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Moving Towards Renewable Energy to Mitigate Carbon Emissions from Fossil Fuel

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Abstract: To power the world efficiently with a sustainable and a reliable future, Renewable energy or clean energy is the solution. Clean energy revolution is displacing 500 years of fossil fuels to lower carbon emissions as well as other types of pollution. Due to experts in the field, innovative technology, and robust software, the cost of the energy is down. Renewable energy utilization is on the rise around the world because of industrialization. Still, the world relies on petroleum oil and coal to meet demand. Burning many fossil fuels creates substantial CO_2 emission into the atmosphere-can be catastrophic. For example, concern of climate change due to Green Gas Emissions (GHG). A viable option to this problem would be to use Renewable energy (RE) in exchange to fuel burning. The objective of the work is to investigate the types of Renewable, the function of Renewable energy sources to mitigate CO_2 Emission, the potential for developing country to scale back CO_2 emission and the problems associated with applying RE in third world countries.

Keywords: Fossil Fuel, Greenhouse Gas, Renewable Energy, CO_2 Emission

1. Introduction

Global climate change is now a severe environmental setback for society to solve. Generally, the risk of this change is associated to greenhouse gas (GHG) productions, particularly (CO_2), methane, & nitrous oxide. It's a fact that CO_2 emission is generated from fossil fuels. In 2012, 87% of the worldwide energy source came from fossil fuel. The solution to this challenge would require replacing fossil fuel technology with something that is affordable, efficient, and doesn't create greenhouse gas emissions [16]. Scientists have confirmed time and time again that the cause of global warming is attributed to GHG emissions from high-level demand for fossil fuels. Therefore, a shift to a zero-carbon transition is the only viable choice. Scientists have become increasingly interested in this path forward. As a result, more attention is placed on renewable sources like wind and solar [23]. Even more compelling is [21] life cycle assessment (LCA) demonstrates that renewable energy is less expensive, more environmentally friendly, and the growth potential is more significant than any other conventional electricity conventional source.

Human activities such as tropical deforestation, carbon cycle, and weather pattern can generate greenhouse gases which impacts the makeup of the atmosphere as well as worldwide weather [37]. The activities have risen with an increase in industrialization and urbanization. It has and continues to cause environmental consequences. In addition, economic development and the expansion of the service industry have increased energy demand, leading to further pollutant emissions. Out of significant concerns to protect the environment, “196 countries joined United Nations Framework Convention on Climate Change (UNFCCC) in 2015”. UNFCC is making efforts since 1995, and finally, along with parties, they have met annually to find a way to regulate global warming and greenhouse gas GHG emission problems. UNFCC is known for its achievement of orchestrating the formation of the Kyoto Protocol. It brought a binding obligation for urbanized countries to reduce greenhouse gases. However, it never indeed took off due to lack of the structure of the agreement, such as exempting developing countries such as China and India from committing to cut their emissions. Further, the Protocol did not have an effective emission trading scheme. As a result, the US Senate refused to join and be required to comply with rules that they believed could damage their economy even though the President sign the treaty. Still, the Kyoto Protocol to the UNFCCC held the United Nations global climate change Conference (UNCC) in Paris in 2015 with over 190 countries participants. After the meeting, the Paris Protocol has intensified the global response to climate change.

It vowed to maintain global warming under two degrees Celsius over the pre-industrial level by 2100, although not known if the US will endorse the treaty. Even though the Paris agreement may not be firm with many loopholes, it should be considered a success. The Paris agreement gained global attention and started the conversation of intensifying actions and investments required for a supportable low carbon future, a crucial key move to combat climate change [8]. Renewable energy sources (RES) are anticipated to play an important responsibility in decarbonizing the earth's energy system. Currently, RES supply 14% of the earth's energy demand. The primary type of RES is hydropower, geothermal, biomass, wind, marine and solar energies. This source of energy can generate a sustainable source of energy without being depleted.

Further, RES is clean, pollution-free electricity and can lower or alleviate the effects of climate change. For example, large-scale hydropower generates 20% electricity worldwide. Secondly, the wind-generated for shore and windy areas is becoming another capable source of energy [12]. RES requires moving away from carbon dependency to sustainable living. It requires meeting the population's needs and being mindful of the future generation's needs [7]. Currently, fossil fuel utilization is considerably rising alongside enhancements within the quality of life, industrialization of third world counties, and population increase. It's well known that the increased rate of consumption of fossil fuel will be depleted over time, not to mention the colossal adverse effect on the environment. It can also lead to a rise in health hazards and, therefore, the risk of worldwide global climate change [10]. On a global and political scale, the need for ecological betterments is flattering further up to standard, particularly in urbanized countries. The Public is slowly reaching "additional sustainable creation strategies, junk minimization, minimized pollution from vehicles, circulated energy generation, protection of national forests, and decrease of greenhouse emissions [25]". The boost in the utilization of fuel is done to gratify our existing energy requirement. It has created concern over the energy situation caused by a rebirth of awareness in fostering renewable substitutes. To meet the developing nations rising demand in energy, they use fossil fuels, which increases carbon dioxide in the atmosphere; therefore, renewable alternatives that produce no greenhouse gas emissions unpolluted energy are enthusiastically needed [15]. It is why the Kyoto Protocol agreement, international "burden-sharing" agreement, to industrialized counties and the European Union agreed on the so-called Kyoto target- to prohibit or lower harmful anthropogenic obstruction with the climate system [32].

