

RENEWABLE ENERGY: A SOLUTION OF ENERGY CRISIS IN BANGLADESH FOR SUSTAINABLE DEVELOPMENT

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ABSTRACT

The primary driver of a nation's continuing development is the growth of its energy industry. Having a mid-income level, Bangladesh. Her GDP is growing at one of the fastest rates in the world. Development is a requirement for ongoing GDP growth in any nation. Energy is also a major factor in the development of the nation. To satisfy the nation's rising energy needs and move from a mid-income to a developed country, proper energy utilization is crucial. Implementing Vision 2021, Vision 2041, and meeting the Sustainable Development Goals all depend heavily on energy. Being a developing nation, Bangladesh is currently experiencing a severe energy crisis, which has put the nation's ability to expand economically in jeopardy. The progressive increase in power usage is a result of technology advancement. Given our strong reliance on natural gas and the potential for its eventual depletion in the near future, finding an alternative energy source has led us down the road of renewable energy. In this essay, the sources of renewable energy are investigated while the current energy picture is analysed. While the status and potential of these resources in Bangladesh are studied, these renewable sources are briefly explained. The social effects of various renewable energy sources are examined in the last stage.

Keywords: Renewable energy, Biomass, Solar energy, Conventional sources etc.

1. INTRODUCTION

Bangladesh is a South Asian nation with a 148,460 sq. km. total area of land (57,320 sq. miles). The nation is home to a sizable population of 167.65 million people, placing it eighth on a list of the world's most densely inhabited nations [1]. Once again, the nation's natural resources are extremely scarce. Nevertheless, despite these restrictions, the nation's economy continues to expand daily. Energy has a direct impact on development. Energy use and economic growth are clearly and categorically related (GDP and its growth). An increase in power use could lead to more investment, and more investment has a favourable impact on GDP growth. Energy use either drives or stimulates economic expansion. In the modern world, the pattern of energy supply and consumption is associated with the development index of any given nation. The annual growth in energy use is roughly 6%. In comparison to its South Asian neighbours, Bangladesh's per-capita energy usage is lower at 334 kgoe (Kilogram Oil Equivalent) and 512 kWh, with 97 percent of the population having access to electricity.

The world's need for energy is rising quickly as a result of technological advancement and population growth. In total, 84 percent of the primary energy consumed worldwide in 2019 came from fossil fuels [2]. Without incorporating renewable energy sources and technology, the way fossil fuels are now used would eventually exhaust these sources [3]. The greenhouse effect and climate change are both caused directly by CO₂ emissions, which are strongly influenced by the combustion of fossil fuels. Coal produces around 888 t CO₂ equivalent per GWh of electricity on average, with oil and natural gas generating approximately 733 and 499 t CO₂ equivalent per GWh, respectively [4]. Global warming and the greenhouse effect are therefore seen as the main issues and obstacles to achieving sustainability in the planet [5][6]. Additionally, these issues and the depletion of fossil fuels encourage the nation and society to change their energy strategy to one that favours alternative energy sources [7].

In order to considerably reduce its greenhouse gas emissions, Bangladesh has set an ambitious goal of producing more than 4,100 megawatts of electricity from renewable sources by 2030. 2,277 MW of the energy will come from solar power, followed by 1,000 MW from hydropower and 597 MW from wind power [8].

In the modern world, the pattern of energy supply and consumption is associated with the development index of any given nation. On the Indian subcontinent, Bangladesh uses the least primary energy per person. Total energy final consumption is predicted to be roughly 55.50 MTOE [9]. GDP, which reflects a nation's economic growth and standard of life, is heavily influenced by its level of energy use. According to estimates [10], a 1% increase in energy consumption per person results in a 0.23 % rise in GDP per person.

Power crisis is a significant concern in Bangladesh. With an impending energy crisis, the gap between demand and production is steadily widening. Technology innovation is causing a steady increase in power usage. For continued and effective economic development and poverty reduction, a sufficient and dependable source of power is essential [11]. Bangladesh has recently made exceptional progress in energy production. 22,031 MW are available in total [12]. According to the Bangladesh Power Development Board (BPDB), the whole population of the nation currently has access to electricity [13]. Bangladesh needs to secure its principal sources of fuel for electrical generation, which include oil, gas, and coal. In Bangladesh, there are several renewable energy resources that might be used to address the country's rising energy needs.

2. ENERGY DEMAND AND CONSUMPTION PATTERN

Electricity demand is rising quickly as a result of increased economic activity and consistent GDP growth in the nation. Currently, the growth in electricity demand is between 9 and 10 percent, and it is anticipated that this trend will continue in the years to come.

