

Energy Conservation Awareness Among University Students in Bangladesh: A Case Study of Comilla University

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Abstract—Energy conservation stands as a crucial and impactful approach to mitigate energy consumption and emissions. University students, characterized by their elevated and advanced energy requirements, represent a unique social group whose awareness of energy conservation offers a glimpse into future energy-saving trends. This study, conducted at Comilla University, Bangladesh, surveyed 90 students to gauge their awareness of energy conservation and the factors influencing it. Our findings indicate that university students exhibit a commendable level of awareness regarding energy conservation. However, they encounter specific challenges in translating this awareness into practical energy-saving measures. Drawing from the insights provided by the surveyed students, we present effective strategies to enhance their awareness and motivation in this regard. This research contributes valuable insights into the localized context of energy conservation among university students, a demographic of paramount importance in cultivating an energy-saving ethos within the younger generation, who are poised to become the future intellectuals and leaders of our society.

Index Terms—Energy Conservation, Awareness, University Students, Bangladesh

I. INTRODUCTION

In the contemporary global landscape, the world grapples with pressing challenges concerning energy security and environmental sustainability. Electricity serves as a linchpin for economic progress, with nations worldwide heavily reliant on finite fossil fuel resources for its generation [1]. Regrettably, this dependence engenders severe pollution, contributing to environmental crises like extreme weather events, catastrophic global warming, and ecological disasters resulting from escalating levels of CO_2 and other detrimental emissions [2], [3], [4]. The mounting threats posed by climate change directly imperil both global economic advancement and human well-being. In response to these challenges, it becomes imperative to implement precise policies that harmonize economic development with environmental preservation [5]. Hence, with a focus on both energy and environmental sustainability, energy economists frequently advocate for a shift from non-renewable to renewable energy sources [6]. Yet, achieving

energy sustainability through this transition poses particular challenges for developing nations compared to their first-world counterparts [7]. Recognizing these limitations, experts and policymakers concur that the most substantial reduction in global energy consumption is of paramount importance. Accordingly, energy conservation takes centre stage in energy policies, with a heightened emphasis on mitigating climate change and ensuring energy sustainability [8], [9]. Energy conservation seeks to curtail end-use energy demand by moderating service demand [10], encompassing a reduction in energy consumption through shifts in consumer behaviour and more efficient energy utilization [11]. This practice permits the prudent management of our finite economic resources, postpones the depletion of fossil fuels on which our energy supply predominantly depends, and stands as a viable means of curtailing carbon dioxide emissions [12], [13]. Alias et al. [14] argue that energy conservation is not only essential but also cost-effective in reducing energy consumption. Numerous scholarly works underscore the significance of energy awareness within energy conservation initiatives [15], [16]. Williams [17] asserts that cultivating awareness is one of the most effective means of motivating individuals to conserve energy. Moreover, as Camp [18] suggests, employee awareness plays a pivotal role in reducing utility bills and can yield substantial outcomes. Therefore, raising awareness serves as a fundamental cornerstone of an institution's energy program [19], instrumental in shaping attitudes and motivating users to actively seek ways to conserve energy and modify their behaviours. This ensures that energy users not only implement energy-saving measures but also sustain the use of energy-efficient equipment after installation. As suggested by Wong [20], awareness marks the initial step toward ushering in transformative changes, signifying that the first stride in energy conservation is raising energy awareness. Furthermore, it's crucial to consider individual awareness levels when formulating energy conservation programs, particularly when crafting regulations and policies [21]. Gafoor [22] defines

awareness as the state or capacity to feel, perceive, or be conscious of objects, events, or sensory patterns. To be aware signifies possessing knowledge, recognizing, or understanding that something is occurring or exists [23]. In some cases, energy awareness relates to energy efficiency, while in others, it pertains to an individual's consciousness of their energy usage. Nunayon et al. [24] emphasizes the role of increasing awareness in public universities as a catalyst in promoting efficient electricity management practices. Acknowledging the pivotal role of energy conservation in achieving sustainability, it is imperative to raise awareness among university students, who can, in turn, become influential educators impacting their communities. Consequently, evaluating the awareness levels of these young energy users regarding energy conservation is crucial for advancing global sustainability objectives, particularly in the context of affordable and clean energy. There exists a substantial body of literature examining awareness levels of energy conservation in educational institutions. For instance, [23] investigated awareness and reported energy usage behaviours among higher education students in Nigeria, revealing a significant familiarity with the positive impacts of energy efficiency but a low awareness of the negative consequences of energy usage behaviours. This points to a general lack of awareness among electricity end-users, potentially leading to significant energy waste.

