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Research Article

Assessment of community knowledge and perception on environmental issues in Jimma Zone, Southwest Ethiopia

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Abstract: Environmental knowledge and perceptions of community govern the sustainable use and management of environmental resources. Ethiopia has been facing serious environmental problems. In spite of the existing problems, little is known about public understanding and perception of environmental issues. Thus, the overall objective of this research was to assess community perception and knowledge of environmental issues. Interview was conducted using structured questionnaire. The collected data were coded, cleaned and analyzed using descriptive and inferential statistics. The result indicates, most of the community members believed that they have better knowledge of environmental issues, but the evidence obtained from measured knowledge shows the reverse. The principal source of environmental information (local media broadcasting) had a positive correlation with perceived knowledge and negatively correlated with assessed knowledge and perception index of environmental issues. Correctly answered questions used in the evaluation of environmental knowledge were weekly associated ($r < .2$) with perceived knowledge and perception, which indicates lacks of uniform environmental concept among community. Perceived knowledge was negatively and significantly ($P < .001$) determined by age and educational levels of respondents. But, measured knowledge was negatively and significantly ($P < .05$) affected by age, childhood area, education and occupation when positively and significantly ($P = .001$) influenced by the origin of residence. Similarly, perception was positively and significantly ($P = .001$) determined by respondent's age, childhood area, education and information source but negatively and significantly ($P < .05$) influenced by the origin of residence and ethnic group. Generally, self-reported knowledge is not reliable source of information for environmental management decisions. So, stakeholders should strongly work on environmental awareness campaigns, engage students in outdoor activities, and training to improve factors negatively determined community's factual knowledge and perception of the environment.

Keywords: *assessed knowledge, environmental information, perceived knowledge, perception index*

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Introduction

Environment includes living things, land, water, weather and climate in their natural state or modified via human actions. It provides lots of benefits for human needs and used to expand habitat (Sudarmadi et al., 2001). The current production, consumption and settlement action become a major global issue (Sudarmadi et al., 2001) and challenges development, stability, and

lifestyle in African continent (Andrew, 2006). In Africa, environmental problems are partly resulting from mismanagement of farmlands and agricultural byproducts, rapid population growth, cropland expansion, and deforestation. The rapid population growth is liable for environmental deterioration, where it is projected over 1.7 billion in 2030 (African Population, 2017). Environmental deterioration could get worst due to overexploitation of environmental resources for the sake of survival.

Many efforts have been made in Africa to improve the environmental conditions and well-being of the society through reducing deforestation, wetland degradation, wildlife migration, water pollution and biodiversity loss (Mabogunje, 1995; UNEP, 2016). The knowledge, perception, and actions of local communities who have full access to environmental resources are among the key elements of solving environmental problems (Dean et al., 2016) and determine sustainable management of the environment (Macura et al., 2011). When a community knows more about their environment, their interest and concern of environmental issues also increase (Durant et al., 1989). A community knowledge is enhanced through informal (e.g., personal observation, media etc.) and/or formal (e.g., curricula based) educations (Rickinson, 2001). Knowledge governs people's perceptions, attitudes and actions through building a sense of concern about local and global environment (Hale, 1993; Yavetz et al., 2009; Pykett, 2012). A person with better knowledge about their surrounding environment are more likely environmental positive, care and provides knowledge-based solution (Bradley et al., 1999). Thus, knowledge is important in decision-making processes at individual or community level. Peoples must know the problem before trying to solve it (Hmelo-Silver, 2004) because their understanding affects the decision quality and actions propose (Delli-Carpini and Keeter, 1996).

