Bulletin de la Recherche Agronomique du Bénin (BRAB) *Mars 2023 - Volume 33 - Numéro 02*
BRAB en ligne (on line) sur le site web http://www.inrab.org
ISSN imprimé (print ISSN) : 1025-2355 et ISSN électronique (on line ISSN) : 1840-7099

Drivers of local communities' behaviour toward biodiversity conservation around ecotouristical sites in North-Western Bénin: Implications for ecotourism sustainability

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Abstract

Understanding the determinants of local communities' behaviour toward biodiversity conservation in touristic areas is important for ecotourism sustainability especially in the global context of rapid population growth and climate change. In the study, an expanded form of the theory of planned behaviour (TPB) was developed to investigate the drivers of local communities' behaviour toward the conservation of biodiversity around the touristic waterfalls of the Atacora region in North-Western Bénin. We randomly surveyed 300 households in the main localities (Kota, Tanongou, Tanguiéta, and Boukoumbé) surrounding the waterfalls. The data collected included sociodemographic characteristics of the respondents (gender, age, ethnicity, level of education or literacy), their perception of biodiversity status (PBS) around the waterfalls, attitude toward natural resources conservation (ACRN), social norms (SN), perceived behavioural control (PBC), intention toward conservation (IC) and behaviour toward conservation (BC). A structural equation model was performed to test the direct and indirect relationships between IC, BC and their predictors. Results show that ACRN, SN and PBC had a positive direct effect (β= 0.19 to 1.16; p=0.000 to 0.008) on IC and explained 72% of households' intention to conserve the waterfall's natural resources. IC was positively correlated with BC (β= 1.16, p=0.000) and explained 53% of households' behaviour. However, PBS had a negative direct effect on ACRN, SN, and PBC (β= -0.27 to -0.13; p=0.000), and a negative indirect effect on IC (β =-0.18 to -0.30; p=0.006 to 0.025) due to an exclusive governance system. Our results suggest the development of a management policy that effectively includes local population and promote fair distribution of ecotourism benefits. This is important to motivate and commit local communities to develop positive conservation behaviours of natural resources.

Keywords: Touristic environment, protection, diversity, beliefs, attitude.

Moteurs du comportement des communautés locales vis-à-vis de la conservation de la biodiversité autour des sites écotouristiques au nord-ouest du Bénin : implications pour la durabilité de l'écotourisme

Résumé

Comprendre les déterminants du comportement des communautés locales vis-à-vis de la conservation de la biodiversité dans les zones touristiques est important pour la durabilité de l'écotourisme, en particulier dans le contexte mondial de la croissance rapide de la population et du changement climatique. Dans l'étude une forme élargie de la théorie du comportement planifié (TPB) a été développée afin d'analyser les moteurs du comportement des communautés locales vis-à-vis de la conservation de la biodiversité autour des chutes d'eau touristiques de la région de l'Atacora au Bénin. Ainsi, 300 ménages ont été interrogés au hasard dans les principales localités (Kota, Tanongou, Tanguiéta et Boukoumbé) entourant les chutes d'eau. Les données recueillies comprenaient les caractéristiques sociodémographiques des personnes interrogées (sexe, âge, origine ethnique et niveau d'éducation ou d'alphabétisation), leur perception de l'état de la biodiversité (PBS) autour des chutes d'eau, l'attitude envers la conservation des ressources naturelles (ACRN), les normes sociales (SN), le contrôle comportemental perçu (PBC), l'intention envers la conservation (IC) et le comportement envers la conservation (BC). Un modèle d'équation structurelle a été réalisé pour tester les relations directes et indirectes entre l'IC, le BC et leurs prédicteurs. Les résultats ont montré que l'ACRN, le SN et le PBC ont eu un effet direct positif (β= 0,19 à 1,16 ; p=0,000 à 0,008) sur le CI et ont

ISSN imprimé (print ISSN) : 1025-2355 et ISSN électronique (on line ISSN) : 1840-7099

expliqué 72 % de l'intention des ménages de conserver les ressources naturelles des chutes d'eau. Le CI a été positivement corrélé avec la CB (β= 1,16, p=0,000) et a expliqué 53 % du comportement des ménages. Cependant, le PBS a eu un effet direct négatif sur ACRN, SN et PBC (β= -0,27 à -0,13 ; p=0,000) et un effet indirect négatif sur IC (β =-0,18 à -0,30 ; p=0,006 à 0,025) en raison d'un système de gouvernance exclusif. Nos résultats suggèrent le développement d'une politique de gestion qui inclut effectivement la population locale et promeut une distribution équitable des bénéfices de l'écotourisme. Ceci est important afin de motiver et d'engager les communautés locales à développer des comportements positifs de conservation des ressources naturelles.

Mots clés : Environnement touristique, conservation, diversité, croyances, comportement.

Introduction

Developing sustainable alternatives activities in the global context of climate change and biodiversity erosion is a central goal in conservation biology. This is important to reverse the negative environmental impacts of human activities, especially agriculture that has long been quoted as the main driver of ecosystems filtering (Singer, 2015; Teyssèdre, 2004). Ecotourism development is one of the Millennium Development Goals (Leroux, 2010) recognized as an alternative to substitute for environmental filtering activities. Ecotourism is defined as the practice of travelling to discover natural landscapes which are less disturbed. The purpose behind ecotourism is to enjoy natural systems, gain knowledge about wildlife, and enjoy local cultures while preserving the environment (Lee, 2019). Ecotourism is considered as a realistic way to conciliate biodiversity conservation and socio-economic development, especially in developing countries (TIES, 2017; Word Bank, 2003). Ecotourism goal perfectly matches with the fundamental concept of «sustainable development and conservation» which is the research focus of conservationists seeking to conciliate conservation and economic development (Simon, 2006 ; Leroux, 2010). Ecotourism accounts for about 10% of global GDP and nearly 9% of jobs creation (UNWTO, 2014).

