

Highlights



Fossil fuel subsidy, especially LNG subsidy, in Bangladesh causes heavy budgetary pressure on the economy. Between 2018 and 2022, the subsidy on account of LNG increased by 44 per cent.



For the countries like Bangladesh, a rise in energy subsidies by 1 per cent of Gross Domestic Product (GDP) results in 1.63 per cent GDP reduction in case of public expenditures in education and health.



Subsidies allocated to power and energy sector to facilitate LNG import need to be rationalised. There are widespread concerns that the increasing trend of LNG prices in the global market might affect the country's macroeconomic stability with a very high subsidy burden, ultimately shifting the price burden to vulnerable social sectors.



Bangladesh Government should promote more investment in clean energy (i) to reduce fiscal pressure and (ii) lessen subsidy for importing LNG and other fossil fuels. Re-allocating LNG subsidies for on-shore gas exploration and off-shore gas blocs needs to be prioritised on war footing.



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Volatile Global LNG Market and Its Impact on Public Spending in Social Sectors

Case of Bangladesh

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1. Introduction

Natural gas availability from domestic sources has historically dominated the energy landscape of Bangladesh. Perspective has however undergone changes since long; decreasing supply of domestic natural gas and increasing demand for gas and other energies by major undertakings and enterprises in the economic arena including power has prompted Bangladesh to go for imported Liquefied Natural Gas (LNG) to meet the prevailing demand. According to Moazzem et al. (2022), imported LNG now meets about 13 per cent of the total natural gas requirement of the country.

Over the years, imported natural gas has been creating a fiscal burden on the economy. The Rupantorito Praktirik Gas Company Limited (RPGCL), a Petrobangla subsidiary responsible for importing LNG, could not manage the entire cost of imported LNG. The rising import of LNG is partly responsible for the lack of investment in exploring domestic natural gas both from onshore and offshore sources. Lack of investment in alternate energy, especially renewable energy (RE), can similarly be attributed to increasing dependence on imported fossil fuels, especially LNG.

The government's fiscal pressure owing to imported LNG has reached its new height because of the Russia-Ukraine War. The subsidy for the power and energy sector accounted for 6 per cent of the total government subsidy in 2022. According to Dipa et al. (2015), the government of Bangladesh spends more on energy subsidies than it does on health and social welfare programs, amounting to more than 4 per cent of the GDP. The cost of imported LNG has increased dramatically since the beginning of the Russia-Ukraine War. The RPGCL had to encounter many troubles while importing LNG within the allocated budget. The government has provided RPGCL more subsidies for LNG import in view of the hindrance in completing payments. Given the forecast of high LNG prices, a larger level allocation of subsidies seems to persist in the coming years.

Due to the government's financial stress, the additional need for subsidies to cover LNG costs would have several negative bearings on the government's capability to apportion the budget funds. These would result in budget curtailment and reduced subsidy allocation to other significant sectors, such as the social sectors. Finalising realistic National Budget becomes challenging, particularly for emerging nations where significant amounts of government expenditure are allocated to fuel subsidies. For emerging Asian countries, energy subsidies have become one of the most significant policy concerns. Quite substantial expenditure on account of energy subsidy limits government spending on important development sectors, including infrastructure, health, and education. One might conclude

that fossil fuel subsidies are regressive and disproportionately affect the poor.

Plante (2014) examined how fuel subsidies affect macroeconomic indicators and overall well-being in countries that are net oil importers and exporters. Several significant and intriguing results involving the net oil importers were highlighted. For instance, subsidy affects and downgrades overall welfare. Furthermore, most welfare losses are caused by the subsidy's distortions in relative prices rather than by the mechanism of funding the subsidy. There also exists a chance that non-oil consumption will be crowded out. Hence, it is important to examine how the rising import cost for LNG due to the war would cause a higher fiscal and financial burden to the government and what would be its impact and implications on the budgetary allocations to other sectors.

Against this backdrop, it is important to learn about how Bangladesh's demand for LNG imports has grown over the past five years and how much has the cost and subsidy increased in this sector. What will the market for LNG import look like in the next five years? What are the potential effects of an increase in LNG subsidies on Bangladesh's financial situation, pressure on the budget, and subsidies in the food and agriculture sector?

