Original Research Article

Cognitive Factors and Climate Change Mitigation Behaviour among Managers of Tourist Hotel Facilities within Naivasha Sub County, Kenya

Abstract

Climate change is now widely recognised as a major anthropogenic-induced environmental threat, with potentially severe and far-reaching consequences on both natural and cultural heritage globally. The hotel sector is an important part of the tourism value chain, which accounts for a substantial share of the sector's greenhouse gas emissions and must urgently engage in climate change mitigation actions. The cognition level of causes, consequences, and responses to climate change among managers is an important determinant of decisions made by any organisation on climate change mitigation behaviour (CCMB). There is, however, scant empirical information on the influence of cognitive factors on managers' climate change mitigation behaviour (CCMB) in the tourist accommodation establishments, which this study sought to establish. A cross sectionalsurvey with a pragmatist worldview was conducted in a stratified random sample of 70 medium to luxury-priced tourist accommodation facilities.Data was collectedfrom three managers in each sampled establishment using self-administered questionnaires. A beta regression model was used to establish the influence of cognitive factors on CCMB. The study identified two categories of CCMB: efficiency and curtailment practices. The results revealed that the surveyed managers had moderate scores on climate change efficiency actions (mean = 0.49; SD = 0.16) and curtailment actions (mean = 0.59; SD = 0.20). Further the results indicated that the three dimensions of cognition: cause, consequence and response knowledge on climate change,had a significant influence on climate change at a Log-likelihood of 67.60 on 5 df and Wald's χ^2 (3) = 43.39, ρ = 0.000) for curtailment CCMB and efficiencyCCMB practices at Log-likelihood of 88.90 on 5 df and Wald's χ^2 (3) = 18.88, ρ = 0.0003).The different dimensions of cognitive factors had divergent effects on both categories of CCMB.Cause knowledge was positively associated with both curtailment (β = 0.347, $\rho < 0.05$) and efficiency (β = 0.269, $\rho < 0.05$) CCMB. Consequence knowledge was negatively associated with curtailment (β = - 0.366, $\rho < 0.05$) but positively with efficiency (β = 0.199, $\rho < 0.05$). Response knowledge had no effects on curtailment (β = 0.092, $\rho > 0.05$) but had positive effects on efficiency (β = 0.36, $\rho < 0.05$) CCMB.Consequently, the proposition suggesting that cognitive factors do not influence CCMB is rejected.These findings indicate that policy frameworks to enhance CCMB among key decision-makers need to integrate cognition of climate change as a critical factor that can be improved through training and awareness creation efforts.

Keywords: *Climate change, Cognitive factors, Efficiency, Curtailment, Beta regression*

1.0 Introduction

Climate change is one of the most critical and contentious issues currently facing the world and which is predicted to lead to adverse and irreversible impacts on the earth and ecosystems as a whole. Broadly, climate change refers to significant long-term changes in global climate that warmthe atmosphere, ocean and land.Climate change is largely thought to be anthropogenic, that is, it results largely from human activity(The National Academy of Sciences & The Royal Society, 2020). Human activities are said to increase the amount of greenhouse gases (GHGs)such as carbon dioxide and methane in the upper atmosphere and to increased amounts of tiny particles (black carbon) in the lower atmosphere, trapping heat from the sun in this planet's atmosphere and thus keeping the earth warm.Global warming, ocean acidification andrise in the sea-level, changing weather extremes and hazards, loss of biodiversity, food and water insecurity, human health risks, economic disruption, displacement and even violent conflict are considered as major impacts of climate change (Kumar et al., 2020).Reversing the negative impacts of climate change isparamount.

Fossil fuels and related uses of coal and petroleum are the most important sources of GHGs and black carbon especially in power generation, industry, transportation and buildings.On its part, the international tourism industry which contributes 7% share of World's total exports (Rasool et al., 2021) is consideredas unique in the climate change discourse.Typically, tourism and climate change have been considered as 'a two-way street' where climate change influences tourism and tourism influences climate change. On the one hand, tourism is vulnerable to direct and indirect climate change impacts, such as water shortages, biodiversity loss, damage to assets, the decline in destination attractiveness, floods, tornados, and heat waves (de Grosbois& Fennell, 2022). On the other hand, the tourism sector contributes to around 8% of GHGs emissions, with aviation (40%), transportation (30%) and the consumption of goods and services (30%), including food and accommodation(Lenzen et al., 2018). The tourism industry needs to be made aware of the consequences of climate change and the need to set in programs to enable it to adapt and adjust its activities accordingly.

