

Impact of Environmental Stress and Energy use Behaviours on Thermal Conflict in Multi-Tenanted Student Housing in Ghana

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Abstract

Thermal comfort disputes in shared university student housing are a growing concern, as they combine social tensions with environmental challenges. This study aims to assess the drivers and effects of thermal conflicts on energy use. Using Environmental Stress Theory as a framework, the study surveyed 245 undergraduate student housing unit and 723 student participants through structured questionnaires in Upper West Region, Ghana. The study employed binary logistic regression and multiple linear regression to analyse the effects of thermal disputes on energy behaviours. The findings show that for every 1°C difference in temperature preference between roommates, the likelihood of conflict nearly doubles (93% increase). The odds also rise by 57% with each additional roommate. However, strong communication skills were found to ease tensions, reducing the chances of conflict by 42%. Notably, cultural diversity and mixed-gender accommodations added to the complexity, further increasing the likelihood of disagreements. Thermal conflicts had a measurable impact on energy usage. Each increase in conflict intensity was associated with an additional 0.84 kWh of daily energy consumption, a 1.2°C deviation from ideal thermostat settings, and 7.5 extra minutes spent adjusting the temperature. This calls for holistic approaches that address both interpersonal dynamics and energy efficiency to improve overall thermal satisfaction

Keywords: Energy use behaviour, environmental stress, thermal conflict, student housing, energy efficiency

1. Introduction

Rapid urbanisation and increase in student enrolment have challenged the quality of indoor environmental conditions in student housing across universities in developing countries. In Ghana, university housing is faced with challenges of inconsistent energy supply, indoor environmental quality, and high occupancy. This makes it difficult to control and maintain comfortable indoor temperatures in many student housings across campuses. Recently, Agorsor et al. (2025) high indoor temperatures (31.7°C), low air velocity, high relative humidity, and significant impact on thermal stress among students living in university housing in Ghana. Away from that, their study observed that disparities in gender show that thermal comfort in shared dormitories were unevenly experience. This has the potential to create thermal tension among students.

In Africa, these challenges are not peculiar to Ghana, but represent a broader pattern across African universities. This is because indoor environmental quality (IEQ) in student housing continue to be a challenge. For instance, Ndou (2025) reported that indoor environmental quality and socio-environmental factors significantly affects students' comfort,

productivity, and well-being in South Africa Universities. Similarly, Oyeyemi et al. (2025) found that an average hostel room temperature in university student housing in Southwestern Nigeria was 32.6°C which exceeds the internationally recommended benchmark. Asaju et al. (2022) reported thermal comfort, overcrowding, and inadequate ventilation as the most critical determinant on indoor environmental quality that affects student living in polytechnics students housing in Nigeria. These studies show that thermal discomfort in student housing in Africa, particularly West Africa is widespread problem.

In the developed world, studies have discussed how building characteristics and human behaviours interact to influence thermal comfort in shared rooms. According to Deng et al. (2021), in Chinese Universities, floor level and gender significantly influenced cooling demand in dormitories. Psychologically, Rony and Alamgir (2023) established that heat mediates as a behavioural stressor that affect cognitive stress and increasing aggression among students. Despite the advancement in indoor environmental quality, most of these existing studies focus primarily on thermal comfort, student's satisfaction, and energy consumption, with limited focus on thermal tensions that arises in shared student

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housing. This represents both an empirical and a knowledge gap in the literature. Empirically, little evidence exists on the occurrence and drivers of thermal conflict within shared student housing environments, particularly in African universities. From a knowledge perspective, the relationship between thermal conflict and energy-use behaviour remains poorly understood despite its potential implications for student well-being, interpersonal relations, and energy efficiency.

Empirically, studies in Ghana have contributed to indoor environmental quality. For example, Attakora-Amaniampong et al. (2025) demonstrated that student's behavioural pattern, occupancy density, and university policies affects electricity use among student living in university housing in Northern Ghana. Their study did not address the contribution of conflicting thermal preferences among roommates may influence social relations and energy use. Thermal conflict is explained as the disagreements and tensions that arise when students with different thermal preferences share limited environmental controls (Agorsor et al., 2025). Based on this gap, the aim of the study is to assess the impact of thermal conflict on energy use behaviour in shared student housing in Ghana. The objectives include: to assess the drivers of thermal conflicts, examine the predictors of energy consumption, and assess the predictors of thermal setpoint deviations and thermostat adjustment times.