The objective of this study is threefold- (a) to estimate the amount of subsidy needed for the import of LNG over the next three years; (b) to highlight any prospective adverse effects of utilising extra subsidies for imports of LNG at higher import prices, especially relating to the social sectors, and (c) to present a set of suggestions for a medium to long-term perspective to address the concerns of the social sectors.

The present study follows Ebeke and Ngouana's (2015) model (see Appendix) to estimate the impact of subsidy expenditure on fossil fuel vis-à-vis apportioning priorities for social sectors. According to Ebeke and Ngouana, social expenditure in the National Budget encompasses subsidy allocation for fossil fuel and other related factors.

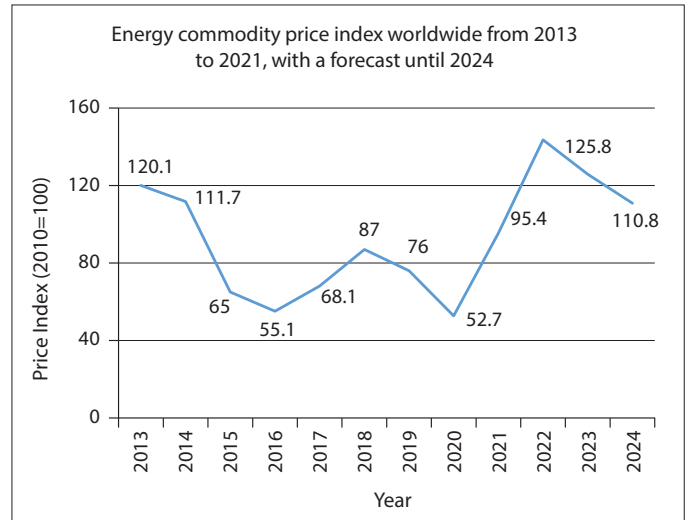
This study was carried out based on secondary data available from national and international sources for Bangladesh and other developing countries. Databases of The World Development Indicator (WDI), International Monetary Fund (IMF), International Energy Agency (IEA), etc., and Annual Reports of Petrobangla, RPGCL, etc., were accessed for data collection and projection of the future LNG market.

2. Volatility in the Global Energy Market during Russia-Ukraine War

The natural gas supply shortage in the country affecting the energy sector has further escalated following Russia's invasion of Ukraine, driving up consumer prices and encouraging fuel substitution. Additionally, it raises doubt on natural gas's long-term commercial prospects, particularly in emerging countries where it was expected to be a key component of energy transitions. (Gas Market Report, Q3-2022 – Analysis, 2022)

Aside from a 50 per cent increase between January 2020 and December 2021, The World Bank's energy price index showed an increase of 26.3 per cent between January and April 2022 (Figure

Figure 1: Energy Commodity Price Index Graph



Source: Statista 2022; Source-Pink Sheet.

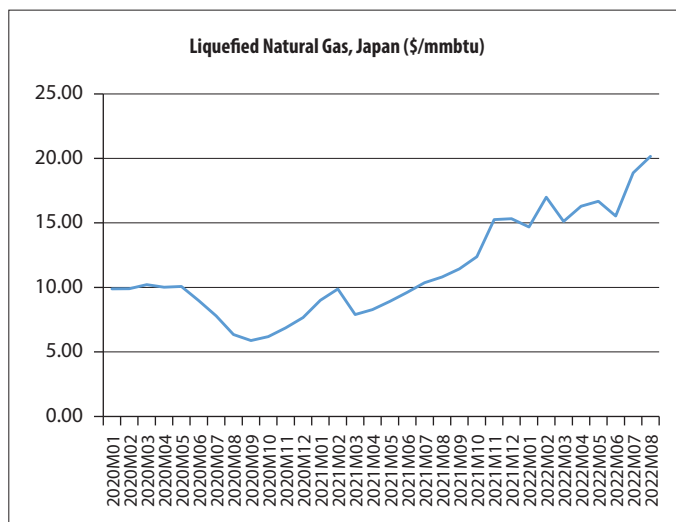
1). The substantial rise in the price of coal, oil, and natural gas is reflected in this spike. The price of crude oil climbed by 350 per cent in nominal terms between April 2020 and April 2022, the highest rise for any comparable two-year period since the 1970s. In the meantime, nominal prices for gas and coal have all risen to record rates. When adjusted for inflation, European natural gas prices have risen to record height and continue to be much higher than their last peak in 2008. While oil prices are still below average, coal prices are near their 2008 peak (Guenette & Khadan, 2022).