Accommodation has been identified as a resource□intensive subsector of tourism that contributes to local or global environmental problems (Haldorai et al., 2022). In the context of global environmental change and mounting vulnerability to energy and water scarcity, resource costs are increasingly relevant to the accommodation industry (Legrand et al., 2022). Due to

investment in fixed assets, this sector is particularly vulnerable to climate change. Globally, however, this sector is also a significant contributor to climate change producing 274 million tonnes of CO_2 in 2005, representing 21% of total tourism emissions. It is predicted that the accommodation sector will soon account for nearly one-quarter of tourism industry's carbon emissions because of the high growth in hotel establishment and its energy-intensive nature (UNWTO & UNEP, 2008). The World Economic Forum (2009) estimates that, even allowing for greater energy efficiencies, accommodation carbon emissions are forecast to grow at 3.2% per year, reaching 728 $MtCO_2$ by 2035 (Koçak *et al*., 2020). Based on this premise it becomes necessary for managers of tourism accommodation facilities to take action in climate change mitigation in order to reduce carbon emissions.

Managers, as the primary stakeholders of enterprises in the tourism industry, play a pivotal role in decision-making on mitigations against the negative effects of climate change (Dahlmann *et al*., 2019). Literature suggests that much of the focus on improving the sustainability of the tourism accommodation and lodging sector has been on encouraging the adoption of technologies and management systems that produce greater efficiencies (Asadi *et al*., 2020). Gössling& Lund-Durlacher (2021) further note that most corporations have limited engagement in mitigation efforts beyond water conservation, energy efficiency and waste reduction. Concerns therefore, exist about the extent to which such measures may contribute to undesirable and unintended effects unless there is also simultaneous attention paid to changes in actual consumption behaviour as well as in the adoption of technological, behavioural and policy options that also contribute to greater sustainability (Xie *et al*., 2021).

Mitigation is defined generally as making the impacts of climate change less severe by preventing or reducing the emission of GHGs into the atmosphere(Sharifi, 2020). Thus climate change mitigation behaviour (CCMB) largely relates to technological, economic and social changes and substitutions that lead to emission reductions that can be realized through either technological innovation and/or market mechanisms(Aghion et al., 2019). From an environmental-psychological point of view, a dichotomous classification scheme that constitutes of two categories of behaviour referred to as efficiency and curtailment actions are identified (Long et al., 2023).

Curtailment behaviour constitutes daily actions that are frequently repeated and are not the result of a planning process and are often only consciously controlled the first times they are

carried out. After people have internalized these actions, they are steered by habits and routines that are done without much thinking. Examples of such actions include heating and ventilation behaviour, driving styles, turning off lights when not in use and reducing shower time.

Efficiency behaviour on the other handcomprises conscious behaviour involving planning and decision making (Li *et al*., 2017). Typical measures include purchases of cars, insulation of roofs or facades, purchase of energy-efficient electric appliances, installation of solar thermal heating systems or the replacement of old windows. It is evident that for these kinds of actions, conscious and deliberate actions is a prerequisite. Those decisions are often one-off energy conservation actions that take rather a long time and are perceived as complex thus may require substantial investments and even structurally engineered alterations of buildings (Akhtar, 2017).

Literature suggests that cognition is related to CCMBin diverse ways (Bamberg & Möser, 2007;Gholamrezai et al., 2021; Hossain et al., 2022; Zeng et al., 2023). Briefly, the cognition measures the extent to which individuals know about the causes, impacts, and effective responses to climate change(Linden, 2014). Knowing about climate change is a prerequisite to reasoning about the risk of climate change. The term knowledge can be defined as information about or awareness of something, an issue, a fact or an understanding of a matter (Bolisani & Bratianu, 2018). Knowledge is also viewed to be a theoretical or practical understanding of a subject or a coherent understanding of a way accepted facts about the subject relate to each other and thus descriptively, the term knowledge implies that its content is meaningful, 'acknowledged', and veridical (Dalkir, 2017). This study builds on the limited data on the role of cognitive factors on climate change mitigation behaviours.

A common distinction separates declarative, procedural, and effectiveness environmental knowledge from each other (Kaiser and Fuhrer, 2003). Declarative knowledge revolves around the nature and causes of environmental problems while procedural knowledge relates to ecological action strategies or 'how-to' knowledge. It has been argued that broader and greater personal engagement in CCMB should depend on the knowledge about the causes and consequences of climate change and knowledge about available courses of action (Ortega-Egea et al., 2014).Literature linking cognition to CCMB(Gholamrezai et al., 2021; Hossain et al., 2022; Zeng et al., 2023) is however equivocal. A notable concern with this literature is the lack methodological rigor including inadequate adjustment for confounding variables and applying statistical models that are not appropriate for the data at hand. In particular, existing literature

tends to apply statistical models that require strict assumptions of normality such as ordinary least squares. Assuming that perceptual CCMB data is normally distributed is inherently inappropriate since individuals differ in their knowledge and skills.

