



Sociodemographic and Psychosocial factors Influencing Pro-environmental Behaviours among Residents in Choke Mountain Watersheds, East Gojjam Zone, Ethiopia

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Abstract

In the pursuit of sustainable environmental practices of Choke mountain watersheds, understanding the interplay between sociodemographic factors, attitudes, social influences, perceived behavioral control and pro-environmental behavior (PEBs) is paramount. Thus, this study investigated the relationships among sociodemographic factors, psychosocial factors and PEBs (considered here as predictor variables) of residents around Choke mountain watersheds. To achieve this objective, a descriptive survey research design was employed and samples were selected through simple random sampling after clustering the residents into smaller villages from six Kebeles in the Debay Tilatgin and Senan districts of East Gojjam Zone, Ethiopia. Data were collected through a questionnaire from 674 samples and were analysed using independent samples t-test, Pearson correlation, and hierarchical multiple regression with SPSS-29. Firstly, as to the sociodemographic factors, the study found that female and adult community members showed higher PEB scores compared to male and youth community members; participants who have no formal education attendance and involved in watershed management activities demonstrated higher PEB than those with formal education and those who did not participate in watershed management activities. Secondly, as to the examination of the relationships between psychosocial factors – environmental attitude, subjective norm, perceived behavioral control – and PEB, the results indicate significant positive correlations among these factors, underscoring their interconnectedness and influence on PEB. Additionally, hierarchical multiple regression reveals the predictive power of these factors, with environmental attitude emerging as a significant predictor, followed by subjective norm and perceived behavioral control, accounting for a total of 49% of explained variance. In conclusion, the study sheds light on the relationships among demographic characteristics, psychosocial factors and PEBs of residents around the Choke mountain watershed. Based on the implications of the findings, recommendations are forwarded for practitioners, researchers and policymakers to foster PEB among residents in Choke watershed.

Keywords: Choke mountain, East Gojjam Zone, pro-environmental behavior, psychosocial factors, sociodemographic factors, watershed.

1. Introduction

Choke mountain watershed, situated in Northwest Ethiopia, is the centre of Abay highlands where many of the tributary rivers of Blue Nile are started. Despite its significant bio-ecological, agricultural, and tourism potentials, the ecosystems of Choke watersheds are facing substantial pressure due to intense land and soil degradation, exacerbated by human and natural factors (Yesgat, 2019). Consequently, communities residing in the Choke watersheds encounter severe challenges, such as reduced soil productivity, water shortage, insufficient livestock feed, and limited firewood supply (Belay, Zaitchik, & Ozdogan, 2013). High population growth rates and erosion-inducing traditional farming and management practices have posed threats to the natural resource bases, including land, water, and biodiversity, within the watersheds (Yesgat, 2019).

The urgency of mitigating environmental challenges in Choke watershed has underscored the need for effective strategies to foster pro-environmental behaviour (PEB) among residents around these areas. That is, while technological advancements and policy initiatives play pivotal roles in addressing environmental degradation around the Choke watersheds, the transformative potential of residents' behaviours should not be underestimated. Besides, scientists, organizations and other concerned people suggest changing human behaviours to behave in pro-environmental ways in order to preserve the Earth's eco-system in general and the Choke watersheds in particular (Ajzen, 1991; Stern, 2000). Saunders, Brook and Myers (2006, p.705) stated that sustainable use of environmental resources "require changes in human values, attitudes, and behaviors" of the communities, the composite elements of PEB.

In the context of Choke watershed, initiating community members to act pro-environmentally plays a pivotal role in addressing the pressing environmental challenges. PEB refers to all possible personal behaviours, which aims at protecting the environment and/or avoiding harm to the environment (Steg & Vlek, 2009). In recent years, researches have increasingly focused on the role of psychosocial factors – such as environmental attitude, subjective norm, and perceived behavioural control – in shaping PEB (Abrahamse & Steg, 2013; Ajzen, 1991; Stern, 2000). In addition to psychosocial factors, understanding the sociodemographic factors that influence individuals' engagement in PEB is, also, essential for promoting sustainable behaviour change and achieving environmental sustainability goals.

Studies (Alemayehu, Bewket, & Belay, 2019; Bires & Raj, 2019; Gamo et al., 2021; Grønhøj & Thøgersen, 2012) have indicated that demographic factors such as income level, gender, education and age significantly influence how to use land and PEB of communities. Bires and Raj's (2019) study highlighted that higher-income households tend to act in a pro-environmental way (i.e., they adopt more sustainable land management practices) than those households with lower-income. Sex plays a critical role in watershed management (WSM) practices in Choke Mountain. Alemayehu et al (2019) suggest that women are often responsible for water collection and household chores, yet their involvement in decision-making processes related to WSM remains limited. Besides, educational attainment correlates with awareness and adoption of sustainable WSM practices. Gamo et al (2021) showed that education played key role in enhancing environmental literacy and promoting behavioural change among local residents. Evidence also portrayed that young people tend to be less willing to engage in PEB

compared to older individuals, even though they generally possess more positive attitudes toward environmental issues (Grønhøj & Thøgersen, 2012).

Different stakeholders (e.g., Addis Ababa University, Ethiopian Society for Appropriate Technology, Organization for Rehabilitation and Development in Amhara, and Choke Directorate of Debre Markos University) have launched a series of WSM initiatives on the Choke areas. In fact, these WSM initiatives are the right approaches to curb the adverse environmental hazards of the Choke watersheds, although the available empirical evidences on the sustainability of these efforts have not had a lasting effect in five dimensions: social, institutional, technical, and financial and environmental (Gemi, & Semane, 2020; Simane, 2013).