The average rise in energy prices in 2022 is now considered to be 50 per cent: prices for coal, natural gas, and crude oil are expected to rise by 81 per cent, 74 per cent, and 42 per cent respectively. And this fuel price enhancement is anticipated to last longer. Energy commodity prices are now apprehended to escalate by an average of 46 per cent in 2023 compared to January 2022 predictions (Guenette & Khadan, 2022).

In August 2022, the nominal price for LNG was 20.15 USD per Million Metric British Thermal Unit (\$/MMBtu), a historical high (Figure 2). However, the sharp price increases for LNG in 2022 did not have a consistent effect on Asia's major LNG importing countries; the degree of purchasing power and exposure to the spot market, market structure, and the availability of fuel replacements - all of these played a role in determining the impact on the individual markets.

The rise in the global fossil fuel price including that of LNG price has already caused multi-dimensional adverse impact on major developing economies. As spot LNG prices rose in the first eight months of 2022, India's gas consumption for electricity production decreased by over 30 per cent, with coal-fired power plants filling most of the gap. Pakistan's LNG imports decreased by 19 per cent in the first eight months of 2022. In China, the power sector gas burn fell by 9 per cent in the first eight months of 2022. However, Japan and Korea did not respond much to the enhanced spot LNG prices due to their strong and sound purchasing power and historical dependence on long-term LNG contracts. To avert a balance of payments problem, Bangladesh stopped purchasing costly spot LNG in July and August 2022 which resulted in major

Figure 2: Monthly Nominal Price of Liquefied Natural Gas



Source: Statista 2022; Source–Pink Sheet.

power outages in the third quarter of 2022 (Gas Market Report, Q4-2022—Analysis, 2022).

3. Bangladesh’s LNG Market

3.1 Structure and Composition of LNG Market

In Bangladesh, LNG is mainly used in generating electricity which accounts for a large percentage of the total import of LNG in the country. This is followed by use in different types of industrial enterprises, including the fertiliser industry, gas-based operation of boilers in textiles, food processing, steel mills, and the glass and ceramic industry (Table 1). A part of LNG is used for transport and other components. However, all these consumer-required engagements are supplied LNG as a mix with the domestic supply of natural gas at a subsidised price compared to the imported price of LNG (Table 2). Most industries use LNG despite having alternate sources of energy.

Table 1: Distribution of LNG Use in Selected Economic Segments (2019-2022)

Item	Natural gas [MMcfd]
Fertiliser	316
Industry	908
Power Generation	1662

Source: Energy Scenario of Bangladesh, Hydrocarbon Unit,

Table 3: Amount of LNG Imports

Fiscal Year	Combined		Spot Market		Total	
	Cargo	Million Cubic Meter	Cargo	Million Cubic Meter	Cargo	Million Cubic Meter
2018-19	41	5.73	-	-	41	5.73
2019-20	66	9.45	-	-	66	9.45
2020-21	61	8.56	11	1.59	72	10.15
Total	168	23.74	11	1.59	179	25.33

Source: RPGCL.

Table 2: LNG Import Price, Import Cost and Retail Tariff, 2021-22

Item	Estimated cost (Taka/CM)
Per Unit Import Price	36.69
Per Unit Import Cost	44.95
Per Unit Regasification Cost	1.85
Per Unit Re-gasified LNG Cost	50.39
Per Unit Gas-LNG Fuel Mixed Retail Tariff	9.7-11.9

Source: Moazzem and Fahad (2022).

