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Demographic Influences On Sustainable Built Environment: Evaluating Behavioral Changes

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Abstract
In this work we investigated the impact of sustainable built environment on end users to analyse its relationship and influence on demographics. The study involves quantitate analysis using statistical package for social science i.e., (SPSS) software. The data can be collected through surveys and interviews targeting users with similar demographic backgrounds. The collected data is further analysed using descriptive and inferential statistical techniques which includes corelation analysis and regression modelling to identify the patterns trends and relationships. The quantitative analysis using SPSS software reveals how demographics influence sustainable building trends, by informing customized solutions.
Keywords: Sustainable built environment, Demographics, Quantitative analysis, SPSS

1. INTRODUCTION

The relationship between sustainable built environments and demographic behaviour holds significant implications for the future of urban planning and societal development [1]. As the world grapples with the challenges posed by climate change and rapid urbanization, the need for sustainable solutions in the built environment becomes increasingly urgent. Sustainable built environments encompass a wide range of practices and principles that aim to minimize negative environmental impacts while promoting social and economic well-being. These include energy-efficient buildings, renewable energy sources, green spaces, walkability, and efficient transportation systems, among others [2]. Demographic behaviour refers to the patterns and trends exhibited by different population groups, such as birth rates, migration patterns, household size, and age distribution. These factors directly influence the demand for housing, infrastructure, and services in urban areas. By understanding the interplay between sustainable built environments and demographic behaviour, policymakers, urban planners, and architects can make informed decisions that promote long-term sustainability and enhance quality of life. One of the key aspects linking sustainable built environments and demographic behaviour is population growth and urbanization [3]. The world's population is projected to reach 9.7 billion by 2050, with a majority residing in urban areas. This rapid urbanization poses immense challenges in terms of resource consumption, waste management, and carbon emissions. Sustainable built environments can help address these challenges by integrating energy-efficient design, renewable energy systems, and sustainable waste management practices into urban infrastructure [4]. By accommodating population growth in a sustainable manner, cities can reduce their ecological footprint and create healthier living environments.Another crucial factor is changing household structures and lifestyles. Over the past few decades, there has been a shift in household composition, with an increase in single-person households, dual-income families, and multi-generational households [5]. These changes have implications for housing demand, spatial requirements, and community services. Sustainable built environments can adapt to these shifting demographics by providing diverse housing options, flexible living spaces, and shared amenities that foster social interaction and support community well-being. Moreover, demographic behaviour is influenced by socio-economic factors, such as income levels, education, and employment opportunities [6,7]. Sustainable built environments can contribute to a more equitable society by ensuring affordable housing, accessible infrastructure, and opportunities for social and economic advancement. For example, mixed-income housing developments that integrate affordable housing units alongside market-rate units can help address the housing affordability crisis and promote socio-economic diversity within neighbourhoods. Sustainable transportation options, such as public transit and cycling infrastructure, can improve mobility and access to employment, education, and healthcare services, particularly for low-income communities. Demographic behaviour is closely linked to health and well-being outcomes [8]. The built environment has a profound impact on public health, with factors such as air quality, access to green spaces, and walkability influencing physical and mental well-being [9]. Sustainable built environments prioritize the creation of healthy living environments by incorporating green building materials, promoting indoor air quality, and providing ample access to parks, gardens, and recreational spaces. These elements not only enhance the quality of life but also encourage physical activity, reduce stress, and improve overall community health [10].In addition to population growth, household structures, socio-economic factors, and health outcomes, demographic behaviour is also influenced by cultural and social preferences [11]. Different demographic groups may have varying preferences for housing types, neighbourhood characteristics, and lifestyle choices. Sustainable built environments can accommodate these preferences through participatory design processes that engage the community in decision-making [12]. By involving diverse stakeholders, including residents, community organizations, and cultural institutions, in the planning and design of the built environment, cities can create inclusive and culturally vibrant spaces that reflect the needs and aspirations of their inhabitants. Understanding the relationship between a sustainable built environment and demographic behaviour is crucial for policymakers, urban planners, architects, and other stakeholders involved in shaping the urban landscape [13]. By recognizing the potential effects of sustainable practices on demographic behaviour, it develops strategies that not only mitigate environmental impacts but also enhance the quality of life for individuals and communities [14]. The sustainable built environment has the potential to create a positive feedback loop, wherein sustainable design and infrastructure promote environmentally conscious behaviour, which, in turn, leads to further sustainable practices and positive demographic outcomes [15]. By critically analysing the existing trends and exploring the perspectives of end users, this study seeks to provide valuable insights and actionable recommendations for creating more sustainable, liveable, and inclusive urban environments.