Besides to these initiatives, it is crucial, however, to closely investigate the relationship between sociodemographic factors of the local communities and their PEB vis-à-vis major predicting psychosocial variables for the sustainable uses of Choke watersheds. That is, it is the underlining sociodemographic factors and psychosocial characteristics, and PEBs of the local communities that appear to ultimately determine the sustainability of the WSM efforts. In the pursuit of sustainable environmental practices, understanding the intricate interplay between individual attitudes, social influences, and perceived control over behavior is paramount. Hence, this study delves into the nuanced relationships between psychosocial factors – specifically environmental attitude, subjective norm, perceived behavioral control – and PEB. To sustainably utilize and preserve the Choke watersheds, it is crucial to comprehend which demographic and psychosocial factors determine community

members living in the Choke areas to act more pro-environmentally.

Empirical studies, generally, are not found on the nature of PEBs and the associated sociodemographic and psychosocial factors among residents living in Choke watersheds. The available empirical evidences emanate from Western and European countries (e.g., the UK, Sweden, Germany, and the USA), which inform us that PEBs often imply personal costs, while the benefits are mostly for the environment and society at large (Steg et al., 2011). Hence, exploring the relationship between demographic characteristics, psychosocial factors, and PEBs of communities residing in the Choke watersheds provides valuable insights into fostering community-driven conservation efforts, and for devising effective strategies tailored to diverse community needs, particularly in areas of Choke watershed, where water resources are vital for agricultural, ecological, and domestic purposes.

Researchers of this study argue that developing a more thorough understanding of what determines PEB among community groups is an important area of research investigation that will have practical applications and implications for promoting PEBs among the residents and for establishing conditions to the sustainable use of the Choke watersheds. Having the gaps found in the existing literature and the motivation of the present researchers, it is important to conduct a study on how sociodemographic and psychosocial factors relate to PEBs of residents in the Choke areas. Thus, this study was conducted with the objective to understand the interplay among sociodemographic factors (sex, education, age, engagement in WSM activities), psychosocial variables (environmental attitude, subjective norm, and

perceived behavioural control) and PEBs of the community, which are crucial for the sustainable utilization and management of the Choke watersheds. With this motivation in mind, the study answered the following basic research questions.

1. Are there any statistically significant differences in PEB among residents in the Choke watersheds across sociodemographic factors (sex, education, age, participation in watershed management activities)?
2. To what extent do psychosocial variables (environmental attitude, social norm, and perceived behavioural control) explain PEBs of residents in the Choke watersheds?

The study was guided by the Theory of Planned Behaviour (TPB). Proposed by Ajzen (1991), the TPB is a commonly utilized model in social psychology that aims to predict PEB, based on the idea that three key factors influence individuals' intentions to act in a specific manner. According to Lucarelli, Mazzoli, and Severini (2020), the first factor is attitude, which is shaped by an individual's beliefs regarding the consequences of their actions and how they

assess those consequences. The second factor is subjective norm, referring to an individual's perception of whether the important people in their life believe they should or should not engage in the specific behavior. The third factor is perceived behavioural control. Ajzen has recognized the fact that the perceived ability to act in a certain way has a great impact on actual behaviour. According Ajzen (1991) attitude towards the behaviour, subjective norm and perceived behavioural control then determine the intention to act, which is the key precedent of any behaviour including PEB.

In addition, empirical evidences (e.g., Alemayehu et al., 2019; Bires & Raj, 2019; Gamo et al., 2021) have also showed that such sociodemographic factors as sex, age, education are intricately related to the PEB of individuals. Drawing on the TPB and existing empirical evidences, the present study examines the relationships among sociodemographic factors, psychosocial variables, and PEBs. Hence, informed by this theoretical perspective and empirical reports, the interactions of the major variables of this study are shown in Figure 1.

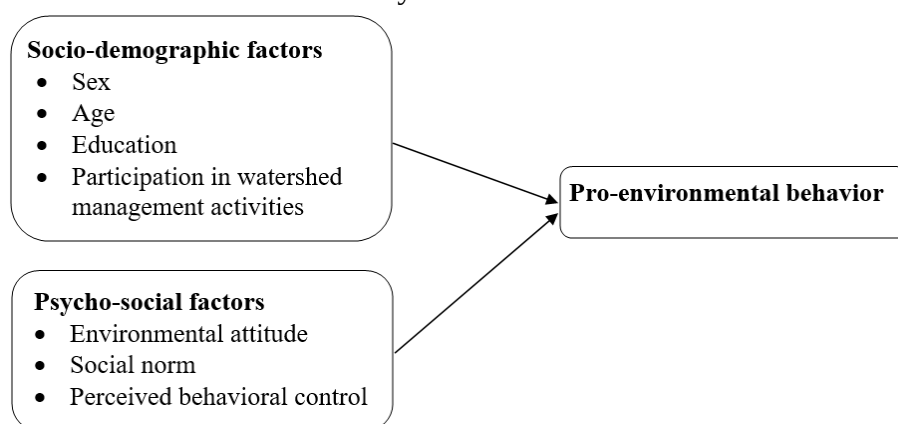


Figure 1. Theoretical framework of the study.

The study has theoretical and practical significances. Theoretically, it may come up with new concepts which may contribute for the literature on sustainable environmental

rehabilitation particularly from less affluent societies. Besides, the TPB was verified in the context of Ethiopia. Practically, identifying the responses of the community to

watershed management activities and their pro-environmental actions may help practitioners and stakeholders who work on the Choke watersheds such as, the Choke Directorate of Debre Markos University and other partner Universities, the federal, regional and Zonal agricultural offices, as well as NGOs to enhance PEB and community engagement in community-based projects.

2. Research Methods

2.1. Study Design

Pertinent to its objectives, the study employed descriptive survey research design. Given that the study aims to provide objective description of the influence of sociodemographic and psychosocial factors on PEBs, this design was deemed appropriate to this study. Thus, this design allows the study to collect quantitative data from relatively larger group of participants.

