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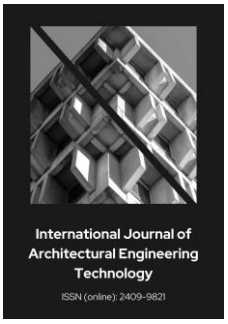

Awareness and Energy Conservation Behaviors: A Case Study of Institutional Buildings in Hail, Saudi Arabia

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ABSTRACT

The growing challenges of carbon emissions and global warming necessitate global efforts to improve energy efficiency and reduce energy consumption. The Kingdom of Saudi Arabia (KSA) faces significant challenges in ensuring a sustainable electricity supply in buildings, including high energy demand driven by extreme climate conditions, heavy reliance on fossil fuels, and inefficiencies in energy distribution and consumption patterns. This study explores the relationship between employee awareness, energy conservation behaviors, and electricity consumption in three architecturally identical institutional buildings in Hail province, which exhibit significant variations in energy use. Using a mixed method of qualitative and quantitative approaches, structured questionnaires were distributed to 27 employees, with 21 responses analyzed through SPSS using a five-point Likert scale. Results reveal that behavior, rather than awareness, is the primary driver of energy consumption, as Building 3 exhibited the highest energy-saving behaviors despite moderate awareness levels. Workplace norms, peer influence, and reinforcement mechanisms significantly impact energy-saving actions, while awareness alone proves insufficient in fostering consistent behavioral engagement.

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1. Introduction

The rapid expansion of urbanization and industrialization has significantly increased global energy consumption, placing immense pressure on natural resources and environmental sustainability [1, 2]. The building sector alone accounts for over 40% of total energy use and 30% of global carbon emissions, making it a critical area for energy conservation efforts [3, 4]. As climate change accelerates, nations worldwide, including those in the Gulf Cooperation Council (GCC), are implementing policies to enhance energy efficiency and reduce carbon footprints [5-8]. Among these nations, Saudi Arabia faces unique energy challenges, with its extreme climate conditions contributing to high electricity demand, particularly for cooling systems[9, 10]. In response to this, the Saudi Energy Efficiency Center (SEEC) and other government-led programs seek to mitigate energy consumption using awareness measures and regulatory systems [11, 12]. Nevertheless, behavioral aspects continue to play a significant role as an obstacle in realizing sustainable energy consumption [13], which demands more exploration of the occupant's understanding of energy use and energy-saving measures [14, 15]. Institutional buildings in Saudi Arabia can still have intermittent energy-use patterns, even when energy efficiency measures are implemented, thus indicating the potent effect of occupant behavior on energy use [16]. Therefore, this study aims to measure employee awareness and conservation behaviors, their association with energy consumption as well as develop strategies to enhance energy efficiency in buildings in the public sector. By filling these gaps, this study intends to contribute empirical findings to the role of human behaviour in energy management, thus underpinning the generation of evidence-based policy recommendations for institutional energy efficiency transformations.

2. Literature Review

2.1. Energy Awareness and Conservation Behaviors

Broadly defined, energy awareness is a key predictor of energy conservation at the individual level, as it includes knowledge of energy consumption and efficiency but also knowledge of the environmental, economic and social costs of too much energy [17]. Research shows that awareness is a prerequisite for behavior changes as it increases motivation toward energy efficiency [18]. Moreover, awareness has been known to encourage behavioral transformation by informing motivation and creating a culture of sustainability in energy utilization [19]. Research consistently identifies awareness as the first step towards behavior change, serving to increase motivation and build models of sustainable energy use [19]. But research also indicates that awareness alone does not mean effective conservation behaviors. Practical energy consumption behavior is largely influenced by habits, social influence, and policy incentives [20]. Further, targeted campaigns, gamification of energy use, and household-level education have been shown to complementing the effect of energy awareness on behavioral change [21].