Beta regression is emerging as a novel approach to model relationship in data that is heteroskedastic and bounded (Cribari-Neto & Zeileis, 2010). A refined understanding on knowledge about climate change based on sound analytical methods would be important to help target interventions for individuals in order to improve CCMB. This is particularly crucial in developing countries like Kenya which are at an increased risk of the adverse effects of climate change. Studies applying novel approaches to measure CCMB and its associated factors are scant, limiting our understanding and consequently choice of appropriate interventions. The aim of this study was therefore to examine the relationship between cognition and CCMB among managers of tourist accommodation facilities in Naivasha Sub-County in Kenya using a Beta regression model. The study was guided by the hypothesis;

Ho_1: There is no significant influence of cognitive factors on climate change mitigation behaviours among managers of the tourists' accommodation facilities.

2.0 Methodsand Materials

This study adopted a cross sectional survey research design. This study was primarily concerned with describing, recording and interpreting cognitive factors as correlates of CCMB among managers of the tourist accommodation facilities in Naivasha sub-county in Kenya. This study adopted a pragmatism approach with a preposition that knowledge and reality are based on socially constructed beliefs and habits.

The target population constituted of 85 medium to luxury priced tourist accommodation facilities in Naivasha.Three groups of the hotels were identified based on the amount of licence fee paid as the stratification criteria as follows: category A (Ksh 75,000-100,000), category B (Ksh 50,000-70,000) and category C (Ksh 25,000-35,000).

A two-stage cluster samplingprocedure was utilized since a list of eligible tourist accommodation facilities was not readily available.This procedure involved the random selection of tourist accommodation facilities in based on their licence groupings.At the first stage, a stratified sample of PSUs was selected with probability proportional to size (PPS) in each stratum (that is category of tourist accommodation facilities). In the selected PSU's, a listing procedure was performed such that alltourist accommodation facilitieswere identified. The

resultant list had a total number of 85 facilities that pay annual licensing fees of between Kshs 25000 and 100000 of which 13 were in category A, 20 in category B and 52 in C. Using formula provided by Krejcie and Morgan (1970) a minimum of 70 facilities were identified as appropriate which were then subdivided as 11 in cluster A, 16 in clusterB and 43 in cluster C using the PPS approach.

At the second stage, managers were selected by using simple random sampling.The selected facilities were then contacted and asked to provide some basic information about the number of individuals in management positions. This exercise indicated that the typical number of managers in any given tourist accommodation facility was on averagethree which translated to a sample of 210 managers in the 70 facilities in the target area.

2.1 Study Instruments

The study used primary sources to generate quantitative data using a structured self-administered questionnaire.Data was obtained through the use of a set of closed ended questions to solicit for managers' and socio-demographic characteristics,knowledge about climate changeissues and their CCMB.This study measured the frequency of application of various CCMB recommended by the United Nations World Tourism Organization-Environment Programme (UNWTO-UNEP) for accommodation establishments to mitigate climate change (Su et al., 2013, World Tourism Organisation & United Nations Environment Programme, 2008). A total of 24 CCMB items were measured using a five point likert scale ranging from 1 = Never to 5 = Always.

The hotel managers' cognitive characteristics were collected using a Managers' Cognitive Questions (MCQ) instrument. This instrument comprised a set of questions that sought to establish the managers' knowledge on the causes, consequences and responses to climate changeusing five point likert scales. Additional data on the characteristics of the tourist accommodation facility including year of establishment,type and ownership of facility,number of roomsand star rating was also collected.

2.2 Data Management and Analysis

Data from the questionnaires was cleaned, counter-checked for accuracy entered into a computer while missing and spurious data were imputed automatically. Exploratory data analyses were conducted to verify whether the data violates the assumptions of a normal

distribution. Numerical data were summarised using means (± SD), median and the 25^{th} and 75^{th} percentiles. On the other hand, categorical data was presented using frequencies and percentages. The data was further presented using graphs such as histograms, line graphs and tables. The individual CCMB and cognitive characteristics scores that were in nature of the likert scale were not be interpreted in their raw form but were converted to Percentage of Maximum Possible (POMP) scores. This involved taking the raw score and subtracting the minimum score and then dividing the result by the possible scoring range.

Factor analyses using Principal component Analysis (PCA) were applied in order to isolate the major dimensions of CCMB. Items with either poor loading scores or cross-loadings were removed. The Kaiser rule of retaining only factors with Eigen values greater than one was used. The specific items in each of the identified dimensions of CCMB were aggregated for every respondent. These identified dimensions of the outcome were subsequently used in all other analyses in the study. The Cronbach's alphas (α) of the emergent scales were also computed.