Meanwhile, its ability to alleviate environmental issues and advance energy efficiency, the sustainable built environment has attracted a lot of attention recently. There is a need to understand the impact of sustainable built environments on demographic behaviour and its implications for behavioural change. This gap in knowledge hinders the development of targeted strategies for promoting sustainable practices among different demographic groups. While studies have explored the relationship between sustainable built environments as well as various outcomes such as energy consumption and environmental impact, there is a noticeable research gap concerning the influence of sustainable built environments on demographic behaviour and the subsequent implications for behavioural change. Limited research has investigated how demographic factors interact with sustainable built environment trends and shape individuals' attitudes, preferences, and actions related to sustainable practices. Understanding this relationship is crucial for designing effective interventions and strategies tailored to specific demographic groups.In this work we investigated the influence of sustainable design principles, energy efficiency, and environmentally sustainable buildings on the behaviour of various demographic groups. Also, a critical analysis of the relationship between sustainable built environment trends and demographics has been performed. Provision of practical recommendations to address barriers and capitalize on motivations among different demographic cohorts, facilitating the implementation of sustainable design principles. Examination of individuals' attitudes, perceptions, and decision-making processes regarding energy efficiency, offering insights into factors shaping individual actions. The subsequent sections are organized as follows: Section 2 reviews prior research, Section 3 outlines the methodology including sample selection and data analysis, Section 4 presents findings from SPSS analysis, Section 5 discusses these findings, and Section 6 concludes the paper.

2. Related Work

Chen et al., in 2022, focused on the sustainable built environment as well as its impact on the public health of older adults in Hong Kong [16]. The study provides evidence of the positive influence of a sustainable built environment on the well-being of older adults. The authors examine various aspects, such as the design of buildings, accessibility, and environmental factors, to understand their effects on public health. Sepasgozar, in 2021 discussed the differentiation between digital twin and digital shadow in the context of a smart and sustainable built environment [17]. This paper highlights a paradigm shift and aims to expedite the development of such environments. The author emphasizes the importance of understanding the distinctions between these concepts to effectively utilize digital technologies for sustainable building practices. Opoku's in 2019 explored the relationship between biodiversity and the built environment, specifically focusing on its implications for the Sustainable Development Goals (SDGs) [18]. The study highlights the importance of incorporating biodiversity considerations in urban planning and design to achieve sustainability targets. It underscores the need for integrating nature into the built environment for a more holistic approach to sustainable development. Abbasi et al., presented a framework in their 2023 paper that helps identify and prioritize key sustainability pointers for assessing heating systems in the built environment [19]. The authors emphasize the significance of evaluating the environmental impact of heating systems and provide a systematic approach to assess their sustainability. This framework can assist policymakers and stakeholders in making informed decisions regarding heating systems in the built environment. Pinheiro and Luís, in 2020 paper, discussed the potential of the COVID-19 pandemic to leverage a sustainable built environment [20]. The authors explore the pandemic's impact on urban environments and suggest that the crisis could serve as a catalyst for adopting sustainable practices in the built environment. They argue that incorporating sustainable features in urban planning and design can contribute to better resilience and preparedness for future challenges. Wang et al., 2021 examined the effects of the multilevel built environment on body mass index (BMI) in China [21]. The authors investigate how different factors, such as urban design and neighbourhood characteristics, influence BMI. The study offers important insights into the connection among urban form and public health, specifically in relation to BMI, by detaching the many elements of the built environment.In Southeast Queensland, Australia, Liu et al. studied in 2019 the impacts of a change in the public transport fare policy and built and non-built environment elements on ridership [22]. The authors analyse the interplay between transportation policies, infrastructure, and the environment to understand their impact on public transit usage. This research contributes to enhancing public transport planning and decision-making processes. Yang et al. investigate the association between streetscape greenery and older persons' inclination to walk in 2021 [23]. The study investigates the non-linear impacts of vegetation on pedestrian patterns, highlighting the value of streetscape planning for fostering physical activity. By understanding the optimal level of greenery, urban planners and policymakers can create environments that encourage walking and enhance the well-being of older adults. Cheng et al., in 2019 investigated active travel as a means of promoting active aging in China, focusing on the role of the built environment [24]. The study examines how factors such as walkability, infrastructure, and neighbourhood design influence older adults' engagement in active travel. The research highlights the significance of creating age-friendly built environments that support physical activity and healthy aging. Shen et al., in 2020 addressed the prediction of household electricity consumption and the effectiveness of intervention strategies based on occupant behaviour and personality traits [25]. The study explores the relationship between energy consumption patterns, individual characteristics, and behaviour. By understanding these factors, policymakers and researchers can develop targeted interventions to promote energy efficiency and sustainability in households, considering occupants' behaviour and personality traits..

3. Research hypothesis.

Hypothesis 1 (H1): There is a significant relationship between sustainable built environments and demographic behaviour.

Hypothesis 2 (H2): Sustainable built environment features, such as green building certifications and energy-efficient technologies, positively impact individuals' behavioural change towards energy efficiency.

Hypothesis 3 (H3): Different demographic groups exhibit variations in their levels of awareness and conviction regarding energy efficiency in sustainable built environments.

Hypothesis 4 (H4): The adoption of environmentally sustainable building practices is more prevalent among younger individuals, higher-educated individuals, and those with higher income levels.

3.1 Variables

a) Dependent variable

The dependent variable in this study is "Demographic Behaviour." It refers to the actions, preferences, and attitudes exhibited by individuals in relation to sustainable built environments and energy efficiency.