This study is relevant for several reasons. First, understanding the nature of thermal conflict can influence facilities managers decisions on controlling the indoor environmental stressors that affect social relations and student well-being in university housing. Secondly, understanding the thermostat setpoint and thermal setpoint deviations can inform architects design and student housing management strategies that promote equitable thermal conditions and reduce disputes among students. Lastly, based on the challenges of intermittent electricity supply, assessing the social dynamics of thermal control will enable student housing managers to balance students' thermal comfort with sustainable energy use

2. Literature Review

2.1 Determinants and effects of thermal conflict on energy consumption

Studies on thermal conflict in shared living spaces shows that disagreements over temperature are influenced by a complex interaction of individual tolerance, social behaviour, psychological, and environmental conditions.

The first cohort of researchers emphasize the role of physical infrastructure such as floor level, differences in room orientation, and building layout in shapes students energy use. For example, Deng et al. (2021)

classified floor level and gender as non-behavioural features that significantly influence cooling demand among students in Chinese dormitories. Also, Wang et al. (2025) established that the discrepancies in room size preferences and spatial conditions in shared university building affect perceived thermal comfort. These studies suggest that physical and spatial characteristics of student housing play an important role in shaping thermal comfort and energy-use patterns. More importantly, they indicate that thermal conflict may emerge when occupants exposed to different thermal conditions are required to share common cooling systems and thermostat controls. Thus, building characteristics not only influence comfort outcomes but may also create conditions that increase the likelihood of interpersonal disagreements regarding thermal regulation.

Other scholars highlighted that thermal tolerance and behavioural responses shapes discomfort and raises tensions in student housing. According to Jian et al. (2022), found thermal tolerance varies based on demographic groups such as age and gender. Their study further found that long occupants tolerate heat before activating air conditioning and adjust to cooling systems. These created tension in shared buildings where thermal control and cooling decisions were collective. Rony and Alamgir (2023) also observed that the high heat exposure increases stress and aggression intensify interpersonal tension among students living in university housing. Conceptually, Budiawan et al. (2024) situated thermal comfort as a "conflict multiplier" that highlights that the little disagreements between roommates may escalate tensions they experience thermal stress. Suleymanov (2024) supports earlier studies and emphasised that the intersection of cultural expectations, social dynamics, and physical challenges influences thermal conflict. While these studies agree that behavioural adaptation and social interactions influence thermal comfort, they differ in their explanations of how thermal stress translates into interpersonal conflict. This suggests that thermal conflict is a multidimensional phenomenon that cannot be explained solely by environmental conditions.

Additionally, other group of studies identified thermostat behaviour as a social determinate of thermal conflict. For instance, Agorsor et al. (2026) assessed thermal inequalities based on gender among student housing in Ghana. Their study found no significant gender differences in thermostat preferences students living in single rooms compared to double occupants. Similarly, Aragon et al. (2022) emphasised that occupants often misunderstand the function of thermostatic radiator valves. This affect temperature adjustments in the rooms. According to their study, many thermostat disputes arose from technological misunderstanding as compared to differences in comfort needs. Malet-Damour et al. (2025) is of the view that personality traits influence thermostat

negotiations and discomfort. However, their study found a hidden dissatisfaction and disputes among shared university dormitories. A significant observation from these studies is the lack of consensus regarding the role of demographic characteristics such as gender in shaping thermal preferences. While some studies report significant gender-related differences in thermal behaviour, others find limited effects. This suggests that contextual factors may moderate these relationships.

The impact of unresolved thermal conflict goes beyond personal relationships to more energy consumption and environmental impact. According to Arowoia et al. (2024) and Zhuang and Wu (2019) domestic thermal disputes through competing thermostat often lead to inefficient behaviours such excessive energy use. In Li et al. (2022) view, communication techniques and issues of interpersonal traits significantly affect household energy use. Graff and Nock (2026) shared a different view. According to their study, temperatures rise and energy consumption increases when thermostat disagreements remain unresolved.

