

## Importance of using Liquefied Petroleum Gas (LPG) in Reduction of Environment Pollution in Bangladesh

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**Abstract:** Alleviating environmental pollution is one of main global agenda keeping the continuous environment development. On the light of this agenda, everyone can use clean fuel (LPG) for household cooking and for transportations. In case of Bangladesh, more than 90% rural people depends on biomass fuels and 99% urban people depends on gas for cooking. And also 100% of urban people depend on gas or oil for transportation. Whenever, only for using Cow dung, biogas digester exhibited the potential to cut carbon emissions on average by about 7.8 tons of CO<sub>2</sub> equivalents yearly. The study mainly focus on the potential reduction of greenhouse gas (GHG) emission, deforestation, air pollution, water pollution, deterioration of scarcity by using Liquefied Petroleum Gas (LPG). The data for this study is secondary that collect from relevant different waive sites and statistical tools and graph for explanation. This study recommends that the government approach, awareness program, and continuous and proper performing of the LPG are helpful for the various environmental benefits.

### **1. Introduction**

Without doubt, energy is a pre-requisite for an entire nation's economic activities and social development. One of the most crucial strategic commodities has long been the energy that has direct linkages with economic security, social security and environmental sustainability. In general, energy contributes to economic development but its impacts on the environment depend on the type of energy source. For instance, it is said to be the main cause of environmental pollution is burning of fossil fuel [1], [2], while almost cleaner alternative fuels are recommended for environmental betterment [3], [4]. In Bangladesh, natural gas fulfills about 70% of energy demand. Among other fuels, like oil, coal, biomass etc. are vital. Natural gas reserve in Bangladesh is not that substantial, but its consumption is the highest among the available resources. On the other hand, there is a huge reserve of coal in our country, but coal is less collected as well as less used here. So, remain demand is met by biomass and imported energy.

The United Nations Framework Convention on Climate Change (UNFCCC) was formed in 1992, and the climate change-induced as ecological problems was approved by 197 [5]. The Paris Agreement inspired the signatory member under the UNFCCC to declare battle against climate change. They undertake for keeping the global temperature rise to below 2 °C above the preindustrial levels and next try to keeping below 1.5° [6]. Bangladesh is one of the most affected countries by climate change and also counted in CO<sub>2</sub> disperse countries due to its extreme fossil fuel use [7]. According to the World Bank, Bangladesh is the 2nd fastest growing economy in South Asia and the 5th fastest growing economy in the world.

The effects of climate change are found all over world, like—low the summer river flows, higher seasonal temperatures, lower household incomes, and increased poverty, among others [8]. A paper by Aneire E. Khan et al. [9] outlined the gravity of these sweeping environmental changes for many different sectors of the Bangladeshi economy (i.e. household livelihoods, agriculture, fisheries, coastal, and urban areas) due to the increase in intense flood-waters, cyclones, over hot

temperature, adverse health impacts, and deforestation. Bangladesh Energy Scenario [10], estimated the energy contribution of natural gas (63.31%), furnace Oil (24.72%), diesel (4.59%), imported (7.63%), coal (2.70%), hydro (1.63%), and wind (0.01%) in 2019.

Liquefied Petroleum Gas (LPG) which is the liquefied form of petroleum gases released during the extraction of crude oil and natural gas or during the refining of crude oil. It also produced increasingly from renewable sources. It contains a flammable mixture of hydrocarbon gases such as propane, butane, propylene, etc. At present time, LPG gain popularity for the substitution of fuels. Also for environmental and socio-economic benefits that is preventing deforestation, reducing the necessity of purchasing fuel for cooking, the reduction of oils, the manufacturing of bio-slurry as a fertilizer replacing the chemical fertilizer, and limiting the GHG emissions. LPG is a movable, clean and systematic energy source which is readily accessible to consumers around the world. LPG can be used in more than 1,000 different applications for this unique. LPG has a very low energy density per liter than either petrol or fuel-oil.

Bangladesh is a fast rising developing country that has recorded magnificently growth performances day by day. GDP growth rate of Bangladesh was around 5.5% throughout the period between 2010 and 2019 (World Bank 2020). In contrast, the corresponding GDP growth rates of global low and lower-middle income countries stood at around 2.50% and 4.20%, respectively (World Bank 2020). However, for all such magnificent economic growth performances, Bangladesh has continuing deteriorated environment with time. In between 1990 and 2014, in Bangladesh the total emissions of greenhouse gases (GHG) rose by almost 50% while per capita carbon dioxide emissions have increased by more than 3-fold (World Bank 2020). Between economic growth and GHG release indicate that the economic growth policies followed by Bangladesh are not place with the nation's environmental sustainability objectives. As a result, it is critically important for the nation to adopt policies that would promote the growth rate of its economy without marginalizing the welfare of environmental quality.