In Africa, ecotourism is an emerging activity although African countries have a wide range of attractive touristic resources (UICN, 2010). The Republic of Benin is one of these cases in West Africa that has an important variety of natural ecosystems that can stimulate local development if they were sustainably managed. The touristic resources of the country are in majority located in the Northern part especially in the Atacora region which is a landscape of mountainous chains suitable for tourism. This region is the most popular touristic area of Benin due to the presence of the Pendjari Biosphere Reserve, one of the largest in West Africa (Wa Bénin, 2014). One also meets some fascinating touristic sites such as the *tata house* recognized as a unique cultural and architectural legacy and some fabulous waterfalls that captivate tourist's attention (Sopkon *et al*., 2018). Those are examples of touristic potential that can be promoted to reduce local population vulnerability to deforestation, land degradation and climate change (PANA, 2008). Developing ecotourism is not only an alternative to biodiversity conservation (Gössling, 1999; Sopkon *et al*., 2018; Tisdell and Tisdell, 2001; Wunder, 2000), but also an important source of income to local communities that heavily depend on agriculture (Vaughan, 2000; Word Bank, 2003). However, the sustainability of ecotourism depends on some key factors such as the uniqueness of the ecosystems, the local community's relationship with their culture and ecosystems (Hadach and Tebbaa, 2015). It also requires an effective involvement of local communities in the governance system (Kia, 2021; Roussel, 2005), good organization, and capacity building of all actors (Vu *et al*., 2020). Integrating these factors can stimulate local communities to adopt positive behaviours toward their environment. Understanding the drivers of local communities' behaviour toward biodiversity in a touristic region can help to define sustainable ecotourism policies. Theoretically, behavioural intention is the first direct predictor of behaviour according to the Theory of Planned Behaviour (Ajzen, 1991). This theory predicts a positive correlation between intention and behaviour and assumes that intention is positively correlated with attitude, social norms, and perceived behavioural control. The Theory of Planned Behaviour is an advanced form of the Theory of Reason Action (Ajzen, 1991, 1985; Ajzen and Madden, 1986) and is still one of the most widely used theoretical models in social science to predict individual's intention and behaviour (Collins and Carey, 2007; Fielding *et al*., 2008; Norman et *al*., 2007). However, in many cases, the original model of this theory fails to explain the full variance in intention and behaviour and for this limitation (Armitage and Conner, 2001), scientists usually recommend to extend the theory by adding other predictor variables. In this study, we expanded the original model of the theory by integrating as a new predictor, communities' perception about biodiversity conservation status around their waterfalls. We added this variable based on the assumption that a negative perception by communities is the expression of their low involvement in ecotourism governance policies which negatively affects their intention toward the waterfalls preservation.

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Using a structural equation model, we tested the general hypothesis that local communities' awareness of biodiversity decline positively shift their attitude and beliefs (normative and control) toward the sustainability of ecotourism environment. Specifically, we tested the following research hypotheses (i) local communities' intention is positively correlated with their behaviour toward biodiversity conservation; (ii) attitude toward natural, social/normative beliefs, and perceived behavioural control are all positively correlated with intention (iii) a positive perception about biodiversity decline around the waterfalls induces a positive attitude and control beliefs.

Study environment

The study was carried out in North-Western Bénin. Precisely, our survey covered the main localities around Atacora waterfalls (Figure 1) including the centre of Tanguiéta Municipality and three villages (Kota-monnongou located in Natitingou, Koussoukoingou located in Boukoumbé and Tanongou located in Tanguiéta).

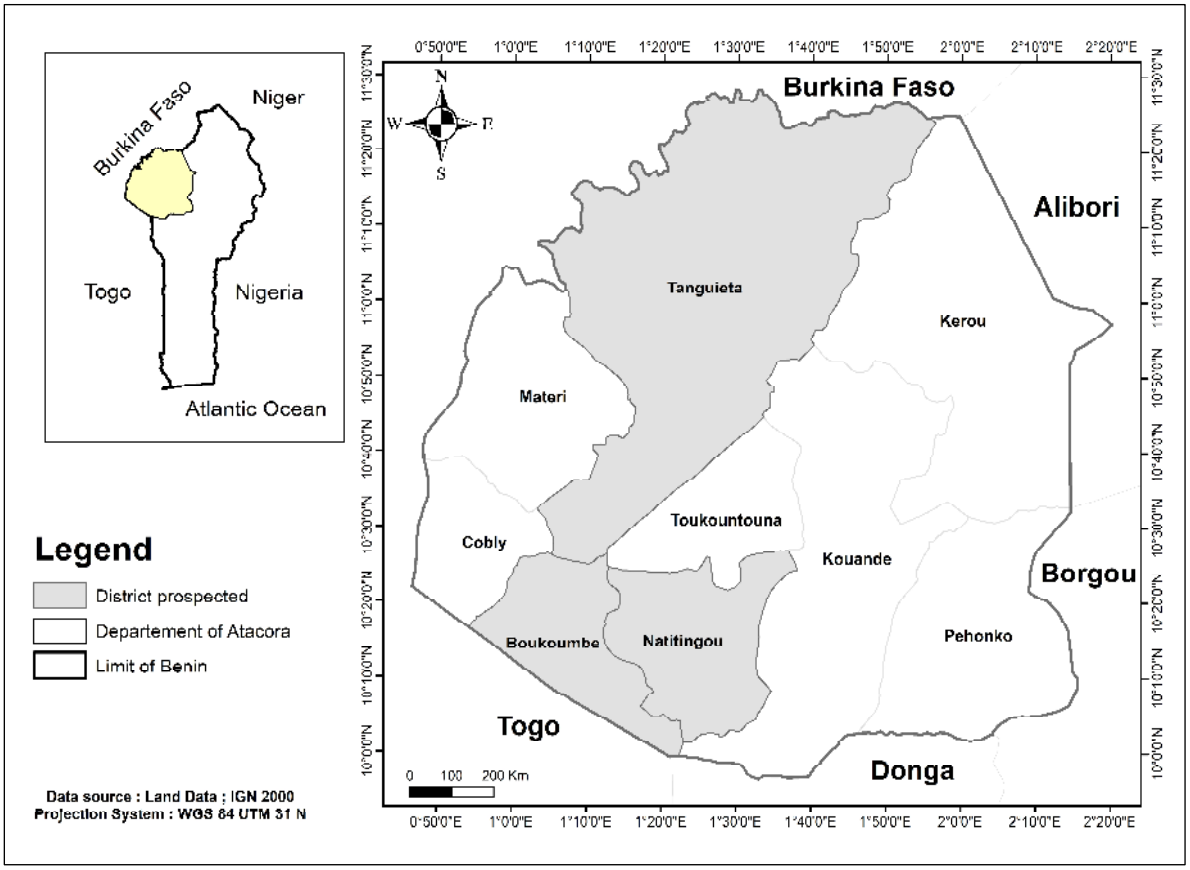

Figure 1. The map of the main localities around Atacora waterfalls in North-Western Bénin

These localities are also borders to Pendjari Biosphere Reserve, one of the largest biosphere reserves in West Africa that covers 480,000 ha of area. The climate is sudanian type with a rainy season from May to October and a dry season from October to May. The topography is a vast peneplain with an altitude varying between 150 m and 200 m (Delvingt *et al*., 1989). The vegetation is dominated by shrubby savannah established along Atacora mountainous chain. Agriculture is the core of the area economic development although ecotourism is increasingly gaining much attention. There is a wide range of touristic values (mountains, waterfalls, wild, cultural monuments, etc.) that attract visitors coming from different parts of the globe. An average number of 350 visitors is recorded yearly. Ecotourism contribution to the national employment is not marginal with 818 citizens employed in 2020. This sector generated about 215 million euros yearly as income which represents 1.4 % of the country GDP (PAG, 2013).

