

Impacts of Energy Subsidy in Bangladesh: An Analysis

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ABSTRACT

Energy subsidies are widespread around the world but country wise varying greatly by the importance of energy supply. As a developing country Bangladesh contains various energy e.g- electricity, natural gas, comprehensive natural gas (CNG), liquefied natural gas (LNG), hydro-electricity, biomass etc. to convey the production purpose, peoples' demand, subsistence needs of general people and standard livelihood. But it is not entirely possible to maintain all kind of national purpose by stored energy which required the essential subsidies to import the necessary energy from abroad as such as above BDT 282 billion (US\$ 3.4 billion) in 2012. Although government provides subsidies for the necessary energy but it (subsidies) has various social, economic and environmental impact that plays the influential impact on our entire national economic growth and development process which is analyzed in the present study.

Keywords: Energy subsidy, Renewable energy, Non-renewable energy, Environmental impact, Economic impact

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INTRODUCTION

Improved energy supply is essential for socio-economic development and ecological sustainability for a nation. It has a direct impact on the life situation of the rural poor, influencing their productivity, health, education and gender related issues. Although it has an impact in the entire national economy in a long, a developing country Bangladesh use an amount of energy to fulfill the subsistence demand and various production of industries. At present in Bangladesh average per capita consumption is 160 kilograms of oil equivalent (kg) while it is 530 kg in India, 340 kg in Nepal and 640 kg in Asia as a whole. Fossil fuels and power (electricity) are vital for economic growth and a key component to improving the socioeconomic condition of the population. Although

electricity has a crucial role to fulfill the household, irrigation, industry and other production demand, but consumers do not have access to the quality supply due to the mismanagement and administrative complexity. At present, only about half of the population has access to electricity although the supply is not reliable even to them. So due various administrative and resource problem government of Bangladesh is bound to export energy from foreign country which lead increase the rate of subsidy is one of the resultant of decreasing impact of entire national economy (International Institute for Sustainable Development, 2012). The paper discusses the size of subsidies to different energy types, the segments of society that benefit the most and how they shape the country's economy as well as socio-economic environment. It emphasizes the procedure of reforming energy subsidies, drawing on the experience of Bangladesh and other developing countries. In addition, the analysis confirms that energy subsidies in Bangladesh have been rising rapidly in recent years and are becoming increasingly difficult for the government to sustain with its inadequate economic resources.

BACKGROUND

In the present context of economic crisis developed and developing countries alike need to phase out inefficient subsidies. Countries have to need implement the subsidy to fulfil the demand of power and energy. Energy subsidies in particular need to be rationalised, appropriate demand and given that their reforming can yield significant environmental and welfare benefits. Subsidies can justified when they promote an overall increase in social welfare. The rate of energy subsidies is increasing gradually due to public demand, production, consumption and development purpose. Though governments of developed and developing countries adopt the subsidies for power and energy but it has a negative impact on the overall growth of economy and socio-environmental areas. The expert consents, fossil fuel subsidies have a net negative effect, both in individual countries and on a global scale include- environmental, economic and social impacts. In particular, fossil fuel subsidies increase energy consumption and GHG emissions, strain government budgets, divert funding of social sector (such as healthcare or education) and reduce the profitability of alternative energy sources. Energy subsidies are large, diverse and wide that is marginalized for entire economy of global spectrum. A recent study (IEA, 2012) displays- in 2011, fossil fuel consumption subsidies in 37 developing and emerging economies to USD 523 billion, with subsidies for oil products representing almost 50 percent of the total. In the EECCA region alone fossil fuel subsidies for consumers (oil, coal, gas and electricity) may have totalled about USD 2 billion in Azerbaijan (about 3.1 percent of GDP), USD 6 billion (3.3 percent of GDP) in Kazakhstan and USD 9 billion (6 percent of GDP) in Ukraine. In the above mentioned amount of subsidies, only 8 percent targeted the poorest 20 percent of the population. Furthermore, the International Energy Agency (IEA) estimated that if all fossil fuel subsidies were completely phased by 2020, global primary energy demand would be cut by nearly 5 percent and carbon dioxide (CO₂) emissions by 5.8 percent, compared to the "business as usual" scenario. IEA assessment of the magnitude of fossil fuel consumption subsidies, comprehensive studies identifying, quantifying and measuring the impact of EHS in the EECCA countries are lacking (www.oecd.org/env/outreach).

Bangladesh is one of the developing countries in South Asia along with a standard energy demand for the household purpose, production, fuel of vehicles and development activities is required a large scale of energy subsidy. Every year government of Bangladesh adopts a large scale of amount for the energy subsidy to import petroleum, electricity and

furnace oil, etc to fulfill the domestic needs. But in the long run it plays a large negative impact on the national economic growth, environment and society. In 2011 government adopted subsidies for petroleum products, electricity, natural gas, and coal \$480 billion equivalent to 0.7 percent of global GDP or 2 percent of total government revenues (www.imf.org/external/np). Though energy subsidies is adopting for the need of entire population but maximum of influential peoples gets the real benefit compare to the poorest which lead the social inequality indirectly. Therefore, due to the over consumption of energy it is increasing the emission of Carbon Dioxide (CO₂) by vehicles, production of large manufacturing industries and recycling of goods, etc is harmful for human being. As the present socio-economic context of developed and developing countries in the world, governments provide a large scale of subsidies to fulfill various domestic needs and production activities instead of its negative impact especially on national economic growth and development. Energy subsidies is associated with various factors as such-scarce resources and high consumption of power and energy, poor GDP, low advancement of technologies and geographical spectrums, etc. Energy subsidy is not particular national issue; it is the crucial concern of the global aspect as per the socio-economic and environmental context, is rationale to study, analysis and evaluation for the long run global development.