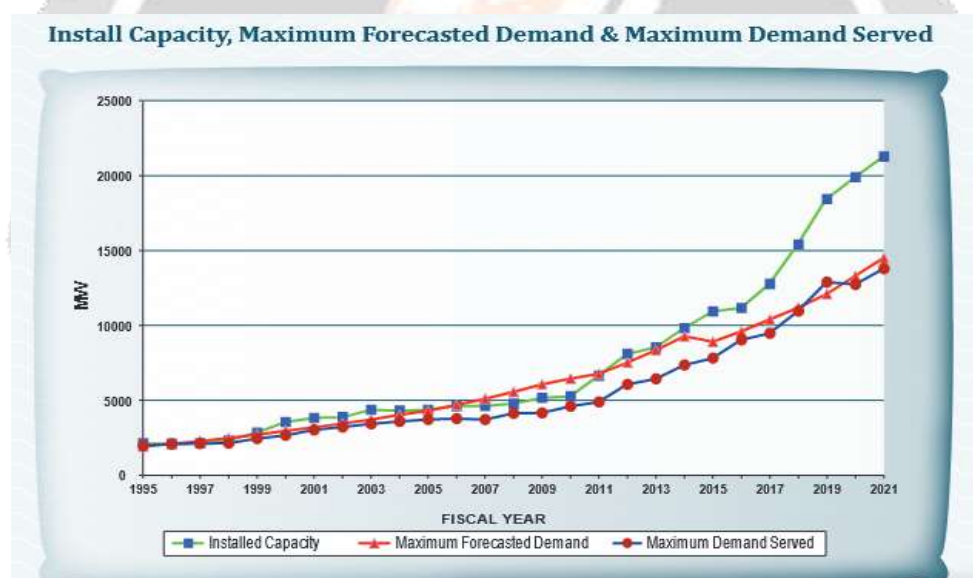


Fig-1: Installed capacity, Maximum forecast demand and maximum demand served [14].

According to the image, natural gas and oil are Bangladesh's primary commercial energy sources. It is to be hoped that the proportion of natural gas in commercial energy use is steadily reducing and that emphasis is being paid to the use of renewable sources like biomass.

The total energy share of Bangladesh is shown in the pie chart.

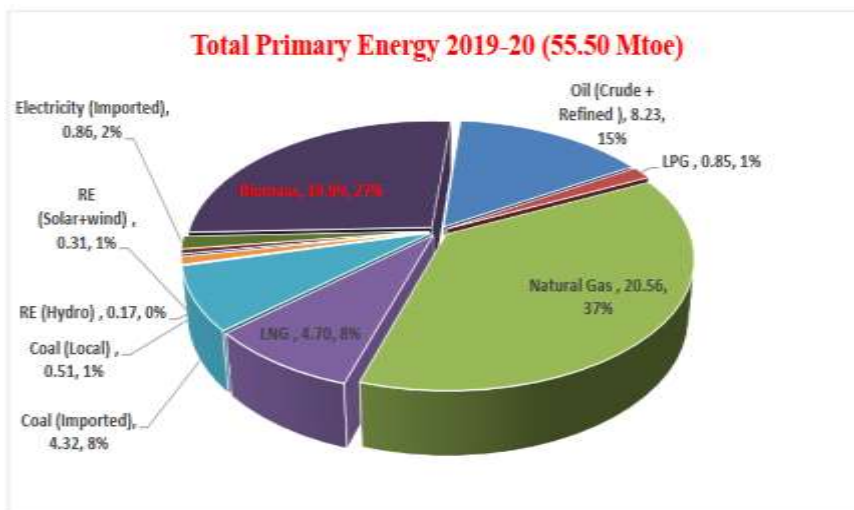


Fig-2: The total energy share of Bangladesh [15].

Approximately 2978 MMcfd of natural gas are produced on average each day. Natural gas production totalled 994 billion cubic feet (BCF) in 2019–20, of which 46% was utilized for electricity, 5% for fertilizer, 15% for captive power, 16% for industry, 13% for household usage, 4% for CNG, and very little else [16].

Another important commercial energy source in Bangladesh is petroleum fuel, which mostly consists of kerosene, diesel, and petrol. petroleum products such as gasoline, diesel, and high-octane furnace oil. Transport accounts for 62.89 percent of petroleum product usage, followed by electricity at 6.84 percent, agricultural at 19.51 percent, industrial at 6.48 percent, home at 3.02 percent, and others at 1.26 percent [17].

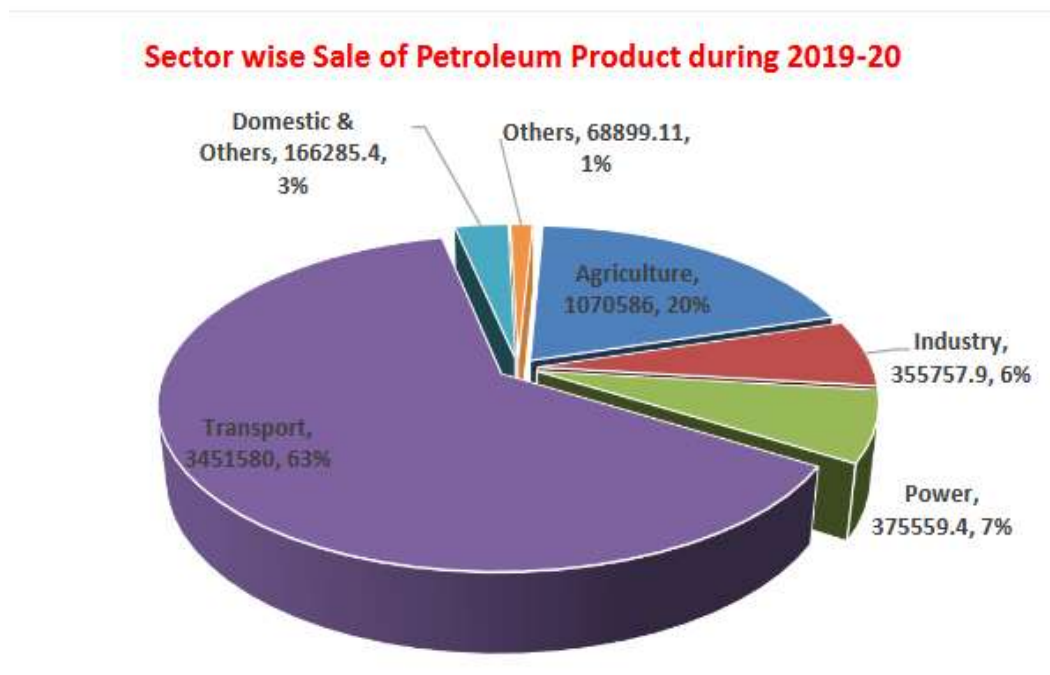


Fig-3: Sector wise oil consumption in Bangladesh [18].