Methods

Sampling and data collection

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The survey was conducted in the main touristic localities surrounding Atacora waterfalls. We randomly interviewed 300 households (75 per locality) using a paper-based questionnaire. The following data were recorded on each respondent: sociodemographic characteristics (gender, age, ethnicity, level of education or literacy), perception of biodiversity conservation status (PBS) around the waterfalls, attitude toward natural resources conservation (ACRN), social norms (SN), perceived behavioural control (PBC), intention toward conservation (IC) and behaviour toward conservation (BC). The latent variables (PCB, ACRN, NS, CP, and IC) were measured using 5-point Likert scale items from "strongly disagree" to "strongly agree." We preliminary drafted a questionnaire of 88 items including informants' demographic data (sex, age, ethnicity, main occupation, etc.). Items were generated on 5-point Likert scale basis. To have the confidence that our items meet the key principles for successful item writing, the questionnaire was first sent to an expert panel for items review. After, a pilot survey was conducted by administering the printed version to a sample of 30 respondents. This pilot survey was important to test the questionnaire quality and to rewrite items that were not comprehensible, ambiguous or ask more than a single question.

Respondents were averagely aged of 39. The oldest was the age of 90 and the youngest was 18. The majority of them were men (70%). Respondents belong to three major ethnic groups including the Otamaribé (34.66%), Waama (27.33%) and Gourmantché (25.67%). A minority of them, respectively 0.67% and 5.33% were alphabetized and have reached university. Most of them have either reached primary school (28.33%), secondary school (29.67%), or are illiterate (36%). They are in majority Christians (46.33%), traditionalists (34.67%) and farmers (70%).

The Theory of Planned Behaviour

The theory of planned behaviour (TPB) has played a major role in human behaviour understanding. This theory was first proposed by Ajzen (1991) and can be defined as an expanded form of the Theory of Reason Action (TRA). Indeed, TRA is a structural model in psychology operating on the assumption that behavioural intention is the accurate predictor of behaviour. TRA was first introduced by Fishbein (1975) to explain the relationship between beliefs, attitude, intention, and behaviour. Consistently, TRA suggests that individuals evaluate the important consequences (benefits and harms) of the behaviour they wish to perform before committing to it and are more likely to engage in desirable behaviours (Ajzen et Fishbein, 1975; Bang et al., 2000). TRA model assumes that behavioural intention is a function of two variables (attitude toward the behaviour and subjective norms). Later, Ajzen (1991) expanded this rooted model by adding Percieved Behavioural Control (PBC) as a new predictor to the model (Figure 2).

Ajzen (1991) defined PBC as the degree of an individual confidence to adopt a behaviour. The author emphasized that individuals can control barriers to the behaviour they want to perform using their internal strengths (skills, knowledge, and experiences) and external factors (information and opportunities) related to the behaviour (Ajzen, 1991; Lee et *al.*, 2010). Attitude is defined as the degree of the behaviour perception by an individual based on favourable or unfavourable judgments of the behavioural evaluation (Ajzen, 1991). Mathematically, attitude is defined as the sum of the product of beliefs (ei) about the behavioural object and the evaluation of those beliefs (ei) (Figure 2). Theoretically, individuals with strong beliefs about the benefits of a given behaviour are more intended to perform it. Subjective norms refer to all social beliefs that may determine an individual behaviour whether he performs it or not (Ajzen, 1991). Mathematically, subjective norms is the sum of what others think about an individual's behaviour, or normative beliefs (NCj), and the individual's motivation to comply with those beliefs (MCj). The theory predicts that individuals with strong normative beliefs are more likely to engage or not in the behaviour.

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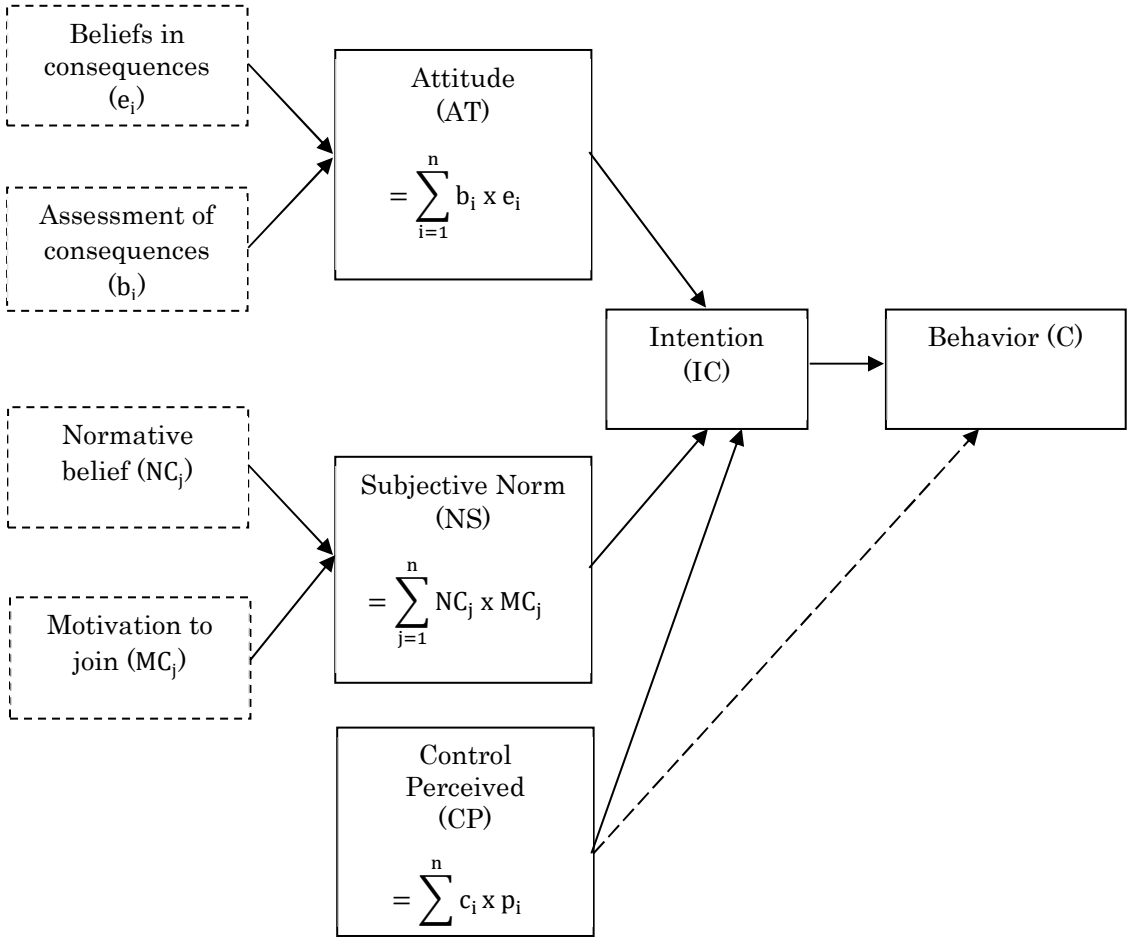

Figure 2. Conceptual representation of the theory of planned behaviour according to Ajzen (1991)

Our Study Model

We used a structural equation model (Figure 3) as an expanded form of TPB to test the relationship between intention (IC) and its three theoretical predictors which are attitude toward natural resources conservation (ACRN), social norms (SN), and perceived behavioural control (PBC). We also tested the theoretical relationship between intention (IC) and behaviour (BC) toward conservation and tested whether respondents' perception of biodiversity conservation status around the waterfalls (PBS) affects intention predictors (PBC, ACRN, SN). Our model assumed that intention is positively correlated with the behaviour and its theoretical predictors (PBC, ACRN, SN). Besides, the model also hypothesized that intention and its predictors (PBC, ACRN, and SN) are positively affected by PBS.