This paper mainly focuses on the bad effect of fuels that affected our environment. This study summarized a comparative analysis of different types of fuels reaction on the environment (air, forest, soil, water, etc.). Most of the previous studies have primarily focused on the impacts of fossil and non-fossil fuel consumption on the economic growth-environmental quality chain. Natural gas and LPG are relatively less damaging to the environment since the burning of these two energy resources release lower volumes of GHG into the atmosphere.

## **2. Scope of Study**

This research covers the effect on environment of consuming different types of energy. In our everyday life in every minute we have to consume energy. But every action has reaction. In this case, consuming energy's reaction is pollution of environment. Energy consume is also important for us. So, we have to make level of using energy and its reaction. That's why, we can choose low effected energy source.

## **4. Objectives of Study**

This study is an attempt for achievement of two major objectives of the energy sector in Bangladesh.

### **A. General Objective**

To analyze the importance of using liquefied petroleum gas.

### **B. Specific Objectives**

The specific objectives are:

- a) To compare CO<sub>2</sub> emissions rate between different fuel consumption in Bangladesh.
- b) To calculate the amount of deforestation, soil and water pollution behalf of gathering energy.
- c) To identify the effect of choosing improper energy source.

## 5. Literature Review

Now a day, one of the most ultimate artistic commodities is —energy that has direct linkages with economic and social security, and environmental sustainability. Bangladesh is one of the energy poverty (limited electricity and smoky cooking systems) and the world's most densely populated country. In Bangladesh, 72% of the total population lives in rural areas. Amin, S. B., & Rahman, S. (2019) [11] showed that about 47% and 6% of people in Bangladesh reached to electricity and natural gas, respectively. There is no natural gas pipeline connection all over the rural and the remote areas of the country. As a result, the rural people use traditional biomass energy sources for cooking that is firewood, agricultural waste, cow dung, etc. Which is about 62% of total energy consumption in Bangladesh that is shown up by Foysal, M. A. et al (2012) [12]. Abbas, T. et al. (2017) in their study talk about direct combustion of biomass caused serious environmental degradation problems such as indoor air pollution, deforestation, and excess discharge of tons of greenhouse gas (GHG) [13]. As a result, the country's environmental quality continues to be harmed by the extensive use of traditional biomass fuels for cooking.

Murshed M (2020) showed in his paper about a central quality of the bitter environmental performances of Bangladesh can be attributed to the monotonic fossil fuel dependency of the nation [4]. A lion's share of the nation's total energy come from traditional sources mostly from fossil fuels and rest from domestic natural gas and imported oils (World Bank 2020). Sk. Masum Billah, et al. (2019) [14] focus on the positive impact on health for using LPG. Muntasir Murshed et al. (2020) [4] discuss on strong economic growth of Bangladesh. Bangladesh has been enlisted as one of the Next-11 nations that are anticipated to become one of the largest emerging economies in the twenty-first century. Thus, the energy demand in Bangladesh is expected to rolling in the years to come. However, if the nation meets its aggravating energy demand using the traditional fossil fuels, such decisions is likely to further influence the trade-off between economic growth and environmental degradation in Bangladesh. The nation is committed to contributing to the attainment of the SDG agenda of the United Nations. In the paper of Murshed M [4] was discussed that the nation's inability to undergo gradually replacing the use of fossil fuels with renewable alternatives. At present, further marginalizes the prospects of ensuring environmental sustainability in Bangladesh. It is seriously important for the nation to modify its energy consumption basket, especially replacing traditional fossil fuels with relatively less carbon-emitting alternatives.

## 6. Methodology

The secondary sources of information has collected from various publications and site, journals, books, newspapers, magazines and websites The data analyzed by applying statistical formula and graphs.

## 7. Analysis

Significant amount of toxic and non-toxic waste are generated during the taking out, refinement, and transportation stages of oil and gas. Generally Some industry, like as volatile organic compounds, nitrogen & sulfur compounds, spilled oil, etc. by-products they pollute air, water, and soil at levels. Obviously that is harmful to life where improperly managed. The industry's releases of greenhouse gases like carbon dioxide (CO<sub>2</sub>) and methane, and micro-particulate aerosols are the cause of global changes increases like climate warming, ocean acidification, and sea level rise .