Jamaludin et al. [9] assessed the awareness level of energy conservation among university students in Malaysia, finding a high level of awareness, strong knowledge, positive attitudes, and commendable energy conservation practices. Zhao et al. [25] found a positive correlation between energy-saving behaviours and awareness among university students in Macau, emphasizing the importance of energy-saving education. Khan et al. [26] identified a high level of energy-saving awareness among students at Universiti Teknologi Malaysia (UTM) and their willingness to support efforts to reduce energy wastage. Ilham et al. [27] found that secondary school students had a low level of knowledge but an acceptable attitude and practice toward energy conservation. In contrast, some studies revealed low awareness levels among students regarding the negative impact of energy consumption and a lack of training in energy-saving techniques [28], [29], [30].

Overall, the existing literature predominantly focuses on renewable energy rather than energy conservation, with a dearth of studies specifically targeting university students, especially in higher education institutions in Bangladesh. To the best of our knowledge, no studies have addressed this gap, which is the central aim of the present research.

Consequently, the objective of this study is to explore the awareness levels of university students concerning energy conservation, identify potential factors influencing their awareness, and offer effective recommendations to enhance their understanding of Bangladesh. To the best of our knowledge, this investigation represents a pioneering effort, shedding light on the untapped potential for energy conservation among university students in Bangladesh, addressing a conspicuous void in the existing literature. The significance of energy

conservation in Bangladesh is underscored by the nation's historical reliance on indigenous natural gas reserves for power generation, coupled with government subsidies that have led to the overexploitation of this critical resource. Consequently, Bangladesh is faced with the imperative of seeking alternative energy sources to avert the depletion of its natural gas reserves by 2030 [31]. However, the diversification of energy sources in Bangladesh encounters impediments due to the sluggish growth in the energy infrastructure, raising questions about the feasibility of a swift transition to renewable energy. Hence, energy conservation emerges as a pivotal strategy to secure energy sustainability in the nation.

This study will contribute to the existing body of knowledge by eliciting the perspectives of university students on energy conservation. Furthermore, the findings from this research will advocate for the implementation of comprehensive policies related to energy conservation strategies and the integration of energy conservation concepts into environmental education curricula, particularly within academic programs

II. RESEARCH METHODOLOGY

Using the probability proportionate sampling (PPS) technique, the study's sample comprised 90 students drawn from a population of 250 undergraduate final-year students who are currently enrolled in the Social Science faculties of Comilla University (CoU) in Bangladesh. More specifically, for the sample size determination, Daniel's [32] formula was utilized with a 7% margin of error and a 93% confidence level, representing 36% of the total population. The unavailability of reaching out to those doing internships is the primary reason for the choice of sample size collected in this study. Therefore, to avoid bias in the survey, the participants of the present study were selected from different departments of the Faculty of Social Sciences of the CoU including Economics, Mass Communication and Journalism, Public Administration, Anthropology, and Archaeology. For data collection, this research primarily employed a questionnaire created using Google Forms. The questionnaire consisted of 16 statements related to awareness. A rating scale of 1 to 5 was utilized to gauge students' responses, where a rating of 5 signified "strongly agree," and 1 indicated "strongly disagree" concerning the awareness-related statements. To obtain a more extensive analysis of the statement's development, please see the research conducted by Khan et al. [26]. Additionally, the questionnaire included ten potential motivational factors related to energy conservation awareness to identify which factor had the most significant impact. The data are analysed based on descriptive statistics.

III. RESULTS AND DISCUSSION

A. Level of Awareness on Energy Conservation among Students

In the initial phase of our analysis, we set out to assess the level of awareness among our respondents focusing on their knowledge, attitude, and behavior regarding energy conservation. To gauge this awareness, we asked respondents to provide their responses to a series of 16 Likert-scale questions, which

are presented in Table I. To ensure the reliability of these awareness items, we conducted a Cronbach's alpha reliability test. The results of this test indicated a Cronbach's alpha value of 0.849, which demonstrates that the items effectively measure the same underlying construct.