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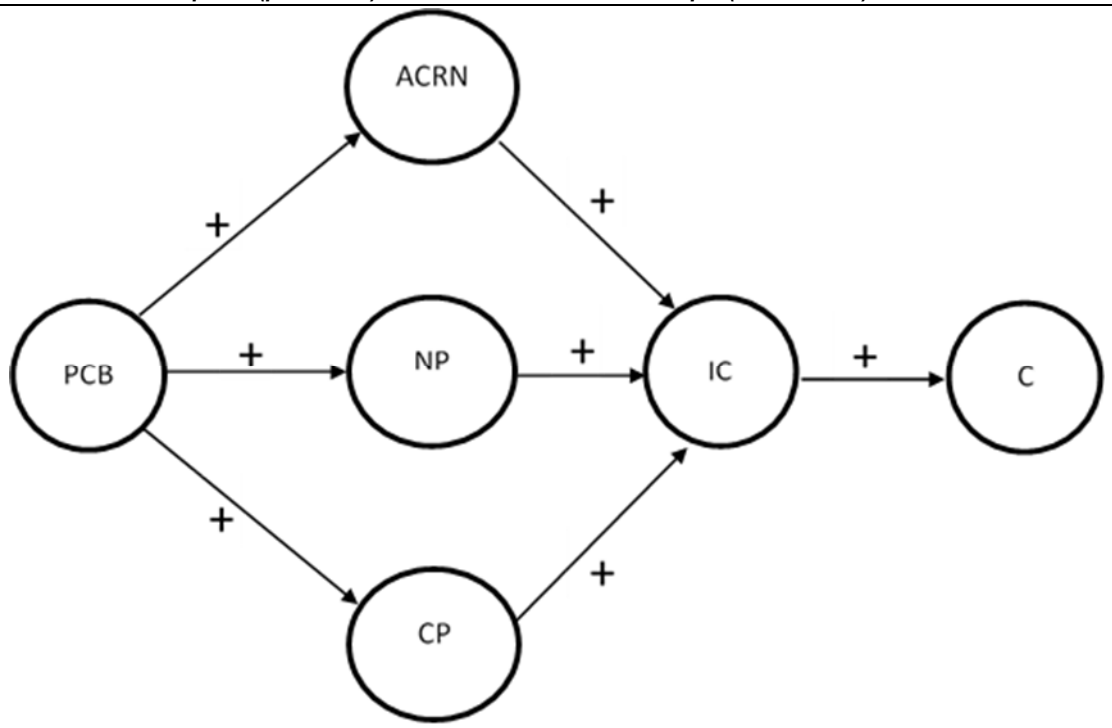

Figure 3. **Structural equation model (SEM) tested: the sign (+) means a positive correlation between the variables**

ACRN = Attitude; PBC = Percieved Behavioural Control; IC = Intention; C = Behaviour; CP: Control Perceived

Statistical analysis

Factor Analysis (FA)

We used Factor Analysis (FA) and Confirmatory Factorial Analysis (CFA) to select the best items and validate the constructs. We also verified the internal consistency between items using Cronbach's alpha. The Kaiser-Meyer-Olkin (KMO) (Kaiser, 1974) and Bartlett's sphericity (Bartlett, 1954) tests were used to confirm the validity of the factorial model. Factor analysis was performed with the factional function contained in the package stats in R.4.0.2 (R. Core Team, 2021). The goal in FA is to get a parsimonious conceptualization of the latent variables by identifying the factor structure (number of factors) that explains the maximum correlation among a set of items (Bourque *et al.*, 2006). Items of good quality were selected based on item analysis criteria (Streiner, 2015). During the analysis, every item that is weakly correlated (Pearson $r^2<0.20$) with other items was deleted (Pearson *et al.*, 2014). Moreover, items loading less than 0.60 across all the underlying factors and those that did not allow for reliable internal consistency were deleted. The internal reliability was verified with Cronbach's alpha (Cronbach, 1951) computed with the package ''coefficient alpha'' (Zhang and Yuan, 2020). An alpha value greater than 0.70 indicates a reliable scale (Kyriazos, 2018). The Kaiser-Meyer-Olkin's (KMO) statistic (Kaiser, 1974) and the Bartlett's test of sphericity (Bartlett, 1954) were also computed to appreciate the quality of the EFA. Bartlett's test of sphericity was performed using REdaS package (Maier 2015). The desirable KMO for the whole data (whole MSA) should be greater than 0.5 (Kyriazos, 2018). A minimum set of three items per latent factor was selected as recommended in psychometry (DeVellis, 2017). The Factorial Analysis was run using data from 300 individuals without any missed values and a number of 88 items (see Appendix).

Structural Equation Modelling

The Confirmatory Factorial Analysis (CFA) was first performed to validate the common factor model underlain from the EFA. CFA is a theory-driven technique that seeks to test whether the theoretical relationships between items and factors are reliable. Technically, it is about comparing a population covariance matrix with the observed covariance matrix and minimize the difference (Schreiber et *al.*, 2006). We applied the diagonally weighted least squares (WLSMV) method for estimating CFA parameters as recommended for ordinal data like Likert-scale items (Li, 2016; Li et *al.*, 2011). The CFA

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was performed using lavaan package (Rosseel, 2012) in R.3.5.2 (R. Core Team, 2021). The CFA model convergence was examined based on the standards recommended by experts (Brown, 2006; Hu and Bentler, 1999) : RMSEA (≤0.06, 90% CI≤0.06), SRMR (≤0.08), CFI (≥0.95), TLI (≥0.95), and the chi-square/df ratio less than 3 (Kline, 2016). Before running the CFA, we removed items having SMC (Squared Multiple Correlation) less than 0.5 in order to have a well-fitted model.

After constructs validation, we performed a SEM using lavaan package (Rosseel, 2012) to test the structural relationship between the latent variables. In the SEM model, the measurement model was simply the well-fit CFA model. We tested three regression models testing (1) the single effect of intention of behaviour, (2) the effect of attitude, subjective norms, and perceived behavioural control on the intention (3) the effect of community perception of biodiversity conservation status on intention and its three predictors. We also tested the indirect effect of PCB on intention. Like in CFA, we used the diagonally weighted least squares (WLSMV) method for estimating the model parameters. The model goodness-of-fit was examined based on the standards recommended: RMSEA (≤0.06, 90% CI ≤0.06), SRMR (≤0.08), CFI (≥0.95), TLI (≥0.95), and the chi-square/df ratio less than 3 (Kline, 2015). We computed the R^2 of each regression model to appreciate their quality. Where latent variables are significantly correlated, we examined item-item correlation so as to deeply explain the relationship between the latent variables.