2.2. Global Studies on Energy Awareness and Behavior

In several studies from different international contexts this link between energy awareness and energy saving behaviors has been examined. A study that assessed household energy awareness and behavioural patterns in India was done across 395 households in Delhi using a Likert-scale survey. The findings further indicated that though a high number of respondents claimed familiarity with energy efficiency labels, many still exhibited wasteful behaviors, such as leaving electrical appliances on when they were not needed, continuing to use fridges to keep unnecessary items cool, and other nonessential activities. Tewathia focused on the urgent need for targeted interventions to facilitate behavioral changes [22]. In a similar area of research, a study done on Institut Teknologi Sepuluh Nopember (ITS) employees, students, and faculty revealed a difference in awareness, with faculty showing the highest awareness, followed by employees and finally students. Structured awareness programs and expert-led interventions were found to significantly encourage a more energy-efficient behavior in the study conducted by [23]. In Pakistan, it looked at awareness factors in electricity conservation including wastage and behaviour change and appliance efficiency. According to a survey of 400 households included in the study, though 78% of people said they endorsed energy-saving initiatives, the absence of immediate financial benefits usually dissuaded proactive conservation efforts. This result highlights the need for combining economic

incentives with awareness programs to promote behavioral changes [24]. By contrast, in Nigeria, a study exploring the association between energy consumption behaviours and awareness of environmental effects among university students Results showed that while awareness levels were medium-high, over 50% of the students wasted energy by leaving lights and electronics on while not using them. It concluded that social norms and behavioral habits had a greater effect on patterns of energy consumption than levels of awareness [25].

2.3. Energy Awareness in the Gulf Region

The Gulf Cooperation Council GCC) countries are characterized by their high levels of energy consumption, due to energy subsidies which exacerbate problems with non-conservation [8]. To explore public awareness of renewable energy and local energy consumption behaviors, a study in Qatar employed a mixed methods approach that included interviews with experts and surveys with 410 consumers. Results showed that, despite their awareness that excess energy consumption had environmental consequences, participants were unlikely to alter their behavior in response, as the expense of energy consumption was relatively low. In the absence of these drivers, raising awareness alone is insufficient [26]. In Cyprus, a similar study examined energy saving behaviors of employees working at large organizations and found that while most employees were aware of the need for saving energy, there were more focused on personal comfort rather than institutional energy efficiency agendas. Moreover, it suggested organizations to adopt automated energy-saving technologies to alleviate the effect of individual behavior on consumption patterns [27]. In Saudi Arabia, the energy awareness and conservation behaviors have been of interest due to increasing electricity demand and governments endeavors to improve energy efficiency. King Saud University is one of the institutions that conducted a study measuring the energy-saving habits of its employees through a survey filled out by 1,676 respondents, which established that the predominant energy wastage was attributed to lighting and air conditioning. The need for awareness campaigns and technological interventions in decreasing consumption was stressed [28]. A separate study by the Saudi Energy Efficiency Center found that both awareness campaigns within the residential and commercial sectors were effective in influencing consumer behavior, although they also called attention to the importance of long-term strategies for sustaining this behavior change.

2.4. Research Gap

Despite the growing body of research on energy awareness [29-31] and conservation behaviors [32-35], existing studies have largely focused on individual households, universities, or large commercial institutions. However, limited research has examined energy conservation behaviors within government-operated buildings that share identical architectural designs but exhibit varying energy consumption patterns. Furthermore, while studies have explored the correlation between awareness and energy-saving behaviors, findings have been inconsistent, with some studies suggesting strong correlations while others report weak or negligible relationships. Additionally, prior research has primarily assessed awareness through self-reported questionnaires, which may not accurately reflect actual energy-saving behaviors. This study addresses this critical research gap by examining three architecturally identical government buildings in Saudi Arabia to assess whether variations in employee awareness and conservation behaviors contribute to differences in electricity consumption. Unlike previous studies that have relied solely on survey data, this research integrates empirical energy consumption data with behavioral assessments. Using survey and data analysis descriptive methods to provide a comprehensive analysis of the factors influencing energy use in institutional settings. The findings of this study will contribute to policy recommendations for energy management in public sector buildings and inform future initiatives aimed at enhancing energy efficiency in the region.