SOUTHEAST ASIA'S ENERGY SUBSIDIES

Like other developed and developing countries, governments of the countries of Southeast Asia also adopt energy subsidies for their production purpose and development. Energy subsidies are especially large in Indonesia along with 14 percent subsidies of fossil fuel of government expenditure. Other Southeast Asian countries in Viet Nam, the state electricity utility buys coal from the state mining company at prices far below market rates by selling electricity to consumers for \$0.07/kWh—the lowest price in the region other than in energy-rich Myanmar.

Table 1: Fossil fuel subsidies in Southeast Asia, 2011

Country	Value (\$billions)	Subsidy Rate (%)	Share of GDP (%)	Share of Government Expenditure (%)
Indonesia	21.3	23.2	2.5	14.3
Thailand	10.3	20.0	3.0	15.2
Malaysia	7.2	18.4	2.6	10.1
Viet Nam	4.1	15.5	3.4	12.8

Source: World energy subsidy database
www.iea.org/subsidy/index and www.iisd.org/gsi/sites

In net energy-exporting countries of Southeast Asia, energy subsidies are a mechanism to redistribute wealth from natural resources along with direct fiscal cost for net energy importers. Under this mechanism, subsidies help the poor and promote economic growth. Low and stable energy prices may hold down living costs with faster growth of national economy. But subsidies of fossil fuels are foster energy-intensive growth that discourages the expansion of labor-intensive/employment-generating industries. Equally importantly, public spending on energy subsidies has high opportunity costs, such as forgone investments in infrastructure, health, and schooling. They also create a crowding-out effect in domestic capital markets (www.asiathways-adbi.org).

India

As IMF cross-country studies, fuel subsidies generally crowd out high priority public spending, like education, manufacture and health, etc. They also put pressure on current savings, deposits, distort productive investment toward energy-intensive sectors and technologies, and contribute to global warming. Fuel subsidies are regressive-actually benefiting the rich much compare to the poor is absolute reality in India. In India fuel subsidies were reaching at 2 Percent of GDP, and crowding out more productive public spending, India's government taken effective steps over the past nine months to reduce. Diesel prices systematically increased to limit the number of subsidized Liquefied Petroleum Gas cylinders per household, and state electricity boards encouraged to set more cost-reflective power tariffs. But a large inconsistency by benefits of energy subsidy is visible in where the top 10 percent of Indian households spends more than 20 times as much on fuel as the poorest 10 percent. Low-income households consume mainly kerosene, while upper income households predominantly use petrol and LPG (<http://blog-imfdirect.imf.org>).

Pakistan

Pakistan is mired in an acute energy crisis for both the nation's floundering economy and unpredictable security situation. According to some estimates, energy shortages have cost the country up to 4 percent of GDP over the past few years. Pakistan government has forced the closure of hundreds of factories (including more than five hundred alone in the industrial hub city of Faisalabad), paralyzing production and exacerbating unemployment. Pakistan's energy problems are deep and complex, and rooted more in shortages of governance and political problems. In Pakistan due to increase of population, rapid urbanization, rise of new industries and other corporate energy customers, the situation of energy has continued to worsen- reached a peak of 8,500 megawatts (June, 2012), above 40 percent of national demand (www.nbr.org/research/activity).

To discuss the energy situation, energy subsidies of Asia, it displays that Asian region is not entirely developed by the essential power and energy. Almost every government of Asian country has to adopt a standard amount of budget for the energy subsidy for the production and other activities due to the scarce of energy resources and increasing population. Bangladesh, one of the Asian and developing countries in the world along with essential power and energy crisis, belongs to the energy subsidies. Every year government provides a standard amount for power and energy import and energy subsidies although it plays a vulnerable impact of the socio-economic structure, total national economy, growth of GDP, social expenditure and environmental aspect. As the current socio-economic and cultural context, like other countries of Asia Bangladesh also belongs to energy subsidy due to various factors and development notions to consider its impact on the entire economy. So it is concluded that the concern of energy subsidy of Bangladesh is applicable for the entire development notions of Asian region.

OBJECTIVES OF THE STUDY

The principle and general objectives of the study:

- Identify the impact of energy subsidy in economic, social and environment aspect;
- Describe the crucial factors (causes) of energy subsidy in Bangladesh.

The broad objectives have been split into the following specific objectives-

- Describe the present energy structure in Bangladesh;
- Describe the institutional set-up in the energy sector.

RESEARCH METHODOLOGY

In this study the impact of energy subsidy in economic, environmental and social aspect of Bangladesh and factors of energy subsidy are concentrated. In order to get proper knowledge on impact of energy subsidy and factors of energy subsidy various research, online articles, reports, text and other primary documents are reviewed.

Sampling method

To find out the major impacts of energy subsidy various research work and article considered as the methods of analysis, published in different scholarly journal and government agencies. Number of articles is selected by purposive (judgmental) sampling technique for the authentic and representative data/information.

Variable

To analyze the impact of subsidy and factors of energy subsidy the following variables is considered- energy subsidy, renewable energy, non-renewable energy, fossil fuel subsidies, natural gas, economic impact, social impacts, and environmental impacts.

Presentation

Though the primary focus of the study is the impact of the energy subsidy and factors (causes) of energy subsidy, for the vast knowledge about energy and energy subsidy situation a short discussion on the energy structure of Bangladesh and institutional set-up of energy sector are also discussed.

