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Green Skills: Save Energy and Reduce Carbon Emission in the Context of Bangladesh

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Abstract: Green skills encompass the knowledge, abilities, values, and attitudes essential for fostering sustainable development and tackling environmental challenges. These competencies empower individuals and organizations to implement practices that minimize environmental harm, conserve resources, and enhance energy efficiency, thus aiding in the transition to a greener economy. Small changes that foster green skills can significantly lower carbon emissions by conserving minimal energy each month. This article examines the relationship between carbon emissions and energy savings. As the best stewards of the planet, we must protect Earth by making conscientious choices. The levels of CO_2 in the atmosphere are rising daily, making the planet increasingly inhospitable. In Bangladesh, the primary sources of electricity are coal, oil, and gas, contributing substantial CO_2 emissions that pollute the environment and drive climate change. The average energy consumption is 640 kWh for the fiscal year 2023-24, translating to approximately 53.33 kWh monthly and 1.753 kWh daily. Research indicates that consumers can help reduce carbon emissions by conserving just a few electricity units each month. With 4.71 crore active consumers in Bangladesh, saving between 1 and 5 units of electricity monthly could lead to a decrease in atmospheric CO_2 levels by 0.03 to 0.14 ppm annually. This reduction not only lowers carbon levels but also yields annual savings ranging from Tk 241.83 crore to Tk 1,209.13 crore. If each of the 4.71 crore consumers saves 1 unit of electricity monthly, potential annual savings could reach between Tk 175 crore and Tk 1,774 crore. Additionally, 40,000 students from UCEP Bangladesh can participate in this green initiative, with the potential to save Tk 1.5 crore annually and cut down 415 tons of CO_2 each year. Numerous other strategies to lower atmospheric carbon levels through green skill techniques will be gradually investigated in future studies by the authors.

Keywords: *Green Skills, GtC, ppm, Energy Savings, Reduction of Carbon Emission.*

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I. INTRODUCTION

The concentration of CO_2 in the atmosphere rises each day. Consequently, air quality is deteriorating significantly, leading to symptoms such as headaches, dizziness, restlessness, breathing difficulties, sweating, fatigue, elevated heart rate, and other impacts on humans. Additionally, the growing levels of CO_2 are a primary factor in global climate change.

The Global Monitoring Lab of the National Oceanic and Atmospheric Administration (NOAA) reported that in 2023, the global average atmospheric carbon dioxide level reached 419.3 parts per million (ppm). By 2024, this concentration rose to approximately 422.5 ppm, which is 52% higher than pre-industrial levels. Throughout the decade from 2014 to 2023, the growth rate of atmospheric CO_2 was 5.2 ± 0.02 GtC per year (2.5 ppm), accounting for 48% of total CO_2 emissions, while a preliminary estimate for the growth rate in 2024 is about 5.9 GtC (2.8 ppm).

The concentration of carbon dioxide (CO_2) in the atmosphere has increased from approximately 278 parts per million (ppm) in 1750 (Gulev, 2021), the beginning of the Industrial Era, to 419.3 ± 0.1 ppm in 2023 (Lan, 2024). The atmospheric CO_2 increases above pre-industrial levels were primarily caused by the release of carbon into the atmosphere from deforestation and other land-use change activities (Masson & Delmotte, 2021). While emissions from fossil fuels started before the Industrial Era, they became the dominant source of anthropogenic emissions to the atmosphere around 1950, and their relative share has continued to increase to the present. Anthropogenic emissions occur on top of an active natural carbon cycle that circulates carbon between the reservoirs of the atmosphere, ocean, and terrestrial biosphere on timescales from sub-daily to millennial. In contrast, exchanges with geologic reservoirs occur on longer timescales (Archer, 2009).

In 1750, atmospheric carbon dioxide concentration was about 278 parts per million (ppm). It had climbed to 300 ppm by the late 1900s, 350 ppm by the late 1980s, and reached

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419.31 ± 0.1 ppm in 2023. The atmospheric carbon mass rose by 51%, from 590 GtC in 1750 to 890 GtC in 2023. Presently, CO_2 levels are unprecedented over the last 2 million years, with the current increase in atmospheric CO_2 occurring at a rate at least 10 times faster than any period in the previous 800,000 years (Canadell, 2007).