These variable captures how demographic factors, sustainable built environment features, and awareness of energy efficiency influence individuals' choices, behaviours, and beliefs regarding sustainable practices [26].

b) Independent variables

The independent variables in this study include,

i) Sustainable built environments
ii) Green building certifications
iii) Energy-efficient technologies
iv) Awareness and conviction
v) Adaptation towards environmentally sustainable building

These variables represent the factors that are hypothesized to influence demographic behaviour and individuals' attitudes and actions towards sustainability. By examining the relationship and interaction between these independent variables and demographic behaviour, the study seeks to understand the role and impact of sustainable built environments and related factors on promoting sustainable behaviours and fostering behavioural change [27].

c) Control variables

The control variables in this study include,

i) Socioeconomic factors
ii) Geographic location
iii) Cultural factors
iv) Environmental awareness

These variables are considered to account for potential confounding factors that may influence both the independent variables and the dependent variable [28].

d) Demographic variables

The demographic variables in this study are characteristics of the study participants that provide information about their personal and social background [29]. These variables help to understand how different demographic groups may exhibit variations in their attitudes, preferences, and behaviours towards sustainable built environments and energy efficiency. The demographic variables include,

i) Age
ii) Gender
iii) Education level
iv) Income
v) Occupation
vi) Geographic location

Figure 1. shows the conceptual framework.

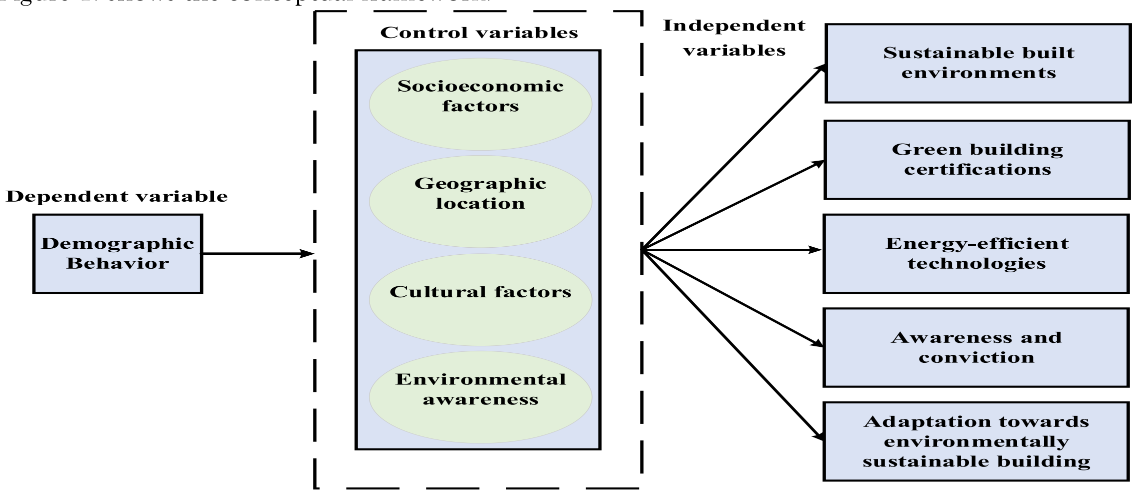

Figure 1. Conceptual framework

3.2 Reliability test for variables

The statistical method known as "Cronbach's alpha" is used to evaluate the reliability of the questionnaire's variables. Cronbach's alpha gauges the internal reliability or dependability of a group of variables used to assess the same construct [30]. Higher numbers denote more reliability, and the value ranges from 0 to 1. Table 1. shows the reliability values for variables.

Table 1. Reliability (R) values for variables

Variable	Cronbach's alpha coefficient (CA)
Demographic Behaviour (DB)	0.912
Sustainable Built Environments (SBE)	0.864
Green Building Certifications (GBC)	0.838
Energy-Efficient Technologies (EET)	0.866
Awareness and Conviction (AC)	0.778
Adaptation towards Environmentally Sustainable Building (AES)	0.769

Based on the results, the variable "Demographic Behaviour" demonstrates a high level of reliability with a CA coefficient of 0.912. This suggests that the items within this variable consistently measure the construct of demographic behaviour. Similarly, the variables "Sustainable Built Environments" and "Energy-Efficient Technologies" show good reliability with CA coefficients of 0.864 and 0.866, respectively. These values indicate that the items within these variables are internally consistent and reliably measure the intended constructs. The variable "Green Building Certifications" also demonstrates acceptable reliability with a Cronbach's alpha coefficient of 0.838. This suggests that the items within this variable consistently measure the presence and importance of green building certifications. However, the variables "Awareness and Conviction" and "Adaptation towards Environmentally Sustainable Building" show slightly lower reliability with CA coefficients of 0.778 and 0.769, respectively. While these values are still acceptable, it may be worth examining the individual items within these variables to identify any items that contribute to lower reliability.

4. Research Methodology

4.1 Source of data

The source of data for this study is a sample of 580 participants. The participants were selected based on specific criteria related to the research objectives and the target population.

4.2 Sampling method

The sampling method employed in this study is likely to be mentioned in the research design. Common sampling methods include “random sampling, stratified sampling, or convenience sampling”, among others. The chosen sampling method ensures that the sample is representative of the target population and allows for generalization of the findings [31].

4.3 Research design

Typically, the methodology section includes a description of the research design that was used for this study. In order to answer the research questions and meet the study objectives, it describes the overall structure as well as methodology used. Common research designs include experimental, quasi-experimental, correlational, or survey designs. The specific design chosen depends on the nature of the research questions and the available resources [32].