ENERGY STRUCTURE IN BANGLADESH

The frequency of energy outage is the major threat of standard livelihood, benefit of natural resources, mass welfare and the entire development prospects. The annual loss to production and income from power outage could well exceed 0.5 per cent of GDP per year. The frequent supply of domestic primary fuel is the result of scarce of fuel energy is forcing shutting down fertilizer factories, rationing gas supplies for household and transport uses etc. Every 1 per cent of GDP growth leads to a growth of 1.4 per cent in electricity demand in a typical developing country. For a 5-6 Percent typical annual economic growth rate, it may imply a need for close to 7-8 per cent growth in electricity supply. In the other side, rural electrification ratio was expended rapidly as well as 10 per cent in 1994 and 37 per cent in 2008 which also one of the results of power crisis for other development works. Government has been forced to enter into contractual agreements for temporary solutions such as- rental power and small IPPs, much of it diesel or liquid-fuel based to consider the energy crisis, but that are imposing tremendous fiscal pressure.

Due to the different uses of energy in various sectors per capita consumption is also decreasing compare to different countries in Asia and the Pacific such as in Bangladesh on an average 160 kg (Kilogram oil equivalent) while it is 530 kg in India, 510 kg in Pakistan, 340 kg in Nepal and 470 kg in Sri Lanka. The average consumption in Asia is 640 kg which display that per capita average consumption of energy in Bangladesh is significantly lower than the average of Asia, calls for an urgent but well-crafted sustainable strategy to address the energy crisis and increase the energy supply to support the entire development of Bangladesh. In the present estimated of energy sector various types of energy is existed for the fulfill of energy demand and goods production is as follows:

Non-renewable Energy

The principles sources of commercially used non-renewable energy include- natural gas, oil from mineral and other sources, coal and coal-like substance, compressed natural gas (CNG), liquefied natural gas (LNG) etc.

Natural Gas

The major sources of the primary energy are natural gas that is most commonly uses in rural and urban areas to fulfill peoples demand. In Bangladesh since 1955 as many as 23 gas field have been discovered, and the first was in Sylhet. The existing natural gas is mainly used in electricity, fertilizer, industry, transport and housing sectors. The reserve and production situation of gas up to 2010 are as follows-

- Total number of gas field-23
- Total reserve of extractable gas (proven and probable)- 20.605 TCF (Trillion Cubic Feet)
- Number of gas fields which are in production- 17 (number of wells-79)
- Total consumption of gas up to June 2010-9.077 TCF
- Total reserve remaining (2P) up to June 2010-11.528 TCF
- Daily gas exploration-about 2000 MMCF (Million Cubic Feet)
- Production by Petrobangla-960 MMCF
- Production by International Oil Companies-1040 MMCF
- Daily demand of gas-2500+ MMCF
- Daily shortage of gas supply-500+ MMCF
- Gas production increased from January 2009 to December 2010-284 MMCF.

Although the total reserve remaining of natural gas up to June 2010 is 11.528 TCF, scarce level but the demand of natural gas is increasing gradually by every fiscal year due to the production purpose. But supply is not in sound amount compare to the demand and so far there is already a shortage of gas that requires extracting more gas through more intense to discover new gas fields.

Table 2: Sector-specific Projected Demand for Gas

Sector	2010-2011	2011-2012	2012-2013	2013-2014	2014-2015
Power	300.5	324.5	350.5	378.5	415.8
Captive Power	142.6	164	188.6	216.9	238.6
Fertilizer	94	94	94	94	94
Industry	160.7	184.8	214.4	246.5	271.1
Household	99.5	11.4	124.8	139.8	153.8
CNG	44.7	51.4	56.5	113	124.3
Others	30.8	31.9	32.7	33.7	37.4
Total	872.8	962	1061.5	1222.4	1335

In order to realize the demand and scarcity of natural gas, a number of policy actions will be implemented and this are-

- Ensure adequate provision of fund.
- Make arrangement for speedy bidding procedures for off-shore blocks.
- Purchase higher quality machineries using advanced technology and build up efficient manpower to strengthen BAPEX.
- Ensure the drilling and development of wells as per plan through streamline work procedures and effective monitoring of the international oil companies.

- Secure speedy resolution of the demarcation of maritime boundary issues with India and Myanmar for the blocks located at the deep sea areas.

Therefore, the shortage of natural gas supply can be mitigated through importing liquefied natural gas (LNG) following actions will be taken-

- Providing opportunities to the private sector to import LNG.
- Along with other necessary facilities, at least the infrastructure of two terminals of 500 MMCFD will be built to receive the imported liquid gas from the ship.
- Involve the private sector in the planning of import LNG and establishment of the terminals.

Renewable Energy

In Bangladesh renewable energy such as- biomass, solar power and wind power are being used to enrich our entire national production. Especially in the remote areas have no natural gas opportunities and supply, household use the biomass for cooking and solar power and wind for drying of different grains, as well as clothes. The use of renewable energy has become popular worldwide in view of the depleting reserve of nonrenewable fossil fuel due to its environment-friendly nature. In the country, at present the different types of renewable energy are being used in the limited range are as follows-

- Hydro-electricity
- Solar power generation using solar rays
- Wind-mill power generation using wind power
- Generation of electricity from municipal refuse
- Production of bio-gas using waste
- Electricity produced by biomass gasification method using wood, rice husk, etc.

In order to reduce the reliance on natural gas and import dependent oil the government has taken a number of steps to spread and develop renewable energy which contains various benefits are as follows-

- Supply of raw materials for power generation is potentially infinite
- Operational costs are low compare to initial investment
- Technology is flexible and portable
- People living separately in place away from the main land can have access to power and energy facilities
- Future energy security is ensured (World Bank & IMF, 2013)

FACTORS (CAUSES) OF ENERGY SUBSIDY IN BANGLADESH

Energy subsidies are commonly defined as “any government action that lowers the cost of energy production, raises the revenues of energy producers or lowers the price paid by energy consumers” (International Energy Agency and World Bank, 2010). As the definition implies, energy subsidies come under two main categories: those designed to reduce the cost of consuming energy and those aimed at supporting domestic production (Burniaux et al., 2009). Producer subsidies are common in developed and developing countries, while consumer subsidies tend to exist on a much larger scale in developing countries. Subsidies may be provided to the energy sector through many mechanisms, including:

- Direct financial transfers to producers or consumers.
- Retail prices set at below-market value.
- Small interest or preferential loans and government loan guarantees.
- Preferential tax treatments, such as tax credits, tax rebates, reduced tax rates.