Most people in rural regions use kerosene and biomass mostly for warmth, lighting, feeding, and cooking. About 95% of families in Bangladesh collect or buy biomass energy for cooking, compared to virtually 100% of rural households who cook with wood, cow dung in the form of cakes or sticks, jute sticks, or other agricultural waste. Only firewood accounts for nearly half of the total consumption, as shown in Fig. 08 [19]. Additionally, kerosene is used for lighting by around 70% of the rural population.

The total sector wise power consumption of Bangladesh is shown below:

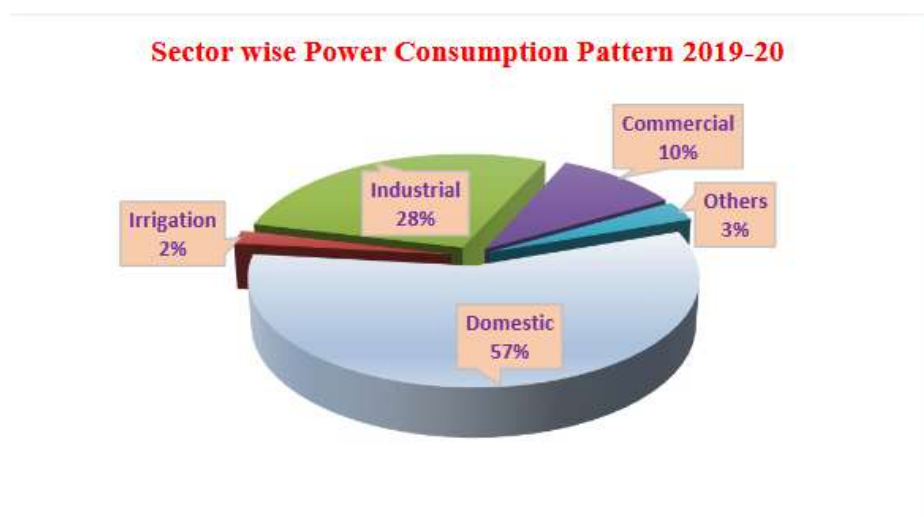


Fig-4: The total sector wise power consumption of Bangladesh [20].

3. PRESENT POWER SCENARIO IN BANGLADESH

As of November 2021, the public and private import sectors now have installed capacity of 22031 MW. Out of this, the state sector owns 10,146 MW (46%) and the private sector, 9,481 MW (43%) in addition to 1,160 MW from imports and 1244 MW from joint ventures. Currently, nearly all people (99.75%) have access to electricity. (including renewable energy), and per capita generation has climbed to 560 kWh (including captive and renewable energy).

The majority of Bangladesh's energy needs are currently met by natural gas, with a small number of coal and furnace oil plants serving as supplements [21].

4. ENERGY GENERATION

The total net energy produced for FY 2020–21 was 80,423 MWh, a 12.61 percent increase over the net energy produced during the prior year, which was 71,419 MWh. Net energy generation for the governmental sector was 31,916 MWh, joint venture energy production was 3812 MWh, and private energy production was 36,592 MWh (including REB). The interconnection in Bheramara and Tripura allowed for the importation of an additional 8,103 MWh from India [22].

Total net energy produced in power plants in the public and private sectors by fuel type are as follows:

Hydro	655	0.81%
Gas	48,403	60.19%
Furnace Oil	17,497	21.76%
Diesel	609	0.76%
Coal	4,997	6.21%
Renewable Energy	158	0.20%
Power Import	8,103	10.08%
Total	80,423 (GWh)	100%

Fig-5: public and private sector power plants by fuel type.

5. RENEWABLE ENERGY POLICY OF BANGLADESH

Bangladesh released a draft renewable energy policy in 2002. According to REP (2008), the following are the policy's primary goals:

- To stimulate, enable, and facilitate investment in renewable energy projects from the public and commercial sectors;
- To spread RETs in both urban and rural regions and to harness the potential of renewable energy resources;
- To replace locally generated non-renewable energy sources, develop sustainable energy sources;
- Increase the proportion of renewable energy used to generate electricity;
- Encourage the use of renewable energy sources at all energy consumption levels;
- To encourage policies that promote sustainable growth and clean energy (CDM).

6. TYPES OF ENERGY SOURCES

There are primarily two types of primary energy sources. Fuels and flows are these. Fuels fall under the category of dense energy reserves that are consumed when used, including coal, natural gas, and uranium. However, flows are organic processes that include energy in motion. Utilizing a flow entails capturing energy from natural forces of motion like winds and tides [23].