Subsequently, we computed the mean values and standard deviations for each of these items, and from these, we calculated an overall mean for the 16 items collectively. This collective mean allowed us to interpret the level of awareness for each statement as well as to gauge the overall level of awareness regarding energy conservation. This interpretation was based on the range of means within which the values fell, as presented in Table II.

The collective average mean for all the surveyed items stands at 3.76, signifying a notable level of awareness among students at COU when it comes to energy conservation. This heightened awareness is attributed to several factors. Firstly, respondents exhibited a robust understanding of the importance of energy conservation, with an average score of 4.20, placing them within the high awareness bracket. Additionally, students displayed a broad comprehension of the pivotal role that the younger generation plays in sustainable energy consumption, with mean score of 4.11. They recognized that raising awareness about energy conservation can have a positive impact on mitigating global warming, with mean score of 4.08. Moreover, the value of implementing simple behavioural changes to conserve energy was well-understood by the respondents, contributing to the overall high awareness level, with an average score of 4.07 respectively.

Closely trailing, there was a substantial awareness of the necessity of reducing the carbon footprint and pollution through practices such as waste collection and energy-saving, reflected in an average score of 3.97. Furthermore, there was a commendable awareness of the importance of conserving natural resources through energy conservation, registering an average score of 3.94. An understanding of the risks associated with overconsumption and depletion of energy resources was also evident, with a mean score of 3.92. The lowest recorded mean, at 2.68, indicated an awareness that it is not essential to educate students and the general population about environmental basics because it is the direct responsibility of the government. It's worth noting that the computed standard deviation for the means of the 16 items is 1.027. This suggests that awareness levels among COU students exhibit significant variability across the statements presented in Table I. In essence, the standard deviation underscores that while some students may have a strong grasp of particular aspects of energy conservation, their knowledge might be less robust in other areas.

B. Motivation of Respondents toward Energy Conservation Awareness

The key motivators behind respondents' energy conservation awareness in our study is given in Table III. We considered ten different motivational variables. Notably, 41.1 percent of the respondents identified the motivation of ensuring a sus-

tainable future for the upcoming generations as their primary driver. Subsequently, 20.0 percent emphasized their motivation to conserve energy, while 11.1 percent were driven by the goal of minimizing their environmental footprint. A smaller but significant 6.7 percent expressed motivation rooted in their concern about global warming and their desire to reduce utility bills. Furthermore, 5.6 percent of respondents cited their motivation stemming from the intermittent shortages of electricity, while 3.3 percent pointed to reasons such as concern about CO2 emissions, government incentives, or policies as their sources of motivation. The remaining respondents indicated various other motivating factors that influenced their energy conservation awareness.

IV. RECOMMENDATIONS

The study's findings suggest that university students demonstrate a commendable level of awareness regarding energy conservation. But the acuity of this awareness must be strengthened. This highlights the need to propose a set of recommendations aimed at enhancing and disseminating awareness and understanding about energy conservation among university students. These recommendations are as follows:

- **Diversify Energy Conservation Education:** To fortify the awareness and knowledge of energy conservation among university students, it is imperative to diversify the methods and formats of energy conservation education and promotional initiatives. This approach ensures a broader reach and resonance with students from diverse backgrounds and learning preferences.
- **Promote Energy Conservation Culture:** Organize energy conservation cultural activities through green groups and non-governmental organizations, fostering active participation, hands-on experiences, and interaction among university students. This dynamic engagement will contribute to cultivating a campus culture that places a high value on energy-saving practices.
- **Energize Energy Conservation Seminars and Workshops:** Prioritize energy conservation education and arrange a series of seminars, workshops, campaigns, and public lectures on energy conservation within the campus environment. These events serve as platforms to inspire and empower students, motivating them to adopt positive energy consumption behaviours.
- **Integrate Energy Conservation into Curricula:** Integrate the concept of energy conservation into the academic curriculum across various disciplines. This approach ensures that energy conservation becomes an integral and interdisciplinary component of students' education, emphasizing its relevance in diverse fields of study.
- **Encourage Scholarships and Contests:** To further support energy conservation education, consider implementing energy conservation scholarships or contests designed to incentivize and recognize students who excel in enhancing their energy conservation awareness. Simultaneously, introduce interactive tools, simulations, and games within the institution to visually demonstrate the impact of