However, environmental knowledge varies among peoples (Barthwal and Mathur, 2012). Peoples with low environmental awareness are linked with negative attitudes (Fiallo and Jacobson, 1995; Heinen and Shrivastava, 2009) and unsure attitudes (Ormsby and Kaplin, 2005). A negative attitude towards environment is emanated from exclusion of local community in environmental related decision-making processes (Silori, 2007). But, sustainable management of the environment depends on local community support (Macura et al., 2011). For centuries, environmental resources are used as livelihood basis in Ethiopia. Consequently, the country has been facing several environmental problems such as biodiversity loss, deforestation, flooding and food insecurity (CEPG, 2011). In return, the country is running various environmental management programs, for instance, environmental rehabilitation, participatory national resource management, watershed development programs, and environmental impact assessment (Bekele et al., 2018; Sinore et a., 2018). These interventions are executed with little scientific understanding and awareness of the community (Ruffeis et al., 2010). Thisimplies, that most of the environmental management interventions are carried out with scientific information at an expert level which is not transferred to the local community to transform their knowledge, perception, and actions.

In Ethiopia, some research conducted on people's knowledge and perception of environment focused on respondent's self-reported knowledge and perception, and failed to measure their actual knowledge of environmental issues using some objective questions. Most of the time respondent's perceived (self-reported) knowledge is defective and relatively far from scientific knowledge. This study was examined community perceived and assessed knowledge, and perception towards basic environmental issues. Therefore, this study hypothesized peoples in the study area lack of sufficient environmental knowledge that could positively shape their environmental perception, attitude and actions.

Materials and Methods

Description of the study area

The study area-Jimma Zone is one of the administrative Zones in Oromia National Regional State (ONRS) situated in southwestern Ethiopia (Figure 1). Jimma town-the capital and administrative center of the zone is locatedat 350 km away from Addis Ababa-the capital city of Ethiopia. Jimma Zone is home for nearly 2.5 million peoples, which is raised by 27% from earlier census (CSA, 2007). The zone has an area of 15,569 square kilometres with a population density of 160. Among the population only 11.31% lives in urban and the rest populations are rural residents. Jimma Zone is bounded with Kafa zone of Southern Nation Nationalities and People's Regional State (SNNPRS) in the south, Illubabor and Buno-Bedelle zones of Oromia National Regional State (ONRS) in West and Northwest, Yemi Special Woreda of SNNPRS in east, and West Shewa of ONRS in Northeast. The elevation of Jimma zone varies from 1000 - 3360 masl (meter above sea level). The maximum and

minimum temperature ranges from 24-30^{o}C and 7-15^{o}C, respectively. It receives mean annual rainfall between 1200 - 2800 mm. The rainfall distribution pattern is characterized as bimodal; shortest from February - March and longest (heavy) from June - September. The principal economic activities of the area are livestock and crop mixed subsistent farming systems. The cropping system includes coffee, cereal and fruit production whereas the livestock sector includes cattle, sheep, goat, horse, donkey and mule.

Design of data collection

A cross-sectional survey was conducted from May - June 2018. The data on explanatory and dependent variables were collected using structured questionnaire. The questionnaire was developed in English language and translated into *Afan Oromo*- local language. To ensure the validity and reliability of information acquired via questionnaire survey, 10% of the respondents were randomly selected for questionnaire pretest activity. During pretest, the researchers examined respondent's understanding and interpretation of each question against the research intention, and checked response. The questionnaire had three sections with varying item numbers; explanatory variables items, environmental fact items, and Likert scale (5-point scales) items. The question under each section was developed after intensive related literature reviews and able to capture basic environmental concepts. As the respondents correctly answer those questions, they were more likely to understand environmental issues better than the others. The respondents knowledge was assessed using: self-reporting (as high, moderate and low) environmental knowledge, and asking subjective environmental questions. Perception was assessed using Likert scale: strongly agree (1), agree (2), neutrals (3), disagree (4) and strongly disagree (5), the values indicate position of community perception towards environmental issues. A face-to-face interview was conducted on 300 randomly selected respondents around Jimma town (Jitu village) and rural areas (Kachama village). The respondents were selected from primary school students, higher education students, and farmers. The lists of students in the school (grade 7-10, and higher institutions) and farmers in district administrative center were used as sample frame to randomly select respondent for face-to-face questionnaire interview. The face-to-face interview was conducted using three trained data collectors. Cochran (1977) finite population formula was used to determine respondent sample size (300).

