Scholars Journal of Arts, Humanities and Social Sciences **ISSN 2347-5374 (Online)**
Sch. J. Arts Humanit. Soc. Sci. 2016; 4(4B):389-401 **ISSN 2347-9493 (Print)**

(An International Publisher for Academic and Scientific Resources) DOI: 10.36347/sjahss.2016.v04i04.012

Cognitive model of ecological behavior of the inhabitants of Cochabamba

Carlos Eduardo Valdivieso Taborga[1], Oscar Álvaro Valdivieso Taborga[2], María Paola Valdivieso Taborga[3]
[1]Research Professor at the Department of Exact Sciences. Universidad Privada Boliviana (UPB)
[2]Head of Production Engineering Career. Universidad Privada Boliviana (UPB)
[3]Project Administrator Pasorapa

***Corresponding Author:**
Carlos Eduardo Valdivieso Taborga
Email: cvaldivieso@upb.edu

Abstract: This paper conducts an empirical study in Cochabamba, Bolivia in order to replicate a model of ecological behavior proposed by González. For this purpose, 400 people were surveyed about their assessment of environmental concern. It was determined that the measuring instruments constructs environmental concern (ecological-altruistic and egocentric values, ecological beliefs, environmental consequences, environmental control, denial of obligation, personal standard and ecological behavior) have a robust factor structure, good explanatory power, items relevant, adequate reliabilities and have construct validity. Using analysis of variance and multiple range test of minimum significant difference, it was determined that the demographic profile of the citizen of Cochabamba with a positive ecological behavior is the elderly (55-85 years), widowed or divorced, who has done advanced studies, middle-high, middle and lower middle class and female. Using structural equation modeling (SEM), the significance and direction of the relationships between constructs model of ecological behavior were checked and found to be the inhabitant of Cochabamba, through ecological and altruist values formed in his life, acquires a confidence that their own actions can improve the quality of the environment, it achieves a greater sense of obligation to carry out protective behaviors and environmental protection, to finally get more involved in the implementation of ecological behavior. The model of ecological behavior achieved a predictive power of 37% and a not very good quality fit.
Keywords: Ecological behavior, structural equation modeling, environmental concerns, socio-demographic profile of environmental behavior, ecological beliefs.

INTRODUCTION

Environmental awareness campaigns aim to change information available to people, but this is not the best strategy to promote behavioral change and environmental actions [1]. The intervention must be based on the perception of context, psychosocial and cognitive processes, not only on technical or financial criteria. .

Environmental problems facing the citizens of Cochabamba are common to all cities: air pollution, climate change, water pollution, solid waste accumulation, soil erosion, loss of species diversity due to degradation of forest, among others [2]. All these problems are well-known to be a behavioral origin. According Corral-Verdugo [3], the relationship between human behavior and ecological deterioration is evident. The people of Cochabamba need to acquire knowledge and ecological behavior that allows the harmonious development of the city and a new consumer culture where a transformative sustainability-oriented education has a key role [4].

The town hall and governorate of Cochabamba, along with other civic institutions, conduct periodic campaigns for the improvement of the environment. However, the increase in social sensitivity towards the defense of the environment seems to not have translated into specific behaviors. This is consistent with studies that show that the correlations between pro-environmental attitudes and ecological behavior are very low [5]. Therefore, it has been suggested that a high awareness about the environment, does not ensure the implementation of responsible environmental behavior [6]. All this emphasizes the need to carry out further research to refine models that attempt to explain behavior in favor of the environment [7]. Kaiser *et al.*[8], then take best strategies, particularly in developing countries where there has been very little studied on pro-environmental behavior [9], Ortega [10].

The limited impact of behavioral analysis applied to environmental problems obeys poor dissemination strategies, making necessary to communicate research results to policy makers[10]. In

that sense, prior to designing any educational strategy for environmental education in Cochabamba, it must be verified by a model of ecological behavior in which the mechanisms, the inhabitants of Cochabamba, form their ecological behavior through the study of close relationships between values, beliefs, attitudes and environmental behaviors.

OBJECTIVES AND HYPOTHESIS

In this research, the significance and direction of all relationships of the cognitive behavioral ecology model of Figure 1, proposed by González [11], applied to the person who lives in Cochabamba will be tested.

The significance of sociodemographic variables on ecological behavior a socio-demographic profile of the inhabitants of Cochabamba about their concern for the environment is also tested.