TABLE I
AWARENESS ASSESSMENT OF UNIVERSITY STUDENTS

No.	Statements	5	4	3	2	1	Mean	Standard Deviation
Knowledge								
1.	Energy conservation is important	36	42	9	0	3	4.20	.877
2.	Electrical energy, which is generated using precious natural resources	20	46	13	8	3	3.80	.997
3.	By practicing energy conservation, you are conserving precious natural resources.	19	54	12	3	2	3.94	.826
4.	Non-renewable energy sources like petrol and diesel should be conserved for future generation	28	36	12	6	8	3.78	1.216
5.	Because of overconsumption, energy may be depleted over time.	22	47	16	2	3	3.92	.902
6.	Appliances bearing the ENERGY STAR label consume less energy during operation than their non-energy-efficient counterparts.	12	46	19	7	6	3.57	1.039
Attitude								
7.	If I am aware of energy conservation, I can have a positive impact on global warming	32	43	7	6	2	4.08	.951
8.	Youth have the potential to drive energy consumption sustainability.	38	33	12	5	2	4.11	.988
9.	Raising energy conservation awareness reduces demand, prevents shortages, and supports economic stability	32	34	13	6	5	3.91	1.128
10.	There is no need to teach students and people the basics of the environment, as it is the direct duty of the government.	9	22	15	19	25	2.68	1.373
Behavior								
11.	Individuals can reduce their carbon footprint and pollution through waste collection and energy-saving practices.	32	34	15	7	2	3.97	1.022
12.	Your simple habits can make a significant contribution to global energy conservation efforts.	32	41	10	5	2	4.07	.946
13.	Conservation guidelines should be communicated to individuals.	20	42	20	6	2	3.80	.939
14.	Some appliances consume more energy than others based on their power rating.	18	40	21	8	3	3.69	1.002
15.	You look for the ENERGY STAR label on electrical appliances such as air conditioners, lights, fans, televisions, bulbs, and refrigerators.	15	44	16	6	9	3.56	1.153
16.	Your electrical appliances are energy-efficient.	6	32	20	27	5	3.08	1.073

TABLE II
INTERPRETATION FOR LIKERT-SCALE FOR MEAN RANGE

Mean Range	Interpretation for awareness level
4.51-5.00	Very high
3.51-4.50	High
2.51-3.50	Moderate
1.51-2.50	Low
1.00-1.50	Very low

Source: Adapted from khan et al. (2019)

TABLE III
MOTIVATIONS FOR ENERGY CONSERVATION AWARENESS

Motivation Factor	No. of respondents	Percentage
Sustainable future for next generations	37	41.1
Reducing environmental impact	10	11.1
Increasing electricity price	1	1.1
Shortage of electricity	5	5.6
To save energy	18	20.0
Consequences of global warming	6	6.7
CO2 emissions	3	3.3
Government incentives or policies	3	3.3
Cost savings on utility bills	6	6.7
Others	1	1.1
Total	90	100.0

Source: Compiled from primary data

energy conservation, thereby contributing to the development of a conservation-oriented social ethic.

- **Strengthen Long-term Motivation:** It is crucial to strengthen long-term motivation for energy conservation, as some students may easily forget and return to old habits. Educational institutions can play a pivotal role in this perspective by instilling a heightened sense of

responsibility and awareness among students regarding energy conservation. This, in turn, contributes to the creation of a more sustainable energy future, benefiting both the environment and society at large.

- **Design an Energy-Efficient School:** To strengthen energy conservation awareness among youth, the long-term focus should be on improving the learning environment at the school level. For instance, focusing on energy conservation in schools can provide opportunities for youth to become actively involved in sustainability efforts. In addition, teaching energy-saving practices at an early age cultivates lifelong habits of sustainability. Students can bring these practices back to their later stages of life, homes, and communities, resulting in a greater impact on energy conservation efforts.
- **Leveraging virtual reality (VR) technology:** Utilizing virtual reality (VR) technology can be a highly effective method to educate and include youngsters in the principles of energy conservation. Additionally, the use of VR technology, combined with game-based environments, may help to cultivate a strong awareness of social responsibility and encourage the adoption of sustainable behaviors.