Results

Items descriptive statistics

A set of 88 items were used to measure the latent variables. Behavioural intention was measured with 13 items and the other latent variables were each measured with 15 items (Appendix A.1). The general mean scores of items varied from 1.29 to 6.74 and the coefficients of variation (CV) from 8.75% to 93.75%. Cronbach's alpha values varied from 0.38 to 0.72 indicating a relatively low internal consistency. Only the Cronbach's alpha of PBS was greater than the threshold value (0.70). But the average score of PBS items were relatively low (2.10 to 5.54) compared to the other latent variables that showed high scores values (5.26 to 6.53) with low variance (8.75%≤CV≤32%). We also found a strong negative correlation (r=-0.96, Figure 4) between scores variation and their mean values.

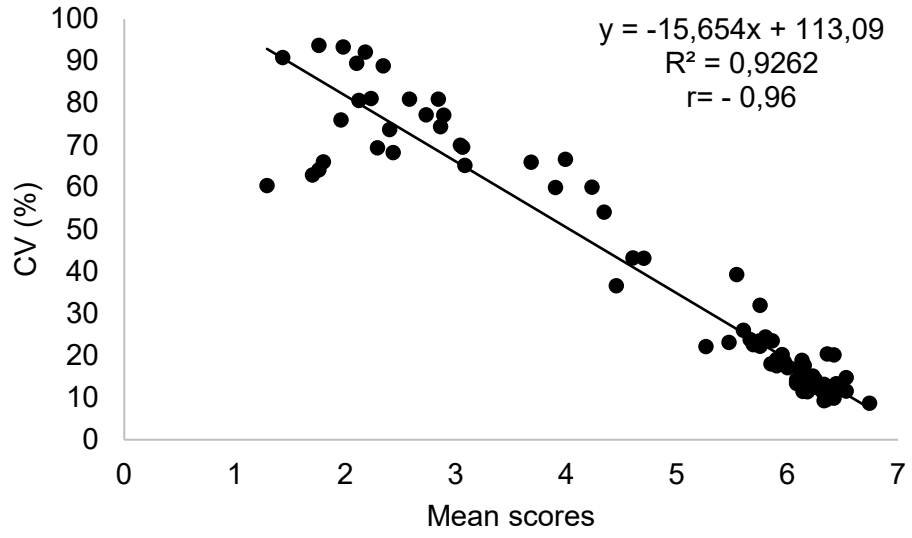

Figure 4. Linear relationship between the mean scores of items and the coefficient of variation (CV)

Selection of Best Items and Constructs Validation

Six-factor model with three items by factor was sufficient to reduce the number of variables in our database (Chi-square= 77.65, DF=60, p=0.6). The six factors accounted for 62.8% of the total variance in the database. We obtained a reliable KMO (0.82) indicating that our Factor model is appropriate. Bartlett's test was also significant (chi-square=2581.038, DF=153, p<0.001). Cronbach's alpha (α) was reliable for all the six factors (α=0.75 to 0.89) (Table 1). The first factor (F1) was strongly related to IC items that heavily load on that factor (score= 0.63 to 0.76). The second (F2) was strongly related to PBS items with also heavy loads (score= 0.66 to 0.95). The third (F3) was strongly related to behaviour (BC)

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items (score= 0.66 to 0.95). The fourth (F4) was strongly related to ACRN items (score=0.55 to 0.73). Factor 5 was strongly related to SN items (score=0.30 to 0.84) and the Factor 6 strongly related to PBC items (score=0.28 to 0.92).

Table 1. Result of the factor analysis: items loads and factors Cronbach's alpha

Factors	F1	F2	F3	F4	F5	F6
Constructs	IC	PBS	BC	ACRN	SN	PBC
Cronbach's alpha	0.81	0.89	0.76	0.75	0.81	0.76
PBS1		0.728		-0.111	-0.151	
PBS2		0.951	-0.109			-0.123
PBS3		0.656	-0.141		-0.155	
ACRN7	0.138			0.729		0.202
ACRN10	0.181			0.546		
ACRN12	0.120			0.713	0.152	
PBC4	0.225	-0.170	0.120	0.216	0.106	0.633
PBC11	0.340	-0.160	0.292	0.101		0.280
PBC13	0.287		0.145	0.130	0.178	0.915
SN1	0.195	-0.241	0.121	0.134	0.844	0.101
SN2	0.195	-0.196		0.207	0.794	0.133
SN6	0.273		0.175	0.333	0.299	0.103
IC6	0.758		0.143	0.216	0.132	0.171
IC8	0.634		0.107	0.300	0.323	0.189
IC9	0.731		0.132	0.217	0.168	0.194
BC3	0.118		0.980			
BC4	0.333	-0.170	0.398		0.118	0.195
BC7	0.122	-0.128	0.773			0.107

Our CFA model converged well with acceptable values of CFI (comparative fit index) =1 and TLI (Tucker–Lewis index) = 1.014. These values are all greater than the minimum recommended (0.95). RMSEA (Root Mean Square Error of Approximation) and SRMR (Standardized Root Mean Squared Residual) values were respectively 0.0001 (<0.06) and 0.062 (<0.08) (Table 2). The chi-square/df ratio was equal to 2.12 which is lower than 3 as recommended. The standardized and unstandardized coefficients values are indicators of a strong correlation between the items and their latent variables. The unstandardized values varied from 0.55 to 1.13 and standardized values from 0.60 to 0.87. The percentage of variance (σ^2) in the item that is explained by the latent variable was relatively low (25% to 64%) across the majority of items.

Our structural equation model (SEM) model also converged well (CFI=0.95, TLI=0,94). RMSEA value was 0.03 (<0.06) and the one of SRMR was 0.05 (<0.08) (Figure 4). The measurement part of the model was significant (Chi-square =212.197, DF=128, P=0.002). The regression part was also significant with the high value of R^2 (0.08 to 0.72). The highest value of R^2 was observed for the regression model that tests the relationship between intention and its predictors (ACRN, SN and PBC) with an R^2 value of 0.72 meaning that the three variables combined explain 72% of the variance in intention. The relationship between intention and behaviour was also strong with an R^2 value of 0.53 meaning that intention explains 53% of the variance in behaviour. The largest part of the variance in intention was explained by PBC (35%) and SN (22%). The regression results showed that intention was positively correlated with attitude (β= 0.19±0.07, p=0.008), social norms (β = 0.24±0.07, p=0.001) and perceived behavioural control (β= 0.40±0.08, p=0.000). The intention was also positively correlated with behaviour (β= 1.16±0.27, p=0.000). Reversely, perception of biodiversity conservation status (PBS) was negatively correlated with attitude (β= -0.13±0.03, p=0.000), social norms (β = -0.29±0.04, p=0.000), and perceived behavioural control (β= -0.27±0.06, p=0.000). PBS did not directly influence intention but its effect was mediated by social norms (β =-0.18±0.08, p=0.025) and perceived behavioural control (β =-0.30±0.11, p=0.006).