A correlation analysis was initially conducted in order to examine the relationship between the different dimensions of CCMB and cognitive factors. This exercise also helped to identify if multicolinearity was an issue of concern with the measured variables. A beta regression model that is commonly used by practitioners to model outcome variables that assume values in the standard unit interval (0, 1) was then employed to establish whether cognitive factors were significant correlates of CCMB.This model is based on the assumption that the dependent variable is beta-distributed and that its mean is related to a set of regressors through a linear predictor with unknown coefficients and a link function (Cribari-Neto & Zeileis, 2010). The choice of this model was informed by the fact that it naturally incorporates commonly observed features such as heteroskedasticity or skewness which is usually notable in data taking values in the standard unit interval, for instance, proportions as was the case with CCMB in the current study. To help the interpretation of observed coefficients in this model, the marginal effects of the role of the cognitive correlates of CCMB were also calculated with the help of both Stata version 11 software and the betareg package in the R computing environment Version 4.2.2. The ρ value was set at the conventional level of 0.05.

3.0 Results and key findings

A total of 182 managers responded to the survey tool out of the target sample size of 210 managers. This translated to a response rate of 86.67% which was deemed sufficient for analysis and generalization.

3.1 The Profile of the accommodation faculties Managers

The surveyed managers were not evenly-balanced in terms of sex, age, education attainment and job characteristics (Table 1). There was greater participation of males (70%), middle-aged (between 30 and 49 years at 93%) and moderately educated individuals (that is, diploma holders at 43%). Further, a majority of the respondents (37%) reported that they had 5-9 years' work experience. In addition, most of the respondents described their job title as head of department (41%). It is important to point out that 68% of the respondents indicated that they were not members of any environmental group.

Table 1: Demographic Profile of Respondents

	Frequency (n = 182)	Proportion (%)	SE	(95% CI)	
Gender					
Female	55	0.30	0.03	0.23	0.37
Male	127	0.70	0.03	0.63	0.77
Age					
Below 29 years	5	0.03	0.01	0.00	0.05
30-39 years	94	0.52	0.04	0.44	0.59
40-49 years	74	0.41	0.04	0.34	0.48
Above 50 years	9	0.05	0.02	0.02	0.08
Educational Attainment					
Secondary	30	0.16	0.03	0.11	0.22
Certificate	5	0.03	0.01	0.00	0.05
Diploma	78	0.43	0.04	0.36	0.50
Degree	67	0.37	0.04	0.30	0.44
Post Graduate	2	0.01	0.01	0.00	0.03
Work Experience					
Below 4 years	14	0.08	0.02	0.04	0.12
5-9 years	67	0.37	0.04	0.30	0.44
10-14 years	43	0.24	0.03	0.17	0.30
Above 15 years	58	0.32	0.03	0.25	0.39
Job Title					
General Manager	45	0.25	0.03	0.18	0.31
Head of Department	74	0.41	0.04	0.33	0.48
Head of Section	63	0.35	0.04	0.28	0.42
Member of Environmental Group					
No	124	0.68	0.03	0.61	0.75
Yes	58	0.32	0.03	0.25	0.39

3.2 Climate Change Mitigation Behaviour

Thedependentvariable containedquestionsonCCMB based on the frequency of applicationof variouspracticesrecommendedby theprescribedbyUnitedNationsWorldTourism Organization-EnvironmentProgramme(UNWTO-UNEP) for accommodation establishments to mitigate climatechange (World Tourism Organization & UNEP, 2008). Factor analyses were deemed appropriate in order to examine the dimensions of the ofthe 24 climate change mitigation items that were utilized in this study. Additional analyses indicated that the 24 items were amenable to factor analysis using several methods that are advocated in the literature (Gorsuch, 2015).

Principal components analysis (PCA) was used because the primary purpose was to identify and compute composite scores for the factors underlying the short version of the CCMB. Initial eigen values indicated that the first two factors explained 19%, and 16% of the variance respectively with each of the other factors explaining below 6% of the variance.The two factor solution, which explained 49% of the variance, was preferred because of: (a) its previous theoretical support; (b) the 'levelling off' of Eigen values on the scree-plot after two factors; and (c) the insufficient number of primary loadings and difficulty of interpreting the third factor and subsequent factors. There was little difference between the two factor varimax and oblimin solutions, thus both solutions were examined in subsequent analyses before deciding to use an oblimin rotation for the final solution.

The Cronbach's alphas of both dimensions were acceptable: 0.68 for efficiency and 0.63 for curtailment CCMB. Composite scores were created for each of the two factors. Higher scores indicate a greater use of the given mitigation practice. Although an oblimin rotation was used, a strong positive correlation existed between the two dimensions of CCMB ($r = 0.64$, $p < 0.05$). Overall, these analyses indicated that two factors were underlying responses to the CCMB items and that each of the two factors was moderately internally consistent.