3. Methodology

This study employs a mixed method research design to assess employees' awareness and behaviors regarding energy conservation. A structured questionnaire serves as the primary data collection tool, utilizing a five-point Likert scale to ensure consistency and robust statistical analysis. The deductive research approach guides the investigation, where hypotheses about energy conservation behaviors are tested using empirical data. By adopting a structured, numerical approach, the study ensures objectivity, reliability, and generalizability.

Mixed methods were employed throughout this research using both qualitative and quantitative approaches for data gathering involving relevant literature review, questionnaire survey and three case studies. Case study is defined by Yin (2003) as a research strategy to review a project in-depth in specific instance or scenario, especially appropriate for exploratory research. Thus, three case studies are used to explore the influence of employee awareness and energy conservation behaviors on electricity consumption as qualitative method research. A total of 27 users were carried out using structured form with employees and members of three government buildings. This mixed scale of views and opinions explored how awareness and behaviors were critically affecting the electricity consumption.

The research targets employees in three identical government buildings in Hail, Saudi Arabia, A census sampling method [36] is applied, meaning all 27 employees in these buildings are included in the study, eliminating sampling bias and enhancing data credibility. The research targets the end users of these three government buildings which include top managers, middle, and employees. Each one building has 10 users in which the study focuses on all of them. The questionnaire was distributed to the entire study population across the three buildings, which collectively comprise a total of 27 individuals, averaging approximately 09 employees per building, The questionnaire comprises three sections: demographic information, energy awareness, and energy conservation behaviors. Responses in the latter two sections are measured using a Likert scale as depicted in Table **1**, allowing for standardized data interpretation. Secondary data is also incorporated, sourced from scientific literature, government reports, and the Saudi Center for Energy Efficiency, along with electricity consumption records obtained from the buildings explored in this study.

Table 1: Five-point likert scale with corresponding rating values.

Answer	Awareness	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
	Behavior	Never	Rarely	Sometimes	Often	Always
Likert		1	2	3	4	5
Level of Awareness or Behavior		Very Low	Low	Moderate	High	Very High
		1 – 1.8	1.81 – 2.6	2.61 – 3.4	3.41 – 4.2	4.21 – 5.0

3.1. Case Study Description

The case study focuses on three structurally identical buildings constructed in 2022-2023 in Hail, Saudi Arabia, serving as operational bases for governmental use. These buildings accommodate paramedics and medical staff working in 12-hour shifts under a continuous 24-hour operational system. Each 99-square-meter building includes a living room, bedroom, kitchen, bathroom, corridor with a storage area, and a closed parking space for an ambulance, equipped with sterilization and storage facilities as presented in Fig. (**1**). The primary energy-consuming appliances in each building consist of three split air conditioners, 26 LED lights, one water heater, and three suction fans, alongside other electronic devices such as televisions, gaming consoles, water coolers, and heaters. Given their identical design, function, and operational structure, these buildings provide an ideal controlled environment to analyze variations in energy awareness, behavioral patterns, and electricity consumption.

More importantly, the electricity consumption profiles of the three state buildings in Hail, which share identical architectural designs, functional purposes, and envelope properties compliant with the Saudi Building Code, are a central focus of this study. The buildings feature cement board walls installed on an aluminum structure with a concrete slab underneath. The front facade comprises a double-glazed aluminum entrance, double-glazed aluminum windows, and an automatic aluminum garage door coated with polyester. Notably, significant variations in their energy demands are observed and further analyzed in Fig. (**2**).

3.2. Data Analysis Techniques

To analyze the collected data, descriptive and inferential statistical techniques are applied. Descriptive statistics summarize the dataset through measures such as mean, median, standard deviation, and frequency distributions.