- Liabilities and accelerated depreciation on energy supply equipment.
- Trade restrictions, including tariffs and non-tariff trade barriers.
- Energy-related services provided by the government at less than their full cost.
- Regulation of the energy sector such as price controls, demand and purchase guarantees, environmental regulations, market access restrictions (International Institute for Sustainable Development, 2012).

On the economic impact of energy subsidy, few study by various renowned institutions and International organizations have been done. Most of them tried to find the impacts of energy subsidy in the form of economic, environment and social perspective.

A subsidy by affecting cost and price always causes a shift in economic resource allocation. Energy subsidies deliberately distort price signals and therefore, investment in infrastructure to supply different fuels and in the capital stock that transform or consume energy. If the subsidy successfully corrects a market failure, such as internalizing the cost of an environmental externality it can improve social welfare. But if the subsidy fails to address a targeted market failure or worsens another one, it will result in a loss of economic efficiency (Morgan, 2007). Subsidies lower the price of energy and thus expand the consumption of energy beyond its natural level. It is harmful for an economy with limited resource. Equally there are negative externalities in the form of environmental damage related with the consumption of energy. Bangladesh is one of the developing countries in Asia and the Pacific that is highly dependent on natural gas and hydropower for energy is facing global climate change via emission of carbon dioxide (CO₂) - 0.36 Percent of global emissions of CO₂ associated with energy and transport systems (www.christianaid.org.uk/Images/low-carbon). But Bangladesh government has to subsidize a huge amount of money in a fiscal year to export energy from abroad. The main goal of most subsidy programs is to promote some "social good" such as improving the quality of life of a group of people or redistributing income to less fortunate group. Subsidies should be directly targeted to the intended beneficiaries and can be justifiably used to promote the development of the market for new products or services. But the real situation is that subsidies grows as different interest groups attempt to capture them and creates different problems (Barnes and Halpern, 2000). Subsidies for energy are a matter of large expenditure compare to other service sector in Bangladesh. Although it is adopted by government for the entire production, transportation, and economic growth but one group of people are benefited by this subsidy, the poorest are most often disadvantaged. Subsidies from the government budget amount to more than US\$100 million a year which is more than expenditure on health (Rijal, 2007).

Rijal (2007) explained his views on a joint UNEP and UNECE expert meeting on energy subsidy and its advantage of particular group. In Bangladesh the poor are mostly dependent on traditional biomass and have little access to electricity and other public utilities. Energy subsidies often benefit wealthier groups of society strangely given that they use more energy. Government of Bangladesh also provides energy subsidies to support important parts of the economy as well as Bangladesh's agriculture sectors in which nearly half of the country's labor force are employed. Bangladesh's agricultural sector depends heavily on energy-intensive irrigation. Recently the Government on June 7, 2012 requested parliament to set aside TK 12,600 crores as subsidy for power and energy sector for fiscal 2012-13 in the budget proposals, finance ministry requested parliament to allocate Tk. 6,400 crores as subsidy for the power sector. Due to the lack of energy supply n rural areas, the rural population depends mainly on biomass (over 70 Percent of primary energy) as a source of energy agricultural waste and wood which has a bad impact on environment. But energy

consumption per capita is increasing in this country which also varies by year. According to the report of World Bank the energy use (kWh per capita) in Bangladesh was 252 in 2009, while it was 229 kWh and 206 kWh per capita in 2006 and 2008 respectively. Government of Bangladesh is taking various steps to fulfill the demand of energy such as- installation of quick rental power plants, repairing and restructuring existing power plants. Due to the shortage of natural gas supply, expected electricity production is being hampered. In order to increase the supply of natural gas, steps have been taken under medium and long term plans to increase additional 2600 MCFD (million cube feet per day) of gas by 2015 through national and international gas companies. Government of Bangladesh also signed agreement with government of India and Myanmar to purchase surplus energy. In the last one year, additional 114 MCFD of gas has been added to the national grid (www.worldenergyoutlook.org/media/weowebiste/2008).

Estimation of Energy Subsidies

In 2012 fiscal year (FY), total subsidies for energy were expended at nearly BDT 320 billion (US\$ 3.9 billion). This is nearly a quarter of the total budget (Table-1), equivalent to the government expenditure of education and more than the expenditure of health and social welfare (FY-2012). In the above mentioned subsidies, almost 90 percent of the total amount spent and nearly 34 percent is off-budget, such as government loans for Bangladesh Power Development Board at favorable lending rates.

Total 3: Subsidies in Bangladesh during FY 2012 (July 1, 2011–June 30, 2012)

Products	Total cost Total (billion BDT)	Sales revenue (billion BDT)	Total subsidy (billion BDT)	Total subsidy (million US\$)
Power	79.04	70.59	8.45	115.6
Power (Rental power plants)	...	...	123.56	1690.3
Natural gas	100.1	103.6	-3.46	-47.3
Petroleum	572.6	418.8	153.8	2103.7
Fertilizer	...	...	19.8	271.3
Food (consumption)	...	...	17.5	239.8
Total	...	...	319.7	4373.4

Source: World Bank

Energy subsidies result from the government setting retail prices for fuel and electricity at much lower than market prices. Although the government periodically adjusts prices to bring them closer to world market levels, subsidies have remained substantial that has been shown in the following tables-

Table 4: Domestic Retail Prices of Petroleum Products

Petroleum Products	Dec 1998	Aug 2000	Dec 2001	Jan 2002	Jan 2003	Jun 2004	Jan 2005	Sep 2005	Jun 2006	Apr 2007	Nov 2011
Kerosene (BDT/L)	12.66	15.17	16.67	16.67	16.83	16.83	16.83	29.37	32.37	40.00	56.00
Diesel (BDT/L)	13.40	16.22	17.60	17.60	19.71	19.71	22.01	28.00	28.00	40.00	56.00
Furnace oil (BDT/L)	5.00	6.50	12.50	12.50	10..	12.00	12.00	14.00	14.00	20.00	55.00
Natural gas, average (BET/1000 Cft)	54.66	62.87	62.87	65.99	70.00	70.00	73.91	73.91	79.91	73.91	...