Fuels are concentrated sources of energy used to provide electricity, heat transportation, and other energy-related services [24]. Biomass, often known as biofuel, is the fuel produced from living organisms, most often plants. Bio-fuels include things like vegetable oil, ethanol, and biodiesel [25]. In a nuclear reactor, nuclear fuel is utilized to maintain a nuclear chain reaction. The radioactive metals like uranium-235 and plutonium-239 are the most prevalent nuclear fuels [26].

The two main energy sources are divided into two categories:

- Conventional Sources
- Non-Conventional Sources

6.1. Conventional Sources of Energy

Conventional energy sources are ones that have been mostly used for the majority of civilisation. Since they are non-renewable by nature, once a supply of a conventional energy source has been consumed, it cannot be replenished. Fossil fuels are the most prevalent type of conventional energy source.

6.2. Non-Conventional Sources of Energy

Modern energy sources that are substantially more sustainable than traditional ones because of their significantly less harmful effects on the environment are known as non-conventional sources of energy. They qualify as renewable energy sources because, in contrast to non-renewable sources, they do not run out when used. Non-conventional sources of energy are being embraced at a rapid rate as knowledge of the negative effects fossil fuels have on the environment grows on a global scale.

7. PROBLEMS OF CONVENTIONAL ENERGY SOURCES

We face so many problems in conventional energy sources. Such as pollution, exhaustible, risky and high cost. Problems are briefly given below.

7.1. Pollution

These traditional sources' biggest drawback is how much pollution they produce. Air pollution is caused by burning fossil fuels and firewood. By utilizing these unconventional sources, this can be avoided. Pollution from conventional energy sources can take many different forms. Acid rain, greenhouse gases, and air pollution are a few of the more prevalent ones. Chemicals and particles are discharged into the atmosphere during the burning of fossil fuels.

7.2. Exhaustible

The main issue with using conventional sources, particularly fossil fuels, is that they are sources that can run out. They need millions of years to regenerate and replenish. However, unconventional sources are renewable and never run out.

7.3. Risky

Extraction of unconventional energy is safer. When mining for energy, many accidents happen.

7.4. High Cost

These energy sources must be extracted at very high economic and environmental costs. If the initial installation costs are covered, the cost of energy production and extraction from non-conventional sources is significantly lower. Compared to the global average of 30%, Bangladesh's electricity industry is responsible for 40% of the nation's carbon dioxide (CO₂) gas emissions (15.24 million tons). It is this release, along with other greenhouse gases, that is to blame for global warming and temperature increase. In Bangladesh, the power sector is responsible for 40% of carbon dioxide (CO₂) gas emissions (15.24 million tons), compared to 30% worldwide from the power sector. It is this release, along with other greenhouse gases, that is to blame for global warming and temperature increase.

8. BENEFITS OF RENEWABLE ENERGY IN BANGLADESH

- The capacity of the electrical industry can be expanded cost-effectively through clean energy solutions (renewable and energy efficient), which not only cut greenhouse gas emissions but also promote jobs and improve human health by reducing air pollution. According to a research by the Low Emission Development Strategies Global Partnership (LEDS GP) and based on in-depth modelling analysis, the advantages of growing clean energy in Bangladesh's power generation mix could result in the following cumulative effects by 2030:
 - Up to a 20% reduction in greenhouse gas emissions.
 - Create up to 55,000 full-time equivalent jobs domestically.
 - A total of 53 gigawatts (GW) of power can be generated from all solar sources, with a possible additional output of 30 GW from solar PV.
 - Save more than US\$5 billion (BDT 420 billion) and up to 27,000 lives [29].

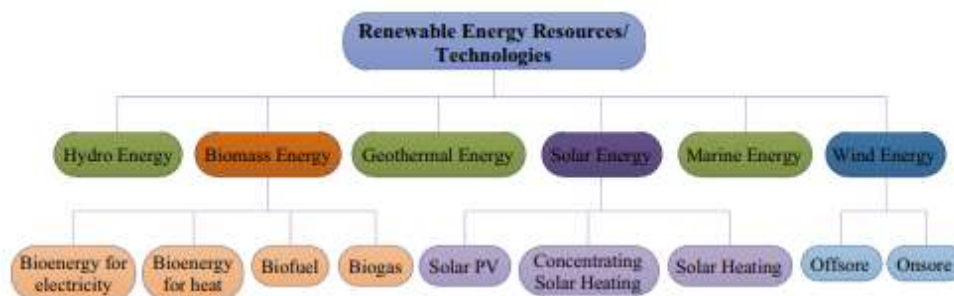
9. SUSTAINABLE ENERGY DEVELOPMENT IN BANGLADESH PERSPECTIVE

Utilizing renewable energy in inaccessible and remote areas of Bangladesh could increase access to electricity, raising people's living and social standards. Bangladesh has a lot of potential for utilizing renewable energy sources, such as modest hydropower, solar photovoltaic (PV), wind, and biomass. In 2004 biomass accounted for almost half of all energy use and provided 98% of all renewable energy. Initiatives involving the installation of solar home systems are thriving in comparison to other renewable energy technologies, such as better cooking stoves and biomass briquetting. This is largely attributable to the original idea behind Grameen Shakti's microcredit program and more recent efforts by the Infrastructure Development Company Limited (IDCOL) to promote solar home systems (SHS) as part of the Rural Electrification and Renewable Energy Development Project (REREDP) with funding from both national and international organizations.