Inferential statistical methods, including t-tests, ANOVA, and regression analysis, examine relationships between awareness, behaviors, and energy consumption patterns. Pearson correlation analysis further quantifies these relationships, identifying potential influences of awareness on conservation behaviors.

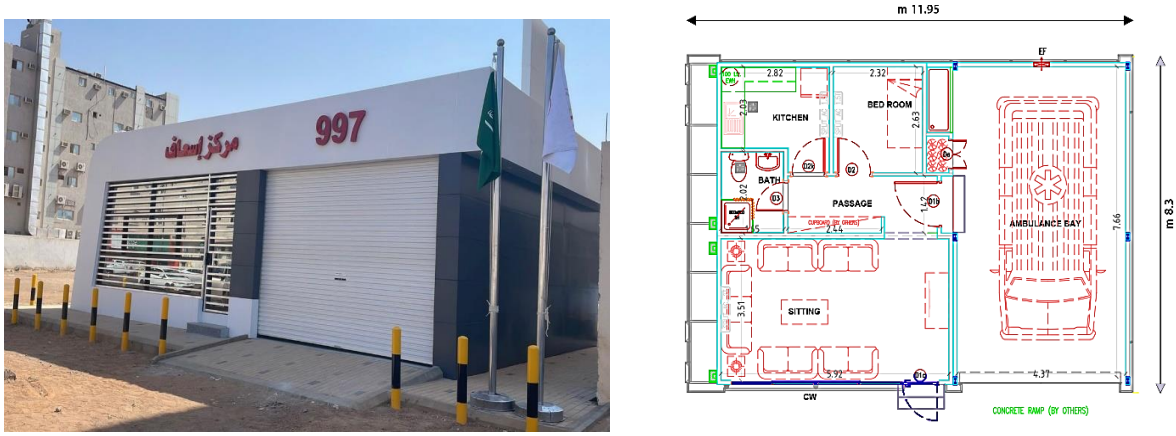

Figure 1: The typical design and plan.

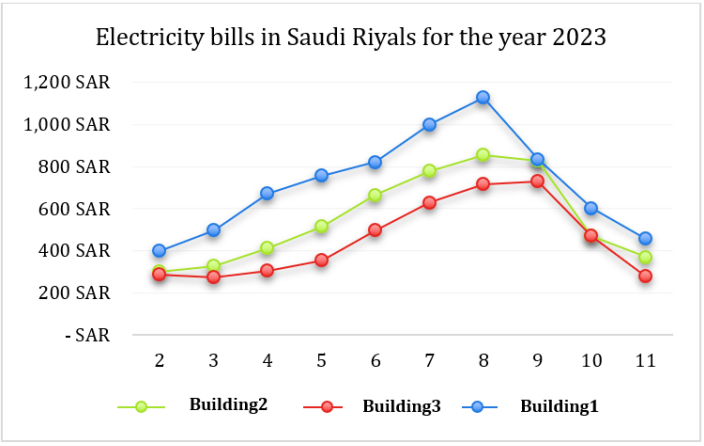

Figure 2: Showing the difference in the prices of electricity bills for the three tested buildings.

The validity and reliability of the study are established through rigorous statistical measures. Pearson correlation coefficients confirm the internal consistency of questionnaire items, demonstrating strong construct validity. Reliability testing using the Spearman-Brown coefficient indicates high internal consistency, with reliability values of 0.706 for awareness and 0.653 for behaviors as depicted in Table **2**. This confirms that the survey instrument effectively measures the intended constructions.

Table 2: Pearson correlation coefficient between the items of each scale and the total scale score.