Studies related to indoor environmental quality highlighted high implications on cooling behaviours when thermal conflicts are unresolved among occupants. Environmental studies further highlight the wider implications of cooling behaviour. For instance, Wei et al. (2024) established that rising air-conditioning use worsens outdoor heat pressure affect indoor comfort. Efforts on resolving thermal comfort have historically focused on energy efficiency Broday et al. (2023) also observe that most thermal comfort studies historically neglect shared spaced and focused on energy efficiency.

3. Research Methodology

3.1 Research Design

This study adopted quantitative research design to assess the determinants and effects of thermal comfort on energy consumption in students housing in Ghana. Purposive sampling was used to select 245 off-campus university student housing in Upper West Region. Purposive sampling was considered appropriate because the study sought to investigate thermal conflict in a setting where thermal stress and shared occupancy conditions are particularly pronounced. The Upper West Region experiences relatively high ambient temperatures compared to many parts of Ghana, making it a suitable context for examining thermal comfort challenges and energy-use behaviours. Similarly, the University of Business and Integrated Development Studies (UBIDS) was selected because of its large concentration of off-campus student housing, diverse accommodation arrangements, and high student occupancy levels, which provide an appropriate environment for studying thermal conflict among roommates. Based on this, 723 out of 912 students

participated in the survey. Data were collected through a structured questionnaire and measured with 5-point-Likert-scale items. The instruments were designed in three parts. First, the study collected demographic profile of respondents. Second, the instruments captured indoor environmental conditions such as room occupancy, energy consumption, and access to cooling systems. Third, includes behavioural responses such as mode of thermostat adjustments, time spent in rooms, nature of conflict, and negotiation strategies. Multiple linear regression was adopted to determine the effects of thermal conflict related factors on energy consumption. Furthermore, binary logistic regression was used to assess the probability of thermal conflict occurrence among students living in shared off-campus student housing. Variables, such as room size, gender composition, access to air conditioning, ventilation access, and thermostat adjustment behaviour, were measured at the shared-room level because they describe conditions experienced collectively by roommates. The analysis therefore used individual student responses while incorporating room-level characteristics relevant to thermal conflict

3.2 Variable Definition and Measurement

The operationalisation of variables was guided by the study objectives and existing literature on thermal comfort, thermal conflict, and energy-use behaviour. Objective One, which seeks to assess the drivers of thermal conflict, informed the selection of variables such as room size, thermal preference gap, communication style, air-conditioning access, gender composition, and time spent in rooms. These variables were incorporated into the binary logistic regression model to predict the likelihood of thermal conflict occurrence.

Objective Two, which examines the predictors of energy consumption, informed the selection of conflict intensity, cooling setpoint, thermal tolerance range, setpoint adjustment frequency, ventilation access, and negotiation skills. These variables were incorporated into the multiple linear regression models to assess their effects on energy consumption, thermostat adjustment behaviour, and setpoint deviations.

In this study, thermal conflict was defined as the primary dependent variable in the logistic regression model. This explains the incidence of disagreements between roommates regarding temperature settings or cooling device usage. These were measured using a binary scale of 1=presence of conflict, and 0=no conflicts (Agorsor et al., 2025). On the other hand, several independent variables were defined. For instance, room size was defined by Wang et al. (2025) as critical determinant of thermal conflict. This was represented as the occupancy density within each student housing and estimated as the number of roommates sharing a room (1-10).

Also, thermal preference gap was measured as the difference between the indoor temperatures reported by roommates and the threshold setpoint recommended by ASHRE. These were measured in degree Celsius as highlighted in Budiawan et al. (2024) and Suleymanov (2024). Temperature set-point were gauged between 20°C and 27°C, and 27°C and above

Additionally, communication index was also used as an independent variable (Li et al., 2022). This explains the quality of interpersonal interaction among roommates on indoor environmental quality decisions. This was measured using a five-item Likert-scale (1=strongly disagree, 5=strongly agree).

Access to air conditioning was defined as the access to and ability of students to control indoor temperature through mechanical cooling (Jian et al., 2022). This was measured using binary outcome such as 1 = Availability of AC, and 0 = no AC.

Gender composition was defined as a dummy factor that distinguishes mixed-gender rooms from single-gender rooms in the off-campus student housing. This was determined based on the gender arrangement within the student housing.