3.2 LNG Import: Long-term Contract and Spot Market Purchase

Bangladesh started importing LNG in 2018 with a view to meeting the rising demand for gas against the depleting supply of domestic natural gas. Import of LNG is also related to the lack of investment in exploring domestic natural gas as well as the lack of investment in renewable energy. Bangladesh executed two long-term contracts for importing LNG. The first contract was signed with Qatar’s Ras Laffan Liquefied Gas Company Limited on 25th September 2017 for a period of 15 years (2018–2032). Under this contract, Bangladesh can import 29–40 cargoes of LNG per year. The second contract was signed with OQ Trading Limited (OQT) on 6th May 2018 for a period of 10 years (2019-2028). Under this contract, Bangladesh can import 16–24 cargoes each year. In addition to these long-term contracts, Bangladesh has contracts with additional 16 companies to import LNG from the spot market.

Since the contract was signed with different companies in 2017–2018, LNG imports have gradually increased in Bangladesh (Table 3). Until June 2021, Bangladesh has imported a total of 25.33 million cubic meters LNG from different sources. Of which 93.70 per cent has been imported under long-term contracts, and the rest 6.30 per cent from the spot market. Under the long-term contract, Qatar Gas has already shipped 110 cargoes containing 4.58 million cubic meters of LNG, while OQT sent 58 cargoes containing 8.40 million cubic meters of LNG. Additionally, 11 cargoes containing 1.59 million cubic meters have been purchased from the spot market. Between the FY2018–19 and FY2020–21, the volume of LNG imports nearly doubled.

During 2022 however, the number of cargoes and volume of LNG delivered by two companies under long-term contracts has dropped. As per the plan, Qatar Gas is supposed to ship 40 cargoes of LNG; as of 30 September 2022, 31 cargoes have reached Bangladesh port. OQT, on the other hand, shipped 13 cargoes against the initial plan of 16 cargoes in 2022.

3.3 Cost of Imported LNG

To determine the per-unit import price, Moazzem et al. (2022) gathered the yearly total LNG purchase price of both the long-term contracts. During the FY2018–19, Bangladesh spent USD 8.97/MMBtu on LNG imports from Qatar Gas. The unit cost dropped over the next years, reaching USD 6.23/MMBtu. The case was similar for the OQT: Bangladesh paid USD 8.08/MMBtu in the FY2018–19 and USD 6.29/MMBtu in the FY2020–21. Bangladesh originally desired to purchase LNG on the spot market at a lower price, but it ultimately ended up paying more than what was paid under the long-term contracts. In FY2020–21, the energy authority paid an average price of USD 7.98/MMBtu for its spot market purchases.

Petrobangla’s Annual Report revealed that the cost of LNG cargo and regasification in the FY2018–19 was Tk. 11,812 crore and Tk. 17,502 crore in the FY2019–20. Over a year, the cost of imports increased by Tk. 5,690 crores. As of 8 September 2022, ANZ Research predicted that the LNG spot price would be \$40.7/MMBtu on average in 2022. LNG is expected to cost \$36.30/MMBtu in 2023 and \$20.5 in 2024 (Wulandari, 2022). Given this unpredictability, it is only reasonable to anticipate that the cost of importing LNG will rise over time.

According to Ember Climate (2022), in 2022, Bangladesh intends to buy 30 cargoes or 4.14 million cubic metres (mcm) of LNG from the spot market. This purchase can cost Bangladesh about \$11 billion between 2022 and 2024.

The cost of importing LNG by the government has increased rapidly due to the sharp rise in commodity prices. By the end of the FY2021–22, Petrobangla estimates that the cost of importing LNG will be Tk. 40,000/- crore, more than twice of what it was the year before (Reynolds, 2022).

4. Bangladesh’s Projected LNG Import and Its Estimated Cost

4.1 Projection of LNG Import

In the interim report of the Integrated Energy and Power Master Plan (IEPMP), Petrobangla forecasted the demand for natural gas between the FY2020–21 and FY2040–41 (Figure 3). According to the report, demand for natural gas will rise by 3010 million cubic feet per day (MMcfd), while natural gas production and supply is likely to decline by 1800 MMcfd per day between the same periods. Hence, there will be a shortage in the supply of natural gas. Unless alternate solution is explored and implemented, this gap in demand for gas will be met by imported LNG. It can thus safely be concluded that the LNG imports will rise by 4810 MMcfd between the FY2020–21 and FY2040–41.