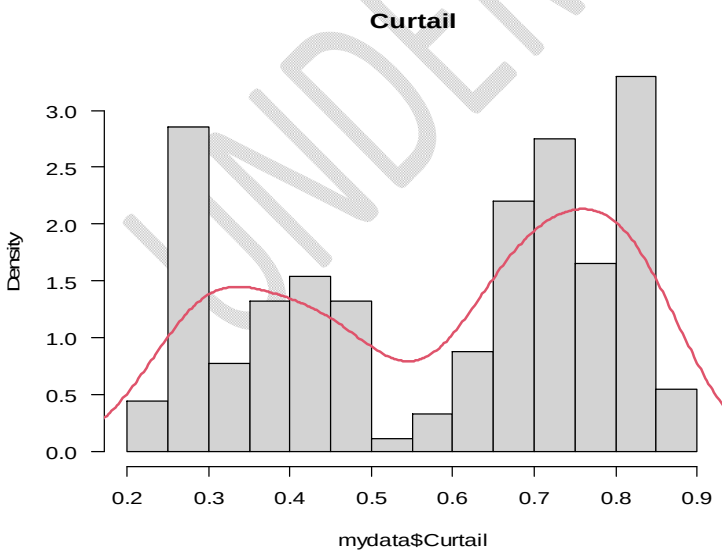
Descriptive statistics for both dimensions of CCMB are presented in Table 2. The skewness and kurtosis were not within a tolerable range for assuming a normal distribution and examination of the histograms suggested that the distributions were not approximately normal. Mitigation curtailment behaviour had a mean of 0.59 (SD = 0.20) but negatively skewed. Efficiency behaviour had a mean of 0.49 (SD = 0.16) with a positive skew. A One-sample Kolmogorov-Smirnov (K-S) test was used to check the normality of the data since the sample

size was greater than 50. The K-S should have a high value (Maximum = 1.0) when the fit is good and a low value (Minimum = 0.0) when the fit is not good. The null hypothesis for K-S test is that the data is normal, and if the p-value of the test is less than 0.05, then the null hypothesis is rejected at 5% significance. A normal distribution was not evident for the composite score data in the current study that was bounded, thus the data were well suited for beta regression analyses.

Table 2: Descriptive Statistics of the Two Dimensions of CCMB

Type of CCMB	Mean	Median (25^{th}-75^{th} Percentile)	Skewness	Kurtosis	K-S Score
Efficiency	0.49 (0.16)	0.46 (0.36-0.79)	0.43	2.17	D = 0.15, p < 0.05
Curtailment	0.59 (0.20)	0.66 (0.23-0.86)	-0.29	1.59	D = 0.16, p < 0.05

A visual presentation of the curtailment and efficiency CCMB data is offered in Figure 1. Curtailment CCMB appears to be amultimodal distribution. Additional inspection of the histogram shows that Efficiency CCMB was positively skewed. The results offered here are suggestive that further statistical analyses that require data to be normally distributed are not applicable with the reported data.



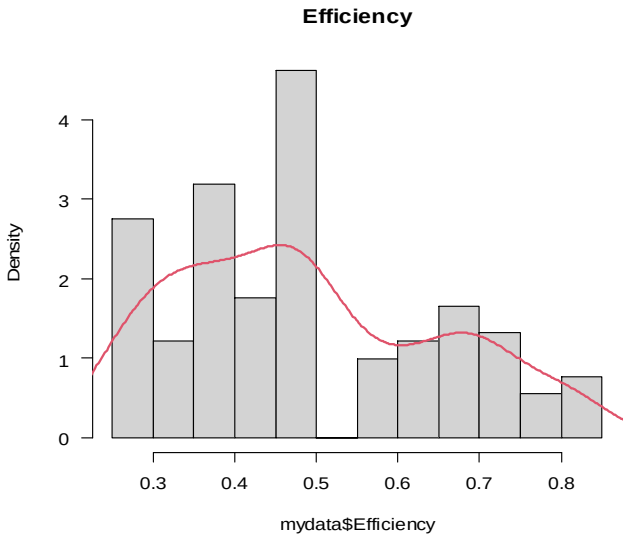


Figure 1: Distribution ofCCMB Scores (Left Curtailment Behaviour, Right Efficiency Behaviours)

3.3 The Role of Cognitive Factors on CCMB

The three dimensions of cognitive factors namely cause, consequences and response knowledge that have been described previously in climate change literature were considered. Reliable scales were obtained for cause knowledge ($\alpha = 0.69$), consequence knowledge($\alpha = 0.69$) and response knowledge ($\alpha = 0.73$) to climate change.

Table 3: Descriptive Statistics of Cognitive factors

Type of Knowledge			Percentiles			Range	
	Mean	SD	25th	50th	75th	Minimum	Maximum
Cause	0.41	0.14	0.31	0.47	0.53	0.19	0.56
Consequence	0.71	0.15	0.66	0.73	0.77	0.41	0.93
Response	0.75	0.15	0.66	0.73	0.84	0.52	0.98

All the surveyed managers had low levels of knowledge on the causes of climate change with a mean of 0.41 (± 0.14). Other pertinent descriptive statistics of the level of knowledge on causes of climate change are presented in Table (4).