The problem of greenhouse gas emission is obvious. Since the industrial revolution, two-thirds of global greenhouse gas emissions are a consequence of fossil fuel burning, but replacing it could generate a geopolitical conflict. Technological changes, innovation, and changes to climate policies will prompt a reevaluation of every financial asset, which can cause global economic instability [3]. The world saw an increase in energy consumption in 2018. Consequently, the carbon emissions rate saw an all-time high in 7 years. There was an energy consumption growth of 2.9%. It was nearly two-fold the 10-year standard of 1.5% per annum, accounting for the fastest growth in 2010 [9]. The effects of climate change put a heavy price burden on the world economy, specifically, first world nations, with little flexibility and resilience [5]. Again, carbon emissions increased 2.0% in just a few years. It means that the emission climbed to 0.6 gig tons [27].

Before the COP21 climate conference in Paris in 2015, about 160 countries turned in their national strategic plan on how they would meet the objectives of the convention climate change beyond 2020 [29]. There is an understanding that Renewable energy technologies could prove profitable to rural communities because they can bring new economic opportunities, lower energy costs, and obtain a more dependable source of electricity, among others [30]. A substantial discussion about why there is a need for Global Energy Governance (GEG) must be initiated. This way, regulations, and enforcement are in place to overcome problems related to energy supply and its use [26]. There are several studies done that focus on renewable energy consumption and harmful emission from different countries with countless findings. This paper will analyze the utilization of Renewable energy and the ways to mitigation CO_2 emissions.

2. Background of the Study

The demand for energy is quickly increasing due to an increase in industrialization. Conventional energy- petroleum oil and coal are the primary energy source that fulfills the demand. Significant environmental damage happens worldwide because of the combustion of a large amount of fossil fuels, and therefore the consequences are often devastating. For example, the planet is experiencing climate change because of Greenhouse Gas Emissions (GHG). One viable solution would be to use Renewable energy (RE) to exchange fossil fuel burning. The study emphasizes on the many sources of renewable energy and their function in lowering GHG emissions, what developing countries can do to scale back GHG emissions, and the problems with implementing RE in developing countries [6].

Menyah, and Wolde-Rufael used the framework of a vector autoregressive (VAR) model to understand the "RE consumption, income, and electricity price and how they may interact with one another." Finding from the study suggests that utilization of atomic energy Granger causes CO_2 releases with no fundamental importance [19]. The result shows that, econometrically, nuclear energy can help with the mitigation of CO_2 emissions. As it stands, RE consumption is not at a level where it is capable of making any meaningful headway to emission lowering.

Apergis, and Payne employed panel integration techniques to approximate long-run correlation [2]. They also looked at "the causal dynamics between renewable energy consumption per capita, real gross domestic product (GDP) per capita, carbon dioxide emissions per capita, and real oil prices for a panel of 11 South American countries over 1980 to 2010." The conclusion of the research showed the need for RE consumption to reduce CO_2 emissions.

In Sims article, he estimated the number of greenhouse emissions which resulted per kWh of electricity produced. Various fuel choices (with and without actual carbon appropriation) were contrasted with the benchmark case of pounded coal, steam cycle power station [25]. Bioenergy, hydropower, wind power, nuclear power, and solar power facilities were also evaluated. The goal was to compare mitigation costs per tonne of averted carbon emissions and predict the total amount of carbon mitigation that will occur in the global electrical industry between 2010 and 2020 as a consequence of fuel switching, CO_2 appropriation, and hence increased renewable energy adoption.

Clifton-brown et al, predict that if Miscanthus were to be planted on an appropriate land area of 10%, it could supply 231 TWhyr-1 power in the European Union (EU15), accounting for 9% of total energy output in 2000. Using the same scenario, overall carbon reduction for the 1990 Kyoto Protocol baseline levels may be 76 Mt C yr1, or around 9% of EU total C emissions [35].