10. RENEWABLE ENERGY RESOURCES IN BANGLADESH

Renewable energy sources might contribute to Bangladesh's energy security and lessen its reliance on natural gas. In areas of the nation without access to or supply of natural gas or the electric grid, people cook with biomass and utilize solar and wind energy to dry different types of cereals and clothing. Three major categories of renewable energy sources are utilised in Bangladesh:

- (i) traditional biomass fuels,
- (ii) conventional hydropower,
- (iii) new-renewable resources (e.g. solar PV, wind, biogas etc.) of energy



10.1. Traditional Biomass Fuels

The most important renewable and sustainable energy source that can be stored and transported is biomass, which is organic material made from living or dead creatures like plants, trees, crops, and their wastes. In the presence of solar energy, biomass uses CO₂ for photosynthesis to create the organic chemicals necessary for its growth. Therefore, it is commonly understood that biomass is physically CO₂ neutral since it absorbs the same amount of CO₂ during growth as it emits during combustion as a fuel, if not more. Figure 6 provides a schematic representation of the carbon cycle and the conversion of biomass energy sources.

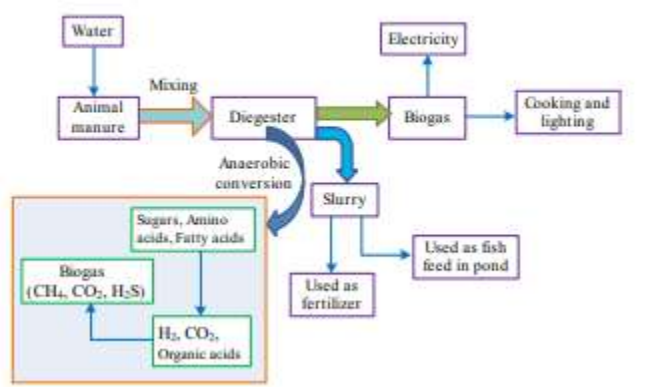


Fig-6: The conversion of biomass energy sources and carbon cycle.

Due to its rain-fed ecology, Bangladesh possesses a vast number of biomass resources, including rice husk, crop residue, timber, jute sticks, animal waste, municipal trash, sugarcane biogas, and other related sources. Furthermore, either directly or indirectly, biomass energy is used by roughly 70% of the population. Bangladesh's primary economic activity is agriculture, which occupies over 64% of the country's total land area. As a result, municipal garbage, livestock waste, and agricultural and forestry leftovers can all be used to generate both heat and electricity. Through a variety of technologies, such as biogas plants, gasification, and others, these biomass resources can be transformed into fuel for electricity generation plants. In addition to the aforementioned, biogas is a gaseous fuel created by the decomposition of biomass, principally animal manure, human excreta, and organic solid wastes in the absence of air, and it contains roughly 40–70% methane (CH₄). There are already roughly 80,000 homes and village-level biogas plants operating throughout Bangladesh. By IDCOL, some 50,000 household biogas plants had already been erected.

The total arable land is 79700 km² which is 54% of the aggregate zone. Roughly 52.54% of the nation's property is utilized for agrarian practices and 17.50% for backwoods. Paddy straw, rice husks [30]. If we make a pie chart according to these data, we will get a figure like below:

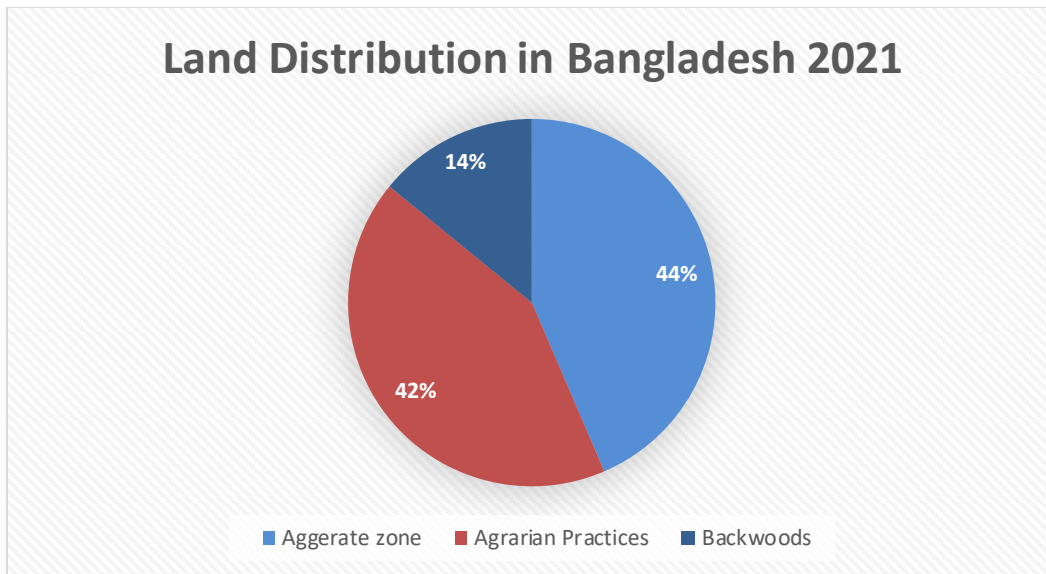
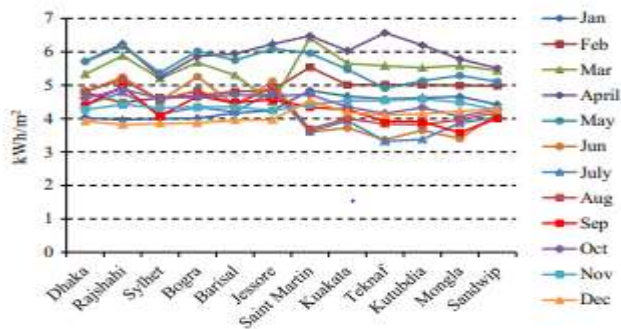
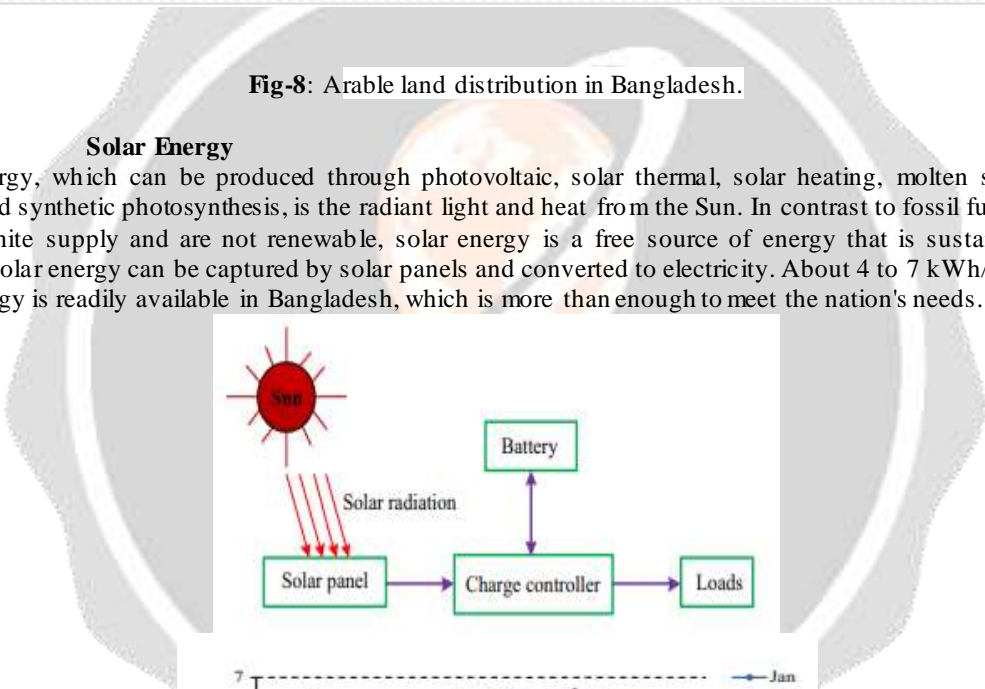


Fig-8: Arable land distribution in Bangladesh.

10.2. Solar Energy

Solar energy, which can be produced through photovoltaic, solar thermal, solar heating, molten salt power plants, and synthetic photosynthesis, is the radiant light and heat from the Sun. In contrast to fossil fuels, which have a finite supply and are not renewable, solar energy is a free source of energy that is sustainable and endless. Solar energy can be captured by solar panels and converted to electricity. About 4 to 7 kWh/m²/day of solar energy is readily available in Bangladesh, which is more than enough to meet the nation's needs.



It is steadily gaining popularity in Bangladesh's outlying regions, and the government has implemented numerous schemes to subsidize it. The government intends to install solar panels with a 5–10 MW capacity.



Fig-9: Solar Irrigation

10.3. Wind Energy

Wind energy is a clean energy source because it is powered by the wind. As opposed to power plants, which burn fossil fuels like coal or natural gas, wind energy doesn't contaminate the air. Acid rain and greenhouse gas emissions are not caused by air emissions from wind turbines. One wind turbine can produce enough electricity for one household, and it is cheap, sustainable, and clean. The production of electricity from wind power accounts for 0.5 percent of all the renewable energy sources in Bangladesh. Its 724 km of coastline and numerous little islands in the Bay of Bengal belies its small size. These regions experience a strong southerly trade wind and sea breeze in the summer and a gentle northerly trade wind and land breeze in the winter. Figure 9 displays the wind power density and wind speed for several regions of Bangladesh.