4.2 Projected LNG Import Cost

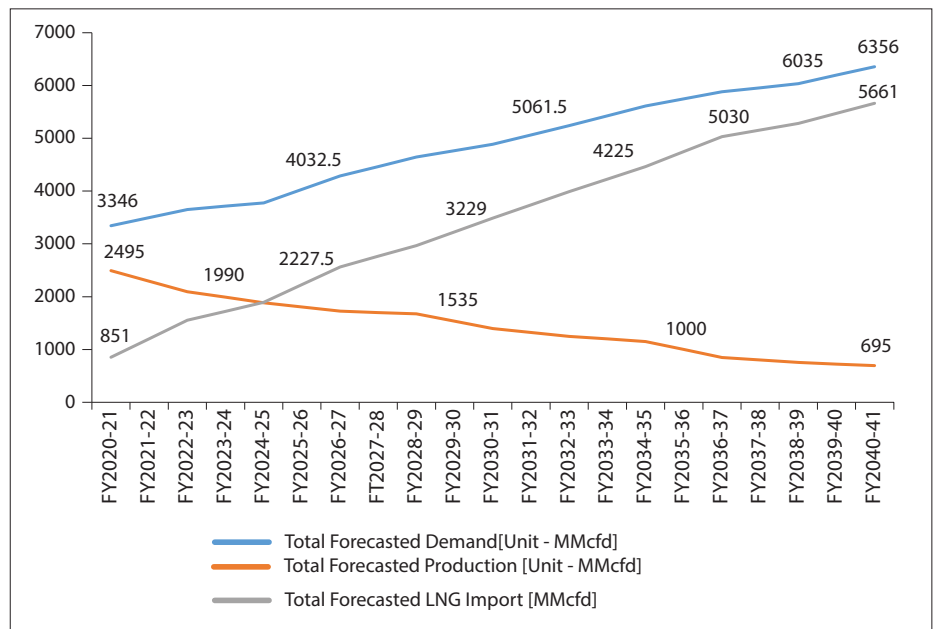
With the forecasted data of LNG import and prices, the import cost for LNG is calculated. Given the spot price is available for the forecasted period, the estimation of LNG cost could not consider the projected price for long-term contracts. Table 4 reveals that the cost to import LNG from the spot market will gradually increase over the upcoming years. During 2022–2028, the government would have to spend USD 228,925,476.00 for importing LNG, which would be required to meet the domestic demand. It can be observed that between 2022 and 2025, import cost will decrease by -3.5 per cent in 2023 due to the gradual reduction of LNG price, which would increase by 3.7 per cent and 0.8 per cent respectively in the following years due to a significant rise in imported gas despite the reduction of prices.

4.3 Subsidies for Imported LNG

Since the commencement of LNG imports in 2018, the extent of government subsidy has increased to keep up with rising costs. Subsidies have been allocated for LNG operation. Petrobangla received Tk. 1,000/- crore in LNG subsidy from the government in the FY2018–19, Tk. 2,500/- crore in the FY2019–20, and Tk. 2,812/- crore in the FY2020–21 (Hasan, 2022). Subsidy on account of LNG increased this year (2022) compared to previous years. The government disbursed Tk. 4000/- crores in subsidies to import LNG in the first nine months of the FY2021–22 (The Financial Express, 2022). Subsidy continued to increase over the years as reflected in terms of percentage of the budget. Table 5 depicts the scenario during 2018 and 2022; subsidy disbursed for LNG has increased by 0.47 per cent.

Given the uncertainty in the global energy market and ever-increasing demand for gas amongst the consumers and its consumption, the government will have to provide more subsidy to

Figure 3: Forecasted Demand and Supply of Natural Gas and Likely Import of LNG



Source: IEPMP.

Table 4: Projected Cost for Imported LNG

Year	Forecasted LNG Import (mmbtu)	Forecasted Price in Nominal U.S. Dollars of LNG, Japan [\$/mmbtu]	Forecasted Import Cost (\$)	Growth Rate (%)
2022	1617200	18.4	29,756,480	(-)
2023	1792440	17.0	30,471,480	2.40
2024	1967680	15.9	31,286,112	2.67
2025	231660	14.6	33,822,360	8.11
2026	2665520	13.3	35,451,416	4.82
2027	2876120	12.1	34,801,052	(-) 1.83
2028	3086720	10.8	33,336,576	(-) 4.21

Source: Pink Sheet, RPGCL, and Authors' Calculation.