Moreover, time spent in the room was defined as the average number of hours per day students spend inside their rooms (Deng et al., 2021). This helps to determine their level and exposure to indoor thermal conditions

Other variables related to energy use outcomes were measured. For instance, conflict intensity was defined as the severity of disagreements regarding temperature. This was measured with a five-point self-rated scale (1=very low intensity, and 5=very high intensity). The cooling setpoint was measured in degrees Celsius and defined as the average thermostat temperature selected by the students. Also, thermal tolerance range was measured as the difference between the minimum and maximum temperatures that students consider acceptable in their rooms. This includes (16°C minimum, and 23°C maximum).

Drivers of energy use were defined as behavioural energy indicators. First, the frequency of thermostat setpoint changes was measured as the average number of setpoint adjustments made per day (1-5, 6-10, and above 10 times) (Aragon et al., 2022). Ventilation access was also defined as the availability of passive ventilation and operable windows in the rooms (Asaju et al., 2022). These were defined as binary outcome (1 = yes, 0 = no). Finally, student negotiation skills were other variables derived from the field. These were expressed as student's ability to manage indoor environmental disagreements (1=very low compromise, and 5=compromise).

On the other hand, the multiple regression was determined using both dependent and independent variables from the literature. In this model, three dependent variables were assessed. These include, energy consumption, setpoint deviations, and thermostat adjustment time. Energy consumption was measured as a dependent variable and defined as daily electricity use in kilowatt-hours (kWh/day). Energy consumption was measured using electricity meter records and monthly electricity consumption data obtained from student housing units. Monthly electricity consumption values were converted into average daily energy consumption (kWh/day) by dividing total monthly electricity use by the number of days in the billing period.

3.3 Model specification

The study adopted two regression models: binary logistic regression and multiple linear regression. Binary logistic regression was used to predict the likelihood of thermal conflict occurrence, while multiple linear regression was used to examine the effects of thermal conflict-related variables on energy consumption, setpoint deviation, and thermostat adjustment time.. The multiple linear regression was defined

$$Y_i = \alpha_0 + \alpha_1(ConflictIntensity) + \alpha_2(CoolingSetpoint) + \alpha_3(ToleranceRange) + \alpha_4(SetpointChangesPerDay) + \alpha_5(TimeInRoom) + \epsilon \dots \dots \dots eq(1)$$

Where Y_i indicates the energy outcomes. These includes energy use, thermostat adjustments and energy use, and represents the dependent variables. On the other hand $\alpha_1(ConflictIntensity)$ represents conflict intensity, $\alpha_2(CoolingSetpoint)$ indicates the cooling setpoint, $\alpha_3(ToleranceRange)$ shows the tolerance level in the room, $\alpha_4(SetpointChangesPerDay)$ represents the cooling setpoint changes per day in a room. $\alpha_5(TimeInRoom)$ represents the time spent in the room by occupants and ϵ as the error term. To determine the probability of thermal of the occurrence of thermal conflicts among students living in off-campus student housing, the logistic regression was defined as:

$$\text{Log} \frac{p_i}{(1 - p_i)} = \beta_0 + \beta_1(RoomSize) + \beta_2(PrefTempGap) + \beta_3(CommunicationIndex) + \beta_4(AC) + \beta_5(GenderComp) + \beta_6(TimeInRoom) + \epsilon \dots \dots \dots eq(1)$$

Where $\log P_i$ represents the level of thermal conflict in student housing. Likewise, $\beta_1(RoomSize)$ and $\beta_2(PrefTempGap)$ were defined as room size and temperature preference gaps among roommates. Also, $\beta_3(CommunicationIndex)$ and $\beta_4(AC)$ represents

the level of communication and Access to Airconditioning.

$\beta_5(\text{GenderComp})$ and $\beta_6(\text{TimeInRoom})$ represents the gender composition of students in the rooms and time spent in rooms.

3.3 Model Diagnosis and Testing

To ensure statistical robustness, STATA was used to conduct several tests. In the logistics regression model, goodness-of-fit and pseudo R^2 statistics were conducted to assess the fit. To avoid multicollinearity among variables, Variance Inflation Factors (VIF) was examined. Further test was conducted for the multiple linear regression. Breusch–Pagan test was conducted to assess homoscedasticity. The Durbin–Watson statistic was assessed to control autocorrelation in residuals. Finally, the Cook's distance and leverage statistics were assessed to ensure that model estimates are reliable.