Awareness			Behaviors		
Item	**Pearson Correlation**	**Sig.**	**Item**	**Pearson Correlation**	**Sig.**
Q1	.765**	0.000	Q7	.589**	0.005
Q2	.707**	0.000	Q8	.497*	0.022
Q3	.593**	0.005	Q9	.446*	0.043
Q4	.454*	0.039	Q10	.614**	0.003
Q5	.642**	0.002	Q11	.826**	0.000
Q6	.541*	0.011			

4. Results and Discussion

4.1. Awareness Levels of Employees

The study examined eleven factors that possibly influence energy consumption either as behavior or as awareness. These factors are categorized as a workplace policy, peer influence, and organizational culture. The findings reveal that almost six factors show significance as shown in Table **3**. The awareness of employees regarding energy consumption and its impact was measured using a five-point Likert scale as displayed in Table **3**. The results indicate a generally high level of awareness, with an overall mean of 4.00. The highest-rated statement was "High electricity consumption is a challenge for Saudi Arabia" (M = 4.19), with 85.7% of participants agreeing or strongly agreeing. This suggests a heightened awareness of the economic and environmental challenges associated with energy consumption. Conversely, the lowest-rated statement was "Energy consumption affects the environment negatively" (M = 3.48), indicating comparatively lower awareness about the direct environmental implications.

Table 3: Frequencies, percentage, means and standard deviations of degree of awareness of employees in three different buildings.

Q	Item	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	M	SD	Rank	Level
1	Energy consumption affects the environment negatively	4	2	2	6	7	3.48	1.53	6	High
		19.0	9.5	9.5	28.6	33.3				
2	High electricity consumption is a challenge for Saudi Arabia		1	2	10	8	4.19	0.81	1	High
			4.8	9.5	47.6	38.1				
3	Global warming and climate change are a challenge to the world		2	3	7	9	4.1	0.99	4	High
			9.5	14.3	33.3	42.9				
4	High energy consumption affects government income		1	3	9	8	4.14	0.85	2	High
			4.8	14.3	42.9	38.1				
5	High power consumption negatively affects the efficiency of devices		1	2	11	7	4.14	0.79	2	High
			4.8	9.5	52.4	33.3				
6	I know that there is an energy efficiency card for electrical appliances, and I believe in its validity		2	2	11	6	4	0.89	5	High
			9.5	9.5	52.4	28.6				
	Awareness	4	9	14	54	45	4	0.62		High
		3.2	7.1	11.1	42.9	35.7				

4.2. Behavioral Patterns of Employees

Employee behaviors related to energy conservation were also evaluated in displayed in Table **4**. The highest-rated behavior was "I take advantage of sunlight during the day and turn off some lights" (M = 3.81), with 66.7% of employees reporting they often or always follow this practice. The lowest-rated behavior was "I set the air conditioning temperature in the summer to 24 degrees or more" (M = 2.38), These behaviors indicate a lack of alignment with recommended energy conservation practices, suggesting resistance or lack of awareness of the impact that proper temperature control can have on energy usage. As HVAC systems are significant energy consumers, improving adherence to these practices could result in substantial energy savings. The overall mean was (M = 3.02) indicates moderate behavior of scale, where 38.1% of the sample reported that they often or always do all the above.

Table 4: Frequencies, percentage, means and standard deviations of degree of behaviors of employees in three different buildings.

Q	Item	Never	Rarely	Sometimes	Often	Always	M	SD	Rank	Level
7	I turn off the lights as soon as I leave the room	1		8	9	3	3.62	0.921	2	High
		4.8		38.1	42.9	14.3				
8	I take advantage of the sunlight during the day and turn off some lights	1	1	5	8	6	3.81	1.078	1	High
		4.8	4.8	23.8	38.1	28.6				
9	If you leave the center, we turn off the air conditioner, or we recommend turning off the air conditioner	2	6	7	5	1	2.86	1.062	3	Moderate
		9.5	28.6	33.3	23.8	4.8				
10	I set the air conditioning temperature in the summer to 24 degrees or more	5	7	6	2	1	2.38	1.117	5	Low
		23.8	33.3	28.6	9.5	4.8				
11	I set the heater to 60 degrees Celsius	7	4	5	4	1	2.43	1.287	4	Low
		33.3	19.0	23.8	19.0	4.8				
	Behaviors	16	18	31	28	12	3.02	0.660		Moderate
		15.2	17.1	29.5	26.7	11.4				