ISSN imprimé (print ISSN) : 1025-2355 et ISSN électronique (on line ISSN) : 1840-7099

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Table 2. Confirmatory Factorial Analysis (CFA) model coefficients with their standard error, variance and Squared Multiple Correlation (SMC)

Items	Constructs	β1	β2	SE	σ^2	SMC
PBS1	PBS	1.00		1.72	0.25	0.57
PBS2	PBS	1.06	0.87	0.09	0.25	0.67
PBS3	PBS	0.88	0.72	0.08	0.27	0.47
IC6	IC	1.00		0.79	0.35	0.57
IC8	IC	0.97	0.86	0.14	0.38	0.59
IC9	IC	0.95	0.79	0.12	0.39	0.58
BC3	BC	1.00		0.97	0.39	0.69
BC4	BC	0.92	0.76	0.12	0.42	0.38
BC7	BC	0.92	0.67	0.08	0.42	0.67
SN1	SN	1.00		0.79	0.46	0.69
SN2	SN	0.87	0.78	0.08	0.49	0.68
SN6	SN	0.55	0.62	0.08	0.50	0.33
PBC4	PBC	1.00		0.90	0.52	0.57
PBC11	PBC	0.64	0.60	0.14	0.53	0.33
PBC13	PBC	1.13	0.78	0.15	0.56	0.63
ACRN7	ACRN	1.00		0.70	0.62	0.44
ACRN10	ACRN	0.90	0.61	0.16	0.62	0.28
ACRN12	ACRN	0.75	0.71	0.10	0.64	0.42

β1 = Unstandardized coefficients; β2 = Standardized coefficients (items, constructs); SE = Standard Error; σ^2 = Item variance explained by the construct; SMC = Squared Multiple Correlation

By testing item-to-item correlation, we found that all intention items were significantly correlated with the ones of attitude, subjective norms and perceived behavioural control (r=0.26 to 0.50, p<0.001, Table 3). Similarly, intention items were significantly correlated with behaviour items (r=0.24 to 0.39, p<0.001, Table 3). PBC and SN items were also significantly correlated with PBS items (r=-0.14 to -0.36, p<0.001, Table 3). In contrast, we found only one PBS item (PCB1) that was significantly correlated with two attitude items (ACRN7 and ACRN12) (r =-0.14 to -0.16, p=0.01 to 0.02,).

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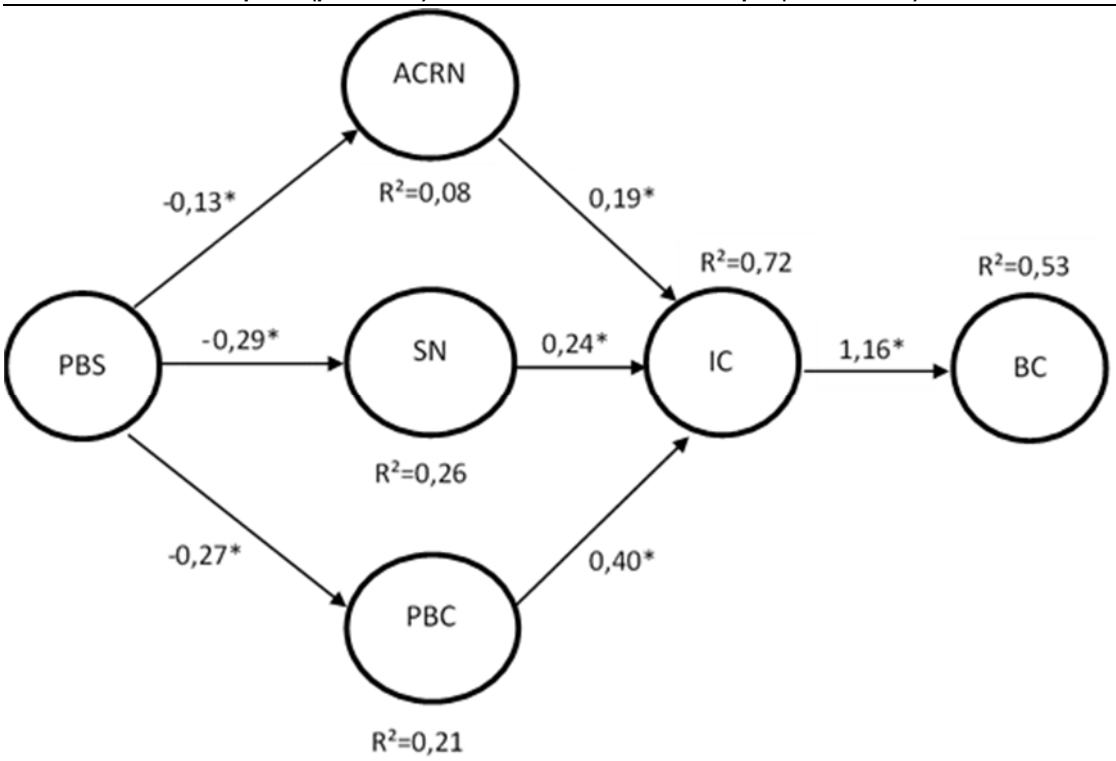

Figure 4. **The results of the regression model show the correlations between variables in the structural equation model (SEM).**

PBS = Perception of biodiversity conservation status; ACRN = Attitude; NS = Social Norms; PBC = Percieved Behavioural Control; IC = Intention; BC = Behaviour; R² = Coefficient of determination; * Means that the relationship is significant at the threshold of 5%.

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Table 3. Correlation matrix between items

	PBS1	PBS2	PBS3	ACRN7	ACRN10	ACRN12	PBC4	PBC11	PBC13	SN1	SN2	SN6	IC6	IC8	IC9	BC3	BC4	BC7
PBS1	1																	
PBS2	0,73	1																
PBS3	0,51	0,66	1															
ACRN7	**-0,16 (0,01)**	**-0,09 (0,13)**	**-0,05 (0,35)**	1														
ACRN10	**-0,11 (0,05)**	**-0,08 (0,17)**	**-0,07 (0,24)**	0,44	1													
ACRN12	**-0,14 (0,02)**	**-0,09 (0,10)**	**-0,07 (0,25)**	0,56	0,42	1												
PBC4	**-0,22 (0,00)**	**-0,28 (0,00)**	**-0,22 (0,00)**	0,32	0,24	0,23	1											
PBC11	**-0,22 (0,00)**	**-0,24 (0,00)**	**-0,15 (0,01)**	0,17	0,19	0,16	0,33	1										
PBC13	**-0,21 (0,00)**	**-0,23 (0,00)**	**-0,15 (0,01)**	0,34	0,19	0,2	0,72	0,42	1									
SN1	**-0,36 (0,00)**	**-0,33 (0,00)**	**-0,33 (0,00)**	0,22	0,18	0,26	0,28	0,16	0,35	1								
SN2	**-0,28 (0,00)**	**-0,28 (0,00)**	**-0,27 (0,00)**	0,26	0,22	0,32	0,3	0,14	0,37	0,8	1							
SN6	**-0,22 (0,00)**	**-0,14 (0,01)**	**-0,21 (0,00)**	0,33	0,23	0,35	0,26	0,14	0,3	0,4	0,39	1						
IC6	-0,11	-0,12	-0,1	**0,33 (0,00)**	**0,28 (0,00)**	**0,26 (0,00)**	**0,33 (0,00)**	**0,40 (0,00)**	**0,45 (0,00)**	**0,33 (0,00)**	**0,34 (0,00)**	**0,36 (0,00)**	1					
IC8	-0,19	-0,18	-0,19	**0,38 (0,00)**	**0,34 (0,00)**	**0,34 (0,00)**	**0,39 (0,00)**	**0,32 (0,00)**	**0,47 (0,00)**	**0,48 (0,00)**	**0,50 (0,00)**	**0,41 (0,00)**	0,63	1				
IC9	-0,14	-0,13	-0,13	**0,27 (0,00)**	**0,26 (0,00)**	**0,33 (0,00)**	**0,41 (0,00)**	**0,34 (0,00)**	**0,47 (0,00)**	**0,36 (0,00)**	**0,34 (0,00)**	**0,40 (0,00)**	0,68	0,64	1			
BC3	-0,16	-0,22	-0,22	0,09	0,09	0,14	0,21	0,36	0,25	0,23	0,16	0,26	**0,26 (0,00)**	**0,24 (0,00)**	**0,25 (0,00)**	1		
BC4	-0,27	-0,25	-0,21	0,17	0,08	0,11	0,27	0,35	0,37	0,26	0,27	0,22	**0,35 (0,00)**	**0,39 (0,00)**	**0,37 (0,00)**	0,47	1	
BC7	-0,16	-0,24	-0,21	0,09	0,1	0,13	0,17	0,36	0,28	0,25	0,18	0,24	**0,24 (0,00)**	**0,25 (0,00)**	**0,24 (0,00)**	0,8	0,37	1