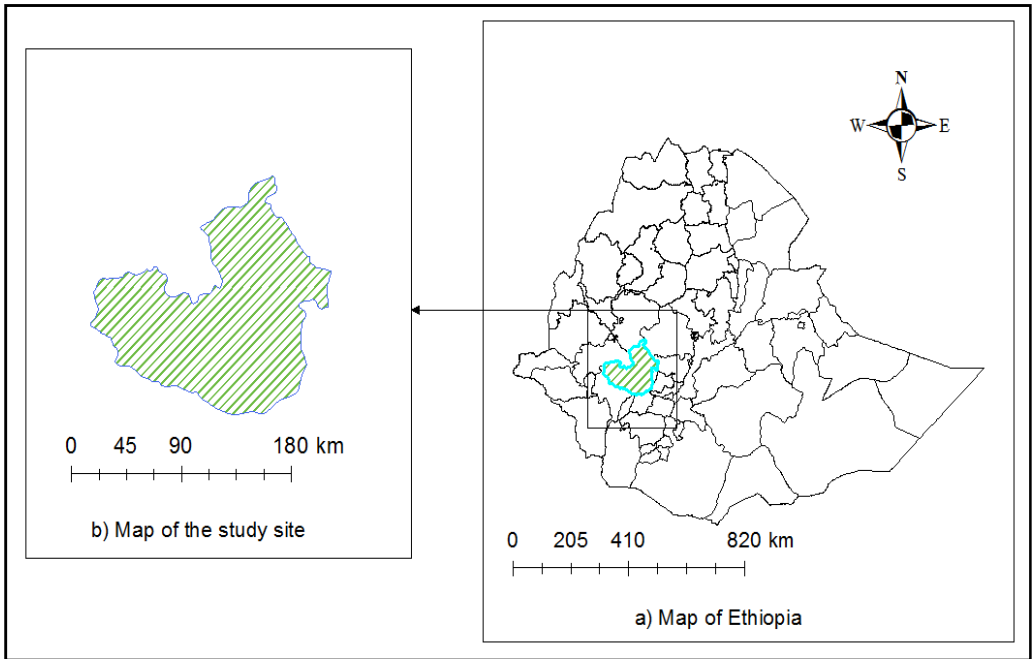

Figure 1. Map showing the location of Jimma Zone (b) in Ethiopia (a)

Statistical analysis

The data collected were coded, cleaned and analyzed using SPSS version 20 (IBM, 2011). A simple descriptive statistic such as mean, standard deviation, and percentage were used to present basic information. As peoples have various extents of perceptions whether they perceive or

not perceive of environmental issues, it does not provide sufficient information about their behaviour, e.g., conservation actions (Baidu, 1999). So, perception and knowledge regarding environmental issue should be indexed and set to an ordered value of low, moderate and high (e.g., Dodendo et al., 2010). Ordered Logit Model was used determine the effects of explanatory variables on knowledge and perception of the community. This model is versatile to capture information of ordered dependent variables and reveals factors determine community perception, and knowledge (Verbeek, 2003). General ordered logit model is specified as follow (Verbeek, 2003);

$$Y_i = \beta' X_i + \varepsilon_i$$

where: Y_i is the underlying latent variable that indexes the level of community perceptions of environmental issues; X_i is a vector of explanatory variables; β'is parameters to be estimated and, ε_i is the error term, assumed to follow a standard normal distribution.

The latent variable shows an ordinal scale, which was observed and coded as a discrete community knowledge and perception of environmental issues (1= high, 2 = moderate, 3= low). Table 1 shows the descriptions of dependent and independent variables considered in this study.