An empirical study with a sample design that allows for the collection of data that can be treated by multivariate statistical techniques will be conducted. To determine a robust structure of the constructs under investigation and retain relevant items, will be carried out by the exploratory factor analysis (EFA). For the demographic profile for acitizen of Cochabamba on their behavioral ecology analysis of variance (ANOVA), with the multiple range test being used. In order to determine the strength and direction of the relationships between constructs of the model, a structural equation modeling (SEM) will make.

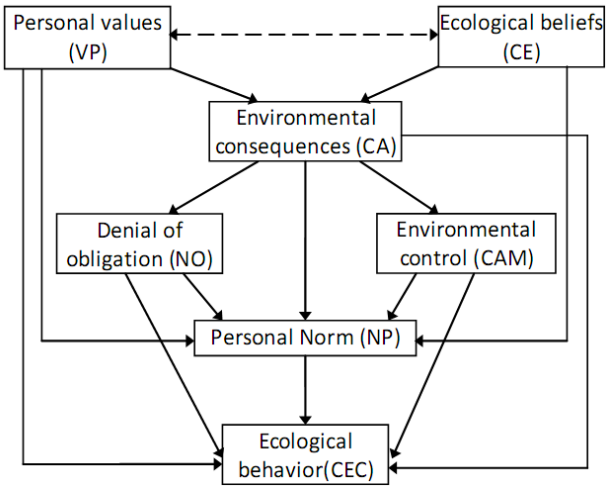

Fig-1: Cognitive model of ecological behavior. Source: González [11]

REVIEW OF LITERATURE

Conduct and environmental behavior

Bolzan and Pol [12] emphasize that there is confusion in the terminology of environmental behavior in the literature. Some call responsible ecological behavior [13], other pro-environmental behavior [14-15] and most environmental behavior [16, 17, 18, 19]. This variety is due to different approaches to the study of eco-friendly behavior [10]. For some it is a habit, for other it is an intentional action and others indicate that only appears in a forced way in individuals [9].

González [11] refers to organic behavior as a deliberate involvement and has real consequences for the protection of the environment [20]. The concept includes human actions that influence in a relevant way the character and intensity of environmental problems [21], as saving resources, recycling, responsible consumption and avoidance of pollution. The pro-environmental behavior incorporates complex behaviors of individuals, and collective characters that can be preventive and corrective, direct and indirect, with the intended purpose to improve environmental quality.

Bolzan and Pol [12] indicate that the environmental performance is not accidental and is related to the individual's effort to anticipate the results of their actions and lead to changes in their environment. Corral-Verdugo [20] warns that imposed or automatic actions cannot be considered as a pro-ecological behavior. Pato [22] emphasizes that although environmental performance is intentional, does not mean that people cannot learn or modify their behavior in favor of the environment through circumstantial random or even forcible actions. From this point of view, the eco-friendly behavior has three characteristics:

1. It is a product or result, since it involves actions that generate visible changes in the environment.
2. Identifies as effective behavior: results from the solution of a problem or a response to a stimuli. These requirements can be derived from attitudes and personal motivations, but also due to social norms.
3. It has a certain level of complexity, i.e., a level that transcends the present situation and anticipates and plan for the expected effective result.

Currently, there is no agreement on the concept of ecological behavior and the areas covered, as they have been the result of empirical research in a specific context and under certain conditions. In conclusion, the ecological behavior would be defined not only by the impact on the environment of a diverse set of human actions, but also the intent of these actions to maximize the protection of the environment and reduce spoilage.

Determinants of ecological behavior

Contextual factors

They refer to a set of variables such as sociodemographic, technological, geographical, social, economic and political, physical or inhibitory facilitators as well as laws, regulations or public policy and institutional regulations [23, 24].

Sociodemographic variables relate to environmental behaviors, but very diffuse form [25, 26]:

- Some research has found that age does not influence the ecological behavior [27, 28], while others express the opposite [29, 30].
- Some studies have investigated that gender is not influential to ecological behavior [31, 29], but others have found that women are more willing to protect the environment [32, 33, 28].
- The level of education has presented a positive relationship with the ecological behavior [31, 29, 34, 35].

Psychosocial factors

Refer to personal variables, such as responsibility for the action and the locus of control, attitudes, beliefs and values. In the case of the environment, social and community factors have also had an effect on personal attribution of responsibility for conduct related to public goods such as environmental resources [36].