4.4 Data collection

Data collection for this study was conducted using surveys and interviews. Surveys involve administering a set of structured questions to the participants, while interviews involve conducting one-on-one or group interviews to gather qualitative data [33]. The survey and interview questions were designed to capture relevant information related to the variables of interest, including demographic behaviour, sustainable built environments, and energy efficiency.

4.5 Data analysis

The collected data was analyzed using quantitative analysis techniques. This may include the use of statistical software such as “SPSS (Statistical Package for the Social Sciences)” to perform data analysis.

Descriptive statistical techniques such as "frequencies, means, and standard deviations" may be used to summarize and describe the data. Inferential statistical techniques such as "correlation analysis as well as regression modelling" may also be applied to examine relationships and associations between variables [34].

5. RESULT & DISCUSSION

5.1 Sample characteristics.

The sample characteristics of the study are important to understand the demographics of the participants and ensure the findings can be generalized to the larger population. Table 2. shows the demographic variables.

Table 2. Demographic variables

	Frequency	Percent
Age (Years)		
18-24	62	10.7
25-34	91	15.7
35-44	116	20.0
45-54	152	26.2
55 and above	159	27.4
Gender		
Male	286	49.3
Female	294	50.7
Education		
High school diploma	26	4.5
Bachelor's degree	31	5.3
Master's degree	267	46.0
Doctorate or higher	256	44.1
Income		
Less than $25,000	58	10.0
$25,000 - $49,999	180	31.0
$50,000 - $74,999	137	23.6
$75,000 - $99,999	153	26.4
$100,000 or more	52	9.0
Employment		
Employed	288	49.7
Self-employed	257	44.3
Unemployed	35	6.0
Location		
Urban	209	36.0
Suburban	187	32.2
Rural	184	31.7

In terms of age, the majority of participants were distributed across different age groups, with the highest proportion being individuals aged 45-54 years (26.2%), closely followed by those aged 55 years and above (27.4%). Participants in the younger age groups, specifically 18-24 years (10.7%) and 25-34 years (15.7%), also contributed to the sample. Regarding gender, the sample was nearly evenly split, with 49.3% identifying as male and 50.7% as female. Education levels varied among the participants, with a significant proportion holding a master's degree (46.0%), followed by individuals with a doctorate or higher (44.1%). A smaller proportion had a high school diploma or equivalent (4.5%), and a bachelor's degree (5.3%). In terms of income, the sample included individuals across different income brackets. The largest proportion fell within the $25,000 - $49,999 range (31.0%), followed by $50,000 - $74,999 (23.6%) and $75,000 - $99,999 (26.4%). A smaller proportion had incomes below $25,000 (10.0%), while a few participants earned $100,000 or more (9.0%). Regarding employment status, the majority of participants were employed (49.7%), followed by self-employed individuals (44.3%). A smaller proportion represented unemployed individuals (6.0%). The participants were also located in different settings, with 36.0% residing in urban areas, 32.2% in suburban areas, and 31.7% in rural areas. Figure 2. shows the sample characteristics percent.