Energy sources encompass fossil fuels, geothermal power facilities, and various alternatives. Petroleum consists of petroleum liquids (predominantly distillates and residual fuel oil) and coke. The CO_2 emissions per kWh from specific power plants can differ significantly. The U.S. Energy Information Administration reports that in 2023, CO_2 emissions vary based on different fuel types.

Table 1 CO_2 Emission from Different Fuel Types

Fuel Type	**CO_2 Emission**	
	Pounds kWh^{-1}	Kg kWh^{-1}
Gas	0.96	0.435
Coal	2.31	1.048
Oil	2.46	1.116

Source: U.S. Energy Information Administration reports, 2023

This study aims to quantify CO_2 emissions associated with per-unit energy production in the subsequent sections, illustrating how reducing just a few units per consumer monthly can significantly lower CO_2 emissions.

- *Concept of Gigatonnes Carbon (GtC) and Parts per Million(ppm)*

To compare CO_2 emissions with atmospheric CO_2 levels, we can convert both datasets into gigatonnes of CO_2. Emissions are usually recorded in gigatonnes of carbon (GtC), where one gigatonne equals one billion tonnes. This measure only accounts for the carbon component of the carbon dioxide molecule. With an atomic mass of 12 for carbon and 44 for CO_2, the conversion from gigatonnes of carbon to gigatonnes of carbon dioxide requires multiplying by 44/12. Thus, 1 gigatonne of carbon is equivalent to 3.67 gigatonnes of carbon dioxide.

Atmospheric CO_2 levels are measured in parts per million by volume (ppm). The Carbon Dioxide Information Analysis Center's conversion tables indicate that 1 ppm of atmospheric CO_2 corresponds to 2.13 gigatonnes of carbon. Applying our 44-over-12 rule, this translates to 1 ppm being equal to 7.8 gigatonnes of carbon dioxide in the atmosphere.

The conversion varies for gigatonnes of carbon dioxide emissions, as natural sinks like the ocean and biosphere absorb roughly 55% of human-generated emissions. Consequently, the "airborne fraction" that enters the atmosphere is approximately 45%. Thus, 1 ppm corresponds to 17.3 gigatonnes of carbon dioxide emissions.

- *In the context of Bangladesh*

The Bangladesh Economic Review 2024 reports that the total population stands at 171 million. In FY 2023-24, per capita energy consumption is 640 kWh, translating to 53.33 kWh per month and 1.753 kWh per day. Based on data from the Daily Electricity Generation Report of the Bangladesh Power Development Board (BPDB) dated December 28, 2024, we have calculated the production cost per energy unit and daily carbon emissions, as shown in the tables below.

Table 2 Production Cost of per Unit Energy

Fuel Type	**Produced Energy (MkWh)**	**Production Cost (Tk)**	**Cost Per Unit Energy (Tk)**
Gas	117.71	327,011,950.00	2.78
Coal	49.58	355,428,536.00	7.17
Oil	3.92	50,097,502.00	12.79
Total	**171.21**	**732,537,988.00**	**4.28**

Source: Bangladesh Power Development Board, 2024

Table 3 Daily CO_2 Emission

Fuel Type	**Produced Energy (MkWh)**	**CO_2 Emission per kWh in Kg**	**Daily CO_2 Emission in Kg**	**Yearly CO_2 Emission in GtC**	**Yearly CO_2 Level in ppm**
Gas	117.711	0.435	51,257,101.926	18.709	1.081
Coal	49.582	1.048	51,951,920.436	18.962	1.096
Oil	3.917	1.116	4,370,733.529	1.595	0.092
Total	**171.210**	**Avg 0.867**	**107,579,755.891**	**39.267**	**2.270**

Calculated by the Authors

Source: Bangladesh Economic Review & BPDB, 2024

- *Impact of Energy Savings on Production Cost and Carbon Level*

One kilowatt-hour (kWh) is the energy consumed by a 1,000-watt (1 kW) appliance in one hour. For instance, using ten 100-watt light bulbs for an hour equals one kilowatt-hour.