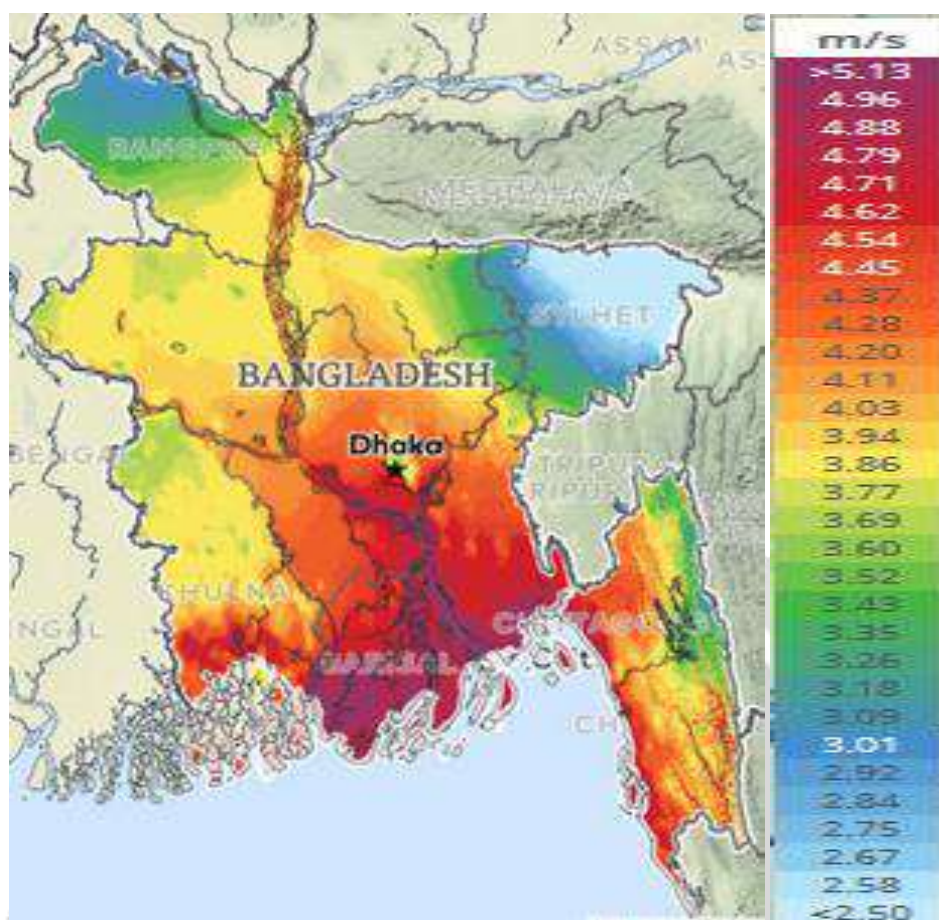


Fig-10: Wind power density and wind speed for different areas of Bangladesh [31].

One of the most important environmentally friendly sources of renewable energy that is generated from wind speed is wind power. The mechanical power of the turbine shaft and generator are used to transform the kinetic energy of the moving air into electrical energy.

Bangladesh is looking at the advantages of wind energy. There are windmills with a 2.9 MW capacity operating in Bangladesh's coastline region. Bangladesh has been forced to wait for a development in wind energy technology before it can compete with other traditional commercial energy sources. The government has planned a trial project to erect 20 MW wind turbines by the coastline. According to the pilot project's findings, 200 MW more of wind energy could be produced. In the ensuing decades, it is anticipated that rising costs for fossil fuels and CO₂, technology advancements, and economies of scale from greater use will make renewable-based systems more cost-competitive (IEA 2011).

10.4. Tidal Energy

The majority of Chittagong's tides are semi-diurnal and have a wide range that varies with the seasons, with the south-west monsoon being when they are at their highest. The daytime tides are smaller than the night-time tides due to a strong diurnal influence on the tides. The EEE department at BUET, Dhaka launched an effort in 1984 to explore the feasibility of tidal energy in Bangladesh's coastal region, particularly in Cox's Bazar and the islands of Maheshkhali and Kutubdia. The amplitude of the spring tide exceeds even 6 meters, while the normal tidal range was found to be within 4-5 meters. According to various calculations, a permanent basin with pumping arrangements could be built at a number of suitable sites in Cox's Bazar, Maheshkhali, Kutubdia, and other locations. This would be a double operation scheme. For Kutubdia Island, where about 500 kw of power might be generated, tidal energy may be a potential alternative source. There are now just 2x73kVA diesel generator sets that can provide 72,000 people with energy for 5 to 6 hours a day, and there is practically no chance that main grid supplies will ever be available.

10.5. Wave Energy

The Bangladeshi government has not yet made any attempt to evaluate the potential for using the waves in the Bay of Bengal to generate energy. With favourable wave conditions, especially from late March to early

October, wave power could be an important alternative energy source in Bangladesh. Waves are typically noticeable and exhibit a clear relationship with the wind. Significant waves are produced in the Bay of Bengal as a result of the southwest wind. A wave rider buoy has been used to measure wave heights and connect them with wind information. On the 29th of July, there were reported maximum wave heights of over 2 m, with an absolute maximum of 2.4 m. For waves that are around 0.5 m in height, the wave period ranges from 3 to 4 seconds to roughly 6 seconds.

Bangladesh has experienced wind gusts as high as 650 kph (400 mph), 221 kph (138 mph), and 416 kph (260 mph) in the years 1969, 1970, and 1989, respectively. There have been reports of powerful cyclonic storms and storm surges up to 15 meters. Additionally, the plant must be able to withstand the rare occurrence of extremely high waves during a storm.

10.6. Geothermal Energy

Geothermal energy is a form of renewable energy that can be drawn from the earth by means of organic processes. For the purpose of supplying heat to a residential unit, this can be done on a small scale. Through the use of a geothermal power plant, energy may also be collected on a massive scale. It is reliable, affordable, and kind to the environment. This method allows for the production of steam and hot water beneath the earth's surface, which may then be utilized to generate electricity [32]. The earth's core, located around 4000 miles beneath the surface, is where geothermal energy is generated. Steam is produced as a result of the process, which involves the slow disintegration of radioactive particles at high temperatures. Globally, 24 countries generate about 10,716 MW of geothermal energy [33]. There are several areas in Bangladesh where geothermal resources can be used. The possibility of discovering geothermal resources is worth considering in Bangladesh's northern regions. Although the demand for power is rising, our ability to produce it is not. The production of power using geothermal energy can control the demand for electricity in rural areas. Private business Anglo MGH Energy has started work on a project to build Bangladesh's first 200 MW geothermal power plant in the Thakurgaon area, which is adjacent to Saland [34].