Granovskii et al, study looks at the financial aspects of using renewable technology in place of fossil fuels to reduce greenhouse gas emissions [34]. Unlike traditional fuel sources, carbon emissions from renewable technologies are mostly linked with plant construction, resulting in significantly smaller magnitudes. Water electrolysis powered by renewable energy sources has a fair chance of producing environmentally friendly hydrogen fuel. Nonetheless, the value of energy provided by wind and solar remains higher than that generated by a gas power plant. When energy from renewable sources replaces electricity from gas, the value of greenhouse emission reductions is around fourfold if hydrogen from renewable sources replaces hydrogen generated from gas, according to the current pricing of wind and solar power. When renewable-based hydrogen is used in a cell vehicle instead of gasoline in an internal combustion engine vehicle, the value of greenhouse emission reduction approaches that of renewable-based electricity, as long as the cell vehicle efficiency exceeds that of an indoor combustion vehicle by a factor of two. When 6000 wind turbines (Kenetech KVS-33) with a capacity of 350 kW and a capacity factor of 24 percent replace a 500-MW gas-fired power station with a 40 percent efficiency, annual carbon emissions are reduced by 2.3 megatons. The increased annual cost is estimated to be around 280 million dollars. The findings suggest a viable strategy for reducing greenhouse gas emissions mitigation.

Assessments of the environmental consequences and economics of the overall production and use life cycle (from "cradle to grave"), including the building and operation phases of the technology, are part of an acceptable evaluation of items impacting the adoption of a renewable technology. LCA is a way for assessing this type of situation. It is a method for assembling and analysing material and energy inputs and outputs in a systematic manner. As a result, the environmental effect is caused by a product's or service system's operation throughout its life cycle [36]. Khan et al, for example, confirms that a system combining a turbine and a fuel cell emits zero emissions when in operation [33]. During the assembling of the various system components, there are considerable GHG emissions (wind turbine, cell, and electrolyzer). However, the global warming potential (GWP) of this type of integrated system is lower (by at least two orders of magnitude) than the classic diesel system now employed in isolated areas. China has set ambitious goals for renewable energy development, which may necessitate massive growth. We find that existing renewable power objectives result in considerable extra renewable energy installation and a 1.8 percent reduction in total CO_2 emissions compared to a No Policy baseline from 2010 to 2020. Renewable energy's impact after 2020 is determined by both economic growth and technological cost forecasts. Importantly, we find that, through 2050, CO_2 emissions reductions attributable to increased renewables are offset by yearly increases in emissions from non-covered industries. After 2020, we look at the sensitivity of renewable power costs and find that if prices decline due to policy or other factors, renewable electricity share rises, leading to somewhat more significant economic growth through 2050. Regardless of the value assumption, anticipated CO_2

emissions reductions under a programme that exclusively targets the availability side of the electrical industry are quite low. A policy strategy that includes all industries and offers flexibility to reduce CO_2 emissions at the lowest cost, such as an emissions trading scheme, would avoid emissions leakage and guarantee that future CO_2 emissions targets are met [31].

Renewable tools are known as clean energy, and optimum use of the energy would reduce environmental effects. They create the lowest wastes and are sustainably present and upcoming economic and social societal needs. The sun is the foundation of all energies. The primary kind of solar power heats and is lightweight. Sunlight and heat are converted and captured by the earth in so many ways. Many of these conversation end in renewable energy moving like biomass and wind energy. Renewable energy technologies give a superb prospect for improving the greenhouse gas release and reducing warming by replacing standards of renewable sources of energy. The breadth of CO_2 reduction using solar cookers, hot water heaters, dryers, bio fuel, better cook stoves, and hydrogen has been reviewed in this article. [32].

3. Discussion

3.1. Types of Renewable Energy

Several renewable energy sources exist that are accessible on the planet. For example, sunlight, wind, hydro, biomass, flowing sources, geothermal, and the most accessible sustainable power sources are sun-oriented and wind energy. Daylight is the primary wellspring of the most sustainable power sources. It caused the breeze to blow, biomass to grow, and the water cycle to operate in order to extract energy from wind, biomass, hydropower, and sea energy. Geothermal energy may be used to remove heat from the earth's interior. [1].

3.2. Solar Energy

Solar energy is the most readily available energy source on the planet. The sun has huge energy, roughly four million exajoules (1EJ = 1018J) of solar energy [17], which is 200 times the entire yearly commercial energy used by humanity. The yearly sun irradiance distribution on the world is seen in Figure 1.