Source: Figures based on unpublished data provided by the Ministry of Energy and Mineral Resources, Government of Bangladesh

Table 5: Estimated Energy Subsidies in FY 2012

Category of Natural Gas	Cost per unit (BDT)	Selling price per unit (BDT)	Profit/loss per unit (BDT)	Quantity (million unit)	Total subsidies (billion BDT)
1. power	3.1	2.9	-0.12	25,747.3	8.45
Residential	3.1	3.3	0.24	2,557.7	-0.27
Agricultural	3.1	1.9	-1.16	151.1	0.18
Industrial	3.1	4.4	1.29	2,109.2	-2.35
Commercial	3.1	6.0	2.98	645.5	-1.77
Bulk	3.1	2.7	-0.41	2,0136.5	12.77
Others	3.1	3.9	0.83	147.4	-0.10
2. Rental Power plants	....	....	....	....	123.56
3. Gas	...	...	...	705.5 (BCF)	-3.46
National	65.1	147.3	82.2	331.6 (BCF)	-27.1
International	....	....	....	....	....
Gas companies	210.0	147.3	-52.7	373.9 (BCF)	23.6
4. Petroleum	....	....	....	8,183.0	153.8
Petrol	88.5	81.0	-7.5	152.0	1.3
Octane	89.5	84.0	-5.5	111.1	0.7
Diesel	79.4	51.0	-28.4	4,007.6	1116.9
Kerosene	79.6	51.0	-28.6	508.5	14.9
JP-1	79.5	61.0	-18.5	368.2	6.8
Furnace oil	52.9	50.0	-2.9	3,035.6	13.2
Total fossil-fuel subsidies	....	....	....	....	282.35

Source: World Bank.

Fuel Oil

Bangladesh has small proven oil reserves, and thus imports much of its oil products. In the domestic market, petroleum prices are subsidized and administratively fixed by the government. The price of kerosene was raised in November 2011 from BDT40/liter to BDT56/liters, (US\$0.49–\$0.68). With average annual consumption of 508.5 million liters, the total subsidy for 2012 is expected to amount to BDT14.9 billion (US\$182 million). Kerosene is largely consumed by low-income households for lighting and cooking. The average annual consumption of diesel is 4,007.6 million liters, most of which is used for operating irrigation equipment. The total subsidy for diesel for 2012 is estimated to be BDT116.9 billion (US\$1.4 billion), which is the highest amongst the petroleum subsidies. The average annual consumption of petrol is 152 million liters, most of which is used for transportation. The amount of subsidy is expected to be BDT1.39 billion (US\$16.9 million) during FY 2011–12. Finally, average annual consumption of furnace oil, which is mainly used as fuel for electricity generation, is 3,035.6 million liter, and the subsidy amounts to BDT13.2 billion (US\$161 million).

Natural Gas

Natural gas is Bangladesh's only significant source of commercial energy, and is expected by some independent analysts to grow by around 6 per cent annually over the next two decades. Potential uses for natural gas in Bangladesh include petrochemicals, compressed natural gas (CNG) for vehicles, power generation and fertilizer production. Bangladesh also possesses around 55 million barrels of natural gas liquids, which could be used for petrochemical production or as a cooking fuel. Bangladesh periodically raises the price of natural gas as part of its efforts to reduce subsidies. Still, natural gas prices in Bangladesh are relatively low by international standards, with electricity consumers, the fertilizer industry and household consumers receiving most of the benefits.

Electricity

Electricity is a scarce service in Bangladesh along with only 55 percent of the user (households) among 160 million, mostly in urban areas and 43 per cent of rural households. Natural gas, diesel oil, furnace oil, coal and hydro are the prominent types of fuel are used to the purpose of electricity generation in Bangladesh. From 1972 to 2008, gross electricity generation increased from less than one terawatt hour (TWH) to more than 25 TWH. As per the official estimate (1976–2003), electricity generation has grown at 7.5 percent per year, but in reality the growth may have been lower—more likely 4 to 5 percent. The provision of low-cost electricity has played a critical role in growth and development of the Bangladesh economy. Although the per-unit supply cost of electricity has risen over time, the rate of increase is rather small. However, due to rapid demand for electricity, the Bangladesh Power Development Board (BPDB) has recently taken steps to install new power plants and to purchase electricity from independent power producers. Considering the rising supply cost of electricity, the bulk electricity tariff rate has recently increased to reduce BPDB's losses. As a result, the bulk price of per-unit electricity increased from BDT2.37 to BDT2.61 (US\$0.029–\$0.032) in February 2011. At present, an acute shortage has emerged as a major constraint to development efforts in different sectors of the Bangladesh economy. Although this process is expensive but government is trying to meet the shortage by installing rental power stations and adopting other quick means of generating electricity that lead increasing subsidies for electricity.

Coal

The country's coal resources have great potential for diversifying its energy sources. Extracted coal can be used in coal-based power plants, and is also a source of energy for manufacturing industries. Bangladesh's total coal reserve at around 2,797 million tones and the heat generation capacity is equivalent to about 37 trillion cubic feet of gas. Moreover, there is ample potential for discovering additional coal mines if extensive exploration initiatives are undertaken all over the country. The government does not provide subsidies for imported coal. However, there is an implicit subsidy for domestically produced coal is using for electricity generation. Currently the BPDB gets coal for power generation at a price that is nearly 40 percent lower than its market price.