2.2. Study Site Descriptions

Choke mountain watershed is the source of more than 23 major rivers and 273 small streams flowing into the Blue Nile River (Aseres, 2015). Due to this, the watershed is often described as the water tower of the Nile basin and as one of the hot-spot area of Ethiopia's biodiversity (Simane, Zaitchik, & Mesfin, 2012). The Choke mountain watersheds span across seven districts within the East *Gojjam* Administrative Zone of the Amhara Region, Ethiopia.

The study site of this research, however, was narrowed down to six *Kebeles*¹ of two districts: Sinan district (*Dangule*, *Tegodery* or *Washa Michael* and *Shewa Kidane Mihiret Kebeles*) and *Debaytilategin* district (*Shemie*, *Ineqoye* and *Nazret Kebeles*). These districts were purposively chosen to this study due to

their significant coverage of the Choke watersheds and the concentration of Choke WSM activities in their respective *Kebeles* (Simane, 2013) (see Figure 2).

¹ In the Ethiopian government structure, *Kebele* (plural, *Kebeles*) is the smallest administrative unit, typically serves as a local governance entity responsible for the delivery of services and implementation of government policies.

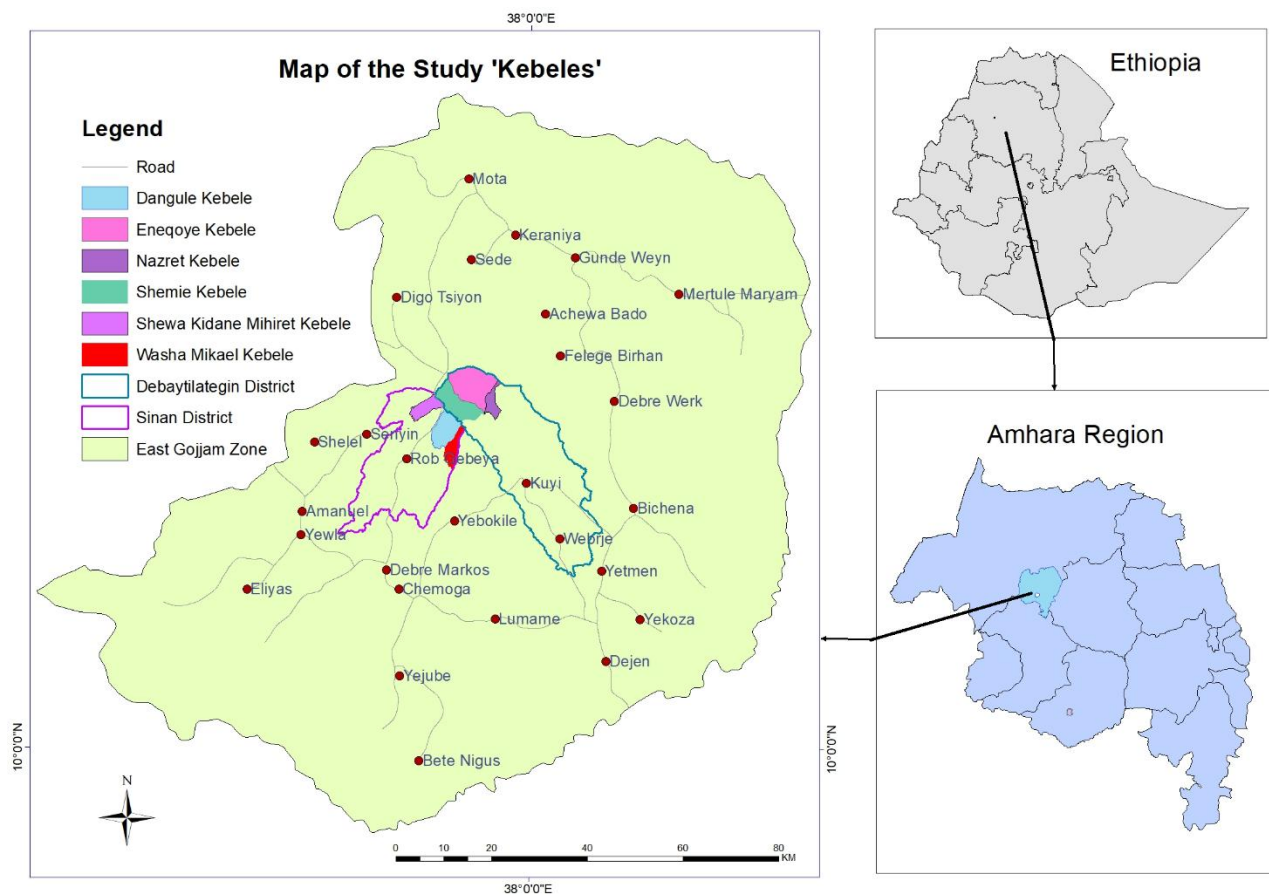


Figure 2. Map of the study site²

² The authors of this study would like to thank Dereje Gebrie, Lecturer and Researcher of Environmental Science at Debre Markos University, for generating the map of the study sites using shape files.

2.3. Population, Sample Size and Sampling Techniques

The target population of this study includes all communities who are residing in the six *Kebeles* of the two districts. Participants of the study include household-heads and youths. Since Ethiopia has a rapidly growing population of adolescents and youths, the sustainability of WSM activities appears to relate with the concerns and preferences of the young people (approximately from 15 to 29-year-olds), the study includes these groups as participants. This age category was defined based on the National Youth Policy (MoH, 2021).