Note: Values in bold in front of the brackets represent the spearman correlation coefficients. The values in the brackets are the probabilities at 5% threshold.

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Discussion

The study investigates local communities' behaviour toward the sustainability of ecotourism in a region constrained by human pressure and climate change. We specifically examined factors that drive local communities' behaviour toward biodiversity conservation around their touristic sites (waterfalls) in Northern Benin. It is a theory-driven study that developed structural equation model based on the theory of planned behaviour to examine the different relationships (direct and indirect) between local communities' conservative behaviour and its predictors. We hypothesized that behavioural intention is positively correlated with attitude, social norms, and perceived behavioural control. As predicted by the theory, our results showed a positive correlation between intention and its predictors. This result translates a strong motivation of local communities to conserve the waterfalls environment. Such a result is favourable for the sustainability of ecotourism in this area. The positive correlation between intention and attitude may be explained by the strong belief by local communities in the benefits related to the waterfalls resources conservation (Ajzen, 1991). The positive correlation between intention and social norms means that local communities' motivation to conserve the waterfalls resources is positively influenced by their neighbours' perception. This positive correlation can be explained by the fact that an individual's willingness or motivation to engage in certain behaviours often integrate their personal feelings of moral obligation (Gorsuch and Ortberg, 1983; Pomazal and Jaccard, 1976; Schwartz et Tessler, 1972). Moreover, it was argued that perceived moral obligation should give consideration to moral issues to increase the predictive power of the theory of planned behaviour Ajzen, (1991) ; Beck and Ajzen, (1991).

The fact that intention was positively associated with perceived behavioural control gives the assurance that local communities have a strong commitment to conserve the waterfalls environment especially through their willingness to support environmental protection actions. We found that Intention was positively associated with behaviour. This is online with the prediction of the theory of planned behaviour that individuals with strong motivation (intention) toward a behaviour is more likely to perform it (Ajzen, 1991). However, communities' motivation to adopt positive conservative behaviours may also be affected by the governance system of the tourism. An inclusive governance system is more likely to stimulate positive motivations toward conservation. In this study, we hypothesized that if communities have a negative perception of biodiversity status around the waterfalls they will show positive attitude, strong control and social beliefs and positive intention toward the waterfalls resources conservation. But the perception effect was surprisingly negative due to an exclusive governance system that has not for long motivated local communities to develop conservative behaviours. Our results translate a low capacity of the current ecotourism system to generate enough benefits to local communities to create other generating income activities that may reduce agricultural land expansion (Vaz and Agama, 2013). In fact, according to the respondents, the actual governance system of ecotourism is profitable to a minority, especially the central government, local leaders, NGOs, technical and financial partners, business men, and a marginal number of ecotourism guides. This is online with the general remark that the share of ecotourism benefits allocated to local communities is marginal in most cases (Bernard et *al.*, 2016).

Although the theory of planned behaviour has provided insights about the drivers of local communities behaviour toward environmental conservation, it explained the behaviour with some limitations. We found that 72% of the intention was explained by the combined effects of attitudes, social norms and perceived behavioural control. We also found that 53% of the behaviour was explained by intention. This means that our model failed to explain 28% of intention and 47% of behaviour variance. Our results suggest the expansion of our model by future studies by integrating new predictors. This is a general limitation discussed by previous studies (Armitage and Conner, 2001). Previous studies recommended that Ajzen's (1991) original model needs to be improved by taking into account other environment-specific variables because an individual's actual behaviour is not always driven by attitude even intention (Ajzen, 2001; Eagly and Chaiken, 1993; Belk, 1985). Future studies may for example integrate the impact of projects interventions such as environmental protection action, education and awareness actions and sociodemographic factors (Prud'homme and Raymond, 2013).

Conclusion

The study investigates the drivers of local communities' behaviour toward the environmental sustainability of ecotourism. Specifically factors that determine communities' behaviour toward waterfalls resources conservation in northern Benin are identified. Local communities are strongly motivated to engage in touristic resources conservation. This motivation is strongly driven by their attitude, social and control beliefs but more by their control beliefs giving the assurance that local

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communities have strong ability, experiences and skills to undertake environmentally friendly actions. However, the fact that communities are aware of biodiversity depletion around the waterfalls due to an exclusive governance system has negatively shaped their attitude, social and control beliefs. Obtained results suggest the need of sustainable ecotourism management policy that effectively involves local communities and promote the fair sharing of ecotourism benefits in order to stimulate strong motivation. To boost ecotourism in the study area, national authorities in charge of tourism including local communities must strongly support NGOs and technical and financial partners.

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Appendix A.1. List of items used and their descriptive statistics

Items	Construit	Description	m	SD	alpha de Cronbach
PCB1	Perception de la conservation de la biodiversité	I think that trees are not preserved at all at the site	2.86	74.48	0.72
PCB2		I think that trees can be harvested at the site	2.58	81.01	
PCB3		I think that firewood can be harvested without limitation at the site	2.73	77.29	
PCB4		I think laundry can be done at the site	2.84	80.99	
PCB5		I think that dishes cannot be done on the site at all	5.54	39.35	
PCB6		I think that animals cannot drink at the site	4.23	60.05	
PCB7		I think that fire can be made at the site	2.89	77.16	
PCB8		I think that farming can be practiced at the site	2.10	89.52	
PCB9		I think animals are killed at the site	3.04	70.07	
PCB10		I think farming can be practiced around the site	3.68	66.03	
PCB11		I think that there is no prohibition of harvesting trees	2.12	80.66	
PCB12		The trees, animals and the whole environment of the waterfalls are not protected at all	3.06	69.61	
PCB13		I think that hunting cannot be practiced in the environment of the waterfalls	4.34	54.15	
PCB14		I think that NTFPs can be used without limitation	3.08	65.26	
PCB15		I think that bathing can be done at the site	3.99	66.67	
ACRN1	Attitude envers la conservation des ressources naturelles	I think that all the trees, animals and the waterfalls if they were maintained and conserved constitute a real opportunity for ecotourism	6.42	9.97	0.38
ACRN2		I am willing to protect trees, animals, water and the environment	6.23	12.52	
ACRN3		The harvest of forest products must be prohibited	6.13	18.92	
ACRN4		I am willing to participate in the development of policies and decisions for the protection of natural resources	6.18	13.92	
ACRN5		The diversity of nature must be valued	6.33	13.27	
ACRN6		The harvesting and sale of NTFPs does not bring benefits to my community	1.98	93.43	
ACRN7		Each individual must maintain the waterfalls for future generations	6.23	15.25	
ACRN8		I am not willing to inform NGOs or foresters about any pollution or destruction of the waterfalls.	2.34	88.89	
ACRN9		I am willing to participate in the environmental protection project	6.12	15.36	
ACRN10		Good ecotourism practice requires that animals and the environment be protected at all times	6.11	16.86	