Table 1. Description of study variables

Variables		**Descriptions**
Dependant variables	Knowledge	1 = High, 2 = Moderate, 3 = Low
	Perceptions	1 = High, 2 = Moderate, 3 = Low
Explanatory variables	Age	Year
	Sex	1= Male, 2= Female
	Marriage status	1= Married, 2 = Otherwise
	Childhood area	1 = Rural, 2 = Otherwise
	Education level	Year of formal education
	Occupation	1= Student, 2 = Otherwise
	Ethnic group	1 = Oromo 2 = Otherwise
	Residence origin	1= Indigenous 2 = Otherwise
	Religion affiliation	1 = Muslim 2 = Otherwise
	Perceived knowledge	1= High, 2 = Moderate, 3 = Low
	Main sources of information	1 = Media, 2 = Training/course, 3 = Friends

Results and Discussion

Socio-demographic profiles of the respondent

The face-to-face interviews were conducted with 300 respondents, 93.7% of the respondents (n=281) responds to all question when 6.7% terminated the interview at a different stage. Table 2 summarizes the descriptive statistics of respondent's age, sex, education, marital status, religious affiliation, ethnicity, origin, occupation, and income status. Out of 281 respondents, 66.9% were students and 33.9% farmers. About 50.9% of the respondents were male, and 49.1% were female with an average age of 27.95 $\pm$ 16.01. Among the respondent's farmers, 31.0% did not attend a formal education, and few had primary education certificate. About 43.8% of the respondents were married which consist all of the farmers and few higher and secondary education students. Regarding childhood area and origin of residence, most of the respondents were spent their childhood time in rural area (78.6 %) and native resident (87.9%) in the study area. The native residents participated in the interview were Oromo (ethnic group). About 86.5% were Muslims while 13.5% were Christians. Among the respondents, 79.7% obtained environmental information from local media (such as FM radio, and TV broadcasting) whereas 20.3% from trainings organized by local government and non-governmental organizations, and school courses-mainly students.

Community knowledge and perception of environmental issues

Figure 2 presents respondents self-reported and assessed knowledge of environmental issues. The respondents reported themselves as knowledgeable had most likely low in assessed knowledge. This indicates most peoples overestimated their environmental knowledge when a few peoples underestimate. This disagrees with Malka et al. (2009) who reported peoples are fairly report their understanding and realize the extent of their actual knowledge about environmental issues.

Table 2. Summary of socio-demographic characteristics of the respondents (n=281)

Variables	Category	N	Percentage (%)
Sex	Male	143	50.9%
	Female	138	49.1%
Age	Mean ± SD (year)		27.95 ± 16.01
Marriage status	Married	123	43.8%
	Unmarried	158	56.2%
Childhood area	Semi-urban	60	21.4%
	Rural	221	78.6%
Education level	Not attended	87	31.0%
	Primary	79	28.1%
	Secondary	19	6.8%
	Higher education	96	34.2%
Occupation	Student	188	66.9%
	Farmer	93	33.1%
Ethnic group	Oromo	229	81.5%
	Other	52	18.5%
Residence origin	Indigenous resident	247	87.9%
	Migrated	34	12.1%
Religion affiliation	Muslim	243	86.5%
	Christian	38	13.5%
Perceived knowledge	High	128	45.6%
	Moderate	130	46.3%
	Little	23	8.2%
Main sources of information	Media	224	79.7%
	Training/course	57	20.3%