Table 5: Share of Subsidy in the Budget in Terms of Percentage

Year	Subsidy for LNG (in Crore)	National Budget (in Crore)	LNG subsidy as percentage of the total budget
2018-2019	1000	464573	0.22%
2019-2020	2500	523190	0.48%
2020-2021	2812	538983	0.52%
2021-2022	4000	603681	0.66%

Source: Hasan (2022) and authors' calculation.

defray for LNG import. Based on the subsidy amount allocated and utilised during the years 2019 to 2022, the subsidy amount for the years 2023 to 2025 has been estimated (Table 6). The reading shows a substantial rise in the subsidy amount during 2023 to 2025.

Table 6: Estimated Amount of Subsidy Required for LNG Import During the Years 2023 to 2025

Year	Subsidy (in Crore BDT)
2019	1,000/-
2020	2,500/-
2021	2,812/-
2022	4,000/-
2023	4,920/- ¹
2024	5,899/-
2025	6,879/-

Source: Hasan (2022) and Authors' calculation.

5. Impact of Energy Subsidy on Public Spending: Implications for Bangladesh

In Bangladesh, a sizable portion of government spending accounts for subsidy in the energy sector. These subsidies have a significant negative impact on the government budget due to increased fuel demand and skyrocketing worldwide prices. If

¹Forecasted Subsidy for the years 2023, 2024, and 2025.

subsidies rise exponentially, the government might be compelled to reallocate money or resources from other economic spheres or resort to borrowing. The economy might become subject to inefficiencies in allocating and distributing resources across various industries and trade options.

There is likely to be a considerable impact of LNG subsidies on social spending in developing countries. Equipped with the framework discussed in the model specification section (Section 2), the model is run in the STATA software. Table 7 presents the findings of the analysis. For the countries with energy subsidies well over 1 per cent percentage point of GDP, public expenditures in education and health were, on average, lower by 1.63 per cent percentage points of GDP. In other words, rising expenditure involving subsidy on LNG is likely to reduce the government's capacity to spend for various social sectors, including education and health.

The volume of social expenditure is positively impacted by the size of the government. As a result of the estimated negative and significant interaction between the public debt-to-GDP ratio and the subsidies-to-GDP ratio, there is evidence that more indebted

Table 7: Impact of Subsidy towards LNG Import on Public Spending in Social Sectors

Social (% of GDP)	Co-efficient	P > t
Explicit Energy Subsidies (% of GDP)	- 1.63	0.001
Age Dependency	0.07	0.153
Urbanisation	0.04	0.266
Government Size	0.71	0.003
Income per Capita	0.00	0.284
Openness to Trade	0.04	0.076
Annual GDP Growth	-0.14	0.464
Debt-GDP	-0.09	0.002
Oil Rents	-0.43	0.001
Government Effectiveness (Normalised)	- 1.48	0.166
Control of Corruption (Normalised)	- 3.13	0.004

Source: Authors' estimate.

nations experience a higher crowding-out impact from energy subsidies as a result of financial limitations.

This analysis is consistent with the reality of Bangladesh. 6.2 per cent of the overall budget is allotted to the agriculture sector in BFY23. The budget for the Social Safety Net Protection (SSNP) did not correspond to the situation in reality—the COVID-19 recovering economy. Only 1.89 per cent of the SSNP increased, which is less than the average rise of 17 per cent from FY2009–10 and FY2021–22. From RBFY22 to BFY23, the overall social safety net budget as a share of the budget and GDP declined. As a proportion of GDP, range of social safety net budget, excluding pensions, contracted from 2.22 per cent in RBFY22 to 1.92 per cent in BFY23 (CPD, 2022).

In FY2022–23, the education sector was allocated 11.8 per cent of the overall Annual Development Plan (ADP), up from 10.3 per cent in FY2021–22. However, it still fell well short of the required percentage for developing nations. Compared to ADP FY2021–22, the health sector's share climbed slightly to 7.8 per cent from 7.7 per cent in ADP FY2022–23. ADP allocation for the agriculture sector decreased by circa 1 per cent from 4.1 per cent in FY2020–21 to 3.4 per cent in FY2021–22, which comes at a time when maintaining food security has been a top concern (CPD, 2022).