In Bangladesh, there are currently 4.71 crore active energy consumers. If each consumer manages to save between 1 and 5 units of energy each month, the potential savings could range from Tk 241.83 crore to Tk 1,209.13 crore.

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Conversely, there's potential to lower CO_2 emissions by 0.03 to 0.14 PPM if each consumer saves between 1 and 5 units of energy monthly. This could help maintain approximately 280 PPM of CO_2 in the atmosphere, aligning with global standards. Our collective efforts can make a small impact in curbing global CO_2 emissions, currently at 426.11 PPM (IPCC, 2025). As of January 6, 2025, the average daily CO_2 level reached 426.11 parts per million (ppm), marking a 3.25 ppm rise from the previous year.

The Intergovernmental Panel on Climate Change (IPCC) forecasts that if CO_2 emissions persist at the current pace, levels will likely rise to:

- 2025: 470 ppm
- 2050: 550 ppm
- 2075: 700 ppm
- 2100: 950 ppm

The projected rise in carbon levels to over 550 ppm by 2050 is concerning. Consequently, we must promptly implement initiatives to lower these levels through the introduction of green skills. Below is a table detailing the calculations for energy savings in relation to production costs and carbon levels.

Table 4 Impact of 1 Unit Energy Savings on Production Cost

Items	UoM	Monthly 1 Unit Savings	Monthly 5 Units Savings
No. of Consumers	Crore	4.71	4.71
Per Month Savings	Unit in Crore	4.71	23.55
Monthly Savings in Production Cost	Tk in Crore	20.15	100.76
Yearly Savings in Production Cost	Tk in Crore	241.83	1,209.13

Calculated by the Authors
Source: Bangladesh Economic Review & BPDB, 2024

Table 5 Impact of 1 Unit Energy Savings on Carbon Level

Items	UoM	Monthly 1 Unit Savings	Monthly 5 Units Savings
No. of Consumers	Crore	4.71 Crore	4.71 Crore
Per Month Savings	Unit in Crore	4.71 Crore	23.55 Crore
Monthly Reduce of CO_2 Emission	Ton	40,805.61	204,028.07
Yearly Reduce of CO_2 Emission in Ton	Ton	489,667.37	2,448,336.85
Yearly Reduce of CO_2 Emission in GtC	GtC	0.49	2.45
Reduce of CO_2 Level	ppm	0.03	0.14

Calculated by the Authors
Source: Bangladesh Economic Review & BPDB, 2024

As reported by coal-price.com, on January 17, 2025, the coal price in Bangladesh stands at Tk 16,617 per metric ton, equating to Tk 16.617 per kilogram. In February 2024, natural gas prices for power plants in Bangladesh were Tk 14.75 per cubic meter (Natural Gas World, 2024). Furthermore, globalpetrolprices indicates that in 2025, the diesel price is Tk 104 per liter. The U.S. Energy Information Administration states that by 2025, the required amounts of coal, natural gas, and petroleum liquids will be needed to generate 1 kWh of electricity, as shown in the table below.

Table 6 Required Amount in BDT(Tk) in Producing 1 Unit of Electricity

1 kWh Electricity or 1 Unit		
Coal	**Natural gas**	**Petroleum liquids(Diesel)**
1.14 pounds/kWh	7.42 cubic feet/kWh	0.08 gallons/kWh
0.517 kg/kWh	0.21 cubic meter/kWh	0.302 liter/kWh
Price of 1kg Coal = Tk 16.617	1 cubic meter = Tk 14.75	1 liter = Tk 104
= Tk 8.59/kWh	= Tk 3.10/kWh	= Tk 31.40/kWh

Calculated by the Authors
Source: coal-price.com, Natural Gas World, globalpetrolprices, 2025

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➢ *Illustrate 1: Impact of Energy Savings on Production Cost and Carbon Emission*