4.3. Relationship Between Job Title and Awareness/Behavior

Independent Samples T-Test was used to assess the impact of job title (paramedic vs. medic) on awareness and behavior. The results indicated no significant differences in awareness ($t = 1.171$, $p = 0.258$) or behavior ($t = -2.243$, $p = 0.811$) based on the job title. This suggests that job designation does not significantly influence energy awareness or conservation behaviors.

4.4. Influence of Shift Colleagues on Awareness and Behavior

An analysis of responses within the same work shifts revealed strong similarities in awareness levels among colleagues. The variation in awareness among employees in the same shift was minimal (0-20%). However, behavioral differences were slightly greater, possibly due to shared responsibilities where one employee might take charge of turning off appliances while others do not. This finding supports the theory that social influence plays a significant role in shaping employee awareness and behavior.

4.5. Awareness and Behavior Differences Across Buildings

Awareness level Scores across the Buildings Awareness was variable across all buildings, with Building 2 achieving the highest overall awareness level scores. People in this building had better awareness of critical concepts related to energy with higher scores (Q1, Q2, Q3) regarding environmental impact, economic implication (Q4, Q5), and trust in energy efficiency measures (Q6). The obvious follow-up would be to see if that is an outlier in this case or if there were some effective method in keeping open communication and training which aligns with studies suggesting proper structure in awareness builds effective ability to retain knowledge and intent to behave [37]. Energy-awareness campaigns along with training initiatives had significant impact on energy-saving behavior through strengthening knowledge when combined with engagement-based learning [38]. On the other hand, building 1 had the lowest awareness scores in several items, which were related to the wider environmental and economic impact of energy use. This situation indicates a possible lack of information spread, which can depend on poor educational programmes or less interested population. Notably, studies suggest that implementing ongoing, interactive learning-based systems such as gamification and real-time feedback can drastically enhance awareness, accountability, and energy-conscious behavior [39]. Moreover, communication tools aimed at specific audiences as well as participatory learning tools can substantially improve workplace awareness campaigns [40].

Behavioral scores follow a different pattern than awareness levels. Building 2 had the strongest awareness, but its behavior scores did not exceed those of other buildings appreciably. Building 3 had lower levels of awareness compared to others but had the highest behavioral engagement in terms of energy-saving activities. Building 3 staff demonstrated higher commitment to saving energy by turning off lights (Q7), using natural daylight (Q8), and setting the air conditioning to the right temperature (Q10). The results are in accordance with behavioral theories proposing that actual behavior is driven by awareness, and that contextual factors like workplace policies and social norms, also play a vital role [41]. Research indicates that workplace norms promote energy-saving behaviors among employees and that energy-saving actions are ingrained in organizational culture [42]. Building 1 showed the lowest behavioral scores, reflecting its awareness number trends. Cold scores were analysed for the action of adjusting air conditioning (Q10) and heater settings (Q11) which indicate the knowledge–practice gap. This corroborates previous studies that noted the necessity of adding reinforcement mechanisms, like incentives, social norm feedback, and policies requiring actions in workplaces, to change behavior with the knowledge. Furthermore, research indicates that augmentation of behavioral interventions, such as delivering real-time feedback and creating a sense of shared obligation, significantly boost energy-saving commitment in offices [43].