4. Findings

Table 1 presents the predictors of thermal comfort among off-campus student housing in Ghana. The analysis showed that student housing room size was positive and associated with thermal conflict ($\beta=0.45$, $(\text{Exp}(\beta))=1.57$). This implies that each additional roommate increases the odds of thermal conflict occurrence by approximately 57% ($\text{OR} = 1.57$), suggesting that higher occupancy density significantly increases the likelihood of disagreements regarding thermal conditions. This finding suggests that increasing occupancy density not only intensifies competition for thermal control but also increases the diversity of thermal preferences within a shared room. As the number of roommates increases, achieving consensus regarding cooling preferences becomes more difficult. This increases the likelihood of thermal disagreements. This supports the proposition of Environmental Stress Theory that overcrowded environments amplify interpersonal stress and conflict

Furthermore, the study observed that a larger thermal preference gap was significant and likely to increase

thermal conflict ($\beta = 0.67$, $(\text{Exp}(\beta)) = 1.96$). The results further indicate that a one-degree increase in thermal preference differences between roommates increases the odds of thermal conflict by approximately 96% ($\text{OR} = 1.96$). This suggests that mismatched temperature preferences are among the strongest predictors of thermal conflict in shared student housing. The result suggests that thermal conflict is driven less by the physical environment itself and more by differences in how occupants perceive thermal comfort. Even when students occupy the same room, variations in physiological adaptation, previous environmental exposure, and personal comfort expectations may lead to competing demands for thermal control. On the other hand, the communication style used by the students reported negative effect ($\beta = -0.54$, $p = 0.010$; $\text{OR} = 0.58$). This finding highlights the importance of social negotiation mechanisms in shared living environments. It suggests that thermal conflict is not solely an environmental problem but also a social process that can be mitigated through effective communication and compromise among roommates. Moreover, Table 1 shows that access to air conditioning had lower thermal conflict values ($\beta = -1.08$, $p = 0.012$; $\text{OR} = 0.34$). This finding indicates the mitigating role of indoor environmental quality strategies. The acceptance of mixed-gender in room composition in student housing slightly increased thermal conflict ($\beta = 0.71$, $p = 0.048$; $\text{OR} = 2.03$). Likewise, students time spent in the room reported modest effects but significantly positive ($\beta = 0.12$, $p = 0.016$; $\text{OR} = 1.13$). This indicates that the longer students stay in rooms leads to disagreement and thermal conflict. Generally, the study can deduce that, social factors such as gender diversity, temperature preference gap, and communication strategies expressively impact thermal conflict, while physical factors such as access to AC and room size were strongest predictors of thermal conflict across off-campus student housing in Ghana.

4.2 Multiple regression

Table 2 presents the multiple regression results of the study. This model assesses the significant effects of thermal conflict on energy consumption among off-

Table 1: Logistic Regression Model Predicting Thermal Conflict Occurrence

Predictor Variable	β	S.E.	Wald χ^2	Odds Ratio ($\text{Exp}(\beta)$)	p-value
Room Size (number of roommates)	0.45	0.19	5.59	1.57	0.018
Thermal Preference Gap ($^{\circ}\text{C}$)	0.67	0.22	9.28	1.96	0.002
Communication Style Index	-0.54	0.21	6.57	0.58	0.010
AC Access (1 = Yes, 0 = No)	-1.08	0.43	6.28	0.34	0.012
Gender Composition (Mixed = 1)	0.71	0.36	3.91	2.03	0.048
Time Spent in Room (hrs/day)	0.12	0.05	5.76	1.13	0.016

Source: (field data, 2025)

Table 2: Predictors of Daily Energy Consumption (kWh/day)

Predictor	β	Std. Error	Beta	p-value
Conflict Intensity	0.84	0.22	0.42	0.001
Cooling Setpoint ($^{\circ}\text{C}$)	-0.18	0.07	-0.31	0.011
Tolerance Range ($^{\circ}\text{C}$)	-0.12	0.06	-0.19	0.048
Setpoint Changes/Day	0.35	0.14	0.27	0.017
Ventilation Access	-0.96	0.29	-0.33	0.002
Negotiation Skill Score	-0.43	0.20	-0.21	0.036