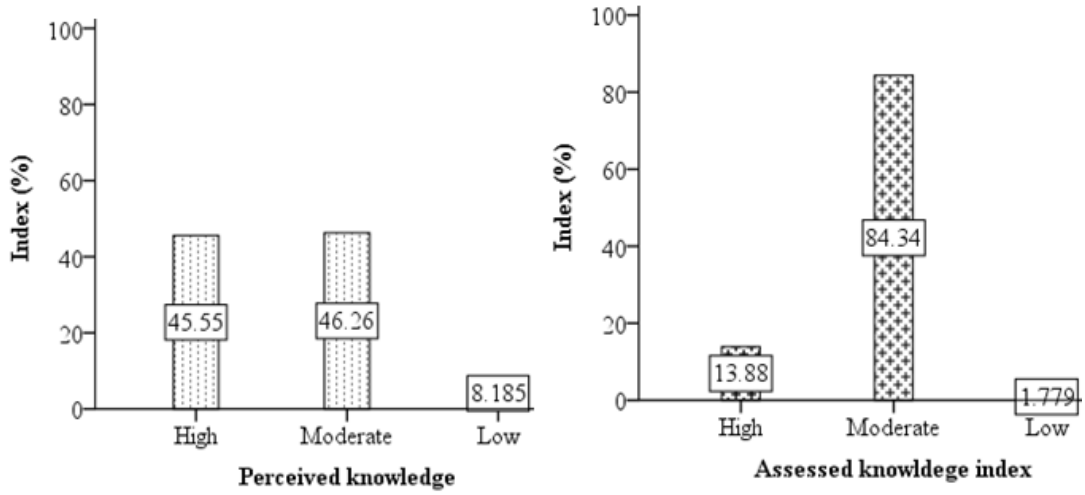

Figure 2. Respondents perceived and assessed knowledge towards environmental knowledge (n=281)

Unlike the developed nations, most peoples in developing nations like Ethiopia have limited exposure to scientific information in the areas of social, economic, environmental and political issues. Consequently, the nation relies on traditional knowledge for any decisions and considers it as correct knowledge. In the 21centry, it is advisable to avoid the use of self-reported knowledge as basis for environmental decisions and to use measured actual knowledge for environmental management decisions. The respondents relied on local media were positively correlated with self-reported knowledgeable, and negatively ($r = -.193$; $P < .01$) correlated with measured knowledge (Table 3). Though the community uses local media as source of environmental information, the media has played little role in sharing scientific environmental

knowledge to the community. Connell et al. (1998) reported media and school courses are primary source of environmental information for peoples. Often, in the study area, local media broadcasting services were mainly focus on politics, entertainment, and provides less attention to expert assisted debate on environmental issues (e.g., pollution, biodiversity loss, climate change etc.). Further, perceived knowledge had strongly positive and highly significant correlation (r = .156; P = .01) with environmental perception. This elucidates the impacts of low environmental knowledge on perception; peoples with better environmental knowledge develops better perception. Community perception had a negative association with the information source and positive correlation with assessed knowledge. This signifies the roles of measured scientific knowledge on environmental perception.

Table 3. Correlation matrix of community knowledge and perception with major source of environmental information (n = 281)

	Perceived knowledge	**Perception**	**Assessed knowledge**
Perceived knowledge	1		
Perception index	0.156**	1	
Assessed knowledge	0.078	0.090	1
Environmental information	0.083	-0.083	-0.193**

*** = very highly significant at P < .001

Table 4 shows correctly answered questions used in the evaluation of environmental knowledge, and the correlation between each question with community knowledge and perception. The correctly answered questions were below 40% this figure out the scopes of local community knowledge towards environmental issues. The correlation results show, most of the questions were weakly associated (r < .2) with environmental perceived knowledge and perception index of the community. This indicates lacks of uniform concepts on environmental issues and presence of weak idea association among respondents. This concedes with Bord et al., 2000) strong association between the dependent variable (e.g., assessed knowledge) and knowledge questions shows the presence of measurement errors.

Table 4. Correlation of knowledge question with perceived knowledge (PK) and perception index (PI) on environmental issues (n= 281)

Question list	**% correct**	**Spearman correlation (r)**	
		PK	**PI**
A variety of life living in different environment is known as?	29.5	0.108	0.165**
What are the major causes of water pollution in Jimma?	28.1	-0.080	-0.048
Currently estimated population of the Ethiopia?	49.1	0.102	0.167**
Currently estimated population of the world?	16.4	-0.104	0.002
Which of the following cause climate change?	41.3	0.072	0.186**
What is the most common cause for species extinction?	40.6	0.075	0.108
What are the major energy sources in rural Ethiopia?	51.6	0.182**	0.090
Which of the following is a non-renewable resource?	38.8	-0.123**	0.092
What are aims of the sustainable agriculture?	36.7	-0.098	0.020
Why people around the world suffer from hunger?	12.8	-0.109	-0.005
What should be done to maintain ecosystem health?	36.7	-0.032	0.094
Which one of the following is a function of wetlands?	40.9	0.175**	-0.092