In this study, households found in the six *Kebeles* serve as the units for selecting household-heads and young people. Using the following formula of the unknown number of population (Cochran, 1977), the

sample size of this study was determined to be $n=449$.

$$n = \frac{Z - score^2 * StdDev^2}{Margin\ of\ error^2}$$

where n = required minimum sample size, z -score = 1.96, Std. Dev = standard deviation (it is the expected level of variance among the responses of participants and it is determined to be 0.5), and margin of error or confidence interval = 5%.

Besides, 10% of the calculated size was added for non-response rate, which the required sample size was $n=499$. These samples were selected proportionally based on the number of households found in each six *Kebeles* of the study site. Thus, Table 1 presents participant types, sample size and sampling techniques of the study.

Table 1. Participant type, sample size and sampling techniques of the study.

Participant type	Sample size	Sampling technique
Adults (household heads)	499	Households were selected using simple random sampling technique by clustering into villages (referred to as ' <i>gotes</i> ') across the six <i>Kebeles</i> . Within these selected households, household heads (such as <i>Abawera</i> or <i>Emawera</i>) were chosen for participation in the study.
Youth	202	Simple random sampling was utilized, intending to include one youth aged between 15 and 29 years from each selected household at the outset of study. However, due to households without youths, data were collected only from 202 youths instead.

Hence, a total of 701 participants were included in this study. But, the data obtained from 674 participants were used for the analysis in the current study. This reduction in the sample size was due to incomplete responses and instances where participants did not meet the inclusion criteria established for the study. The final dataset of 674 participants provided a robust basis for analysing pro-environmental behaviors.

2.4. Data Collection Instruments and their Validation

The data for this study were collected from the sample household heads and youths through questionnaire. Generally, the questionnaire has three major parts with the items consisting of checklist, open and close-ended, and Likert-scale types. The first part deals with the sociodemographic profiles of participants (e.g., sex, age, educational level, etc.). The second and third parts of the questionnaire were related to the psychosocial and pro-environmental behaviour variables of the study, which were

measured through different items developed by the present researchers based on the review of existing literature (e.g., Oreg & Katz-Gerro, 2006; Schultz et al, 2001; Stern, 2000).

Psychosocial variables: in this study, they refer to emotional and social factors related to PEBs including environmental attitude, subjective norms, and perceived behavioural control of residents around Choke mountain watershed. The items developed to measure these factors were grouped into three sub-scales: environmental attitude, perceived behavioural control and subjective norm. Environmental attitude consisted of 13 items with a reliability coefficient of $\alpha = .73$, perceived behavioural control had 10 items with $\alpha = .69$, and subjective norm included nine items with $\alpha = .86$. The items were responded in five-point scale, ranged from 1 (strongly disagree) to 5 (strongly agree).

Pro-environmental behavior: In this study, PEB refers to the actions taken by residents engaged in subsistence agriculture to preserve and rehabilitate the watersheds in the Choke areas. This behavior was assessed using a 13-item questionnaire, measured on a five-point Likert scale, with a reliability coefficient of $\alpha = .84$. Examples of these items include practices such as implementing crop rotation, using organic fertilizers, conserving water through rainwater harvesting, and engaging in agroforestry initiatives. By clarifying these behaviors, we aim to provide a clearer understanding of how agricultural practices contribute to environmental sustainability in the research sites.

In the process of validating the questionnaire, several iterative tasks, including drafting items, translating them, contextualizing idiomatic expressions and linguistic nuances, assessing content clarity and relevance, and conducting pre-testing were undertaken

(Borsa et al., 2012). To enhance content validity and improve the internal consistency of the items, the questionnaire was translated from English to Amharic and evaluated by experts in the field.

A significant component of our validation process was the pilot testing, which involved administering the translated questionnaire to a sample of participants. Feedback collected during this phase was instrumental in informing revisions. Specifically, we analysed responses for clarity, comprehension, and relevance, leading to changes in item wording and format to better align with participant understanding. This feedback loop allowed us to refine the questionnaire to ensure it accurately captured the intended constructs.

To further strengthen the validation of our questionnaire, we conducted an exploratory factor analysis (EFA). This analysis aimed to identify the underlying factor structure of the psychosocial and pro-environmental behaviour variables and to confirm that the items grouped within each sub-scale accurately represented the constructs they were intended to measure. The results of the EFA provided evidence that the items loaded appropriately onto their respective factors, confirming the intended measurement of environmental attitude, perceived behavioural control, subjective norms, and pro-environmental behaviour. This robust validation process ensured that our instrument is reliable and effective in assessing the psychosocial and pro-environmental behaviour variables relevant to the Choke mountain watershed context.

During the time of data collection, the data collection team aimed to include every available head of household. In instances where a household member was not present during the initial visit, several strategies were implemented. The data collectors scheduled

follow-up visits at various times of day to accommodate different schedules. Additionally, community leaders and local networks were engaged to help identify and reach out to households. When a head of household remained unavailable after multiple attempts, the data collection was conducted with another knowledgeable adult member of the household to gather relevant information about household practices and decisions.

The data collectors were agricultural development agents (DAs) who were well-acquainted with the study area. Prior to data collection, they underwent comprehensive training led by the research team, focusing on the specific data collection instruments and procedures. This training equipped the DAs with the necessary skills and knowledge to effectively gather data among households of the study sites. Their familiarity with the community not only facilitated effective communication with respondents but also enhanced the reliability of the data collected.