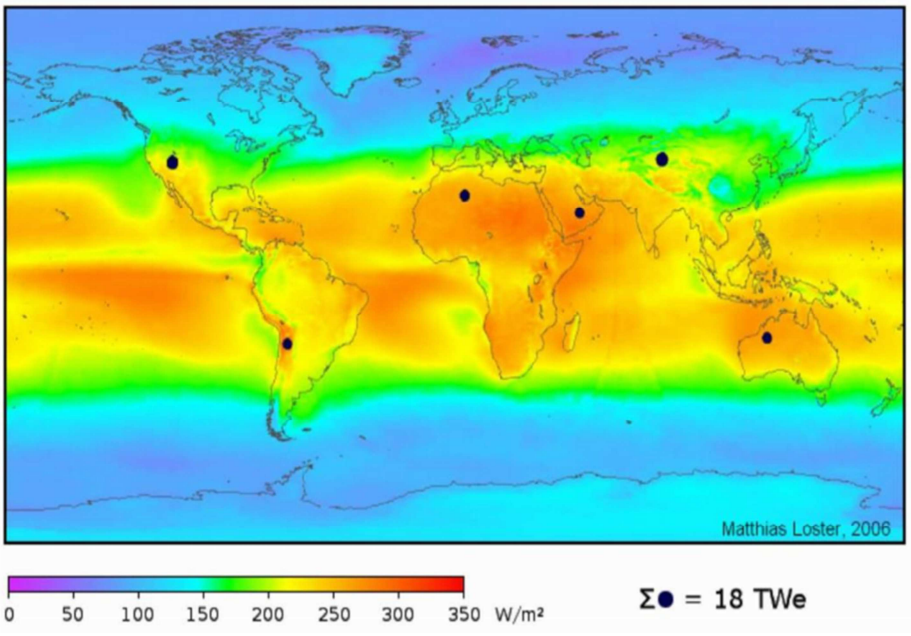

Figure 1. *Annual average solar irradiance distribution over the surface of the Earth (Kabir et al., 2018).*

Passive solar energy technology (SET) and active solar energy technology (SET) are two significant solar energy technologies—passive technology uses solar energy without converting it to another energy source, such as electricity. Solar power, like a solar hot-water heater, gathers, stores, and distributes energy for heating. The second category is active solar technology, which includes two approaches. Semiconductors convert solar energy into electricity in photovoltaic systems. These cells have an efficiency of around 18%. In solar thermal systems for commercial usage, applications such as drying, heating, cooling, and cooking are used. Concentrated solar power uses electricity generation to power high magnification mirrors that concentrate solar heat to power turbines. [17].

3.3. Wind Energy

Temperature causes wind, and pressure variations are caused by the sun. Because it is a readily available source, like sunshine, wind generating has become crucial after solar power. In 2016, the installed wind power capacity was 487 GW, and by 2020, it is predicted to reach 700 GW [4]. Figure 2 depicts the capacity of wind generating during the previous 20 years. Turbine technologies are frequently used to extract the facility from wind energy. Wind turbines are rapidly evolving in terms of size and power output [4]. Vertical and horizontal wind turbines are the two types of wind turbines.

These two have a similar fundamental mechanism. Wind blowing through the blades generates mechanical energy, which is then supplied into the generator to generate electricity. The position of the turbine has a considerable impact on the machine's performance. The summit, which is roughly 30 metres high, must be higher. The well-known wing turbine is a horizontal axis turbine that generates 50 to 350 kW of power. [1].

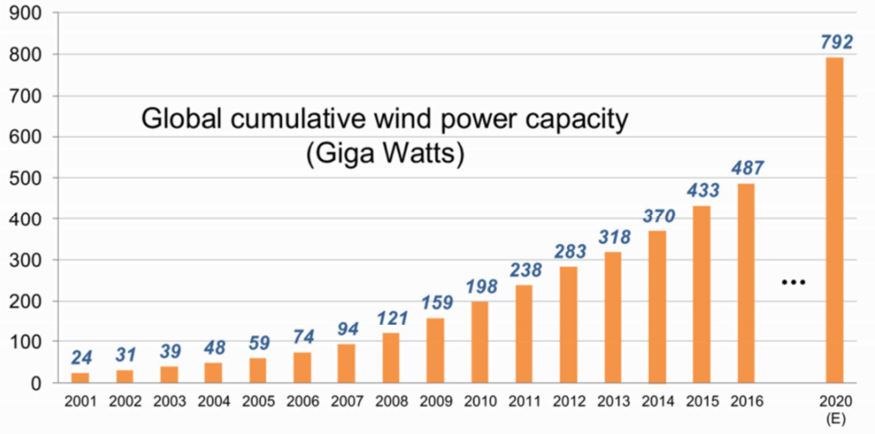

Figure 2. *Global cumulative wind power capacity from 2001 to 2020.*

3.4. Biomass Energy

Biomass is the world's oldest and most widely used renewable energy source. In rural regions, people continue to use it for cooking. Due to its low cost, even modern enterprises utilise biomass to power their machinery such as boilers. Woods, crops, plants, organic, agro-industrial waste, and home garbage are all examples of biomass. [28] (Table 1).