Indeed, by enlightening future adults and implementing wide-ranging energy policies and environmental education curricula with community participation, we can improve awareness among students and stimulate an energy conservation culture.

V. CONCLUSION

This study has undertaken a comprehensive examination of the awareness levels and motivating factors associated with

energy conservation. Moreover, it has delved into the practical recommendations provided by the surveyed respondents to enhance energy conservation awareness among university students. The results illuminate a noteworthy level of awareness among COU students when it comes to energy conservation. For future research endeavors in this domain, it is imperative to employ more stringent scientific methodologies, such as behavior surveys, to quantitatively assess energy conservation awareness. Additionally, it is essential to acknowledge that the outcomes of this study were based on questionnaires distributed exclusively to final-year students within the social science faculties of a single public university in Bangladesh. Given this confined scope, there may be limitations in generalizability to the broader student population. Therefore, forthcoming questionnaire surveys should encompass a more diverse and representative sample, offering a more holistic perspective on awareness levels among higher education students. This will enhance the validity and applicability of findings, allowing for a deeper understanding of the intricacies of energy conservation awareness.

REFERENCES

- [1] M. A. Aktar, M. M. Alam, and M. Harun, "Energy efficiency policies in malaysia: A critical evaluation from the sustainable development perspective," *Environmental Science and Pollution Research*, vol. 29, no. 13, pp. 18 365–18 384, 2022.
- [2] Z. Ding, W. Gong, S. Li, and Z. Wu, "System dynamics versus agent-based modeling: A review of complexity simulation in construction waste management," *Sustainability*, vol. 10, no. 7, p. 2484, 2018.
- [3] B. Umar, M. M. Alam, and A. Q. Al-Amin, "Exploring the contribution of energy price to carbon emissions in african countries," *Environmental Science and Pollution Research*, vol. 28, no. 2, pp. 1973–1982, 2021.
- [4] I. S. Zen, A. Q. Al-Amin, M. M. Alam, and B. Doberstein, "Magnitudes of households' carbon footprint in iskandar malaysia: Policy implications for sustainable development," *Journal of Cleaner Production*, vol. 315, p. 128042, 2021.
- [5] M. K. Anser, W. Iqbal, U. S. Ahmad, A. Fatima, and I. S. Chaudhry, "Environmental efficiency and the role of energy innovation in emissions reduction," *Environmental Science and Pollution Research*, vol. 27, pp. 29 451–29 463, 2020.
- [6] M. Murshed, "Electricity conservation opportunities within private university campuses in bangladesh," *Energy & Environment*, vol. 31, no. 2, pp. 256–274, 2020.
- [7] M. M. Islam, K. Sohag, and M. M. Alam, "Mineral import demand and clean energy transitions in the top mineral-importing countries," *Resources Policy*, vol. 78, p. 102893, 2022.
- [8] R. F. Mustapa, N. Y. Dahlan, A. I. M. Yassin, and A. H. M. Nordin, "Quantification of energy savings from an awareness program using narx-ann in an educational building," *Energy and Buildings*, vol. 215, p. 109899, 2020.
- [9] A. A. Jamaludin, N. E. I. Zulkifli, S. Bharin, R. Jani, M. I. Mokhtar, S. Abdul Halim-Lim, W. A. A. Q. I. Wan-Mohtar, and Z. Ilham, "Awareness on energy conservation: a case study of first-year undergraduate students in malaysia," *International Journal of Sustainability in Higher Education*, vol. 24, no. 3, pp. 678–699, 2023.
- [10] R. Banerjee, "Importance of energy conservation," *International Journal of Innovative Research in Advanced Engineering (IJIRAE)*, vol. 2, no. 4, pp. 2349–2163, 2015.
- [11] V. Oikonomou, F. Becchis, L. Steg, and D. Russolillo, "Energy saving and energy efficiency concepts for policy making," *Energy policy*, vol. 37, no. 11, pp. 4787–4796, 2009.