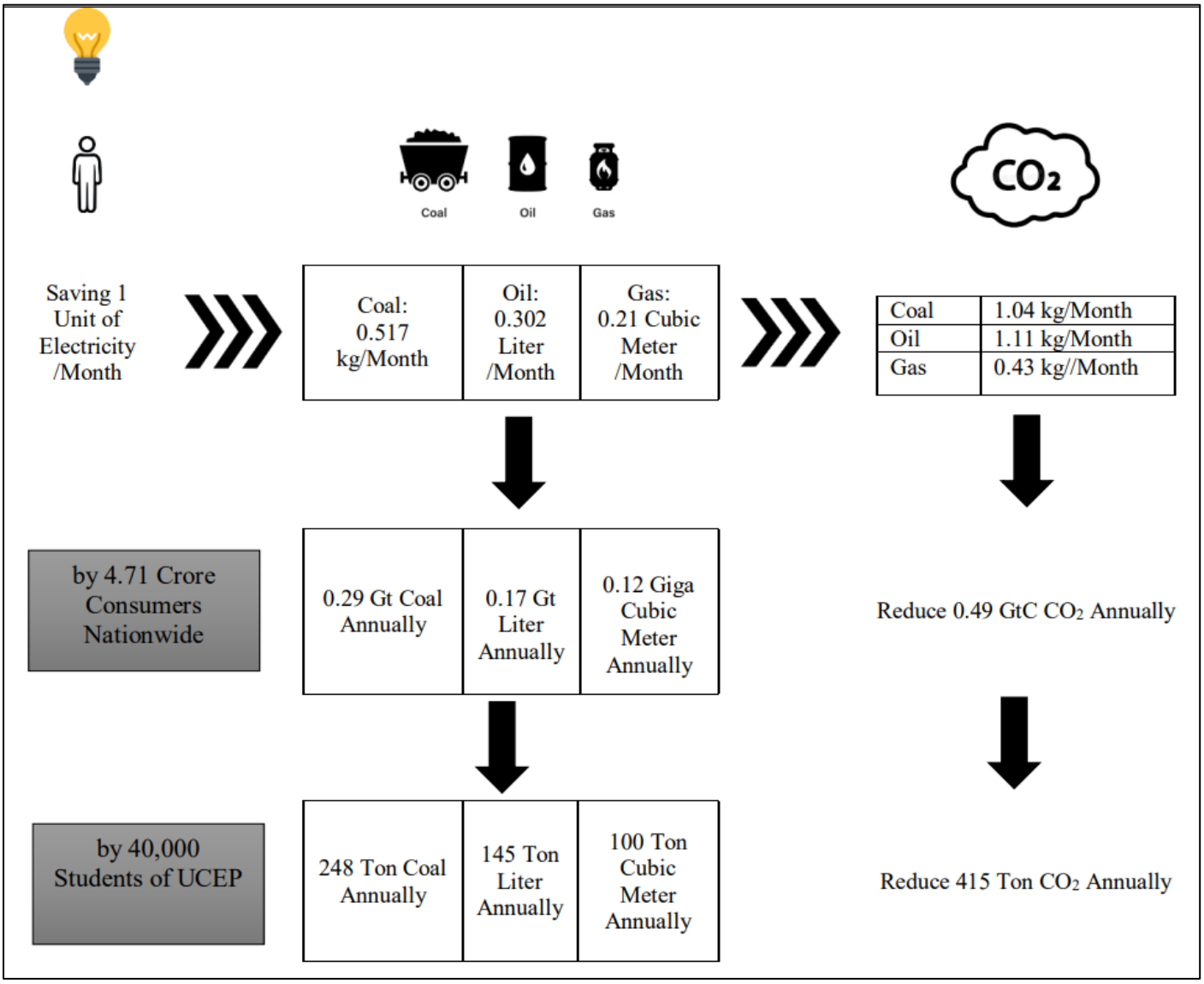

Fig 1 Developed by the Authors

➢ *Ways to Save Energy: A Collective Responsibility*

In Bangladesh, the annual per capita energy consumption is 640 kWh, averaging about 53.33 kWh a month for each person. This reveals a considerable opportunity for individuals to aid in energy conservation. Protecting the environment is essential, and sustainability must be prioritized. Successful energy savings depend on adopting the proper mindset and developing habits that focus on efficiency. By pledging to save between 1 and 5 energy units monthly, individuals can achieve a meaningful effect.