INSTITUTIONAL SET-UP IN THE ENERGY SECTOR

To maintain the energy sector, preserve all, proper utilize of store energy and appropriate distribution of energy among the crucial sections various important institutions were established in Bangladesh governed by government of Bangladesh is as follows:

Government

- Bangladesh Energy Regulatory Commission (BERC): BERC has authority over consumer protection, approval of tariffs and pricing, issuance of generation and distribution licenses, and promotion of competition.
- Power Cell: Within the MPEMR power division, the Power Cell oversees power sector reform.
- Rural Electrification Board (REB): REB oversees operations of consumer-owned rural electric cooperatives (PESs). It performs supervisory and regulatory duties to ensure that technical standards met, and performance is monitored.
- Sustainable and Renewable Energy Development Agency (SEDA): SEDA will act as a focal point for sustainable energy development and promotion, 'sustainable energy'

comprising renewable energy and energy efficiency. (This institution is not established yet but concrete steps have taken in this regard by the Government, with SED support).

- Bangladesh Power Development Board (BPDB): BPDB operates most publicly owned generators and some urban distributors; it acts as a single buyer, purchasing from public and private generators and selling.
- Power Grid Company of Bangladesh (PGCB): PGCB is a wholly owned subsidiary of the BPDB, operates the national transmission grid, schedules operations and wheels energy to distributors.
- The Dhaka Power Distribution Company Ltd. (DPDCL): DPDCL distributes energy and conducts commercial operations in Dhaka and adjoining areas, except for Mirpur and Gulshan.
- Dhaka Electricity Supply Company Ltd. (DESCO): DESCO distributes energy and conducts commercial operations in the Mirpur and Gulshan jurisdictions of the Dhaka metropolitan area.
- West Zone Power Distribution Company (WZPDC): The WZPDC is responsible for regional distribution in Khulna.

Private Sector

- Summit Power Company: A private power company that operates some smaller size power plants.
- Energy Pac: A private sector enterprise that produces transformers, energy saving lamps, etc.
- Rahim Afroz: The biggest manufacturer of batteries in Bangladesh. Besides manufacturing, it is also involved in the import of solar panels and installation of solar home systems:
- Infrastructure Development Company Limited (IDOL): IDOL is a government owned company. Although its mandate is to finance all types of infrastructure projects in Bangladesh, its activity is to manage REREDP project and biogas projects supported by KfW and SNV.
- Grameen Shakti (GS): The biggest NGO involved in the dissemination of renewable energy technologies in Bangladesh.
- Rural Services Foundation (RSF): A foundation established by Rahim Afroz. It engaged in the dissemination of renewable energy technologies.
- Bangladesh Rehabilitation Assistance Committee (BRAC): One of the biggest NGOs in the world is internationally active. The focal areas are in Bangladesh they comprise of poverty alleviation micro-finance, health, environmental protection, and social empowerment, also through the provision of improved energy services with a focus on solar household systems.

Activities of Other Donors

- Asian Development Bank (ADB): The ADB as the donor took the coordinating role and acted as the chief negotiator with the Government of Bangladesh. All international donor activities in the energy sector coordinates by the Local Consultative Group led by ADB. Since recently ADB is providing funds to the REREDP program implemented by IDOL.
- The World Bank (WB): The WB is providing funds to the Government of Bangladesh to increase the electricity generation, transmission and distribution capacity. The WB initiated the REREDP program and is still financing the credit part of the program.

- Japan International Cooperation Agency (JICA): JICA is helping Bangladesh in the generation of electricity. Currently, JICA is also providing funds to REREDP program.
- Global Environment Facility (GEF): GEF has supported REREDP from the very beginning and plans to undertake projects in the areas energy efficiency and improved brick kilns.
- SNV: SNV is active in the field of biogas technology dissemination and is showing interest in improved cook stoves.
- Urban Partnership for Poverty Reduction (UPPR): Under UNDP initiated UPPR is collaborating with SED in the cook stove sector and is also open for cooperation in biogas plants in urban settings.
- U.S. Agency for International Development (USAID): USAID has been supporting rural electrification program of Bangladesh for the last 35 years. Currently, USAID supported the implementation of the project “Integrated Protected Area Co-management” (IPAC). SED and IPAC are collaborating in the promotion of improved cook stoves.
- Practical Action (PA): PA is mostly active in infrastructure and livelihood improvement in poor urban areas. As part of their efforts to provide energy access to the poor, they are interested to cooperate with SED in the promotion of improved cook stove as well as related monitoring and evaluation activities.
- Swedish International Development Agency (SIDA): SIDA is planning to start improved cook stove activities in Bangladesh. It is in decide- whether this will happen in cooperation with GIZ.
- UK Department for International Development (DFID): DFID has made tremendous funds available for electrification projects. They have indicated the strong interest in SHS/SSHS, PicoPV as well as improved cook stove activities. Also, they will be active in the field of political advisory, e.g. they are working on the topic of reallocation of subsidies for energy services and fuels.
- Climate and Clean Air Coalition (CCAC): CCAC is a new partnership represented by the USA, Canada, Sweden, Mexico, Ghana, and Bangladesh. This group is focusing on the reduction of short-lived pollutants such as black carbon and methane by promoting new environmentally friendly technologies and processes like improved cook stoves, brick kilns, and rice parboiling system. Detailed discussions for cooperation have taken place in Toronto and Paris recently.