- [12] J. Ren and J. Du, "Evolution of energy conservation policies and tools: The case of japan," *Energy Procedia*, vol. 17, pp. 171–177, 2012.
- [13] P. Linares and X. Labandeira, "Energy efficiency: Economics and policy," *Journal of Economic Surveys*, vol. 24, no. 3, pp. 573–592, 2010.
- [14] R. Alias, Z. Hashim, N. Farzana, and S. Mariam, "Energy conservation behaviour among university students," *Global Journal of Business and Social Science Review*, vol. 1, no. 2, pp. 127–134, 2013.
- [15] V. Vesma, "Power to the people facilities management," *Facilities Management*, vol. 9, no. 5, p. 26, 2002.
- [16] M. El Halimi, N. Biswas, S. Kamaruzzaman, and M. Yusof Hj Othman, "A sustainable energy future for malaysia," *Kamaruzzaman Sopian and Othman (ed) Advances in Malaysia Energy Research*, pp. 31–43, 1999.
- [17] M. Williams, "Initiating, organizing, and managing energy management programs in: Wayne c. turner. energy management handbook lisburn the fairmont press," 1993.
- [18] A. Camp, "Counting every drop," *Facilities Management*, vol. 12, no. 4, pp. 16–17, 2005.
- [19] N. S. Yen and C. W. Wai, "The needs to measure energy awareness in malaysian universities," in *International Universities Social Responsibility Conference and Exhibition 2010*, 2010.
- [20] S. S. Wong, *Energy Conservation and Human Behaviors: The Professional Faculties Building in the University of Calgary*. University of Calgary, 1997.
- [21] A. Z. Syaiful, "The effect of knowledge and attitude of student towards save energy behavior in makassar city," Ph.D. dissertation, Universitas Negeri Makassar, 2016.
- [22] K. A. Gafoor, "Considerations in the measurement of awareness," *National Seminar on Emerging trends in education, Department of Education, University of Calicut*, 2012.
- [23] E. Olanipekun and C. Iyiola, "A study of awareness and electricity use behaviour of on-campus residence students in nigeria," *Int. J. Sci. Basic Appl. Res*, vol. 54, pp. 19–43, 2020.
- [24] S. S. Nunayon, E. A. Olanipekun, and I. O. Famakin, "Determining key drivers of efficient electricity management practices in public universities in southwestern nigeria: An empirical study," *International Journal of Sustainability in Higher Education*, vol. 21, no. 2, pp. 281–314, 2020.
- [25] S. Zhao, Q. Song, and C. Wang, "Characterizing the energy-saving behaviors, attitudes and awareness of university students in macau," *Sustainability*, vol. 11, no. 22, p. 6341, 2019.
- [26] M. J. Khan, A. S. bin A Haris, M. N. S. bin Abdul Rahim, M. A. bin Mat Salim, M. N. bin Harun, M. H. bin Jamaluddin, M. N. bin Lokman, A. R. bin Zailan *et al.*, "Energy saving awareness among utm students," in *International Conference on Student and Disable Student Development 2019 (ICoSD 2019)*. Atlantis Press, 2020, pp. 24–29.
- [27] Z. Ilham, N. E. I. Zulkifli, N. F. Ismail, A. S. Danik, S. Abdul Halim-Lim, W. A. A. Q. I. Wan-Mohtar, and A. A. Jamaludin, "Energy conservation: awareness analysis among secondary school students," *Environmental Education Research*, vol. 28, no. 6, pp. 925–947, 2022.
- [28] K. Richard, "Level of awareness of energy measures of electricity users at universities in kenya," *International Journal of Engineering and Computer Science*, vol. 7, no. 4, pp. 23 875–23 882, 2018.
- [29] E. G. Assenga and F. A. Massawe, "Energy saving behavior among university students: A case study of sokoine university of agriculture, tanzania," *International Journal of Development and Sustainability*, 2018.
- [30] E. A. Al-Ammar, "Measuring and evaluating degree of awareness and behaviors of electricity conservation at king saud university," in *Advances in Energy Planning, Environmental Education and Renewable Energy Sources*, 2010.
- [31] E. Efficiency, "Conservation master plan up to 2030," *Sustainable and Renewable Energy Development Authority (SREDA) and Power Division Ministry of Power, Energy and Mineral Resources Government of the People's Republic of Bangladesh: Dhaka, Bangladesh*, 2015.
- [32] W. W. Daniel, *Biostatistics: a foundation for analysis in the health sciences*. Wiley, 1978.