2.5.Data Analysis Procedures and Techniques

The data analyses to this study follow the quantitative approach. Thus, after coding the variables and organizing the items, the data were fed into SPSS-29. Then, the raw data entered into SPSS were edited against the responses on the questionnaire to check that the data have been fed correctly. Frequencies of responses to each item of the questionnaire were run to identify missing data. Finally, different descriptive and inferential statistical tests were run to analyse the data. Hence, for analysing the difference between the categories of sociodemographic factors in PEB among the participants, independent samples t-test was utilized. To assess the relationships among the psychosocial factors and pro-environmental behavior (PEB), we computed Pearson correlation coefficients. This approach aligns with theoretical

frameworks that suggest structured relationships among variables, enabling us to build and test models based on prior hypotheses. Additionally, to examine the extent to which the psychosocial variables explain PEBs within the community, we conducted hierarchical multiple regression analysis. This method allows for a systematic evaluation of how well these variables predict PEB while controlling for potential confounding factors. In order to find out whether these statistical tests are statistically significant or not, the p-value of .05 was used. Besides, the Cohen's d was used as a measure of effect size.

2.6.Ethical Considerations

Various activities were done to maintain the basic ethical principles of a scientific research when conducting and reporting this study. Prior to collecting the data, ethical clearance was obtained from Ethics Review Committee of Debre Markos University with a protocol number DMU/001/2015. The anonymity of the participants was kept secret while collecting the data and reporting the results. To do this, the basic identifying characteristics (e.g., names, residence) of individual participants were not disclosed in the analysis or report of this study. When the analysis requires such characteristics, a separate 'coding scheme' technique was used. Besides, informed consent of the participants was also assured. The participants were briefed about the purpose of the data collection before they provide data. They were informed that the collected data were used only for academic scientific research and publication. Because some adult participants of this study could not read or write, verbal informed consent for providing data and publication of their data were obtained. Their willingness to provide and publish data was confirmed, and their responses were recorded by data collectors. Participants who were able to read and write provided Written Informed Consent to

provide and publish data to this study. For participants under 18 years old, consent was obtained from their parents, and these minors themselves also expressed their willingness to participate and provide data.

3. Results

3.1. Sociodemographic Profiles of Participants

A total of 674 participants, comprising of 476 adults and 198 youths, respond to the

questionnaire correctly and were included in the analysis of the current study. The sociodemographic profiles of these participants and their involvement in WSM activities are portrayed in Table 2.

Table 2. Sociodemographic characteristics of participants and involvement in WSM activities.

Variable/ Question	Category/ Response	Frequency	%
Place of residence	<i>Nazret Kebele</i>	145	21.5
	<i>Shimie Kebele</i>	102	15.1
	<i>Enkoye Kebele</i>	106	15.7
	<i>Dangule Kebele</i>	108	16.0
	<i>Tegodery or Washa Michael Kebele</i>	109	16.2
	<i>Shewa Kidane Mihiret Kebele</i>	104	15.4
Sex	Male	555	82.3
	Female	119	17.7
Attendance of formal education	Do not attend formal education	156	24.1
	Attend formal education	490	75.9
Age category	Youth	198	29.4
	Household heads	476	70.6
Have you participated in WSM activities in this year?	Yes	642	95.5
	No	30	4.5
How did you participate in WSM activities?	Voluntarily	586	91.0
	Forcefully	27	4.2
	To get money	31	4.8
When did you participate in WSM activities?	Every 1 year	499	78.1
	Every 2 years	63	9.9
	When necessary	73	11.4
	Others	4	0.6
Why don't you participate in WSM activities?	Because there is no soil erosion	4	13.3
	Because of shortage of labor	5	16.7
	Because land is owned by government	2	6.7
	Because it makes the land smaller	10	33.3
	Because of rat and weeding	8	26.7
	Others	1	3.3

Table 2 displays the sociodemographic profiles of study participants, showing that they were residents of six *Kebeles* in *Debaytilatgin* and *Senan* districts of East

Gojjam Zone. The data presented in the Table indicates that the majority of the participants in this study were males (82.3%), with female comprising 17.7%. The data

collection resulted in a higher proportion of female participants than typical male-headed households in the area. This discrepancy can be primarily attributed to the data collection approach employed by our agricultural DAs. In many cases, when male heads of households were unavailable during interviews—due to work commitments or other obligations—the DAs opted to interview women, who often play significant roles in decision-making and agricultural practices within the household. While this approach allowed us to gather valuable insights into pro-environmental behaviors, we recognize that it may not fully reflect the demographic distribution of household heads in the community. To enhance the representativeness of our sample in future studies, we will implement strategies to ensure that both male and female heads of households are consistently approached for interviews, regardless of availability. This adjustment aims to capture a more balanced perspective on household behaviors and responsibilities in the context of subsistence agriculture. In terms of their attendance of formal education, 75.9% of participants reported having attended formal education,

while the remaining 24.1% indicated they have not attended any formal education. Table 2 denotes that the majorities (70.6 %) of the participants were above the age of 30 years and 29.4 % were between the ages of 15 and 29 years.

Table 2 also indicates the nature of involvement in different WSM activities in their areas of living and it is depicted that more than 90% of the participants reported that they have participated in one form of WSM activities in their areas voluntarily. Besides, 78.1% of them participated every one year in WSM activities. Participants who reported not engaging in any form of WSM activity mentioned such reasons as no threat of soil erosion, shortage of labor, government's land ownership, smaller land holding, and presence of rat and weeding for not participating in WSM activities.

3.2.Pro-Environmental Behaviour across the Categories of Demographic Profiles

Independent sample t-tests were computed to analyse the differences between the categories of each sociodemographic variable in PEB. The results are shown in Table 3.

Table 3. Differences in PEB across sociodemographic categories.