PK = Perceived knowledge; PI = Perception index

Factors determine community knowledge and perception of environment issues

Table 5 presents logit regression analysis results that examine determinants of community perceived and assessed knowledge, and perception towards environment. Among the explanatory variables; sex, ethnic group and settlement origin were positive determines community perceived knowledge of environmental issues. The native residents especial the males had constructive contribution

for the perceived knowledge than females. This could be due to the fact that, males consider themselves as knowledgeable group in the society. Other study show, males are aware of environmental issues in long-term and females tend to understand local environmental issues immediately (Myers et al., 1999). Other dependent variables; age and educational level of respondents had negative and significantly ($P < .05$) influence on the perceived knowledge. These variables affect the knowledge of community with the rates of 0.94 and 0.21, respectively when the other explanatory variables being constant. In the study area, as people's age and educated level increases, they consider themselves as experienced and knowledgeable on all issues including environment, and becomes overconfident. The overconfidence without and/or with little scientific trainings on environmental issues was a reason for self-reporting as knowledgeable community member. This agrees with Palmer et al. (1996) who stated the older peoples are better understanding of environmental issues than the younger groups, with some degree of misunderstanding. Assessed knowledge of community was positive and significantly ($P<.05$) influenced by origin of settlement (Table 5).

The odds ratio indicates origin of residence improves measured environmental knowledge with 932.62 factors when other independent variables kept constant. The native residents were more concerned about the environment than peoples migrated from other areas of the country for various socioeconomic purposes. Because indigenous residents feel ownership for the environment where they live, realizes environmental changes over time, and becomes more concerned about the environment than the others. Another study also confirms factual knowledge of people on environmental issue is determined with place of residence area (Rickinson, 2001). Unlike native residents, migrated residents had little-measured knowledge and high self-reported environmental knowledgeable. This reveal, due to lacks of sufficient environmental knowledge and perceptions migrated residents may more contribute to environmental degradation than the natives.

Studies show little factual knowledge of environmental issues is associated with poor understanding of the issue (Connell et al., 1998; Kuhlemeier et al., 1999). Further misunderstanding of the sciences of environmental processes (e.g., greenhouse gas, biodiversity loss, waste management etc.) and facts become common in the school children and the general public (Glazar et al., 1998; Myers et al., 1999). Beside poor awareness of environmental issues, little scientific knowledge and misunderstanding of environmental issues may aggravate environmental degradation problems in developing countries like Ethiopia unless corrected quickly. Palmer et al. (1996) reported misconception about environmental facts and processes should be corrected soon unless environmental problems will continue or increase over time. Contrasting to origin of residence respondent's age, childhood area, education, and occupation were negatively and significantly ($P > .05$) determines measured knowledge of environmental issues.

Table 5 presents the determinate of respondent’s perception. Among the studied explanatory variables, respondents age, areas of childhood spent, education level, and source of environmental information were positively and significantly influenced their perception. A unit change in respondent's age and educational level improve their perceptionof environmental issue by 1.1 and 2.9 factors, respectively when other variables kept constant. This explains the progressive improvement of people's perception on environmental issues as they acquire more information through formal education, informal education, and experience. This disagrees Tesfai et al. (2016) who reported educational level does not influence people's perception of environmental issues. The observed difference was happened due to difference in target sample population and in civilization status. Peoples exposure to a scientific information and training (e.g., short-term- capacity building; long term-curriculum based) on environmental issues improves their perception with the magnitude of 2.2. This shows the presence of environmental topics in school syllabus and short-term trainings for students and farmers improves their perception of environment. In the study area, the poor farmers and youths at school were more aware of economic and material benefits obtained from environmental resource utilization to meet their basic needs. In other countries, young people are less environmentally conscious due to material desires; for instance, youths in Australia to recent technology (Connell et al., 1998) in Singapore for cars (Ivy et al., 1998).

