustainable Development. http://pesd.fsi.stanford.edu/publications/the_history_and_future_of_indonesias_coal_industry_impact_of_politics_and_regulatory_framework_on_industry_structure_and_performance/

Ministry of Energy and Mineral Resources. 2009. *Pertamina Dan PGN Bentuk Joint Venture Company FSRT Untuk LNG Receving Terminal Jawa Barat*. http://www.esdm.go.id/berita/37-umum/3146-pertamina-dan-pgn-bentuk-joint-venture-company-fsrt-untuk-lng-receving-terminal-jawa-barat.html (retrieved 16 July 2013).

———. 2013. Dampak Penyesuaian Tarif Tenaga Listrik terhadap Inflasi diprediksi 0,3 - 0,5%. http://esdm.go.id/index/39-listrik/6146-dampak-penyesuaian-tarif-tenaga-listrik-terhadap-inflasi-diprediksi-03-05.html (accessed July 2013).

Ministry of Finance. 2014. Nota Keuangan Dan Anggaran Pendapatan Dan Belanja Negara. http://www.anggaran.depkeu.go.id/dja/edef-konten-view.asp?id=969

Organisation for Economic Co-operation and Development (OECD). 2013. *Inventory of Estimated Budgetary Support and Tax Expenditures for Fossil Fuels 2013.* Paris: OECD.

———. International Development Statistics. http://stats.oecd.org/qwids/

Olz, S., and M. Beerepoot. 2010. *Deploying Renewables in Southeast Asia: Trends and Potentials*. Paris: IEA.

Perdana, A. A. 2014. *The Future of Social Welfare Programs in Indonesia: From Fossil-Fuel Subsidies to Better Social Protection*. Geneva: International Institute for Sustainable Development.

Pradiptyo, R., and G. Sahadewo. 2012. On the Complexity of Eliminating Fuel Subsidy in Indonesia: A Behavioral Approach. MPRA Paper No. 40045. Munich: Munich Personal RePEc Archive.

PT Perusahaan Gas Negara. Our Shareholders. http://ir.pgn.co.id/phoenix.zhtml?c=202896&p=irol-homeprofile (accessed July 2013)

PT PLN. Various years, 2006–2013. *Financial Statements*. Jakarta: PT PLN (Persero).

———. Various years, 2011–2012. *Annual Report*. Jakarta: PT PLN (Persero).

Satriana, S., and S. Schmitt. 2012. *Social Protection Assessment Based National Dialogue: Towards A Nationally Defined Social Protection Floor in Indonesia*. Geneva: International Labour Organization.

TNP2K. 2013. *Penanggulangan Kemiskinan: Situasi Terkini, Target Pemerintah, dan Program Percepatan.* Jakarta: Government of Indonesia.

US Energy Information Administration. 2013. Countries. http://www.eia.gov/countries/

Vagliasindi, M. 2012a. *Implementing Energy Subsidy Reforms: Evidence from Developing Countries*. Washington, DC: World Bank.

———. 2012b. *Implementing Energy Subsidy Reforms: An Overview of the Key Issues*. Washington, DC: World Bank.

Widjaja, M. 2009. An Economic and Social Review on Indonesian Direct Cash Transfer Program to Poor Families in 2005. Institute of Economic and Social Research Working Paper. Jakarta: University of Indonesia. http://www.welfareacademy.org/pubs/international/policy_exchanges/asp_papers/widjaja.pdf

Widodo, T., G. Sahadewo, S. Setiastuti, and M. Chaerriyah. 2012. Impact of Fuel Subsidy Removal on Government Spending. In Y. X. Wu, Y. Wu, X. Shi, and F. Kimura, eds. *Energy Market Integration in East Asia: Theories, Electricity Sector and Subsidies*. Jakarta: Economic Research Institute for ASEAN and East Asia.

World Bank. 2007. *Spending for Development: Making the Most of Indonesia's New Opportunities. Indonesia Public Expenditure Review 2007*. Washington, DC: World Bank.

———. 2012a. *Targeting Poor and Vulnerable Households in Indonesia.* Jakarta: World Bank.

———. 2012b. *Protecting Poor and Vulnerable Households in Indonesia.* Jakarta: World Bank.

———. 2012c. *BLT Temporary Unconditional Cash Transfer.* Jakarta: World Bank.

———. 2012d. *Indonesia Economic Quarterly: April.* Jakarta: World Bank.

———. 2013a. *Mapping Carbon Pricing Initiatives: Developments and Prospects.* The World Bank.

———. 2013b. *Indonesia Economic Quarterly*. March. Jakarta: World Bank.

———. 2013c. *Indonesia Economic Quarterly.* July. Jakarta: World Bank.

Yusuf, A. A. 2013. The Direct and Indirect Effect of Cash Transfers: The Case of Indonesia. Working Paper in Economics and Development Studies No. 201305. Bandung, Indonesia: Padjadjaran University.

Yusuf, A.A. and A. Ramayandi. 2008. Reducing Fuel Subsidy or Taxing Carbon? Working Paper in Economics and Development Studies No. 200808. Bandung, Indonesia: Padjadjaran University.

Fossil Fuel Subsidies in Indonesia: Trends, Impacts, and Reforms

Subsidized energy is provided to all Indonesian citizens as a public service obligation. This study measures the size of fossil fuel subsidies such as underpricing of petroleum products and electricity, tax exemptions, and subsidized credit; examines the potential economic, energy, and environmental impacts of reducing them; and discusses options for social safety nets to mitigate the impacts of the reforms. It shows that the short-term adverse impacts of subsidy reform turn positive in the long term as households and industry respond to changing market realities by adjusting energy demand, supply, and production capacity. Policy options for sustainable energy use are provided to aid policy makers in their current subsidy reform process.

About the Asian Development Bank

ADB's vision is an Asia and Pacific region free of poverty. Its mission is to help its developing member countries reduce poverty and improve the quality of life of their people. Despite the region's many successes, it remains home to the majority of the world's poor. ADB is committed to reducing poverty through inclusive economic growth, environmentally sustainable growth, and regional integration.

Based in Manila, ADB is owned by 67 members, including 48 from the region. Its main instruments for helping its developing member countries are policy dialogue, loans, equity investments, guarantees, grants, and technical assistance.

ADB

ASIAN DEVELOPMENT BANK
6 ADB Avenue, Mandaluyong City
1550 Metro Manila, Philippines
www.adb.org