To address the ongoing volatility in the global energy market, the Ministry of Finance (MoF) will periodically grant subsidy to Petrobangla for purchasing LNG from long-term suppliers and spot markets. The Ministry recently permitted Petrobangla to utilise Tk. 2000/- crore temporarily from the Gas Development Fund (GDF) in response to a plea from the energy and mineral resources division (EMRD) (Rahman, 2022). These kinds of measures and decisions leave substantial impacts on the other social sectors of the economy.

As estimated per Table 6 above, the subsidy required to import LNG during the years 2023, 2024 and 2025 will be Tk. 4,920/-, Tk. 5,899/-, and Tk. 6,879/- crores, respectively. This will most likely put a strain on the budgetary dispensation and subsidy allocation for the food, agriculture, health, and education sectors of Bangladesh economy. The huge amount of LNG subsidies will outweigh the marginal increases in the budget for social sectors.

6. Policy Recommendations

Greater dependency on imported LNG is acknowledged in the study in order to meet and/or scale down the demand-supply gap of the natural gas requirements in the power and other sectors of the country. Some recent trends and developments reflect the fact that the growing dependence on obtaining LNG from external sources to meet the essential internal requirements of the power sector might create threatening uncertainties in the development process of the country. In terms of price surges, LNG is found to be one of the most unpredictable energy commodities. The current Russia-Ukraine crisis and the associated international diplomacy might also affect the LNG price and supply negatively for our country. Based on the analysis, the study put forward several policy suggestions.

a) Rationalisation of Subsidy Allocation to the LNG Sector

LNG imports and subsidies given to the LNG sector need to be rationalised. There are widespread concerns that the increasing trend of LNG prices in the global market might affect the country's macroeconomic stability with a very high subsidy burden, and eventual shifting of the price burden to vulnerable social sectors. Bangladesh should undertake subsidy reforms and implement the plan fast in order to ease the constraints that weigh down on public social expenditures. Bangladesh could take lessons from Malaysia. The Malaysian government formally moved away from gasoline subsidies in December 2014. Currently, market pricing has an impact on the retail price of gasoline and diesel. The resultant revelation was that the price increase in transportation fuel following the elimination of energy subsidies was overstated.

b) Re-allocating LNG Subsidies for Gas Exploration

Transitioning to clean and green energy will become difficult for Bangladesh as long as it continues to subsidise the LNG sector. Gas exploration and production inside the country could be an effective way forward to combat the crisis we are referring here, since (a) scope and opportunity for oil-and-gas exploration on-shore and off-shore have not been exhausted, plus, (b) many gas fields in Bangladesh are underutilised. Hence, instead of importing expensive LNG with a high amount of subsidies, the government authority ought to invest more in its own gas fields.

c) More Investment in Clean Energy

Government should gear up more investment in clean energy with a view to reducing fiscal pressure and subsidy for importing LNG and other fossil fuels. In this context, the necessary budgetary allocation and/or item-wise rescheduling should be made by the government. The private sector should be encouraged to invest in clean energy using green climate funds. The Climate Fund, which is globally developed, needs to be spent on renewable and sustainable energy development. Necessary fiscal instruments need to be developed to encourage foreign direct investment in renewable and sustainable energy and energy efficiency, and smart grid system development in the country. The Malaysian government is reported to be raising current grants and subsidies for the promotion of renewable energy's commercialisation. This was done to promote the use of renewable energy so that by 2050, the nation will have no carbon emissions. To expand the renewable and sustainable energy sector, the government will collaborate with key players to address technical and financial issues. Why not Bangladesh follows suit in its own way in consideration of the prevailing situation?

d) Withdrawal from LNG-related Infrastructure Plans in the Pipeline

Even with price volatility and subsidy pressure, the government plans to construct a third Floating Storage and Regasification Unit (FSRU) in Moheshkhali sea-side point within littoral Cox's Bazar district, to import more LNG. Additionally, new locations in Payra of Patuakhali and Bhola are being considered for the construction of land-based LNG terminals. Given the expected high import

costs in the future, the government should reconsider these decisions, and rather withdraw from these plans.

e) Dismantle Future Plans for LNG-based Power-Plants

Government power and energy authority should postpone or step away from future plans for LNG-based power plants considering the availability of domestic gas.

f) Step Away from Future Long-term LNG Contracts

Future long-term LNG contracts must account for and be restricted to the gas demand that is currently in place; they must not consider expected future demand. This will make it easier for alternate energy sources, such as renewable energy, to meet future demand.