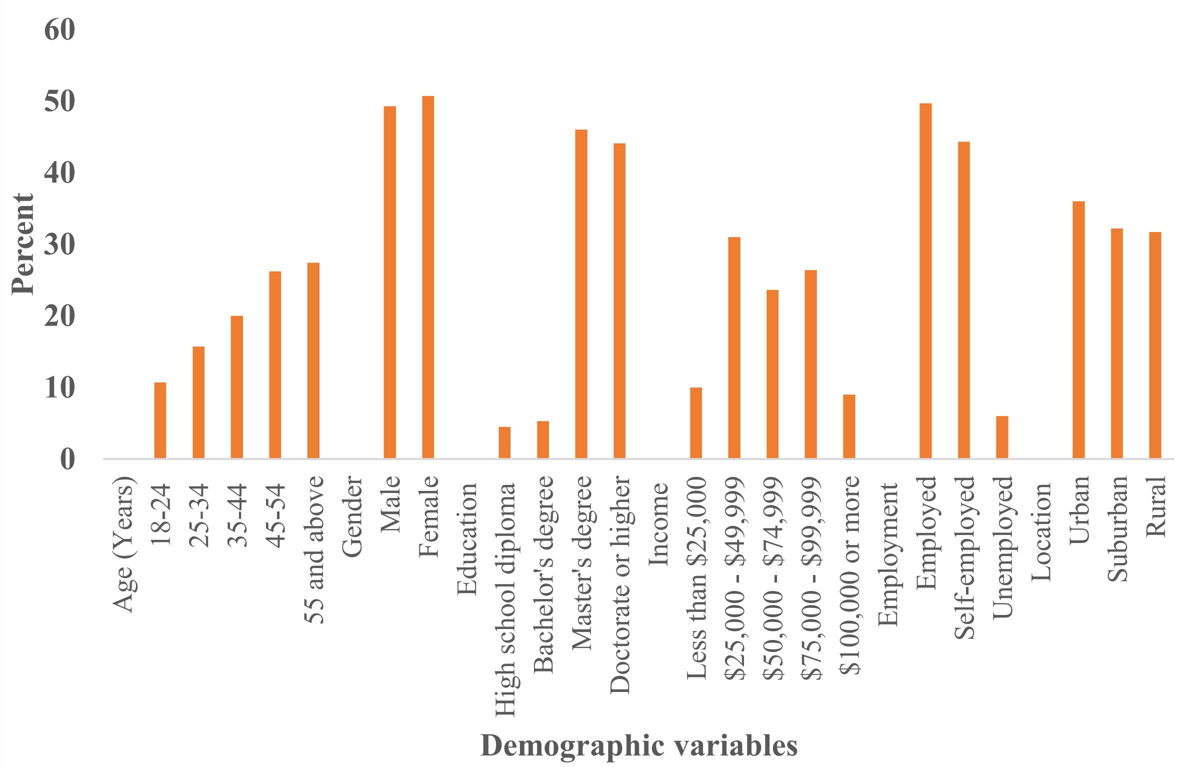

Figure 2. Sample characteristics percent

5.2 Descriptive statistics

It provides a summary of the key characteristics and features of the data collected in the study. The variables included in the research, namely age, gender, education, income, employment, and location. The descriptive statistics allow to understand the central tendencies, distributions, and variability within these variables. Table 3. shows the statistical summary table.

Table 3. Statistical summary table

Characteristics	Mean	Standard deviation (SD)
Age	3.44	1.324
Gender	1.51	0.500
Education	3.30	0.766
Income Range	2.93	1.153
Employment	1.56	0.606
Location	1.96	0.823
Demographic Behaviour (DB)	4.05	0.908
Sustainable Built Environments (SBE)	4.01	0.900
Green Building Certifications (GBC)	4.01	0.903
Energy-Efficient Technologies (EET)	4.00	0.923

Awareness and Conviction (AC)	3.88	1.025
Adaptation towards Environmentally Sustainable Building (AES)	4.05	0.925

In terms of participant characteristics, the mean age of the sample was 3.44, with a SD of 1.324. This indicates that the participants' ages varied around the mean, with a moderate level of dispersion. For the gender variable, the mean was 1.51, indicating that the sample had a slightly higher proportion of males. The SD of 0.500 suggests that the gender distribution was relatively balanced. Regarding education, the mean value was 3.30, with a SD of 0.766. This indicates that the participants' education levels were slightly above the midpoint of the scale, with moderate variability. In terms of income range, the mean value was 2.93, with a SD of 1.153. This suggests that the participants' income levels varied, with a moderate degree of dispersion around the mean. For employment, the mean value was 1.56, indicating that the sample had a slightly higher proportion of employed individuals. The SD of 0.606 suggests a moderate level of variability in employment status. In terms of location, the mean value was 1.96, indicating that the sample had a slightly higher proportion of participants residing in urban areas. The SD of 0.823 suggests a moderate level of variability in geographic distribution.

5.3 Inferential statistics

It is used to analyse and test hypotheses, estimate population parameters, and make predictions. Inferential statistics typically involves using probability theory to determine the likelihood of certain outcomes based on sample data. The techniques in inferential statistics include “hypothesis testing, confidence intervals, and regression analysis”. These methods allow researchers to make generalizations about a population based on data from a sample, while accounting for the uncertainty and variability inherent in sampling.

For Hypothesis 1 (H1): “There is a significant relationship between sustainable built environments and demographic behaviour”.

To test Hypothesis 1 (H1) that there is a significant relationship between sustainable built environments and demographic behaviour, regression and correlation analyses is conducted.

a) Regression (R)

A multiple regression analysis will be performed to assess the relationship between sustainable built environments (independent variable) and demographic behaviour (dependent variable). Table 4. shows the R results for H 1.

Table 4. R results for H 1

	SS	df	MS	F	Sig.
Regression	204.642	1	204.642	1909.039	.000[b]
Residual	61.959	578	.107		
Total	266.601	579			

The results of the regression analysis indicate a significant relationship between sustainable built environments and demographic behaviour. The regression model was found to be significant, $F(1, 578) = 1909.039$, $p < .001$. The sum of squares (SS) for the regression was 204.642, with 1 degree of freedom (df), resulting in a mean square (MS) of 204.642. The significant F-value suggests that the variation in demographic behaviour can be explained by the variation in sustainable built environments. The residual sum of squares (SS) was found to be 61.959, with 578 degrees of freedom (df), resulting in a mean square (MS) of 0.107. This is the unexplained variation in population behaviour that the sustainable built environments do not take into account. The total sum of squares (SS) was calculated to be 266.601, with a total of 579 observations. This value represents the total variability in the demographic behaviour variable.

b) Correlation (C)

We will conduct a correlation study to evaluate the degree and direction of the linear link between sustainable built environments (SBE) and demographic behaviour (DB). The correlation coefficient (Pearson's r) will be calculated to measure the degree of association between these two variables. “The correlation coefficient can range from -1 to +1, where -1 indicates a perfect negative correlation, +1 indicates a perfect positive correlation, and 0 indicates no correlation". Table 5. shows the C results for H 1.