Variables	Groups	M	SD	df	T	Cohen's d
Sex	Male	41.68	6.48	650	-5.881*	.584
	Female	45.62	6.95			
Formal education attendance	Attend formal education	40.95	5.22	622	-7.968*	.691
	Do not attend formal education	45.61	8.83			
Age category	Youth	39.81	4.30	650	-6.690*	.551
	Adults	43.52	7.28			
Participation in WSM activities	Yes	42.57	6.71	648	2.954*	.55
	No	38.87	6.65			

* $p < .05$, two-tailed. M =mean, SD =standard deviation

Table 3 reveals the results on the differences between categories of sociodemographic profiles of participants in their PEB. The results demonstrate that there is a statistically significant mean difference between male and female community members in their

PEB. The result showed that female community members had higher PEB ($M = 45.62$, $SD = 6.95$) than did male community members ($M = 41.68$, $SD = 6.48$), $t(650) = -5.881$, $p = .000$ with a medium effect size ($Cohen's d = .584$).

Table 3 presents the statistical test whether community members' attendance of formal education has impact on their PEB. The result showed that there is a statistically significant mean difference between those who attend formal education and those who do not attend formal education, $t(622) = -7.968, p = .000$. This indicates that community members who do not attend formal education had higher PEB ($M = 45.61, SD = 8.83$) than their counterparts who attended formal education ($M = 40.95, SD = 5.22$) with a medium level of effect size (*Cohen's d* = .691).

Table 3 also reveals that there is statistically significant mean difference between youths and adults in PEB. Participants whose age is found at adulthood period (≥ 30 years) outperform ($M = 43.52, SD = 7.28$) youths (15 to 29 years) in PEB ($M = 39.81, SD = 4.30$), $t(650) = -6.690, p = .000$ with a medium level of effect size (*Cohen's d* = .551).

Table 4. Relationships among psychosocial factors and PEB using Pearson correlation.

Variables	EA	SN	PBC	PEB
EA				
SN	.36**			
PBC	.53**	.42**		
PEB	.59**	.51**	.56**	

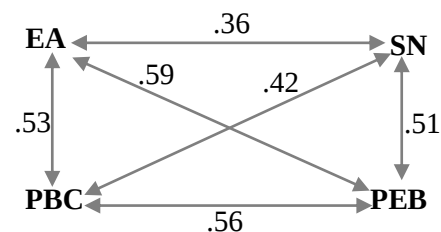
** $p = .001$ (2-tailed).

According to the results presented in Table 4, all the variables exhibit significant and positive correlation with each other. The results revealed that there is a moderate, positive and significant correlation between EA and SN, $r(662) = .36, p = .001$; EA and PBC, $r(659) = .53, p = .001$; and EA and PEB, $r(649) = .59, p = .001$. This implies that participants who possessed positive environmental attitude tend to have stronger subjective norm, perceived behavioural control and PEB and vice versa.

Finally, as to the participation in WSM activities, statistically significant mean difference was found between participants who participate and those who do not participate in WSM activities in their pro-environmental activities. Community members who participated in WSM ($M = 42.57, SD = 6.71$) were better in their PEB than those who do not participate ($M = 38.87, SD = 6.65$), $t(648) = 2.954, p = .003$ with a medium level of effect size (*Cohen's d* = .545).

3.3. Relationship among Psychosocial factors and Pro-environmental Behaviour

Pearson correlation coefficients were computed to analyze the relationships among the three psychosocial factors [viz. environmental attitude (EA), social norm (SN) and perceived behavioral control (PBC)] and PEB of the participants this study. Table 4 portrays these results.



Moreover, subjective norm is moderately and positively correlated with the participants' perceived behavioural control, $r(653) = .42, p = .001$ and with their PEB, $r(648) = .51, p = .001$, meaning that as subjective norm increases, the perceived behavioural control and PEB of participants also increase. Finally, the perceived behavioural control of participants was correlated positively and significantly with their PEB, $r(642) = .56, p = .001$.

To analyse the relationship between psychosocial factors (considered here as predictor variables) and PEB, treated as the outcome variable, we

employed hierarchical multiple linear regression analysis. This approach allowed us to assess the contribution of each set of predictors in explaining the outcome variable. To control for potential confounding variables, we included relevant demographic and contextual factors in the regression model. Multi-collinearity statistics

were examined to ensure that the assumption criteria were met, with Tolerance values exceeding 0.2 and Variance Inflation Factors (VIF) remaining below 5. The results of the three-step hierarchical multiple linear regression analysis, including the psychosocial factors and PEB, are displayed in Table 5.

Table 5. Three-step Hierarchical Multiple Regression Analysis Predicting PEB from EA, SN and PBC (n = 643).

Predictors	β	T	R	R^2	Adj. R^2	ΔR^2
Step1 ^a			.59	.35	.35	.35
EA	.59	18.44*				
Step2 ^b			.67	.45	.45	.10
EA	.47	14.77*				
SN	.34	10.91*				
Step3 ^c			.70	.49	.49	.04
EA	.36	10.61*				
SN	.28	8.74*				
PBC	.25	7.33*				

^a constant (b_0) = 10.56; ^b constant (b_0) = 1.43; ^c constant (b_0) = -1.76

* $p = .001$

The hierarchical regression analysis revealed that at step one, environmental attitude contributed significantly to the regression model, $F(1,641) = 340.16$, $p < .001$ and accounted for 35% of the variation in PEB. Environmental attitude when viewed alone at step one weighted a significant standard beta coefficient, $\beta = .59$.

Adding the variable social norm in step two explained an additional 10% of the variation in PEB and this change in R^2 was also significant, $F(2,640) = 260.94$, $p < .001$. At this step, social norm weighted a significant standard beta coefficient, $\beta = .34$. Albeit statistically significant, the estimate of

standard beta coefficient for environmental attitude was dropped into $\beta = .47$ than at step one.

Finally, in step three, when perceived behavioural control was added to the regression model significant contribution to explain PEB was observed on it, $F(3,639) = 206.21$, $p < .001$. Although very small, perceived behavioural control explains a change of 4.3% of variation in PEB. When all the three predictor variables were included to the model, 49% of the variation in PEB was explained with environmental attitude having the greatest contribution, followed by social norm (see Figure 3).