11. SOCIAL IMPACT OF RENEWABLE ENERGY SOURCES

For the sake of future energy security, stability, and prosperity, renewable energy is crucial. Additionally, it is thought that switching to renewable energy can lower emissions that contribute to global warming. Solar, wind, and biomass are three potential sources of renewable energy in Bangladesh; their societal effects are described here. Solar energy has numerous other economic advantages and is nearly infinitesimal, which can help stable energy prices. The potential for solar energy is the highest of any practically constant energy source [35]. Rural residents can prolong their labour into the evening thanks to solar illumination. Lighting is regarded as the most significant advantage of solar energy since it is convenient, safe, clean, and bright, and because it extends study and domestic work hours. Radio and television are the most efficient ways to reach rural residents because of the high rate of illiteracy in these areas, and as a result, they are crucial to socioeconomic development [36]. Rural places, particularly those that are geologically remote, such as hill paths, wetlands, and tea gardens, can benefit greatly from solar power in terms of both health and the environment. Solar energy is projected to have more positive environmental effects than fossil and biomass fuels due to its low installed carbon footprint and near-infinite supply in the foreseeable future. Kerosene lamps can be replaced with solar energy since they release large volumes of fine particles, carbon monoxide (CO), nitric oxide (NO_x), and sulphur dioxide (SO₂), all of which have a negative impact on indoor air quality [37]. These pollutants may worsen lung function and raise the chance of developing cancer, asthma, and infectious diseases including tuberculosis [38].

12. CHALLENGES AND OPPORTUNITIES

Lack of proper institutional setups, markets, finance, technological advancement, human resources, and the slowly spreading adoption of new technologies are only a few of the underlying problems and obstacles that have limited the use of renewable energy technology in developing countries. The commercial constraints that externality costs create also hinder the development of renewable energy technology. In the context of Bangladesh, these obstacles are frequently pertinent. A suitable institutional framework and policy procedures are required for Bangladesh in order to continue designing and implementing effective initiatives. According to research, Bangladesh's rural and urban areas equally struggle with a lack of access to energy. Utilizing on-site renewable energy sources, among other possible solutions, may improve access to energy and provide additional synergistic benefits like socioeconomic growth.

13. RECENT ACHIEVEMENT AND FUTURE TARGET IN RENEWABLE ENERGY DEVELOPMENT IN BANGLADESH

Incorporating a long-term electricity generation strategy is the PSMP 2016. According to the proposal, generation capacity needs will be 30,000 MW in 2030 versus 27,000 MW in demand, and 57,000 MW in 2041

versus 51,000 MW in demand. Out of the overall generation capacity of 57,000 MW in 2041, approximately 35% of the power will be produced using coal and 35% using gas/LNG [39]. Since 1990, Bangladesh has experienced an increase in coal consumption of 33% each year. It intends to guarantee coal-based power stations with the ability to generate 7.5 GW of electricity by the end of 2021. This is a reduction of about 50% from what it was in 2017. Even yet, Bangladesh will continue to rely primarily on natural gas and won't be as dependent on coal as other nations in the region. The move to renewable energy won't have such a significant immediate effect on the coal business. Long-term projections indicate that by 2050, the amount of coal in the overall energy mix would be insignificant if Bangladesh is successful in achieving its renewable energy goals.

The nation's most pressing problems are the production and distribution of electricity, which presents a significant challenge for the government. However, the inclusion of renewable energy sources in this sector is a spectacular accomplishment that outperforms the nation's entire capacity for electricity generation. In order to encourage various public and private organizations to invest in the replacement of indigenous non-renewable energy sources, renewable energy was incorporated into the national energy strategy in 2008. Since then, consumption, research, and development of renewable energy resources have expanded rapidly; nevertheless, in the context of the country, commercial utilization of these resources is still years behind. 722 MW of power are now produced using renewable sources. Ten percent of the total electricity from Renewable Energy will be generated by solar and wind power plants, which are now being installed.

14. CONCLUSIONS

Maintaining the capacity of natural systems to continue delivering the natural resources and ecosystem services that are crucial to the economy and society is a guiding principle in sustainable development. The ideal social situation is one in which resources are used to suit human needs while preserving the stability and integrity of the natural system. Sustainable development is defined as meeting present-day requirements without endangering the ability of future generations to meet their own. Consistently improving social and economic circumstances without exhausting the planet's finite natural resources is the aim of sustainable development. We must all find methods to address these demands so that our children and grandchildren can leave behind a world that is healthier and more environmentally friendly. Due to the current depletion of fossil fuel supplies, their current limitations, and the issues raised by climate change, it is imperative to explore for alternative energy sources. We are on the path to renewable energy thanks to alternative energy sources. This study looks at the sources of renewable energy as well as the potential and availability of these resources in Bangladesh. The energy problem won't exist for very long if we can take advantage of renewable energy sources while minimizing their drawbacks. Therefore, to ensure sustainable economic development, renewable energy should be used as much as possible. This will help to reduce the estimated energy and save conventional energy for the next generation.

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