Cognitive factors

It refers to beliefs of people of their actions to reorient their conduct and their knowledge of strategies to solve the environmental problem [37]. Young [38] suggests that despite environmental concerns, positive attitudes and external incentives, ecological behavior occurs only in contexts that stimulate the cognitive basis of intrinsic satisfaction such as competition, participation and frugality.

Models of environmental behavior

González [11] made the following classification: 1) contextual models are those where the causal order between variables goes from external factors of socioeconomic environment (technology, economics and demographics) to personal factors (beliefs, attitudes, values and norms concerning the environment), 2) psychological models: they are based on the cognitive structure of individuals, including attitudes, beliefs, values and environmental behavior, and 3) procedural models: trying to understand the relationship between personal and contextual variables, through the study of social interaction processes that influence people to acquire a certain ecological behavior.

One of the most complete models is that of value, norms and beliefs towards the environment (VBN) raised by Stern *et al.* [39] and Stern [40]. It is based on the model of normative influence on altruism of Schwartz [41] that the mechanism that leads people to act altruistically is explained. Ecological behavior depends on the activation of personal standards, explained by the beliefs associated with the conduct (AC) and the assignment of responsibility (AR) (See Figure 2).

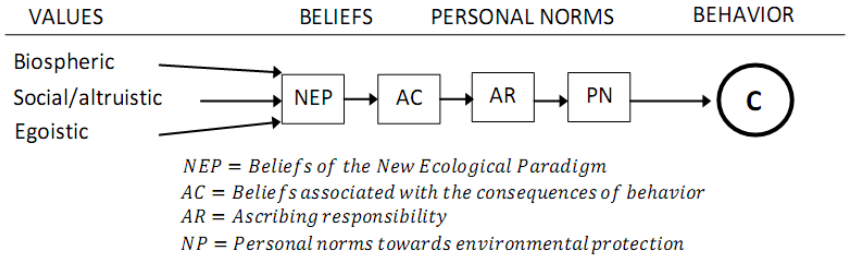

Fig-2: Model V-B-N (value, beliefs and norms) Source: Stern [40]

In conclusion, the models analyze relations and socio-psychological variables, to understand the mechanisms by which certain cognitive structures and attitudes, values and beliefs influence environmental behavior. All models studying pro-environmental behaviors represent a low percentage of variance explained by environmental behavior [24, 40, 42, 43].

Cognitive behavioral ecology model proposed by González [11]

González [11] proposed a cognitive model of ecological behavior, recognizing the need for a multivariate approach that also considers contextual factors. The model was based on the theory of activation of altruistic norms of Schwartz [41] and the empirical and conceptual framework developed by

Stern *et al.* [44], [39]. González [11] suggested the model to analyze the effects of various factors (personal values, ecological beliefs, consequences of protection or environmental degradation, denial of the obligation to the environment, environmental control and personal norms) on ecological behavior (see Figure 1).

Instruments used to measure

González [11] developed and used a closed questionnaire response, 7-scales: New Ecological Paradigm (NEP), general awareness of the environmental consequences (EC), Ecological Behavior (EB), Environmental Obligation Denial (NOA), Personal Environmental Norms (PEN), Environmental Control Behavior (ECB) and Scale Values (EV).

Results

González [11] obtained several results of the cognitive model of ecological behavior (see Figure 3).

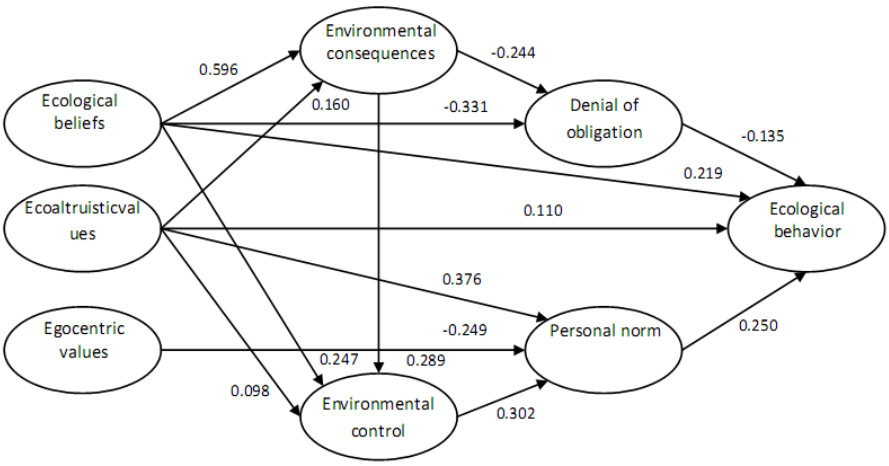

Fig-3: Model of ecological behavior. Source: González [11]