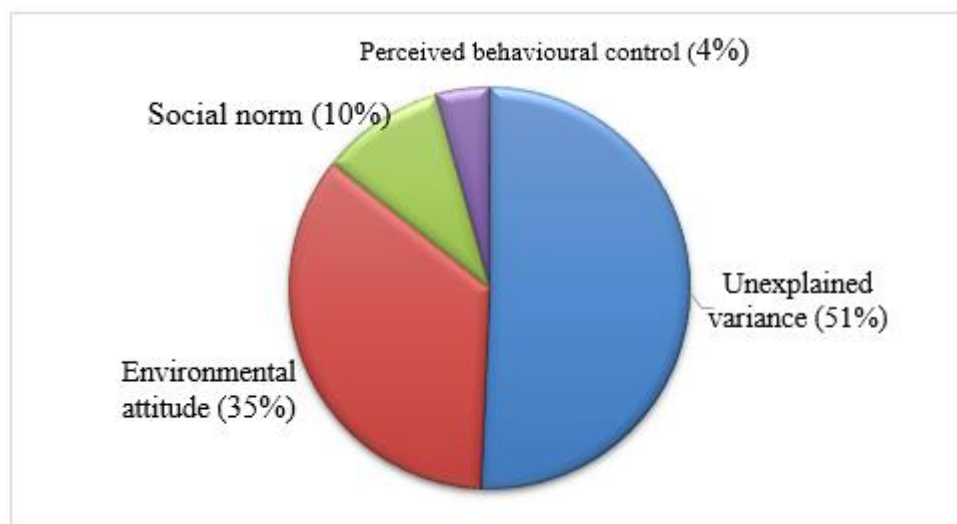


Figure 3. Percentage of explained variance for PEB by EA, SN, PBC.

4. Discussion

4.1. Relationship between Sociodemographic factors and Pro-environmental Behavior

The results of the present study shed light on the relationship between sociodemographic factors and PEB behavior among community around the Choke Mountain watershed. Each category of sociodemographic profiles, including sex, education level, age, exhibits statistically significant difference in PEB, signifying the multifaceted nature of PEB across these sociodemographic factors.

The present study highlights the existence of sex differences in PEB. The study found that female community members showed higher PEB scores compared to male community members, as evidenced by a notably higher mean score. This aligns with existing researches suggesting that women tend to be more environmentally conscious and engaged in sustainable behaviors (Alemayehu et al., 2019; Gökmen, 2021). More recently, Tien and Huang (2023) also showed that women in Taiwan had significantly stronger pro-environmental behavioural intentions and environmental values than men. While further investigation may examine the underlying factors, it appears that women's higher PEB can be attributed to their

traditional roles as caregivers and their close ties to natural resources for household necessities, such as collecting wood for charcoal and fetching water. In this context, Blocker, Jean and Eckberg (1997) found that women, being socialized primarily in caregiving roles, are often encouraged to develop traits such as compassion, empathy, and cooperation, which may make them more protective of the environment. Conversely, male socialization tends to emphasize the role of economic provider and market engagement, fostering traits such as dominance, rationality, and competitiveness in men, which may be associated with more anti-environmental attitudes. The medium effect size was observed in the current study indicating a moderate but meaningful difference between sexes, emphasizing the relevance of considering sex-specific approaches in environmental initiatives. This research result contributes to a growing body of evidence showing that sex plays a role in shaping individuals' environmental behaviors, which appear to have important implications for environmental policies and initiatives (Bosena, 2017).

The current study investigates the impact of formal education or school attendance on PEB within the context of WSM. The results,

unexpectedly, showed that participants with no formal education attendance demonstrated higher PEB than those with formal education. This counterintuitive finding challenges conventional assumptions that formal educational exposure correlates positively with pro-environmental attitudes and behaviors (Powdthavee, 2021). This finding may be attributed to several interrelated factors. Individuals without formal education may possess a stronger reliance on traditional knowledge and practices, which often emphasize sustainability and resource conservation due to their close connection to local environments (Gould & Pellow, 2003). Additionally, these participants may depend more heavily on natural resources for their livelihoods, thereby increasing their awareness of the importance of conservation and sustainable practices (Berkes, Colding, & Folke, 2000). It is also plausible that formal education, while imparting theoretical environmental knowledge, can create disconnect from practical environmental behaviors, as individuals may engage in environmentally conscious actions more out of necessity than understanding (Taylor, 1999). Overall, this finding of the present study reminds a deeper exploration into the underlying mechanisms shaping environmental consciousness among individuals with varying educational backgrounds. Moreover, the present researchers posit that this particular outcome may be attributed to the prevailing conditions in the study area where many individuals who have attended formal education do not own farmland, thus leading to their lower level of PEB.

Additionally, the current study found out that adult community members showed higher PEB compared to youths. Contrary to this finding, Ágoston et al (2024) found out that there was no age differences in the overall

PEB score in a sample of high school students and their parents. This may be attributed to factors such as increased responsibility, awareness of environmental issues, maturity, accumulated knowledge, and possibly greater involvement in community affairs among older individuals (Marrese et al., 2024). That is, adults with their accumulated knowledge and life experiences, may exhibit greater environmental consciousness and engagement than the youths. The superior PEB among adults appears to suggest a potential shift in attitudes and priorities as individuals transition into adulthood (Santrock, 2006). Thus, our finding contributes to the broader discourse on age-related differences in environmental behavior, emphasizing the importance of fostering an early understanding of environmental responsibility among youths to bridge the gap in PEB between these demographic groups.