Source: (field data, 2025)

campus student housing in Ghana. Table 2 shows that daily energy consumption and conflict intensity emerged as the strongest positive predictor ($\beta = 0.84$, $\beta = 0.42$, $p = 0.001$) of thermal conflict. This result suggest that high levels of thermal conflict are linked to increase in energy use among roommates. This reflects a 0.84kWh unit each increase in energy use when conflict intensity increases.

More so, the tolerance range and cooling setpoint reported negative relationship associations ($\beta = -0.12$, $\beta = -0.19$, $p = 0.048$; $\beta = -0.18$, $\beta = -0.31$, $p = 0.011$). This implies that wider tolerance ranges and high cooling setpoints minimises energy consumption in off-campus student housing. Conversely, the frequent setpoint changes per day increase energy use ($\beta = 0.35$, $\beta = 0.27$, $p = 0.017$). This suggest that the repeated adjustments of cooling setpoints among roommates often raises conflict among them. However, access to ventilation and negotiation skills significantly reduces energy use ($\beta = -0.96$, $\beta = -0.33$, $p = 0.002$; $\beta = -0.43$, $\beta = -0.21$, $p = 0.036$). This indicates the moderating role of behavioural control in controlling energy consumption and thermal conflicts in students housing in Ghana.

Also, changes in cooling setpoints (setpoint deviation) were positively influenced by conflict intensity ($\beta = 0.41$, $\beta = 0.37$, $p = 0.001$). Similar to that, wider tolerance range and higher cooling setpoints reduce setpoint deviations ($\beta = -0.32$, $\beta = -0.29$, $p = 0.008$; $\beta = -0.18$, $\beta = -0.22$, $p = 0.03$) (see Table 3). These finding show that roommates who demonstrate more flexible thermal comfort preferences adjust thermostats less frequently.

5. Discussions

The aim of the study was to assess the drivers of thermal conflict and its effects on off-campus student housing energy consumption in Ghana. Using both multiple linear and ordinary logistic regression shows that this study supports and extend the limited discussions of thermal conflict in literature. The study found a positive relationship between room size and thermal conflict. This is in line with (Agorsor et al., 2025; Wang et al., 2025) who reported discomfort and interpersonal tensions among students in dense student housing. While previous studies have identified overcrowding as a contributor to thermal discomfort, the present study extends this discussion by demonstrating that occupancy density influences not only thermal comfort but also interpersonal relationships and energy-use behaviour. This finding suggests that thermal conflict should not be viewed solely as an indoor environmental quality issue but as a socio-environmental phenomenon emerging from the interaction between shared occupancy conditions and competing thermal preferences. Consequently, student housing management strategies that focus exclusively on physical building improvements may fail to address the social dimensions of thermal conflict. Also, the strong impact of thermal preference gaps on thermal conflict supports Suleymanov (2024) and Budiawan et al. (2024) who conceptualised thermal comfort expectations as a “conflict multiplier” in shared living spaces. However, unlike previous studies that largely conceptualise thermal comfort as an individual experience, the findings of this study suggest that differences in thermal preferences become particularly problematic when environmental controls are shared.

Table 3: Predictors of Setpoint Deviation and Thermostat Adjustment Time

Predictor	B	Std. Error	Beta	p-value
Predictors of Setpoint Deviation (°C)				
Conflict Intensity	0.41	0.12	0.37	0.001
Cooling Setpoint	-0.32	0.08	-0.29	0.008
Tolerance Range	-0.18	0.09	-0.22	0.034
2.1.1 Predictors of Thermostat Adjustment Time (minutes/day)				
Conflict Intensity	3.75	1.01	0.40	0.002
Setpoint Changes/Day	2.18	0.88	0.29	0.019
Negotiation Skill	-2.65	0.97	-0.24	0.011

Source: (field data, 2025)

Moreover, conflict intensity increases with thermostat adjustment time and cooling setpoint change ($B = 3.75$ min/day, $\beta = 0.40$, $p = 0.002$; $\beta = 2.18$, $\beta = 0.29$, $p = 0.019$). on the flipside, student’s negotiation skills reduce thermostat adjustment time ($\beta = -2.65$, $\beta = -0.24$, $p = 0.011$). This indicates that efficient interpersonal management and effective behavioural control can reduce thermostat manipulation and energy consumption in off-campus student housing in Ghana.