Table 5. C results for H 1

		DB	SBE
Pearson Correlation	DB	1.000	.876
	SBE	.876	1.000
Sig. (1-tailed)	DB		.000
	SBE	.000	

The correlation analysis reveals a strong positive correlation between demographic behaviour (DB) and sustainable built environments (SBE). The Pearson correlation coefficient (r) between DB and SBE is 0.876, indicating a high degree of association between these two variables. According to the correlation value of 0.876, there is a strong positive linear association between the level of sustainable built environments and the propensity for positive demographic behaviour. Conversely, as the level of sustainable built environments decreases, demographic behaviour tends to become less positive. The p-values for both correlations (DB and SBE) are found to be significant at the 0.001 level ($p < .001$). This indicates that the observed correlations are unlikely to have occurred by chance and are statistically significant. The significant positive correlation between DB and SBE implies that as sustainable built environments improve, there is a greater likelihood of observing positive demographic behaviour. This result confirms the notion that there is a strong correlation between population behaviour and sustainable built environments.

For Hypothesis (H 2): Sustainable built environment features, such as green building certifications and energy-efficient technologies, positively impact individuals' behavioural change towards energy efficiency.To test Hypothesis 2 (H2) that sustainable built environment features, such as green building certifications and energy-efficient technologies, positively impact individuals' behavioural change towards energy efficiency, both regression analysis and correlation analysis will be conducted.

a) Regression (R)

R results for H 2 are highlighted in Table 6.

Table 6. R results for H 2

	SS	df	MS	F	Sig.
Regression	220.629	3	73.543	921.453	.000[b]
Residual	45.972	576	.080		
Total	266.601	579			

The results of the regression analysis indicate a significant relationship between the sustainable built environment features (green building certifications and energy-efficient technologies) and individuals' behavioural change towards energy efficiency. The regression model was found to be significant, $F(3, 576) = 921.453$, $p < .001$. The sum of squares (SS) for the regression was 220.629, with 3 degrees of freedom (df), resulting in a mean square (MS) of 73.543. The significant F-value suggests that the variation in behavioural change towards energy efficiency can be enlightened by the variation in the sustainable built environment features. The residual sum of squares (SS) was found to be 45.972, with 576 degrees of freedom (df), resulting in a mean square (MS) of 0.080. This represents the unexplained variability in behavioural change towards energy efficiency that is not accounted for by the sustainable built environment features. The total sum of squares (SS) was calculated to be 266.601, with a total of 579 observations. This value represents the total variability in the behavioural change towards energy efficiency variable.

b) Correlation (C)

C results for H 2 is shown in Table 7.

Table 7. C results for H 2

		DB	SBE	GBC	EET
Pearson Correlation	DB	1.000	.876	.782	.838
	SBE	.876	1.000	.767	.798
	GBC	.782	.767	1.000	.773
	EET	.838	.798	.773	1.000
Sig. (1-tailed)	DB		.000	.000	.000
	SBE	.000		.000	.000
	GBC	.000	.000		.000
	EET	.000	.000	.000	

The correlation between DB and SBE is 0.876, indicating a strong positive association. Similarly, DB is positively correlated with GBC (r = 0.782) and EET (r = 0.838), suggesting significant relationships. SBE also demonstrates strong positive correlations with GBC (r = 0.767) and EET (r = 0.798), highlighting their interrelatedness. GBC and EET exhibit a moderate positive correlation of 0.773. All of these correlations are "statistically significant ($p < 0.001$)", indicating that the observed relationships are unlikely to have occurred by chance.For Hypothesis 3 (H 3): Different demographic groups exhibit variations in their levels of awareness and conviction regarding energy efficiency in sustainable built environments.To test Hypothesis 3 (H3) that different demographic groups exhibit variations in their levels of awareness and conviction regarding energy efficiency in sustainable built environments, both regression analysis and correlation analysis is conducted.

a) Regression (R)

Table 8. shows the R results for H 3.

Table 8. R results for H 3

	SS	df	MS	F	Sig.
Regression	111.690	1	111.690	416.737	.000[b]
Residual	154.911	578	.268		
Total	266.601	579			

The results of the regression analysis indicate a significant relationship between demographic variables and awareness and conviction (AC) regarding energy efficiency in sustainable built environments. The "regression model was found to be significant", $F(1, 578) = 416.737$, $p < .001$. The significant F-value indicates that the demographic variables have a strong influence on awareness and conviction. The large F-value suggests that a significant amount of variation in awareness and conviction can be explained by the variation in demographic variables. The low p-value ($p < .001$) further supports the significance of the relationship. These findings provide evidence to support Hypothesis 3, indicating that different demographic groups exhibit variations in their levels of awareness and conviction regarding energy efficiency in sustainable built environments. The results suggest that demographic variables play a crucial role in shaping the awareness and conviction levels of individuals from different demographic backgrounds.

b) Correlation (C)

Table 9. shows the C results for H 3.

Table 9. C results for H 3

		DB	AC
Pearson Correlation	DB	1.000	.647
	AC	.647	1.000
Sig. (1-tailed)	DB		.000
	AC	.000	

The correlation analysis reveals a moderate positive correlation between demographic behaviour (DB) and awareness and conviction (AC) regarding energy efficiency in sustainable built environments. The Pearson correlation coefficient (r) between DB and AC is 0.647, indicating a moderate degree of association between these two variables. The correlation coefficient of 0.647 suggests a "positive linear relationship", meaning that as the level of demographic behaviour increases, there is a tendency for awareness and conviction regarding energy efficiency to also increase. Conversely, as the level of demographic behaviour decreases, awareness and conviction levels may also decrease. The p-values for both correlations (DB and AC) are found to be significant at the 0.001 level ($p < .001$).