Ecological behavior is determined by the personal standard, ecological beliefs, for eco altruistic values and denial of the obligation. Ecological beliefs have a significant direct effect on the ecological behavior and an indirect effect through the denial of the obligation. Eco altruistic values have significant direct and indirect on ecological behavior (through personal norm). The personal norm has a positive effect on environmental behavior. The denial of obligation and had a lower negative impact on the ecological behavior. Awareness of the consequences, environmental control and egocentric values were minimal and indirect effects on ecological behavior, mediated by the denial of obligation and the personal norm.

González [11] concluded that people who maintain feelings of moral obligation to carry out environmental protection behaviors and identified with ecological beliefs about the interaction of humans and the environment, and maintain eco altruistic values, will be more involved in the implementation of ecological behavior.

Evaluation of the model fit

The variables included in the model came to explain 21.3% of the variance of ecological behavior. The RMRS index was 0.086, showing some approximation of close fit. The GFI and AGFI indicators had values of 0.996 and 0.912 respectively, which are indicative of a good model fit.

RESULTS OF THE INVESTIGATION

Sampling plan for data collection

Was conducted a pseudo-random sampling plan for data collection perceptions of Cochabamba resident of the different constructs that form the ecological behavior through a questionnaire containing 7 parts designed by González [11] in June 2015.

A minimum sample size of 200 is suitable for reducing possible biases in the estimation method of the MEC [45]. As this is a replication study, the sample size was the same as that used by González [11] which is 400 individuals.

Characteristics and suitability of the sample

Data collected by the sampling plan have the following demographic characteristics of the individuals surveyed (see Table 1). The age of the respondents showed an average of 36 years and a deviation of 17 years.

As the data collected were subjected to multivariate statistical techniques, previously two tests of suitability [46] were performed: multivariate normality test (kurtosis of Mardia = 700.8), which was not met; and linearity (Pearson correlation coefficient), which was fulfilled.

Table-1: Attributes of individuals in the sample

Variable	Groups	Percentage	Variable	Groups	Percentage
Gender	Male	45.5	Socieconomic level	High	3.0
	Female	54.5		Medium-high	30.0
Age	15-35	51.5		Medium	58.3
	36-55	31.0		Medium-low	8.3
	56-85	17.5		Low	0.5
Marital status	Single	50.5	Education level	Without studies	0
	Married	38.8		Primary studies	1.5
	Widowed	3.0		Secondary studies	8.0
	Divorced	5.5		High School	17.5
	Concubine	2.3		Higher education	73.0

Instruments

Methodology

The methodology used to design construct instruments for evaluating the ecological behavior was as follows [47]:

1. Identification of the purpose of the instrument. In this case the instruments were diagnostic and predictive.
2. Identification of the domain of the construct (conceptualization of the construct).
3. Analysis and choice of appropriate measurement approach (in all cases they are one-dimensional constructs multiple items, except for the values).
4. Specification of some external factors of the instrument: a) Characteristics of the population: people of the city of Cochabamba, Bolivia, b) Languages: Spanish, c) Application time: 20 minutes, d) Application Type: individual, and) Temporary Application scenario: June 2015.
5. Selection and preparation of a sample of items that cover the domain of each construct. The questionnaires designed by González [11] were used.
6. Format specification items. The survey measured perceptions of different constructs of environmental concern, using a Likert scale of 5 points.
7. Elimination of irrelevant items (low correlations, commonalities or factor loadings). The AFE (principal components method) is used.
8. Determination of the predictive validity of the instruments designed.

Design of measuring instruments constructs evaluation model for ecological behavior

The following instruments for measuring constructs evaluation model of ecological behavior were generated: ecological beliefs (EC), environmental consequences (CA), personal values (VP), environmental control (CAM), denial of the obligation (NO), personal norm (NP) and ecological behavior (CEC). All these instruments have been obtained from the study of González [11] (abbreviations are in Spanish).

Before performing exploratory factor analysis they were carried out KMO and Bartlett test of sampling adequacy. These tests and EFA results are shown in Table 2.