Due to the non-normal character of the data, a beta regression model was used to establish the influence of cognitive factors on both dimensions of CCMB. Two models were run, one for curtailment CCMB and the other for efficiency CCMB.The utilized models were statistically informative with satisfactory log likelihood ratios and Wald test statistics(Table 5).The different dimensions of cognitive factors had divergent marginal effects on both categories of CCMB.Cause knowledge was positively associated with both curtailment ($\beta = 0.347$, $\rho < 0.05$) and efficiency ($\beta = 0.269$, $\rho < 0.05$) CCMB. Consequence knowledge was negatively associated with curtailment ($\beta = -0.366$, $\rho < 0.05$) but positively with efficiency ($\beta = 0.199$, $\rho < 0.05$). Response knowledge had no effects on curtailment ($\beta = 0.092$, $\rho > 0.05$) but had positive effects on efficiency ($\beta = 0.36$, $\rho < 0.05$) CCMB.

Table 5:The Role of Cognitive Factors on CCMB

Dimension of Cognition	Curtailment CCMB		Efficiency CCMB	
	Coefficients (SE)	Marginal Effects (SE)	Coefficient (SE)	Marginal Effects (SE)
Cause	1.472*** (-0.465)	0.347*** (-0.108)	1.087*** (-0.388)	0.269*** (-0.095)
Consequence	-1.555*** (-0.417)	-0.366*** (-0.096)	0.804** (-0.358)	0.199** (-0.088)
Response	0.392 (-0.403)	0.092 (-0.095)	1.455*** (-0.348)	0.360*** (-0.085)
Constant	0.554 (-0.62)		-2.138*** (-0.536)	
Pseudo R^2		0.2		0.1
Log Likelihood	67.60 (5df)		88.90 (5df)	
Wald chi^2 (3)	43.39, ρ value = 0.000		18.88, ρ value = 0.0003	

4.0 Discussions

This study provides important and previously unreported estimates of CCMB among managers of tourist accommodation facilities in Naivasha Sub-County in Kenya using recommended indicators. The study identified that efficiency and curtailment behaviours were two categories of CCMB practiced by the surveyed managers. This finding is consistent with some literature(Long et al., 2023; Matsumoto & Sugeta, 2022)but differs with another literature stream which shows that CCMB consists of many other dimensions(Gillis, 2016; Hamann, 2022; Melo et al., 2018).Variations in the findings may partly be due to differences in studied populations. It is more probable that the variation in findings may also be due to the type of measured indicators. The plethora of CCMB measures impedes cumulative science since incomparable measures have been used in different studies. Linking among different measures and consensus on standard CCMB measurement should now be prioritized. In addition, enabling widespread access to common measures is necessary to accelerate future progress.

The surveyed managers had moderate scores on climate change efficiency actions and curtailment actions which is inconsistent with the magnitude of the threat of climate change. Comparing this finding to existing literature is not easy since incomparable CCMB measures have been used in different studies. The limited sources of climate change information may explain the unsatisfactory levels of knowledge among the surveyed managers. This study set

itself apart by the use of recommended indicators of CCMB in the tourist accommodation sector. The challenge now is on identifying appropriate interventions that can enhance CCMB in tourist accommodation facilities.

The different dimensions of cognitive factors had divergent associations with both categories of CCMB.Cause knowledge was positively associated with both curtailment and efficiency CCMB. Consequence knowledge was negatively associated with curtailmentbut positively with efficiency. Response knowledge had no statistical associations with curtailment but had positive relationships with efficiency CCMB.The findings of this study is are in line with findings inLinden(2014) and Sundblad et al., (2009).The results are however at variance with some studies that report no significant relationship between knowledge and CCMB (Rousell & Cutter-Mackenzie-Knowles, 2020, Frantzeskaki et al., 2019) and others that found that knowledge is negatively associated with climate change mitigation behaviours (Bergquist et al., 2022; Xie et al., 2019). Other studies (Hornsey & Fielding, 2020) provide mixed evidence, suggesting that increased knowledge about climate change only leads to higher concern and actions by some groups (such as the most educated) but not for others (for example, those with lesser educational attainment). This confusion has been explained partially as a result of the use of different classifications and measurements of the concept of cognition in different studies (Linden, 2014). Standardizing the measurement of cognition is therefore paramount.

This study established that age, sex and educational attainment are also important correlates of CCMB in addition to cognition. This is consistent with some literature (Ortega-Egea et al., 2014; Linden, 2014; Xiao & McCright, 2007)but not with others(Bamberg & Möser, 2007provide a compelling review). The differences in opinion in existing literature are largely attributable to metrological properties (accuracy, validity and reproducibility) of utilized research tools. A key observation in this study is that socio-demographic variables may be representations for personal competencies, that is, the knowledge, skills and attitude necessary for actualize some given behavior. Thus, demographic variables like age, sex and education should be related to CCMB largelydepending on personal capabilities.