For Hypothesis 4 (H 4): The adoption of environmentally sustainable building practices is more prevalent among younger individuals, higher-educated individuals, and those with higher income levels.

To test Hypothesis 4 (H4) that the adoption of environmentally sustainable building practices is more prevalent among younger individuals, higher-educated individuals, and those with higher income levels, both regression analysis and correlation analysis will be conducted.

a) Regression (R)

Table 10. shows the R results for H 4.

Table 10. R results for H 4

	SS	df	MS	F	Sig.
Regression	120.099	1	120.099	473.828	.000[b]
Residual	146.502	578	.253		
Total	266.601	579			

b) Correlation (C)

Table 11. shows the C results for H 4.

Table 11. C results for H 4

		DB	AES
Pearson Correlation	DB	1.000	.671
	AES	.671	1.000
Sig. (1-tailed)	DB		.000
	AES	.000	

The results of the regression analysis indicate a significant relationship between the adoption of environmentally sustainable building practices (AES) and at least one of the demographic variables (age, education, income). "The regression model was found to be significant, $F(1, 578) = 473.828$, $p < .001$". These findings provide evidence to support Hypothesis 4, indicating that the adoption of environmentally sustainable building practices is influenced by at least one of the demographic variables. The results suggest that younger individuals, higher-educated individuals, and those with advanced income levels are more likely to adopt environmentally sustainable building practices.

The study confirmed all hypotheses, showing significant relationships between sustainable built environments, demographic behaviour, energy efficiency, and adoption of sustainable practices. Sustainable environments positively impact demographic behaviour, fostering a correlation between them. Green certifications and energy-efficient technologies drive behavioural changes towards energy efficiency within these environments. Demographic groups exhibit varying levels of awareness and conviction regarding energy efficiency, emphasizing the need for targeted strategies. Younger, higher-educated, and wealthier individuals are more inclined to adopt environmentally sustainable practices. The findings stress the importance of tailored interventions and policies to promote sustainable behaviour and energy efficiency across demographics. Architects, planners, and policymakers should utilize these insights to develop strategies for widespread adoption of sustainable practices.

6 CONCLUSION

In this work SPSS software has been used for analysis, discovers the significant link between demographics and sustainable built -in -environments. The study reveals how the built environment influences the demographic behaviour and vice versa. The results indicate the features like green certifications and energy-efficient technologies impact on individuals' or user behaviour. It highlights variation in awareness and conviction across different demographic groups, suggesting the need for targeted interventions to promote the sustainable behaviour effectively.

Different statistical methods like regression modelling and correlation analysis provides insights of relationships between sustainable built environments and demographics. The results contribute to understanding the patterns, offering evidence-based insights for architects, urban planners, and decision-makers. In future these insights have been incorporated in sustainable built environments to meet the specific needs of peer groups by fostering a more sustainable and environment friendly society.

REFERENCES

[1]. Nkeki, F.N. and Asikhia, M.O., 2019. Geographically weighted logistic regression approach to explore the spatial variability in travel behaviour and built environment interactions: Accounting simultaneously for demographic and socioeconomic characteristics. Applied geography, 108, pp.47-63.

[2]. Liu, X., Wang, Q., Wei, H.H., Chi, H.L., Ma, Y. and Jian, I.Y., 2020. Psychological and demographic factors affecting household energy-saving intentions: a TPB-based study in Northwest China. Sustainability, 12(3), p.836.

[3]. Mitra, R. and Hess, P.M., 2021. Who are the potential users of shared e-scooters? An examination of socio-demographic, attitudinal and environmental factors. Travel behaviour and society, 23, pp.100-107.

[4]. Wang, J. and Lindsey, G., 2019. Neighborhood socio-demographic characteristics and bike share member patterns of use. Journal of transport geography, 79, p.102475.

[5]. Dearry, A., 2004. Impacts of our built environment on public health. Environmental health perspectives, 112(11), pp.A600-A601.

[6]. Codinhoto, R., Tzortzopoulos, P., Kagioglou, M., Aouad, G. and Cooper, R., 2009. The impacts of the built environment on health outcomes. Facilities.

[7]. Yu, H. and Peng, Z.R., 2019. Exploring the spatial variation of ridesourcing demand and its relationship to built environment and socioeconomic factors with the geographically weighted Poisson regression. Journal of Transport Geography, 75, pp.147-163.

[8]. Stanislav, A. and Chin, J.T., 2019. Evaluating livability and perceived values of sustainable neighborhood design: New Urbanism and original urban suburbs. Sustainable cities and society, 47, p.101517.

[9]. Azmi, A., Ibrahim, R., Abdul Ghafar, M. and Rashidi, A., 2022. Smarter real estate marketing using virtual reality to influence potential homebuyers' emotions and purchase intention. Smart and Sustainable Built Environment, 11(4), pp.870-890.