This highlights an important distinction between thermal discomfort and thermal conflict. While thermal discomfort can be experienced individually, thermal conflict emerges when individual comfort expectations compete within collective living environments. This distinction contributes to the growing literature on shared thermal environments and student housing management

On the other hand, the negative effects of Access to AC and Communication style significantly support

findings by Rony and Alamgir (2023). More importantly, the findings challenge the dominant assumption that thermal conflict is primarily a technical or environmental problem. The strong influence of communication style and negotiation skills indicates that social interaction processes play a critical role in determining thermal outcomes. This finding reinforces the argument that behavioural interventions may be as important as technological interventions in improving thermal satisfaction among students. With respect to energy consumption, conflict intensity was the strongest predictor. This supports Arowoiya et al. (2024) and Graff and Nock (2026) studies who observed that unresolved personal disagreements among students affected thermostat control and higher electricity consumption. The negative relationship between access to ventilation, tolerance range and cooling setpoint, and energy consumption was consistent with studies Wei et al. (2024) and Jian et al. (2022). This confirms that passive cooling strategies and behavioral flexibility among roommates can reduce energy use.

These findings provide empirical support for Environmental Stress Theory. According to the theory, environmental stressors generate psychological and behavioural responses that influence social interactions. In the context of this study, high indoor temperatures, overcrowding, and limited thermal control act as environmental stressors, while thermal conflict represents the social and behavioural response to these conditions. The results therefore demonstrate that thermal conflict is not simply a consequence of temperature differences but a manifestation of environmental stress operating within shared living arrangements.

Similarly, cooling setpoint changes per day reported limited impact on thermal conflict and energy consumption. However, from a predictive standpoint, weak drivers such as gender composition and time spent in the room may slightly affect energy consumption and thermal conflict. Despite that, this effect could be secondary to critical drivers such as conflict intensity. This implies student housing energy interventions targeting access to AC, tolerance range, and negotiation skills are likely to produce high reductions in thermal conflict and energy consumption. Likewise, structural drivers may only partially moderate these impacts.

6. Conclusions

The study examines the drivers and impact of thermal conflict on energy consumption among off-campus

student housing in Ghana. Using both multiple and logistics regression models, the study derives both physical and social drivers as critical in influencing thermal conflict and energy consumption in student housing. Physically, the study found that thermal preference gaps and room size were the strongest predictors of thermal conflict, while access to AC, negotiation skills, and communication strategies were social determinants. The study concludes that higher occupancy density and the mismatch in temperature preferences significantly increase the likelihood of thermal conflict, whereas student's interpersonal relationship are critical for harmonious shared living in off-campus student housing in Ghana. On the other hand, the intensity of conflict in each student housing served as the strongest determinant of daily energy consumption. Away from that, this intensity had impact on setpoint deviations and thermostat adjustment time across the rooms. On the flipside, access to ventilation and level of tolerance reduce energy consumption levels. Also, time spent in the rooms and gender composition were weak predictors that somewhat influence thermal conflict and energy consumption across the study locations.

These findings have several implications. First, the over reliance on access to air conditioning as thermal control measure is insufficient. Thus, social and behavioural aspects are equivalent factors that need to be institutionalised in youth housing such as off-campus student housing. Secondly, energy inefficiency is closely connected to social factors. This implies that energy management interventions must be linked to student communication styles, interpersonal, and negotiation skills. Based on this implication, the study recommends that student housing managers must conduct training and develop structured communication approaches that can include reporting roommates who do not agree on AC setpoint in rooms. Student housing managers should individualise thermostat access, encourage ventilation, and adjust cooling of student room to a minimum cooling setpoint. With this approach students can combine both natural ventilation with active design approaches to control thermal conflicts. Student housing managers should reduce occupancy density and allow students to make roommate choices. This will improve energy use and thermal conflicts in off-campus student housing in Ghana.

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