Overall,current studies on ecological issues use statistical methods that have strict statistical assumptions of normality of data. The use of a single measure of CCMB as opposed to the multidimensional nature of the concept is a further issue that may raise controversial

results.The use of better analytical methods especially beta regression in the present study provide support for the proposition that cognition is an important correlate CCMB.

5.0 Conclusion

CCMB consists of two interrelated dimensions namely curtailment and efficiency behaviours. Curtailment behaviors are repetitive efforts that reduce consumption (such as turning off a light switch). Efficiency behaviors are one-time choices that involve the adoption of an efficient technology (for instance planting of trees and native plants in the hotel gardens). The surveyed managers did not demonstrate satisfactory levels of either dimensions of CCMB. Accordingly, an intense shift is needed in the behaviors of these managers' from limited action levels toward broader and greater levels of behavioural engagement in order to mitigate against the negative effects of climate change.

The various dimensions of cognition are diversely and significantly associated with both dimensions of CCMB.This study extends the discourse on the cognitive psychology of climate change by using data from a developing country and using the beta regression model as an emerging potent statistical framework. The reported findings indicate areas where action is required. Managers need to update their knowledge on the causes, effects and responses to climate change in order to alter their behaviours accordingly.Moreover, educators and communicators need to acknowledge that a single intervention that is suitable for every purpose and every person is inappropriate to enhance CCMB. Additionally, policy initiatives on climate change need to integrate cognition in their pronouncements.

References

Aghion, P., Hepburn, C., Teytelboym, A., & Zenghelis, D. (2019). Path dependence, innovation and the economics of climate change. *Handbook on Green Growth*, 67–83.

Akhtar, N. (2017). *Assessing Determinants of Consumers' Energy Conservation Behavior in Pakistan* [[PhD Thesis].]. Department of Mechanical Engineering, Capital University of Science and Technology.

Asadi, S., Pourhashemi, S. O., Nilashi, M., Abdullah, R., Samad, S., Yadegaridehkordi, E., Aljojo, N., & Razali, N. S. (2020). Investigating influence of green innovation on sustainability performance: A case on Malaysian hotel industry. *Journal of Cleaner Production*, *258*, 120860.

Bamberg, S., & Möser, G. (2007). Twenty years after Hines, Hungerford, and Tomera: A new meta-analysis of psycho-social determinants of pro-environmental behaviour. *Journal of Environmental Psychology*, *27*(1), 14–25.

Bergquist, M., Nilsson, A., Harring, N., & Jagers, S. C. (2022). Meta-analyses of fifteen determinants of public opinion about climate change taxes and laws. *Nature Climate Change*, *12*(3), 235–240.

Bolisani, E., & Bratianu, C. (2018). The Elusive Definition of Knowledge. In E. Bolisani & C. Bratianu (Eds.), *Emergent Knowledge Strategies: Strategic Thinking in Knowledge Management* (pp. 1–22). Springer International Publishing. https://doi.org/10.1007/978-3-319-60657-6_1

Cribari-Neto, F., & Zeileis, A. (2010). Beta Regression in *R*. *Journal of Statistical Software*, *34*(2). https://doi.org/10.18637/jss.v034.i02

Dahlmann, F., Branicki, L., & Brammer, S. (2019). Managing carbon aspirations: The influence of corporate climate change targets on environmental performance. *Journal of Business Ethics*, *158*, 1–24.

Dalkir, K. (2017). *Knowledge management in theory and practice*. MIT press.

Frantzeskaki, N., McPhearson, T., Collier, M. J., Kendal, D., Bulkeley, H., Dumitru, A., Walsh, C., Noble, K., Van Wyk, E., & Ordóñez, C. (2019). Nature-based solutions for urban climate change adaptation: Linking science, policy, and practice communities for evidence-based decision-making. *BioScience*, *69*(6), 455–466.

Gholamrezai, S., Aliabadi, V., & Ataei, P. (2021). Understanding the pro-environmental behavior among green poultry farmers: Application of behavioral theories. *Environment, Development and Sustainability*, 1–19.

Gillis, A. J. (2016). *Categorizing Pro-environmental Behaviors Using the Laypeople's Perspective*. https://digitalcommons.unf.edu/etd/641

Gorsuch, R. L. (2015). *Factor analysis* (Classic edition). Routledge, Taylor & Francis Group.

Haldorai, K., Kim, W. G., & Garcia, R. F. (2022). Top management green commitment and green intellectual capital as enablers of hotel environmental performance: The mediating role of green human resource management. *Tourism Management*, *88*, 104431.

Hamann, K. (2022). *Psychological Empowerment in the Context of Environmental Protection—How Can Personal, Collective, and Participative Efficacy Beliefs Foster Pro-environmental Behavior and Activism?*

Hornsey, M. J., & Fielding, K. S. (2020). Understanding (and reducing) inaction on climate change. *Social Issues and Policy Review, 14*(1), 3–35.