[10]. Yıldız, S., Kıvrak, S., Gültekin, A.B. and Arslan, G., 2020. Built environment design-social sustainability relation in urban renewal. Sustainable Cities and Society, 60, p.102173.

[11]. Haruna, A., Shafiq, N. and Montasir, O.A., 2021. Building information modelling application for developing sustainable building (Multi criteria decision making approach). Ain Shams Engineering Journal, 12(1), pp.293-302.

[12]. Munaro, M.R., Tavares, S.F. and Bragança, L., 2020. Towards circular and more sustainable buildings: A systematic literature review on the circular economy in the built environment. Journal of Cleaner Production, 260, p.121134.

[13]. Yang, J., Huang, J., Su, Y., He, X., Tan, H., Yang, W. and Strnadel, B., 2019. Eco-friendly treatment of low-calcium coal fly ash for high pozzolanic reactivity: A step towards waste utilization in sustainable building material. Journal of Cleaner Production, 238, p.117962.

[14]. Nicholson, J. and Kurucz, E., 2019. Relational leadership for sustainability: Building an ethical framework from the moral theory of 'ethics of care'. Journal of Business Ethics, 156, pp.25-43.

[15]. Dahy, H., 2019. Efficient fabrication of sustainable building products from annually generated non-wood cellulosic fibres and bioplastics with improved flammability resistance. Waste and Biomass Valorization, 10(5), pp.1167-1175.

[16]. Chen, S., Bao, Z., Chen, J., Yang, L. and Lou, V., 2022. Sustainable built environment for facilitating public health of older adults: Evidence from Hong Kong. Sustainable Development, 30(5), pp.1086-1098.
[17]. Sepasgozar, S.M., 2021. Differentiating digital twin from digital shadow: Elucidating a paradigm shift to expedite a smart, sustainable built environment. Buildings, 11(4), p.151.
[18]. Opoku, A., 2019. Biodiversity and the built environment: Implications for the Sustainable Development Goals (SDGs). Resources, conservation and recycling, 141, pp.1-7.
[19]. Abbasi, M.H., Abdullah, B., Castano-Rosa, R., Ahmad, M.W. and Rostami, A., 2023. A framework to identify and prioritise the key sustainability indicators: Assessment of heating systems in the built environment. Sustainable Cities and Society, 95, p.104629.
[20]. Pinheiro, M.D. and Luís, N.C., 2020. COVID-19 could leverage a sustainable built environment. Sustainability, 12(14), p.5863.
[21]. Wang, X., Shao, C., Yin, C. and Guan, L., 2021. Disentangling the comparative roles of multilevel built environment on body mass index: Evidence from China. Cities, 110, p.103048.
[22]. Liu, Y., Wang, S. and Xie, B., 2019. Evaluating the effects of public transport fare policy change together with built and non-built environment features on ridership: The case in South East Queensland, Australia. Transport Policy, 76, pp.78-89.
[23]. Yang, L., Ao, Y., Ke, J., Lu, Y. and Liang, Y., 2021. To walk or not to walk? Examining non-linear effects of streetscape greenery on walking propensity of older adults. Journal of transport geography, 94, p.103099.
[24]. Cheng, L., Chen, X., Yang, S., Cao, Z., De Vos, J. and Witlox, F., 2019. Active travel for active ageing in China: The role of built environment. Journal of transport geography, 76, pp.142-152.
[25]. Shen, M., Lu, Y., Wei, K.H. and Cui, Q., 2020. Prediction of household electricity consumption and effectiveness of concerted intervention strategies based on occupant behaviour and personality traits. Renewable and Sustainable Energy Reviews, 127, p.109839.
[26]. Mattes, A. and Roheger, M., 2020. Nothing wrong about change: the adequate choice of the dependent variable and design in prediction of cognitive training success. BMC Medical Research Methodology, 20(1), pp.1-15.
[27]. Bidve, G.R., Anarase, M.S. and Sasane, G.K., 2021. Study Of Relationship Between Marketing Behaviour Of Pomegranate Growers And Selected Independent Variables. The Pharma Innovation Journal, pp.1875-1876.
[28]. Zeiler, M., 2022. Schedules of reinforcement: The controlling variables. In Handbook of operant behaviour (pp. 201-232). Routledge.
[29]. Stewart, A.N., Jones, L.A. and Gensel, J.C., 2022. Improving translatability of spinal cord injury research by including age as a demographic variable. Frontiers in Cellular Neuroscience, 16, p.1017153.
[30]. Adeniran, A.O., 2019. Application of Likert scale's type and Cronbach's alpha analysis in an airport perception study. Scholar Journal of Applied Sciences and Research, 2(4), pp.1-5.
[31]. Mweshi, G.K. and Sakyi, K., 2020. Application of sampling methods for the research design. Archives of Business Review–Vol, 8(11).
[32]. Mishra, S.B. and Alok, S., 2022. Handbook of research methodology.
[33]. Ahlin, E.M., 2019. Semi-structured interviews with expert practitioners: Their validity and significant contribution to translational research.
[34]. Shrestha, N., 2020. Detecting multicollinearity in regression analysis. American Journal of Applied Mathematics and Statistics, 8(2), pp.39-42.