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APPENDIX

Specification of the Model and Estimation Method

Specification of the Model

Energy subsidy in the economy management of Bangladesh place a heavy budgetary burden on country's economy itself causing suffering to people, as they do in many other countries, with benefits accruing disproportionately to people with high income. The effects of eliminating direct subsidies in Bangladesh's energy market and indirect subsidies in the natural gas industry have been examined in a study published in 2018 by Timilsina et al. According to their analysis, the economy would benefit, and GDP would advance if energy subsidies were eliminated.

In another study published in 2018, Amin et al. examined how the welfare of a small oil-importing nation like Bangladesh would be impacted by the elimination of fossil fuel subsidies. The findings show that a 10 per cent reduction in fossil fuel subsidies can result in an overall 0.36 per cent rise in household welfare. Furthermore, there would be a rise of 1.89 per cent if all fossil fuel subsidies were to be eliminated. As a matter of fact, the study outcomes also demonstrate that the country's economic strain would improve and gradually wither away if the Bangladesh government moves away from subsidy withdrawal strategies.

Ebeke and Ngouana (2015) found that public expenditures in education and health were, on average, lower by 0.6 per cent percentage points of GDP in countries where energy subsidies were 1 per cent percentage point higher in country's GDP.

$$\left(\frac{Social}{Y}\right)_i = \alpha + (\beta_1 + \beta_2 F_i) \left(\frac{Subsidies}{Y}\right)_i + \beta_3 F_i + X_i' \Gamma + \varepsilon_i$$

Ebeke and Ngouana created a model where the term "social" encompasses the government's expenditure on health and education, and "subsidies" represented all pre-tax energy subsidies. Both series were expressed as a percentage of GDP. The model included some controls that are important factors influencing public social expenditure. These include the dependence ratio and urbanisation of a country, as well as macroeconomic aggregations such as initial real per capita income, government size, trade openness or least-controlled trade, and macroeconomic volatility. The public debt-to-GDP ratio, the reliance on natural resources (measured by the oil rents-to-GDP ratio), and the competency of domestic institutions were all considered in determining the level of crowding-out. Government efficiency and corruption-related information provide insight into the competence of domestic institutions.²

Estimation Method and Sources of Data

Due to the non-availability of comprehensive data on Bangladesh's expenditure on food and agriculture in the global database, the model for this study was undertaken in consideration of the government's expenditure on health and education. Unlike Ebeke and Ngouana's model, which performed a panel data analysis, this study carried out a cross-sectional analysis using data for the year 2019. Initially, all LNG-importing countries were considered but later narrowed down to developing and emerging nations. Twenty-five countries³ including Bangladesh were on the row for the analysis.

Data for expenditure on health and education (as a percentage of GDP) were taken from the World Development Indicator database, which was then summed up to represent the dependent variables of this model. Next, pre-tax energy subsidies (pre-tax subsidies exist when energy consumers pay prices below the costs incurred to supply them with this energy) were not available for all the selected countries. Hence, explicit energy subsidies (as a percentage of GDP) were taken as a viable proxy. Explicit subsidies occur when the retail price is below a fuel's supply cost. The data for total explicit subsidies were taken from the IMF, which were expressed as USD billion and had to be calculated as a percentage of GDP to represent the independent variable of this model.

²Using the World Governance Indicators database, the variables have been estimated for different countries. These variables were rescaled using the min-max transformation to have a range between 0 and 1, with 0 being the lowest governance quality value.

³Argentina, Armenia, Azerbaijan, Bahrain, Belarus, Cameroon, El Salvador, Georgia, Guatemala, Honduras, India, Jordan, Lebanon, Moldova, Morocco, Pakistan, Paraguay, Peru, Philippines, Serbia, Sri Lanka, Thailand, Uzbekistan, and Zambia.

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