Hossain, I., Nekmahmud, M., & Fekete-Farkas, M. (2022). How do environmental knowledge, eco-label knowledge, and green trust impact consumers' pro-environmental behaviour for energy-efficient household appliances? *Sustainability, 14*(11), 6513.

Koçak, E., Ulucak, R., & Ulucak, Z. Ş. (2020). The impact of tourism developments on CO2 emissions: An advanced panel data estimation. *Tourism Management Perspectives, 33*, 100611.

Legrand, W., Chen, J. S., & Laeis, G. C. (2022). *Sustainability in the hospitality industry: Principles of sustainable operations*. Taylor & Francis.

Lenzen, M., Sun, Y.-Y., Faturay, F., Ting, Y.-P., Geschke, A., & Malik, A. (2018). The carbon footprint of global tourism. *Nature Climate Change*, *8*(6), 522–528.

Li, G., Liu, W., Wang, Z., & Liu, M. (2017). An empirical examination of energy consumption, behavioral intention, and situational factors: Evidence from Beijing. *Annals of Operations Research*, *255*(1–2), 507–524.

Linden, S. (2014). *The social-psychological determinants of climate change risk perceptions, intentions and behaviours: A national study* [[PhD Thesis].]. The London School of Economics and Political Science (LSE.

Long, R., Wang, J., Chen, H., Li, Q., Wu, M., & Tan-Soo, J. S. (2023). Applying multilevel structural equation modeling to energy-saving behavior: The interaction of individual-and city-level factors. *Energy Policy*, *174*, 113423.

Matsumoto, S., & Sugeta, H. (2022). Efficiency Investment and Curtailment Action. *Environmental and Resource Economics*, *83*(3), 759–789. https://doi.org/10.1007/s10640-022-00709-7

Melo, P. C., Ge, J., Craig, T., Brewer, M. J., & Thronicker, I. (2018). Does work-life balance affect pro-environmental behaviour? Evidence for the UK using longitudinal microdata. *Ecological Economics, 145*, 170–181.

Ortega-Egea, J. M., García-de-Frutos, N., & Antolín-López, R. (2014). Why Do Some People Do "More" to Mitigate Climate Change than Others? Exploring Heterogeneity in Psycho-Social Associations. *PLoS ONE*, *9*(9), 106645. https://doi.org/10.1371/journal.pone.0106645

Rasool, H., Maqbool, S., & Tarique, Md. (2021). The relationship between tourism and economic growth among BRICS countries: A panel cointegration analysis. *Future Business Journal*, *7*(1), 1. https://doi.org/10.1186/s43093-020-00048-3

Rousell, D., & Cutter-Mackenzie-Knowles, A. (2020). A systematic review of climate change education: Giving children and young people a 'voice'and a 'hand'in redressing climate change. *Children's Geographies*, *18*(2), 191–208.

Sharifi, A. (2020). Trade-offs and conflicts between urban climate change mitigation and adaptation measures: A literature review. *Journal of Cleaner Production*, *276*, 122813.

Su, Y. P., Hall, C. M., & Ozanne, L. (2013). Hospitality Industry Responses to Climate Change: A Benchmark Study of Taiwanese Tourist Hotels. *Asia Pacific Journal of Tourism Research*, *18*(1–2), 92–107. https://doi.org/10.1080/10941665.2012.688513

Sundblad, E. L., Biel, A., & Gärling, T. (2009). Knowledge and confidence in knowledge about climate change among experts, journalists, politicians, and laypersons. *Environment and Behavior*, *41*(2), 281–302.

The National Academy of Sciences & The Royal Society. (2020). *Climate Change: Evidence and Causes: Update 2020* (p. 25733). National Academies Press. https://doi.org/10.17226/25733

World Tourism Organisation, & United Nations Environment Programme. (2008). *Climate Change and Tourism: Responding to Global Challenges*. https://wedocs.unep.org/xmlui/handle/20.500.11822/25945

World Tourism Organization & UNEP (Eds.). (2008). *Climate change and tourism: Responding to global challenges*. World Tourism Organization.

Xiao, C., & McCright, A. (2007). Environmental concern and socio-demographic variables: A case study of statistical models. *J Environ Educ*, *38*, 3–13. https://doi.org/10.3200/JOEE.38.1.3-14

Xie, B., Brewer, M. B., Hayes, B. K., McDonald, R. I., & Newell, B. R. (2019). Predicting climate change risk perception and willingness to act. *Journal of Environmental Psychology*, *65*, 101331.

Xie, Z., Wu, R., & Wang, S. (2021). How technological progress affects the carbon emission efficiency? Evidence from national panel quantile regression. *Journal of Cleaner Production*, *307*, 127133.

Zeng, Z., Zhong, W., & Naz, S. (2023). Can Environmental Knowledge and Risk Perception Make a Difference? The Role of Environmental Concern and Pro-Environmental Behavior in Fostering Sustainable Consumption Behavior. *Sustainability*, *15*(6), 4791.