Fossil fuel burning is the largest contributor to the ongoing buildup of carbon in the earth's biosphere among all human activities. The International Energy Agency and others report said that oil & gas use comprised over 55% (18 Billion Tons) of the record. Coal use comprised most of the remaining 45%. From all energy sources during year 2017, about 32.8 Billion Tons (BT) of CO<sub>2</sub> released into the atmosphere. Total emissions continue to stand up nearly every year up another 1.7% to 33.1 BT in 2018.

### 7.1 The present scenario of Natural Gas in Bangladesh

(Source: Worldometer, Data shown for 2015)

|                 | Million /Cubic Ft (Mcf) | Global Rank of Bangladesh |
|-----------------|-------------------------|---------------------------|
| Gas Reserve     | 8,500,000               | 42nd in the world         |
| Gas Production  | 948,609                 | 32nd in the world         |
| Gas Consumption | 948,609                 | 32nd in the world         |

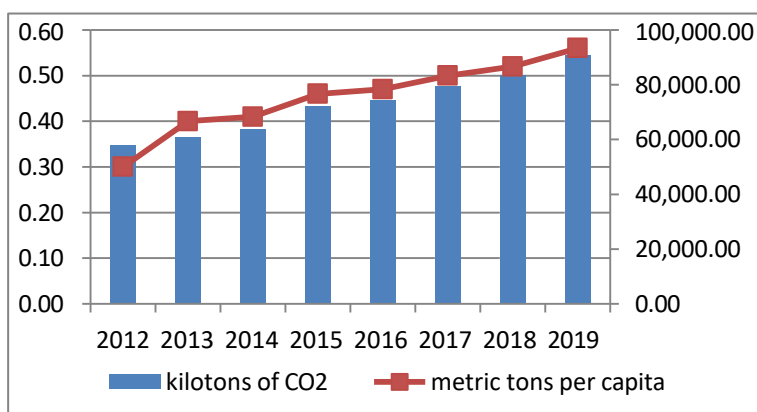
We know, natural gas is best for energy in all sectors. It is cheap and less harmful. Bangladesh holds 7.25 trillion cubic feet of proven natural gas as reserves as of 2017, On ranking 42<sup>nd</sup> in the world and accounting for about 0.105% of the world's total natural gas reserves of 6923 trillion cubic feet and has proven gas reserves equivalent to 7.0 times its annual consumption. This means it has about 7 years of gas left (excluding unproven reserves), which is not good news for Bangladesh. We need to find its' alternative in time.

### 7.2 Bangladesh Carbon (CO2) Emissions 2012-2019

In the following table shown total amount Carbon dioxide emissions per year and increasing rate per year from previous. Carbon dioxide emissions are those stemming from the burning of fossil fuels, the manufacture of cement and also produced during consumption of solid, liquid, and gas fuels and gas burning.

| Bangladesh Carbon (CO2)<br>Emissions - Historical Data |                    |                              |                                       |
|--------------------------------------------------------|--------------------|------------------------------|---------------------------------------|
| Year                                                   | Kilotons<br>of Co2 | Metric<br>Tons Per<br>Capita | Increasing rate from<br>previous year |
| 2012                                                   | 57,990.00          | 0.3                          |                                       |
| 2013                                                   | 60,600.00          | 0.4                          | 4.500775996                           |
| 2014                                                   | 63,830.00          | 0.41                         | 5.330033003                           |
| 2015                                                   | 72,190.00          | 0.46                         | 13.09728968                           |
| 2016                                                   | 74,380.00          | 0.47                         | 3.033661172                           |
| 2017                                                   | 79,340.00          | 0.5                          | 6.668459263                           |
| 2018                                                   | 83,450.00          | 0.52                         | 5.180236955                           |
| 2019                                                   | 90,740.00          | 0.56                         | 8.735769922                           |