Moreover, the present research found that participants who were involved in WSM activities demonstrated significantly higher PEB compared to those who did not participate. This finding is in line with previous research highlighting the importance of community participation in environmental conservation in promoting pro-environmental actions (Gamo et al., 2021). This appears to highlight the positive impact of practical engagement in environmental conservation initiatives on individuals' attitudes and behaviors on environmental issues (Abelieneh, 2017).

4.2.Psychosocial factors and Pro-environmental Behavior

The current study demonstrates significant moderate positive correlations among environmental attitude (EA), subjective norm (SN), perceived behavioral control (PBC), and PEB, indicating the interconnectedness

of these psychosocial factors. This finding is consistent with previous research emphasizing the influence of attitudes, subjective norms, and perceived behavioral control on behavior (Ajzen, 1991; Stern, 2000).

The moderate positive correlations observed between EA and SN, EA and PBC, and EA and PEB highlight the importance of individuals' environmental attitudes in shaping their perceptions of social norms and behavioral control, ultimately influencing their engagement in PEB. More importantly, the study showed that these three predicting factors (EA, SN and PBC) collectively accounts of 49% of variance in PEB. This is consistent with the principles of the Theory of Planned Behavior, which suggests that attitudes, subjective norms, and perceived behavioral control together forecast behavioral intentions and, in turn, pro-environmental behavior (Ajzen, 1991).

Furthermore, the positive correlations between SN and PBC, SN and PEB, and PBC and PEB underscore the complex interplay between social influences, individual beliefs, and behavior (Batool et al, 2024). Social norms, characterized by the perceived expectations of significant others, play a crucial role in shaping individuals' perceptions of their behavioral control and subsequent behavior (Ajzen & Fishbein, 1980; Cialdini et al., 1991). This appears to suggest that interventions targeting social norms may effectively promote PEB by leveraging social influence processes.

The hierarchical regression analysis further elucidates the predictive power of these psychosocial factors on PEB. Environmental attitude emerges as a significant predictor in the initial step, explaining a substantial portion of the variance in PEB. This finding corroborates previous research highlighting

the central role of EA in driving PEB (Schultz, 2001). However, the slight decrease in the beta coefficient for EA when social norm is added to the model suggests a partial mediation effect, indicating that social norms may moderate the relationship between environmental attitudes and PEB (Oreg & Katz-Gerro, 2006).

Moreover, the significant contribution of PBC to the regression model underscores the importance of individuals' beliefs about their ability to perform pro-environmental actions. This finding aligns with Bandura's social cognitive theory, which emphasizes the role of self-efficacy in shaping behavior (Bandura, 1986). This tend to highlight that interventions aimed at enhancing individuals' perceived control over environmental actions may therefore be effective in promoting sustainable behavior change (Stern, 2000).

Finally, as we come to the end this section, it is crucial to acknowledge some limitations of the current study. Firstly, while the study presents a comprehensive overview of the participants' sociodemographic characteristics, it lacks such contextual information as socioeconomic status, and cultural backgrounds, access to resources, etc. These factors could significantly influence individuals' attitudes and behaviors towards environmental conservation (Joireman et al, 2001). Secondly, the reasons cited by the current study participants for non-participation in WSM activities provide valuable insights into perceived barriers. However, these reasons are self-reported and may not capture underlying factors such as lack of awareness, social norms, or institutional constraints. Thirdly, while the statistical analyses reveal significant differences in PEB across demographic categories, the effect sizes are relatively moderate. This suggests that other unexplored factors may also contribute to

variations in environmental attitudes and behaviors. Fourthly, the hierarchical regression analysis highlights the incremental contributions of environmental attitude, social norm, and perceived behavioral control. Although big enough that a single study can find, the explained variance (49%) accounted for PEB by environmental attitude, social norm, and perceived behavioral control indicates that a substantial portion (51%) of the variation remains unaccounted. This could also signify the limitation of relaying on a single theoretical framework (i.e., the theory of planned behavior) for a study. Future studies could explore additional predictors or moderators by including other competing theories (e.g., value-belief norm theory) to enhance the predictive accuracy of the model (Batoool et al, 2024).

5. Conclusion and Recommendations

5.1.Conclusion

In conclusion, the findings of this study found out that individuals who expressed stronger pro-environmental behaviour (1) were women; (2) didn't go to school; (3) were older than thirty; (4) took an active part in WSM; (5) scored higher environmental attitudes; (6) subjective norms; and (7) higher perceived behavioral control. Cognizant of the limitations of the current study which were indicated in the discussion section, the results provide valuable insights into the factors influencing PEB, which can help policymakers and practitioners to understand these dynamics in developing a more nuanced and effective strategies for promoting PEB in resource poor residents, the Choke watershed areas.

5.2.Recommendations

Based on the lights of the current study, the following recommendations are forwarded for practitioners, researchers and policymakers with an emphasis on practical strategies for community engagement.

- For practitioners:
 - Interventions aimed at promoting PEB should consider demographic differences and tailor strategies accordingly. For instance, programs targeting youth may focus on education and awareness, while those targeting adults could emphasize community engagement and participation. This could contribute to the bridge of generational divide that is essential for fostering long-term sustainability and resilience in environmental conservation efforts.
- For researchers:
 - Future research should adopt mixed-methods approaches to complement quantitative analyses with qualitative insights. In-depth interviews, focus group discussions, or participatory methods could provide richer narratives and facilitate a more nuanced understanding of environmental attitudes and behaviors among participants of this study site.
- For policy makers:
 - They should recognize the influence of sociodemographic factors and psychosocial determinants on PEB for more effective and targeted policy interventions. They, for instance, should consider sex differences when designing and implementing programs aimed at promoting PEB.

Data Availability: The datasets used to support this study are available from the corresponding author upon reasonable request.

Conflict of Interest: All authors declare that there is no conflict of interest.

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