Table 1. *Overview of the global potential of bioenergy supply (Toklu, 2017).*

Biomass Category	Technical potential in 2050 (EJ/yr.)
Energy crop production on surplus agricultural land	0-700
Energy Crop production on marginal land	< 60 – 110
Agricultural residues	15 – 70
Forest residues	30 – 150
Dung	5 – 55
Organic wastes	5-50
Total	<60-1100

Figure 3. *Floating tidal power plant with vertical triple-helix turbines (Gorlov, 2001).*

Biomass energy is frequently divided into two categories: contemporary and traditional. Wood agro-industrial waste, urban garbage, and bio fuels are all examples of modern biomass. For residential usage, traditional biomass comprises fuel wood, charcoal, and rice husk. Biomass output is estimated to be over 146 billion metric tonnes per year [28]. Stored energy is released during the degradation of biomass. Biomass is frequently used to extract energy using this concept. Biomass production is one of the most efficient ways to extract energy. This will be utilized to generate heat and power. [1].

3.5. Tidal Energy

Sea waves are used to harvest tidal energy. The regular rising and lowering of saltwater with kinetic and potential energy is caused by gravitational forces from the sun and moon [13]. Turbines may convert the potential and kinetic energy of water movement into electricity. This energy is available all along the coast, with a density of about 65MW/mile in some places [1].

3.6. Geothermal Energy

The heat that exists within the ground is referred to as geothermal energy. It is frequently a renewable, environmentally favourable energy source. It can start at a temperature of 3 metres to a few miles below the surface of the planet, eventually increasing to extremely high-temperature magma. The temperature ranges from 50° to 60°F within the 3-

meter range. These thermal energy savings are often extracted to heat buildings during the winter season [1], The installed thermal power for direct utilisation in 2019 is estimated to be 107,727 MWt, representing a 52.0 percent increase over 2015 data. This increase is occurring at an annual compound rate of 8.73 percent. [18] The amount of thermal energy utilized is 1,020,887 TJ/yr (283,580 GWh/yr). Table 2 shows how much geothermal energy is used across the world.

Table 2. *Summary of direct-use data worldwide by region and continent, 2019 [18].*

Region/Continent (#countries/regions)	MWt	TJ/year	GWh/year	Capacity
Africa (11)	198	3,730	1,036	0.597
Americas (17)	23,330	180,414	50,115	0.245
Central America and Caribbean (5)	9	195	54	0.687
North America (4)	22,700	171,510	47,642	0.24
South America (8)	621	8,709	2,419	0.445
Asia (18)	49,079	545,019	151,394	0.352
Commonwealth of Independent States (5)	2,121	15,907	4,419	0.238
Europe (34)	32,386	264,843	73,568	0.259
Central and Eastern Europe (17)	3,439	28,098	7,805	0.259
Western and Northern Europe (17)	28,947	236,745	65,762	0.259
Oceania (3)	613	10,974	3,048	0.568
Total (88)	107,727	1,020,887	283,580	0.300

4. Renewable Energy Implementation

CO_2 concentrations in fossil fuels are quite high. Many greenhouse gases are discharged into the atmosphere as a result of incomplete combustion of those fossil fuels. Furthermore, anthropogenic activities are responsible for a major portion of the greenhouse gas emissions in the atmosphere. The use of fossil fuels for energy and transportation is widespread across the world. Textile, petrochemical, and cement manufacturing industries all contribute to significant amounts of greenhouse gas emissions. Coal, petroleum (crude oil), and natural gas are the world's principal fuel sources. Fuel usage has skyrocketed since the industrial revolution, as shown in Figure 4.