Source: World Bank

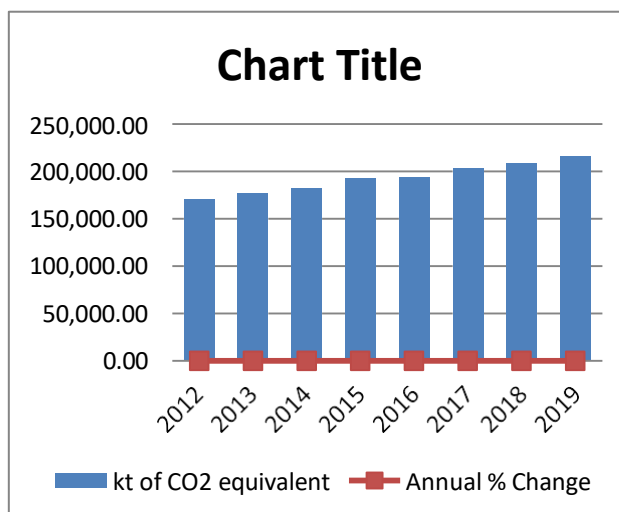


### 7.3 Bangladesh Greenhouse Gas (GHG) Emissions 2012-2019

In the following table shown total greenhouse gas emissions in kiloton of CO<sub>2</sub> equivalent are composed of CO<sub>2</sub> totals excluding short-cycle biomass burning such as agricultural waste burning and Savannah burning, but including other biomass burning such as forest fires, post-burn decay, peat fires and decay of drained peat lands, all anthropogenic CH<sub>4</sub> sources, N<sub>2</sub>O sources and F-gases (HFCs, PFCs and SF<sub>6</sub>) of Bangladesh.

| Bangladesh Greenhouse Gas (GHG) Emissions<br>- Historical Data |                                             |                       |
|----------------------------------------------------------------|---------------------------------------------|-----------------------|
| Year                                                           | kiloton of<br>CO <sub>2</sub><br>equivalent | Annual<br>%<br>Change |
| 2012                                                           | 170,484.67                                  | 3.00%                 |
| 2013                                                           | 176,780.00                                  | 2.28%                 |
| 2014                                                           | 181,850.01                                  | 2.87%                 |
| 2015                                                           | 192,179.99                                  | 5.68%                 |
| 2016                                                           | 193,960.01                                  | 0.93%                 |
| 2017                                                           | 203,080.00                                  | 4.70%                 |
| 2018                                                           | 208,000.00                                  | 2.42%                 |
| 2019                                                           | 215,940.00                                  | 3.82%                 |

(Source: World Bank)



7.4 The Comparative situation of Coal

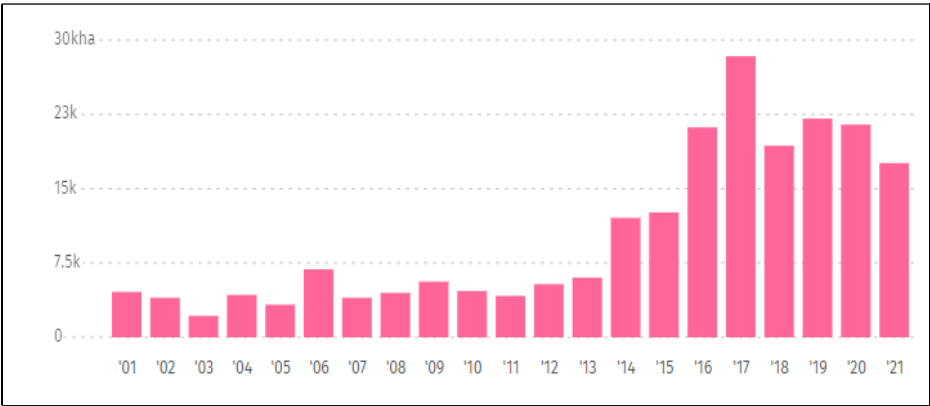
Which fuel contributes more CO<sub>2</sub> on air? The general answer is coal (210), then gasoline (157), then natural gas (117) — where units are pounds of CO<sub>2</sub> per million British thermal unit (Btu) when the fuel is burned. Coal is twice as dirty as natural gas, and this is why many countries been able to reduce its GHG substantially, as coal-fired power plants have been changing to gas-fired plants because natural gas was cheaper. Burning propane (139) or butane (143) is cleaner than gasoline (157) and not much dirtier than natural gas (117).

| Fuel type        | Pounds CO <sub>2</sub> / Million Btu |
|------------------|--------------------------------------|
| Natural Gas      | 117                                  |
| Propane          | 139                                  |
| Butane           | 143                                  |
| Gasoline         | 157                                  |
| Coal (all types) | 210                                  |