Items	Construit	Description	m	SD	alpha de Cronbach
ACRN11		Ecotourism should not promote environmental protection to all people who have an interest in tourism	1.70	62.94	
ACRN12		I think that ecotourism should improve the environment for future generations	6.34	11.83	
ACRN13		The diversity of nature should be valorized and protected	6.36	12.42	
ACRN14		The preservation of natural resources should not be a priority for all	2.18	92.20	
ACRN15		I am willing to take part in the conservation of the forest resources	6.25	13.92	
CP1	Contrôle perçu	I am convinced that I can help in the conservation of trees, animals, and waterfalls	6.25	14.40	0.53
CP2		I am willing to support the protection of trees, animals and water	6.16	12.18	
CP3		I will not have difficulty to conserve trees, animals, and the environment	4.70	43.19	
CP4		I have enough time for natural resource conservation	5.66	23.85	
CP5		I can support the state in the rules to protect trees, waterfalls	6.08	13.49	
CP6		I cannot support NGOs to better ensure the protection of trees and maintain the waterfalls clean	1.76	64.20	
CP7		I am not able to convince my brothers to protect the waterfalls and the surrounding trees	2.23	81.17	
CP8		I have the right to harvest trees without limits at the site,	1.29	60.47	
CP9		The NGOs do not give us the right to enjoy NTFPs at the site,	2.43	68.31	
CP10		I can achieve conservation goal if I sensitize my relatives	5.95	20.34	
CP11		We constitute a real support for the protection of trees and the maintenance of a healthy environment	5.90	17.63	
CP12		I am able to respect the rites and cultures of our environment for the conservation of waterfalls, trees and animals	6.21	14.17	
CP13		I have enough time to help NGOs to ensure the protection of trees and maintain waterfalls clean	5.69	22.67	
CP14		I can successfully harvest and sell NTFPs from the vegetation around the waterfalls	3.90	60.00	
CP15		I have enough information for natural resource conservation	4.45	36.63	
NS1	Normes sociales	My traditional leaders agree that I am against felling trees	6.21	14.81	0.65
NS2		My traditional leaders agree that I should respect the waterfalls related regulation	6.18	14.08	
NS3		Most of the people who are important to me think I should participate in reforestation	6.08	14.31	
NS4		Most of the people who are important to me expect me to denounce illegal harvest of trees	5.74	23.52	
NS5		My cooperative supports the fight against deforestation	5.26	22.24	
NS6		People whose opinions are important to me should also conserve natural resources	6.18	11.49	
NS7		My parents do not mind conserving natural resources	5.80	24.48	

Items	Construit	Description	m	SD	alpha de Cronbach
NS8		My traditional leaders say that sacredness of species is a guarantee for conservation	6.36	20.44	
NS9		My friends do not approve my participation in tree conservation	2.29	69.43	
NS10		My friends actively participate in awareness sessions to preserve our resources for the needs of future generations / children	5.75	22.26	
NS11		The delegate of my village agrees that I am for the protection of our environment and make decisions to discourage abusive users	6.25	13.44	
NS12		My traditional leaders say that there are important plant and animal species (medicinal and spiritual) that are endangered	5.75	32.00	
NS13		My community says we have valuable resources that attract visitors	6.44	13.35	
NS14		All my community must adhere to and respect the decisions made to conserve our resources	6.35	9.61	
NS15		My traditional leaders affirm that the conservation of resources is in accordance with the rites and customs of our environment	6.37	11.62	
IC1	Intention comportementale	I will participate in any meeting where we discuss how to save the vegetation around the waterfalls and make it enjoyable for visitors	6.31	12.20	0.63
IC2		I will keep my living environment (village) clean and healthy	6.33	9.32	
IC3		I have not enough time for the protection of trees, mushrooms and animals at the waterfalls	2.40	73.75	
IC4		I will avoid throwing garbage (bags, etc.) around the houses and the waterfalls	6.40	11.72	
IC5		I will take part in the instruction and the way of doing for the conservation of the vegetation	6.14	11.56	
IC6		I plan to sensitize people who are important to me to the conservation of trees, animals, and the waterfalls as soon as possible	6.00	17.17	
IC7		I am interested in participating in awareness sessions on the moderate use of forest resources as soon as possible	6.28	12.58	
IC8		I plan to get involved in the conservation of trees, animals and waterfalls so that future generations can benefit from them	6.11	14.40	
IC9		I plan to participate in the environmental protection project	6.18	15.21	
IC10		I think it is important to think of our children (future generation) when we mess up the environment and fell trees	6.53	11.64	
IC11		I think we should avoid doing laundry and washing cars around the waterfalls	6.42	20.25	
IC12		I believe that no matter how we use resources there will always be some for future generations (our children)	1.43	90.91	
IC13		I am interested in protecting the trees and animals at the sites	6.25	12.96	
C1	Comportement	I help to keep my surroundings clean and healthy	6.31	11.73	0.52
C2		I educate the people who are important to me about the conservation of vegetation	5.90	19.15	

Items	Construit	Description	m	SD	alpha de Cronbach
C3		I report to the forestry administration any pollution around the waterfalls	5.60	26.07	
C4		I take care of trees and animals at the sites	5.47	23.22	
C5		I make moderate use of the resources available near the waterfalls	5.97	18.59	
C6		I do not support conservation actions by NGOs or the government	1.80	66.11	
C7		I denounce to local leaders all people who harvest trees around the site without limit for their own needs	5.86	23.55	
C8		I actively support all decisions taken to safeguard the vegetation and make it enjoyable for visitors	6.19	14.70	
C9		I do not sensitize my community at all to preserve our wealth for the needs of future generations / children	1.96	76.02	
C10		I use non-timber forest products only for my basic needs, I do not waste	6.15	17.72	
C11		I do not practice agroforestry	1.76	93.75	
C12		I do not systematically kill all trees for agriculture	6.53	14.85	
C13		I sensitize the people who are important to me to the conservation of trees, animals, waterfalls	5.85	18.12	
C14		I participate in the environmental protection project	4.60	43.26	
C15		It is important for me to avoid throwing garbage around the houses and at the waterfalls	6.74	8.75	