All three of them were built using the same materials, going through the same orientation and construction site climatic conditions, the energy consumption of these buildings varied significantly which could be explained mainly by awareness and behavioral aspects as depicted in Table **5** and Fig. (**3**). Despite knowledge, however, it is evident that not all buildings translate their high awareness into actual energy savings (e.g., Building 2), showing that knowledge is not the sole incentive for taking energy-saving behavioral actions. That said, this aligns with findings from studies in the social sciences over the last few years which have indicated that awareness is a necessary but insufficient condition for energy-efficient behavior [44]. Thus, behavioral intention and reinforcement strategies are pivotal in converting awareness into practices of energy saving [39].

Table 5: Descriptive statistics of scores of awareness and behaviors at the item level according to different buildings.

	Item	Building1		Building2		Building3		Higher Score	Lowest Score
		Mean	Std. Deviation	Mean	Std. Deviation	Mean	Std. Deviation		
Awareness	Q1	3.38	1.302	4.67	0.516	2.57	1.813	B2	B3
	Q2	3.88	0.835	4.67	0.516	4.14	0.900	B2	B1
	Q3	3.38	1.188	4.50	0.548	4.57	0.535	B3	B1
	Q4	3.88	1.126	4.50	0.548	4.14	0.690	B2	B1
	Q5	3.88	0.354	4.67	0.516	4.00	1.155	B2	B1
	Q6	4.25	0.463	4.00	1.095	3.71	1.113	B1	B3
Behaviors	Q7	3.63	0.744	3.67	0.816	3.57	1.272	B2	B3
	Q8	3.75	0.886	3.67	1.751	4.00	0.577	B3	B2
	Q9	2.63	1.188	2.33	1.033	3.57	0.535	B3	B2
	Q10	2.00	0.756	2.00	1.095	3.14	1.215	B3	B2
	Q11	1.75	1.165	2.83	1.169	2.86	1.345	B3	B3
	Awareness	3.77	0.445	4.50	0.459	3.86	0.729	B2	B1
	Behaviors	2.84	0.604	2.90	0.576	3.43	0.697	B3	B1

Building 3 actually shows the highest behavioral engagement, yet, medium scores regarding awareness. This indicates that there may be other factors in play in motivating employees in this building to engage in energy saving behaviors, such as social norms, workplace policies, or peer pressure. Research in social studies indicates that people will exhibit climate-conscious behaviors based on having a culture of conservation to which they belong [45]. Moreover, methods of behaviour-change that incorporate frequent behaviour-reinforcement in the

target workplace have been demonstrated more effective than knowledge-only methods [46]. This suggests the need for developing an organizational culture that goes beyond awareness-raising to promote sustainable energy practices.