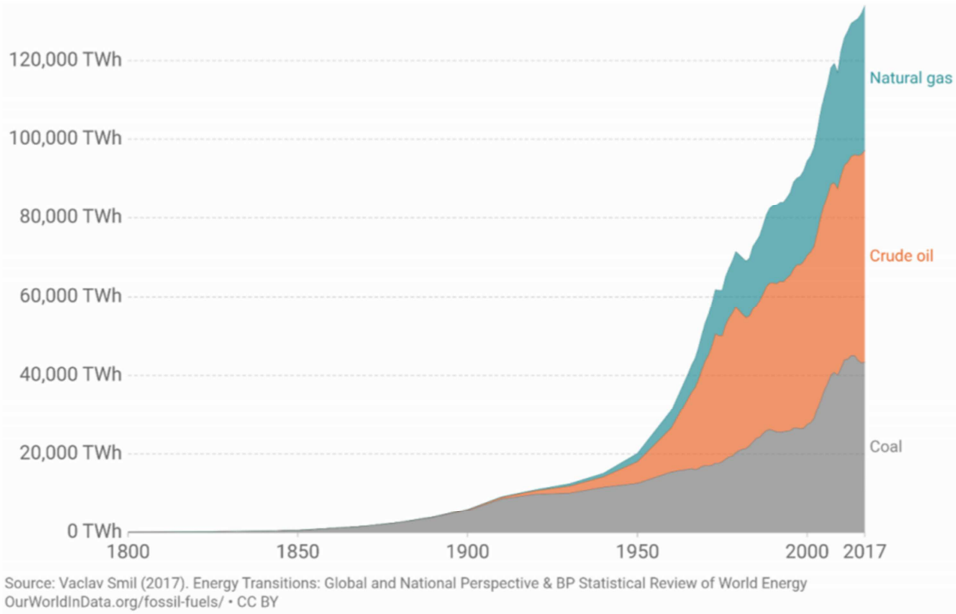

Figure 4. *Global Fossil Fuel Consumption [6].*

Gas flaring is one of the most serious environmental issues in oil-rich areas. Gas flaring is the practise of burning excess gas pumped from oil wells, which produces carbon dioxide, hydrocarbons, and nitrogen. Acid rain is caused by these gases. According to a 2005 estimate by the International Bank for Reconstruction and Development, 100 million cubic metres of gas are flared annually throughout the world. Gas flaring and venting from oil and gas wells contribute significantly to greenhouse gas emissions. Flaring and venting release a large amount of methane into the air, which has a heating potential of 28 times that of oxygen. The fundamental issue with greenhouse gases is that they tend to prolong the heating cycle. Many climatic changes are caused by warming, including acid rain, ozone depletion, heat waves, rising water levels, and photochemical smog.

The planet warms daily over the world. The US, China, and Russia contribute the most to the problem. Next, the primary significant problem is ozonosphere depletion. With the rise of

greenhouse emission, chlorofluorocarbon (CFC) molecule increases can destroy up to 100000 ozone molecules. Hazardous solar rays entered the atmosphere as a result, while greenhouse gases absorbed the sun's heat and raised the atmospheric temperature. When it comes to the environmental implications of fuel combustion and heating, the spike in temperature caused by heat waves has a substantial influence. Warmth waves killed over 2300-2330 persons in 2005 [20]. Another impact is an increase in sea level owing to decreased air temperature and melting polar ice caps and glaciers, as well as a rise in water level of 20 to 165 cm due to thermal expansion of ocean water. As a result, the island, coastal regions, and arable fields have become severely impacted. Acid rain is another man-made environmental issue. The main contributions are sulphur dioxide and nitrogen oxides. According to the following equation:

$$S\,(s) + O_2\,(g) \rightarrow SO_2\,(g) \quad (1)$$

$$2SO_2\,(g) + O_2\,(g) \rightarrow 2SO_3\,(g) \quad (2)$$

$$SO_3\,(g) + H_2O \rightarrow H_2SO_4\,(l) \quad (3)$$

Another environmental issue is photochemical smog, which is caused by sunshine photons. As the atmosphere undergoes a chemical process, they collide with molecules of various types of contaminants. Many health concerns arise as a result of the high levels of pollution. Eye and nose irritation, increased susceptibility to sickness, reduced lung functioning capacity and shortness of breath, as well as sneezing and coughing, are some of these issues. Wildfires have the potential to completely destroy an environment. They suffocate forests' carbon sinks while demolishing homes in their way.

They wipe off vital plant species; fast-moving animals can withstand them, but slow-moving animals may be harmed. Wildfires pollute the atmosphere and raise CO_2 levels. As a result of global climate change, they raise temperatures and induce droughts. Drought in the southern Amazon in 2010 was attributed to global climate change, according to studies. Dryness favors the spread of fireside, which is triggered by humans' fireplaces. Renewable energies such as hydroelectric power, biomass, wind production, geothermal power, and solar energy can be used to replace fossil fuels. We can cut emissions in four sectors by substituting renewable energy for fossil fuels: power production, hot water/space heating, transportation fuels, and rural (off-grid) energy services.

Renewable energy are more convenient than fossil fuels in the facilities generating sector and in the automobile industry since they emit less CO_2 across their whole life cycle. Fuel may be the principal source of transportation power on a global scale. Most future breakthroughs and inventions will consider clean energy, and green technologies command a high market price.

In developing countries with plenty of sun, GHG emissions are often reduced easily by renewable energy due to the country's cheap supply of energy sources. In the past, a country like Sri Lanka relied only on renewable energy sources, such as hydropower, which provided 100 percent of the energy for electricity generation [6]. The use of renewable resources is fast growing at the moment. Within the electricity generation and another sector that influences GHG emissions, the most popular renewable energy types are hydropower and wind. Table 3 illustrates CO_2 emissions in Sri Lanka by sector.