IMPACT OF ENERGY SUBSIDIES IN BANGLADESH

Environmental Impacts

The environmental effects of energy subsidies are complex along with positive and negative impact, depending on the precise nature of the energy source. Subsidies that result to end- users increase the consumption of the respective fuels that have harmful impacts on the environment-including higher airborne emissions of noxious and greenhouse gasses. Higher fossil-fuel production can also damage the environment directly by polluting water supplies and spoiling the landscape. Subsidies for bio fuels, used by several OECD countries, usually trigger more intensive farming. Subsidy phase-out leads to fuel switching (as opposed to increased efficiency) the net impact on emissions of greenhouse gasses depends on whether the energy source affected is more or less carbon-intensive than the alternative.

Bangladesh has one of the lowest per capital rates of carbon dioxide emissions in the world. There are two major reasons for such low emissions. First, the country lacks

energy-intensive industries such as steel and aluminum manufacturing. Second, nearly two-thirds of the country's commercial primary energy of the country come from natural gas. Bangladesh shares 0.36 Percent of global emissions of CO₂. (Source: *Energy Information Administration*) But Bangladesh is the one of the sufferer for the environmental change of the world. However, urban air pollution is one of the most significant environmental issues related to the energy sector in Bangladesh. Old and badly maintained vehicles are the sources of particulates, and the problem gets further complicated by the particulate load of brick-fields using biomass fuel around major cities. It may argue that subsidized fuels lead to inefficient fuel consumption into the transport sector resulting in increased air pollution, especially in the cities. Subsidies may well act as a disincentive to adopting energy-efficiency measures or alternatives such as LED (Light-emitting diode) lights and solar lanterns.

Over energy consumption has adverse impacts on the human livelihood, is the resultant of energy subsidy and import of energy from the foreign country. Currently, more than 20 Percent of all energy consumed (in the form of biomass) in developing countries and the poorest countries using this as their 70-80Percent energy needs, plays the adverse impacts on health, productivity and deforestation. So over energy consumption and energy subsidy has a vast human health impact through the environmental aspects which is also a great challenge for the entire economies of a nation.

Economic Impact

An energy subsidy involves a complex set of changes in economic resource allocation through its impact on costs or prices that is also the result of a vast range of economic, social and environmental effects. There are lots of examples from different countries and regions of the high economic costs associated with energy subsidies. In a study of 1999 IEA (International Energy Agency) it is displayed that due to consumer energy subsidies the eight largest non-OECD countries faces the loss of economic growth at \$257 billion per year. These costs are more important than any overall social and economic benefits that might accumulate from those subsidies that could often be achieved more and at lower cost in ways what do not involve subsidizing energy. Depending on the type, the loss of economic efficiency is manifested in one or more of the following ways:

- Subsidies to consumption or production are the result of higher energy use and reduce incentives to conserve or use energy more efficiently.
- Subsidies for production, producers are not intended to reduce incentives to minimize costs that lead in less efficient plant operation and less investment in more efficient technology. Subsidies for coal production in several countries have long hampered efforts to improve productivity.
- Direct subsidies in the form of grants or tax exemptions play as a drain on government finances. Such direct subsidies lead to acute pressure on the government budget, especially during periods of rising international prices.
- At the higher energy use, consumption subsidies boost demand for imports or reduce the amount of energy available for export that decrease the balance of payments and energy supply security by increasing the country's dependence on imports.

Large fuel subsidies make Bangladesh's fiscal position highly vulnerable to changes in global energy prices. When global fuel prices rose steeply in 2008, the government faces the fact either raise domestic fuel prices or increase subsidies to absorb the global price. While the first response can increase inflation and is politically difficult to implement, the second distorts the economy and limits of development options.

The over-consumption of imported fuels resulting from subsidized prices leads to increased demand, which may contribute to declining in the country's balance of payments and increase its dependence on imported fuels. The government's policy of subsidizing domestic fuel may have other negative consequences, such as the smuggling of subsidized fuels to neighboring countries that is the ultimate result of higher prices and corruption for the expensive fuels. Moreover, when subsidies rise quickly, the government may be forced to divert resources from other productive activities or resort to borrowing. Overall, the economy may be exposed to inefficiencies in both allocation and distribution of resources across different sectors and activities. Again, selling imported fuel at lower prices in the domestic market is the results of losses for the Bangladesh Petroleum Corporation (BPC), the national oil company in Bangladesh. BPC's operating losses are, in turn, covered by loans from state-owned commercial banks, direct budget transfers and net lending by the government. The amounts of this "losses" are not too small.

Table 6: Operating Losses Incurred by BPC in Recent Years

Year	Amount of Loss (in million BDT)
2002-03	76.1
2003-04	9589.3
2004-05	23178.8
2005-06	33377.8
2006-07	26438.8
2007-08	63620.8
2008-09	266.23
2009-10	23075.7

Source: Bangladesh Petroleum Corporation (BPC)

Social Impact

Studies reviewed by the Independent Evaluation Group (IEG) of the World Bank (IEG 2009) found that the bottom 40 Percent of the population ranked by income distribution receives 15-20 Percent of the fuel subsidies. But the poor are often willing to pay for better-quality energy but alternatives are frequently either unavailable or entail high access cost. It is one of the realistic matters as per the context of Bangladesh that energy subsidy intended for one group of people but provides benefit the other group and the poorest are most often disadvantaged. As the economic theory, social welfare is maximized when the price of each good and service is determining by the intersection of producer's willingness to supply and consumer's willingness to pay. When price deviates from this point of static equilibrium, resource allocation is economically inefficient since the benefits to consumers from the last units of energy consumed are smaller than the cost involved in supplying the energy service. The social implications of energy subsidies are varying according to the type of subsidy. Subsidies to modern cooking and heating fuels such as kerosene, liquefied petroleum gas (LPG) and natural gas, as well as electricity are common in Bangladesh. They aimed at improving poor household's living conditions by making those fuels more affordable and accessible. These include less indoor pollution and a reduction in the time women and children spend gathering fuel and more time for productive activities like farming and education. In reality, these subsidies often benefit mainly the energy companies, equipment suppliers, and the better-off households, especially in the towns and cities while the poorest are not entire benefited. So many energy subsidy programs intended to boost poor at all along with marginalized poor households' purchasing power or rural communities' access to modern energy, is the resultant of the shared distributed of