Table-2: Exploratory factor analysis of the constructs evaluation model of ecological behavior

EFA features	Ecological beliefs (CE)	Personal values (VP)	Environmental consequences (CA)	Denial of obligation (NO)	Personal norms (NP)	Environmental control (CAM)	Ecological behavior (CEC)
Items removed	2, 10	-	5	1	-	-	2,3,9,12,16
Dimensions	1	2	1	1	1	1	1
KMO test	0.747	0.876	0.831	0.763	0.918	0.884	0.759
Bartlett's test	857.673 (g.l. 78)(Sig. 0.000)	2190.332 (g.l. 136)(Sig. 0.000)	851.720 (g.l. 28) (Sig. 0.000)	359.376 (g.l. 15) (Sig. 0.000)	2157.219 (g.l. 36) (Sig. 0.000)	1239.927 (g.l. 28) (Sig. 0.000)	1746.063 (g.l. 300) (Sig. 0.000)
Variance extracted (%)	23.795	45.003	41.865	40.543	60.408	51.493	16.279
Cronbach alpha	0.623	0.869	0.573	0.698	0.915	0.855	0.771

The percentage variance extracted of the seven constructs considered and Cronbach's alphas are adequate. All items have high or moderate factor loadings, so it can be said that adequate factor structure was achieved.

Validity

Predictive validity is the degree to which a construct scores are associated with conceptually related measures, but which are subsequently taken and checked against correlations between constructs of the model (see Table 3). The model has predictive validity,

since the ecological behavior(CEC) is related to background constructs. Therefore, different instruments designed for this research measure different constructs.

Table-3: Matrix correlations between constructs model of ecological behavior

	CE	VPECO	VPEGO	CA	NO	CAM	NP	CEC
CE	1.000							
VPECO	0.337**	1.000						
VPEGO	0.089	0.147**	1.000					
CA	0.460**	0.294**	0.022	1.000				
NO	-0.105*	-0.348**	0.131**	-0.135**	1.000			
CAM	0.289**	0.525**	-0.063	0.341**	-0.319**	1.000		
NP	0.116*	0.325**	0.016	0.065	-0.196**	0.374**	1.000	
CEC	0.145**	0.292**	-0.150**	0.099*	-0.237**	0.460**	0.336**	1.000
**. Correlation is significant at the 0.01 level (bilateral).								
*. Correlation is significant at the 0.05 level (bilateral).								

Effect of sociodemographic variables constructs evaluation of the ecological behavior

Approach

The influence of sociodemographic variables on ecological behavior was analyzed using Analysis of Variance (ANOVA). Input factors are sociodemographic variables considered, with different levels, and the response variable is the score of the ecological behavior, according to Figure 4.

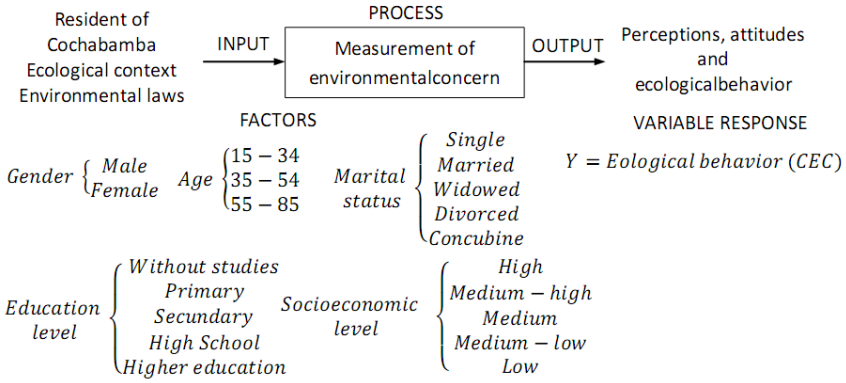

Fig-4: Factors, levels and variable response for the ANOVA

Results

In Table 4, the results of ANOVA analysis for each sociodemographic variable, using as a response variable ecological behavior are described.