Table 3. *CO_2 Emissions from fuel combustion [6].*

CO_2 emissions (Million tons of CO)		
Total	20.89	100.0%
Electricity and heat production	8.67	41.5%
Other energy industry own use	0.04	0.2%
Manuf. industries and construction	1.62	7.8%
Transport	9.36	44.8%
Other sectors	1.2	5.7%

Figure 5 shows the expected reduction in GHG emissions once more renewable energy plants are installed [6]. The reference scenario, and hence the base case scenario, frequently support this. Several thermal power plant additions were removed with the implementation of 3325MW renewable resources, 450MW Natural Gas-fired Combined Cycle, 400MW Pumped Storage Hydro, and 39MW Major Hydropower Plants [6].

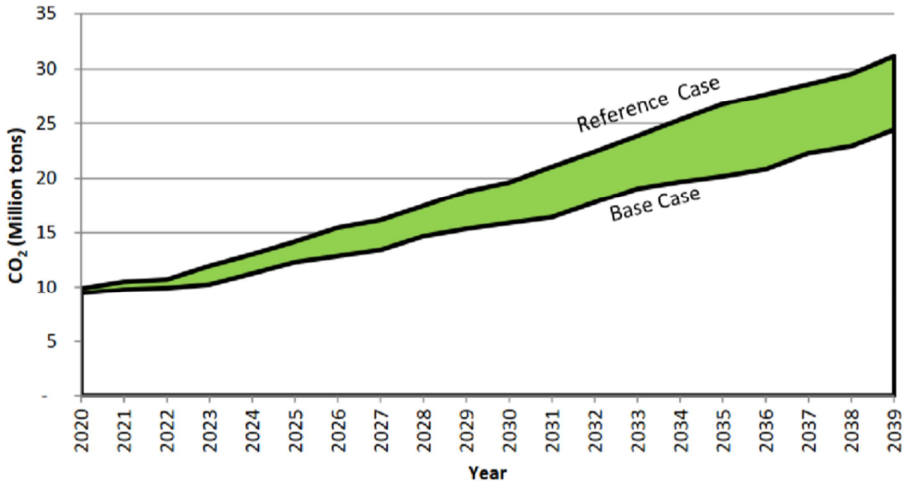

Figure 5. *CO_2 Emission reduction by Base case plan compared to the Reference plan [6].*

This data shows that incorporating renewable energy into Sri Lanka's electrical output helps to drastically reduce CO_2 emissions. The transportation industry is the other major source of CO_2 emissions, accounting for 44.8 percent. Not only in Sri Lanka, but all around the world, it is mostly due to petrol and diesel automobiles. Many firms have produced hybrids and electric cars (EV) to address this issue. It is obvious that hybrids and electric vehicles are replacing gasoline and gasoline vehicles. Promoting EVs with solar power technology is best suited for developing countries with enormous sunlight. These new vehicles can mitigate greenhouse emissions [11].

5. Implementation Barriers of Renewable Energy

Renewable energy (RE) has a lot of promise for addressing environmental challenges. Despite the fact that every government strives to exploit this potential, various obstacles impede the adoption of these technologies. Some of these issues include policy, technological, and economic obstacles, as well as information and human resource concerns. [24].

5.1. Policy-Wise Challenges

It is impossible to ignore a link between policy and national project implementation. Policies and regulations must be followed in order for a project to be effective. Making strategies to advertise and motivate these renewable technologies in the private sector is critical to their advancement. Countries that have policies and legislation that encourage the use of renewable energy technology have a better chance of adopting them [14]. Lack of involvement within the private sector due to government policies and week regulation on the environment often impacts developing countries [24].

5.2. Technical Challenges

Technical challenges, restricted capacity to style, installation, operation, and maintenance emerge while applying these advanced technologies. Lack of standard technology and expertise, as well as a lack of local manufacturing, might be a significant hurdle to the success of RE deployment [24].

5.3. Economic Challenges

This is one of the most difficult issues for many developing countries. Despite the many advantages of RE technology, the high implementation costs and delayed payback period push the event behind. Low and middle-income individuals cannot afford the high installation costs of end-user RE systems [24]. This high initial cost is influenced by policies and technical obstacles.

5.4. Information and Human Resource-Wise Challenges

Another stumbling block is a lack of data and competent professionals with a thorough understanding of new technology. The lack of available knowledge, the limitations of knowledge collecting, prospective funders, and civil society awareness should all be addressed. Apart from the aforementioned possible roadblocks, societal approval is also a critical aspect. Land usage is critical when it comes to establishing renewable energy plants. A hydropower or solar power project, for example, may necessitate extensive land use, which the surrounding society may not accept. Landowners have the right to seek compensation for their lands [22]. In poorer nations, civil society understanding of RE is quite low. These are the most essential challenges to overcome in order to properly integrate RE technology in underdeveloped nations, among a slew of others.