cost by the entire population including the poor. There are three main reasons for this: The poorest households may be unable to afford even subsidized energy or may have no physical access to it. Even if the poor can benefit from an energy subsidy, the financial value to them may be very weak since their consumption is modest. Rich households tend to benefit much more in nominal terms since they consume more of the subsidized fuel. Middle and higher income households tend to get hold of the bulk of subsidized energy where it is rationed, through petty corruption and favoritism. Price caps also encourage subsidized household fuels, such as kerosene, to be diverted to the black market or other uses, such as transport. Subsidies can hurt the interests of poor people in other ways, too. In practice, energy subsidies often go to large capital intensive projects, such as hydroelectric dams, at the expense of local, small scale labor-intensive alternatives such as biomass digesters. The construction of dams usually involves displacing communities, although the improved availability of electric power and water for irrigating can bring important social benefits as well (Rijal 2007).

ENERGY SUBSIDIES AND THE FACT OF SUSTAINABLE ENERGY DEVELOPMENT

Subsidies tend to encourage overconsumption and inefficient use of subsidized energy. Investment decisions may also be altered by changes in relative prices, discouraging energy diversification and creating disincentives for building energy infrastructure. The Bangladesh government's priority is to develop the country's natural gas resources, but the lack of domestic funding and constraints in applying cutting-edge technologies have severely hampered progress. Even though international oil companies involved in exploring and developing offshore gas resources, Bangladesh has failed to attract adequate investments. The situation with independent power producers is similar and has not led to a sustained expansion of the power sector. The development of coal resources also remains inefficient and lacks funding. Subsidized prices, in many instances, fail to recover immediate costs and the pricing system does not allow for fund accumulation to support expansion, development, and recover depreciation costs.

GOVERNMENT OF BANGLADESH'S PLANS FOR REFORMING ENERGY SUBSIDIES

The government has repeatedly expressed its strong desire to rationalize fuel prices and reduce subsidies, in order to promote an efficient and sustainable development process. The implementation of the policy, however, has not been smooth. Although price adjustments to energy products in Bangladesh done by the Bangladesh Energy Regulatory Commission, a statutory body, it does so mostly on an ad hoc basis. In the FY 2012 budget, total subsidies are estimated at BDT205 billion (US\$2.5 billion) which is nearly 13 per cent of the revenue budget and 2.3 percent of GDP. However, due to the increase of demand and price in subsidized products, the total subsidy could rise to BDT474 billion (US\$5.8 billion), nearly 30 percent of the revenue budget and 5.0 percent of GDP. Out of the above mentioned amount, the total are distributing as- nearly 60 percent would be required for fuel, another 11 percent for electricity, 14 percent for fertilizer and agriculture subsidies and the rest for food and other areas (Source: Bangladesh Budget FY 2012, Ministry of Finance).

In order to reduce subsidies, fuel prices were adjusted four times in 2011 and 2012 (Table 7). In May 2011, prices of all petroleum products were raised by BDT 2 per liter (US\$0.02). The next round of price hikes took place in September 2011, followed by adjustments in December 2011 and January 2012. The price of CNG was also raised by BDT5 per cubic meter (US\$0.06) in November 2011.

Table 7: Fuel Price Adjustments in 2011 (BDT per Liter)-

Items	May 2011	September 2011	December 2011	January 2012
Diesel	46	51	56	61
Petrol	76	80	86	91
Octane	79	84	89	94
Kerosene	49	51	56	61
Furnace oil	42	50	55	60

Source: Ministry of Energy and Mineral Resources, Government of Bangladesh

Despite recent increases in prices, the total volume of fuel subsidy is expected to rise, mainly due to the import of additional petroleum products for quick rental and peaking power plants. The government will have to import about 7 million ton in FY 2012, compared to 5.4 million ton in FY 2011 and 2.6 million ton in FY 2010. However, the government has plans to liberalize fuel prices, as part of an April 2012 agreement with the International Monetary Fund for a loan under its Extended Credit Facility. Bangladesh has agreed to a comprehensive reform program covering various aspects of the policy framework, including subsidy reforms. The reform program stipulates that an automatic adjustment formula for fuel prices will be adopted by December 2012 that will ensure full pass-through of changes in international prices.

CONCLUSION

While there is a clear need to support energy access for the poor in Bangladesh, current fuel and electricity subsidies are expensive and ineffective means for doing so. The government is spending more than 4 per cent of GDP on energy subsidies more than it spends on health and social welfare programs. Proper pricing of primary fuel and energy is crucial to conserve energy and to attract domestic and foreign private investments in the energy sector. Since the cost of electricity production is expected to rise in the near future due to the installation of high-cost, liquid-fuel-based plants, it is prudent for the Bangladesh Energy Regulatory Commission to raise gradually power tariffs. Similarly, the prices of other fossil fuels should follow actual costs of imports in order to keep subsidies within acceptable fiscal limits. Although the poorest households do not receive the biggest benefits from energy subsidies, they will be disproportionately affected by rising energy costs. When reforming subsidies, the government should pay attention to measures that reduce the negative impacts to the poor, improve energy access and provide support through targeted social assistance programs. Several issues act as impediments to implementing reforms, including the absence of strong political will, capacity to tackle vested interest groups and the administrative tools to provide targeted support programs for poor or vulnerable groups. These problems may overcome by improving transparency in reporting the full amount of fuel subsidies (both direct and indirect) with relevant government accounts and raising public awareness about the cost of subsidies and the options for reform, including how the government plans to reinvest that money back into the economy.

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