Source: BPN (BUTEN PROPEN NEWS)

7.5 The scenario of deforestation in Bangladesh

Bangladesh has about 17.4% of the total land area which the total forest area is 2.6 million hectares. According to the report of the forestry department, about 3% of the country's gross domestic product (GDP) and 2% of the labour force. The forest department calculated that the rate of deforestation was 10 million hectares per year between 2015 and 2020. About six hundred thousand trees are cut down every year in Bangladesh. If this rate be continued, the forest will disappear in less than 10 years. The forest of Bangladesh has contribution on economy by different way such as Madhupur forest is fueling the local economy. During 2001 to 2021, Bangladesh lost about 214 kilo hectares of tree cover area, equivalent to an 11% decrease in tree cover area since 2000. For this reason 108Mt of CO<sub>2</sub> add on the air.



The methods behind this data have changed over time

7.6 Environment Impact Associated with used Oil and Petroleum

The most extensive damage of environment comes from the used oil and grease. They are also known to cause of create risks of contaminating air, water and soil with substantial hazards to animal and plant life, deaths to migrating birds, marine life, as much harmful to human life. They are great threat to environment. The used/waste oils degrade very slowly. After one year, 20% to 80% of petroleum products in soil are degraded. This scenario for waterways is very poor, only 20%. A film of used oils on a water surface prevents oxygen from entering the water and blocks

sunlight. This creates difficulties for plants to photosynthesize and reduces plant and animal life in water body. Crude oil and natural gas are primary energy and raw material sources that aloe many point of modern daily life and the world economy. Over the last 150 years, the demands of Crude oil and natural gas grown very quickly for rapidly increasing human population, creativity, and consumerism.



Through its own operations, The petroleum industry directly contributed CO<sub>2</sub> in terms of the air pollution, about 8% (2.7 BT) of the 32.8 BT in 2017. Where, the industry directly contributed at least 79 Million Tons of methane that same year and about 14% of all known anthropogenic and natural emissions of the potent warming gas.

## 8. Limitation of Study

Researcher was really unable to collect enough information for research due to proper guidance and relevant information. To the best of knowledge for this study, very little study was conducted on this specific area, that's why there is lack of guidance.

## 9. Findings and Recommendations

### 9.1 Findings

The energy is Unavoidable for a country to meet its increasing population's need and sustainable and developing economy. But as a reaction of using energy, environment pollution day by day reaches at extreme level. Where we have to control discharge of greenhouse gas, there we mixed this kind of gas in air at high level. However, we can control this increasing environmental degradation by the forest, but in our country deforestation rate is also very high. In case of using LPG, have some probable of degradation but comparatively less than other. Infect, LPG is more beneficial for bearing system than bio-gas.

### 9.2 Recommendations

To protect environment pollution that's mean to save our water, air, forest, we have to give more attention at use of LPG. LPG sector can be a new site for business in our country, also can put strong step on developing economy. Some recommendations are given below:

1. Government should reduce the tax which is now 7%. So that people easily buy.
2. To reduce LPG cylinder accident in the country, Government should import good quality Regulator and hosepipe.
3. The Reticulated system should apply on every household for better and friendly usage of LPG.
4. Government should give a subsidiary in this industry so other large company can start business here and available the product in the market and start healthy competition.
5. To get low price of LPG, Government can import PLG directly from abroad or they increase the production rate at —Eastern Refineryl.
6. BPC (Bangladesh Petroleum Corporation) should elaborate their distribution all around the country, so that general people will get BPC LPG easily.
7. BPC should monitor the cylinder quality time to time for each and every company, so that accident rate will reduce.

8. In the market 12 kg, 30 kg and 45 kg cylinder are available, but product line like 5 kg, 8 kg also should bring in the market.
9. Government and companies should arrange training session for the house wife's and for the retailers, so that they know how to use LPG safely.
10. Increase motivational advertisement, especially at rural area to use LPG.

## 10. Conclusion

LPG has a wide variation of uses. It can be use in the field of agriculture, recreation, hospitality, industry, construction, transportations, sailing and fishing. It has many uses such as fuel for cooking, central heating and water heating and is a particularly cost-effective and efficient way to heat off-grid homes. It is very important to generate alternative technologies at this time for energy generation, transportation, and storage. Petroleum products are effective industry. Consumer actions toward achieving better environmental sustainability for its conservation, efficiency, and minimizing waste impacts of petroleum products.

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