6. Conclusion

Renewable energy has a large potential to be utilised in the energy industry throughout the world, according to this report. CO_2 emissions from fossil fuels may have a big influence on global environmental concerns such as global warming and climate change. The world is now attempting to replace fossil fuels with renewable energy technologies. Many countries are implementing and researching green energy to reduce GHG emissions and mitigate environmental impact. The threat posed by those negative consequences cannot be underestimated. Developing countries also must face the same crisis with the ever-increasing demand in urbanization, and industrialization. Despite the fact that developing nations have a large RE potential, the majority of energy is now provided by burning petroleum oil and coal. They are spending a significant amount of money on petroleum and coal. They will not be able to easily convert to renewable energy due to the increase in existing energy consumption. They pay a lot of money to buy coal with a high sulphur content, which has negative consequences such as acid rain and health problems owing to the dust particles that sulphur contains. The transportation industry in third-world nations is the largest source of CO_2 emissions, due to the widespread use of fossil-fuel-powered autos and imported old vehicles that travel throughout the country. Incomplete combustion raises GHG emissions in certain cars. GHG emissions in the transportation industry may be reduced by promoting conveyance and RE-based cars. There are several obstacles to implementing these RE technologies, which are causing the event to be pushed back. Policies and regulations are the most significant stumbling block. Most difficulties that arise during RE implementation may be avoided thanks to the strategic preparation of such rules and regulations. Promoting RE in civil society raises public awareness of CO_2 emissions and its consequences for humanity in today's world. Understanding isn't enough if society can't afford the RE. Strategic planning, education, and technical skills will help to lower the high initial cost.

It is also critical to encourage the business sector to participate in cutting-edge research and development. More

attention should be paid to removing these impediments and utilising the current RE potential for the future green energy economy. Plans should be developed and implemented to prevent major disasters from occurring as a result of CO_2 emissions' negative influence on the environment.

7. Further Studies

Several countries promote renewable energy as a meaningful policy framework for dealing with climate change, primarily via climate change mitigation, which refers to practices that mitigate climate change's effects, but also through climate change adaptation, which refers to practices that adapt to climate change's effects. Renewable energy sources relying on wind, solar, and hydroelectric power have emerged as preferred energy options in worldwide attempts to mitigate climate change since they emit little to no GHGs. Renewable energy are also being included into climate change adaptation plans in some countries since depending on them can lower the susceptibility of power networks to major climate change-related events. As a result, whereas climate change mitigation focuses on global concerns (i.e., lowering global GHG emissions), adaptation is more local in nature (i.e., each state must adapt to climatic change in its own unique way). Since several years, mitigation oriented solutions were the driving force behind worldwide attempts to deal with climate change and its consequences. Mitigation techniques use a variety of approaches to try to lessen the physical consequences of climate change, the most common of which being lowering GHG emissions. This has been accomplished through the employment of more environmentally friendly modes of transportation, the reduction of factory emissions, the advancement of improved farming systems, and other processes. As a result, mitigation measures are essentially global in nature, as they aim to reduce global greenhouse gas emissions.

Climate change and renewable energy, the two primary concerns mentioned thus far, are inextricably linked, as renewable energy is an important instrument for dealing with climate change, both as a mitigation and adaptation approach. Traditional electrical systems, such as coal-fired power stations, account for a major portion of GHG emissions. Updating these systems with alternative energy (i.e., renewable energies) is widely recognized for lowering GHG emissions into the atmosphere, which helps to reduce climate change consequences. Renewable energies, on the other hand, might be used in climate change adaptation efforts. Renewable energy systems, unlike traditional electrical networks, are more decentralized and operate with varied capabilities, preventing total failure in the event of a single facility's failure. Renewable energies also help countries to diversify their energy portfolios, allowing them to rely on sources other than fossil fuels, lessening their exposure to climate-related catastrophic events like temperature changes, fires, and floods.

According to studies Renewable energy sources are the most cost-effective way to increase power availability, reduce air pollution, and reduce carbon dioxide emissions throughout the world. According to one more study approximately 1 billion people live without power throughout the world, putting them at risk of dangerous cooking practices and indoor pollutants. Renewable energy, he says, are one of the strongest solutions for closing the electrical deficit. Renewable energy is the most cost-effective approach to provide 90% of the needed reduction in energy-related carbon dioxide emissions, according to a research by the International Renewable Energy Agency. It will also have considerable socioeconomic advantages, raising global GDP growth by 1%, employing close to 29 million people, and producing a 15% improvement in welfare, primarily due to health benefits from reduced air pollution.

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