Regarding the childhood area, respondents who grew in rural area had better exposure to the natural environment, values conservation and developed better perception towards the environment than those who spent their childhood time in urban areas. A unit change in exposure to natural environment during childhood improves people's perception on environmental issues by 2.3 factors when keeping other variables constant.

Table 5. Determinants of local community knowledge and perception of environmental issues (n=281)

Variables	**Perceived knowledge**			**Assessed Knowledge index**			**Perception index**		
	β (ε)	**Wald**	**exp(β)**	**β (ε)**	**Wald**	**exp(β)**	**β (ε)**	**Wald**	**exp(β)**
Knowledge1/Perception 1	-3.541 (1.068)	11.002		-38.873 (16.649)	5.451		-5.479 (1.292)	17.980	
Knowledge 2/Perception 2	-0.700 (1.046)	0.448		-5.831 (9.201)	0.402		-1.454 (1.154)	1.587	
Age	-0.060 (017)***	12.109	0.942	-.249 (.118)**	4.434	0.780	0.065 (.026)**	6.070	1.067
Sex	0.014 (.244)	0.003	1.014	0.116 (.576)	0.040	1.123	0.283 (.219)	1.671	1.327
Marriage	-0.283 (.367)	0.595	0.754	3.800 (2.328)	2.663	44.702	0.155 (.360)	0.187	1.168
Childhood	-0.422 (.383)	1.214	0.656	-5.301 (2.820)*	3.533	0.005	.854 (.419)**	4.142	2.349
Education	-1.572 (.489)***	10.309	0.208	-7.617 (3.289)**	5.364	0.0005	1.083 (.401)***	7.297	2.953
Occupation	-0.718 (.788)	0.830	0.488	-6.297 (8.458)*	3.713	0.002	-0.380 (.722)	0.277	0.684
Ethnic	0.436 (.409)	1.135	1.547	0.055 (.875)	0.004	1.057	-0.896 (.352)**	6.487	0.408
Origin	0.413 (.559)	0.545	1.511	6.838 (3.125)**	4.786	932.622	-1.827 (.481)***	14.456	0.161
Information source	-0.102 (.395)	0.088	0.903	-0.792(.708)	1.252	0.453	0.769 (.335)**	5.267	2.158
-2 Log Likelihood (LH)	412.444	P-value		-2 Log LH	186.660	P-value	-2 Log LR	263.105	P-value
λ^2	465.740	0.020		λ^2	542.208	0.000	λ^2	466.489	0.008
Nagelkerke R^2	0.137			Nagelkerke R^2	0.295		Nagelkerke R^2	0.410	

ε=standard error; exp(β) = odds ratio; *** = significant at P = .001; ** = significant at P = .01; * = significant at P = .05

This show, exposing school children (especial urban schools) to the natural environment for the topic covered in class curricula on environmental issues is very important to improve student's perception of environmental issues and provides practical oriented knowledge. The present study concedes with Berto et al. (2018) who reported individual's connection to natural environment determines their perception towards nature. Further, Langlois (2012) stated living area of people's determining their perception of environmental issues.

Conclusion

The results of this investigation reveal most of the community members feel that they have better environmental understanding but the realty indicate majority of the community have moderate knowledge. Those who overestimate their environmental knowledge mainly depend on local media broadcast (e.g., FM radio and TV) for environmental information. Among the studied variables origin of residence is positively determine community knowledge (assessed knowledge) whereas age, areas of childhood sent, education, and source of environmental information optimistically determine their perception. This calls strong scientific intervention in the area of community education and conservation to improve the local community knowledge and perception towards environmental issues.

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