➢ *To better understand energy's significance, it's helpful to know what defines 1 unit of energy. For instance:*

- Using ten 100 W light bulbs for an hour results in the consumption of 1 kWh, or one unit of energy.
- Running a 1-ton air conditioner for one hour also uses 1 kWh, equivalent to one unit of energy.

By fostering "green skills," which are critical for sustainable development, we can turn energy-saving habits into impactful actions. These habits, when adopted by the masses, can significantly reduce carbon emissions. Below are some simple yet effective ways to achieve energy savings of 5 units per month:

- Reduce Air Conditioning Utilization: Adjust the thermostat to a higher temperature, use fans, or close curtains to decrease solar heat influx.
- Minimize Hot Water Usage: Prefer short warm showers during colder seasons and allow clothing to air-dry instead of using a dryer.
- Disconnect Nonessential Appliances: Ensure lights are off and appliances are unplugged when not in use.
- Transition to Energy-Efficient Bulbs: Replace traditional bulbs with LED lighting for improved efficiency.
- Maximize Heating and Cooling Efficiency: Maintain a comfortable indoor environment by using natural

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ventilation, such as opening windows and doors to promote airflow.
- Implement Smart Power Strips: Organize charging stations with smart power strips to automatically limit charging time and reduce standby power consumption.

Minor actions, when performed by millions, can generate a wave of positive change. By embracing these habits, we not only conserve energy but also contribute to a greener and more sustainable Earth. Let's seize this chance to make energy conservation a personal commitment and encourage others to follow suit.

Corporate professionals can achieve significant energy savings through the implementation of the aforementioned strategies.

- Switch off electrical devices such as ACs, lights, and fans independently, without relying on office assistants.
- Activate the ACs, fans, and lights only when necessary. Refrain from turning on these appliances too far in advance of meetings or conferences.
- Ensure to utilize natural daylight whenever possible.

➢ *Practical Implications: The Case of UCEP Bangladesh*

UCEP Bangladesh stands as the largest NGO dedicated to promoting technical education across the country, potentially playing a crucial role in advancing sustainable practices. With about 40,000 active students each year, there is a substantial opportunity to initiate effective energy-saving awareness campaigns. If each student saves just 1 unit of energy each month, the total savings would reach 40,000 units monthly. This effort would translate into a reduction of 34.65 tons of carbon emissions per month, leading to an annual decrease of 415.85 tons. Such accomplishments would significantly aid in the battle against climate change.

UCEP Bangladesh has launched various initiatives aimed at promoting energy conservation, with outcomes monitored monthly and annually. A major initiative is the implementation of Education for Sustainable Development (ESD) and the greening of education and TVET within its training programs. These initiatives not only raise awareness but also motivate students to develop energy-saving habits that can transform into significant "green skills." As a large educational organization, UCEP has a distinctive opportunity to inspire future leaders to adopt sustainable practices. By incorporating green habits into our daily routines, we can advance toward a sustainable development future, ensuring a healthier planet for everyone.

II. CONCLUSION

Minor habits that evolve into green skills can substantially decrease atmospheric carbon level. Atmospheric CO_2 concentration of 426 ppm makes life uncomfortable for the planet's inhabitants. Rising CO_2 levels could lead to serious long-term effects. If we overlook these grave consequences, it might critically affect human civilization. Numerous strategies exist to lower carbon emissions, including implementing green initiatives to minimize our carbon footprint. This article highlights just one approach to decreasing carbon levels. Similar investigations could be conducted in the manufacturing and transportation sectors. In the future, we plan to undertake comprehensive research in Bangladesh to lower atmospheric carbon level through green initiatives, potentially setting a precedent for other nations to follow.

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