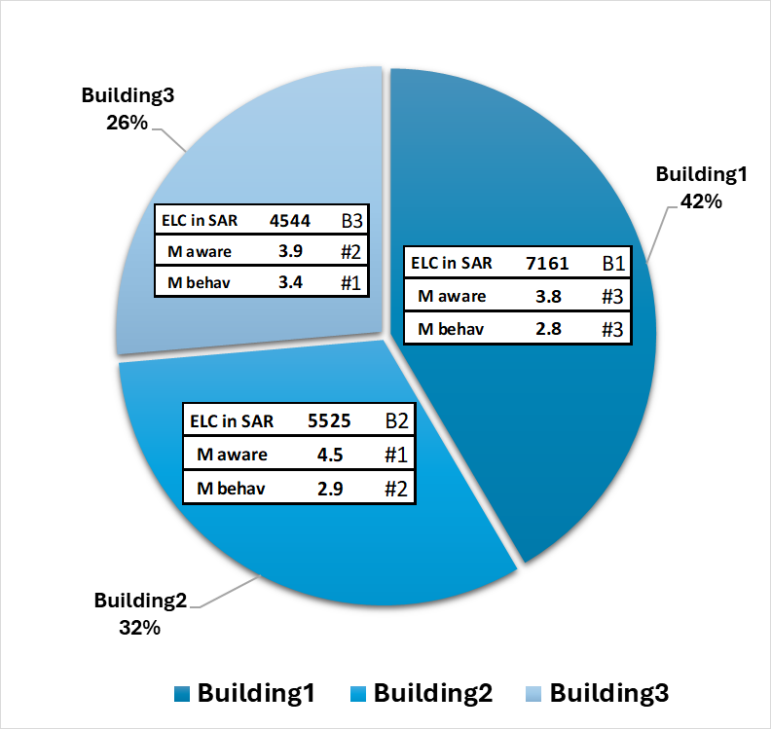

Figure 3: Electricity consumption and the percentage of consumption out of the total of the three buildings, and each building is evaluated according to awareness and energy conservation behaviors.

Building 1 has low levels of both awareness and behavioral engagement and demonstrates the lowest level of energy efficient practices, providing an affirmation of the deep connection between knowledge, attitudes, and action. Most of the time, people work in a building like this and have no idea to what extent their actions impact energy use. Past studies have revealed that the organizations that treat awareness campaigns as a singular and standalone imperatives tend to succumb to chronic energy inefficiency [38]. Reinforcement strategies based on behavior (e.g, gamification, real-time energy tracking, and workplace-related rewards [47], should also be considered when designing interventions to encourage energy efficient behaviors in buildings.

5. Conclusion and Recommendations

This study provides a critical evaluation of the relationship between awareness and behavior in energy conservation among employees in government buildings. Eleven factors related to awareness and behavior on energy conservation were defined from the literature. These eleven factors are grouped into three categories which are workplace policies, peer influence, and organizational culture. These factors were examined in three constitutional building through a case study in Hail, Saudi Arabia. Workplace policies, peer influence, and organizational culture have been found to be significant influences of employee energy-saving behavior. The findings also highlight a far-reaching disconnect between knowledge levels and energy-efficient actions, as awareness alone does not guarantee action. Even though Building 2 had the highest awareness scores, it was not the most energy-efficient building when behaviors were examined. Whereas, Building 3 displayed the highest engagement in energy-saving practices, despite moderate awareness levels, highlighting the impact of behavioral reinforcement mechanisms, workplace norms, and social influence. The analysis shows that significant reductions in energy use come more from behavioral interventions than they do awareness campaigns. Working in Building 3 the peer reinforcement, workplace policies, and frequent practices led to a higher level of energy-efficient behaviours. The lowest concentration of building awareness and behavioral engagement came from Building 1,

the same building that had the highest inefficiency of energy practices, which reiterates the understanding this gap can be ameliorated by a structured intervention.

Additionally, there was no significant difference in awareness or behavior based on job designation, while shift colleagues showed similarities in awareness, as social dynamics appeared to have a stronger influence. This process of motivational cycling in energy-efficient behavior is critical as it makes evident that awareness campaigns alone are, to a larger extent, redundant and also reinforces the use of behavioral conditioning mechanisms, such as real-time energy monitoring, feedback and triggering methods, and other incentives. The main conclusions of this study are:

- Awareness is critical, but behavior does more to save energy. However, despite the high awareness about the people in the Building 2, it does not have the highest energy-saving behaviors, on the other hand, moderate awareness in the Building 3 demonstrated the most-efficient use energy behaviors.
- Workplace norms and reinforcement mechanisms matter. Workplace policies, peer influence, and organizational culture have been found to be significant influencers of employee energy-saving behavior [33].
- Awareness alone is insufficient to induce behavioral change. Without active reinforcement mechanisms, knowledge about energy efficiency does not necessarily lead to meaningful action.
- Social influence plays a significant role in shaping behavior. Employees working within the same shifts exhibited similar awareness levels, but behavioral differences suggest that shared responsibilities impact energy conservation efforts.

These findings highlight the need for a paradigm shift in energy conservation strategies, moving beyond awareness-raising efforts to behavior-focused interventions that drive tangible reductions in energy consumption.

Conflict of Interest

The authors declare that there are no conflicts of interest regarding the publication of this paper.

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