Table-4:ANOVA between sociodemographic variables and ecological behavior (CEC)

One way ANOVA		Sum of squares	Gl	Mean square	F	Sig.
CEC (Gender)*	Inter-groups	1.094	1	1.094	4.650	0.032
	Intra-groups	93.612	398	0.235		
	Total	94.706	399			
CEC (Age)**	Inter-groups	8.716	2	4.358	20.121	0.000
	Intra-groups	85.989	397	0.217		
	Total	94.706	399			
CEC (Education level)**	Inter-groups	6.217	3	2.072	9.274	0.000
	Intra-groups	88.489	396	0.223		
	Total	94.706	399			
CEC (Socioeconomic level)	Inter-groups	1.458	4	0.364	1.544	0.189
	Intra-groups	93.248	395	0.236		
	Total	94.706	399			
CEC (Marital status)**	Inter-groups	4.623	4	1.156	5.068	0.001
	Intra-groups	90.083	395	0.228		
	Total	94.706	399			
Significant level p <0.01, ** p <0.05 *						

Gender, age, educational level and marital status of Cochabamba residents, significantly influences their behavioral ecology.

Table 5 are shown statistics by level of socio-demographic variables, with mean differences and their significance by the method of least significant difference (LSD), with regard to ecological behavior.

Table-5: Sociodemographic statistics on ecological behavior

Factors	Niveles	N	Mean	Standard deviation	Coefficient of variation [%]	Mean differences	Value	Sig.
CEC (Gender)	Male (1)	182	3.27	0.49	14.98			
	Female (2)	218	3.37	0.48	14.24			
CEC (Age)	15 – 34 (1)	206	3.18	0.46	13.08	1-2**	-0.27	0.000
	35 – 54 (2)	124	3.46	0.50	14.45	1-3**	-0.33	0.000
	55 – 85 (3)	70	3.51	0.40	11.40	2-3*	-0.05	0.452
CEC (Education level)	Primary (2)	6	2.97	0.34	11.31	2-3	-0.03	0.871
	Secundary (3)	32	3.01	0.57	18.85	2-4	-0.24	0.225
	High School (4)	70	3.22	0.52	16.18	2-5*	-0.42	0.031
	Highereducation (5)	292	3.40	0.45	13.29	3-4*	-0.21	0.038
						3-5**	-0.39	0.000
						4-5**	-0.18	0.005
CEC (Socioeconomi clevel)	High (1)	12	3.08	0.44	14.15			
	Medium-high (2)	120	3.29	0.48	14.68			
	Medium (3)	233	3.35	0.47	14.01			
	Medium-low (4)	33	3.38	0.61	18.14			
	Low (5)	2	2.92	0.34	11.62			
CEC (Marital status)	Single (1)	202	3.23	0.50	15.52	1-2**	-0.19	0.000
	Married (2)	155	3.43	0.44	12.85	1-3	-0.23	0.106
	Widowed (3)	12	3.46	0.34	9.74	1-4*	-0.,27	0.012
	Divorced (4)	22	3.51	0.55	15.73	1-5	0.12	0.453
	Concubine (5)	9	3.11	0.50	15.98	2-3	-0.04	0.792
						2-4	-0.08	0.463
						2-5	0.31	0.056
						3-4	-0.04	0.806
						3-5	0.35	0.095
						4-5*	0.39	0.038

Conclusions

The profile of the inhabitants of Cochabamba differs to that obtained González [11] in the city of Cuenca-Spain. González found that people older, female gender, with lower levels of studies, lower socioeconomic status, and that no political ideology, are those that show a greater commitment to the environment. Instead, the residents of Cochabamba that are more concerned about the environment are older, female, educated, middle-high, middle, and medium-low socioeconomic status, and is widowed or divorced.

The most common profile is that younger, more educated, liberal-democratic ideology and not employed in the primary industry are more concerned with the protection of the environment [48]. From the results shown it can be concluded that the socio-demographic profiles vary according to culture and context.

Cognitive model of ecological behavior of residents in Cochabamba

Construct relations between antecedents and consequences of ecological behavior model proposed by González [11] (See Figure 1) were analyzed, taking into account that there are constructs that provide mediators with indirect effects for ecological behavior. This analysis was conducted using structural equation modeling (SEM) setting function with maximum likelihood. A SEM model is decomposed into two [46]: 1) A structural component (the relationship between the latent factors), and 2) a measurement component (the observed variables measuring the latent factors). For clarity in the analysis of the proposed model, the component of measurement is not showed.

Modeling results

In Figure 5, the magnitude and direction of the relationships that were significant (at $p < 0.05$ level) between the constructs involved in predicting environmental behavior of the Cochabamba-citizens, are exhibited.

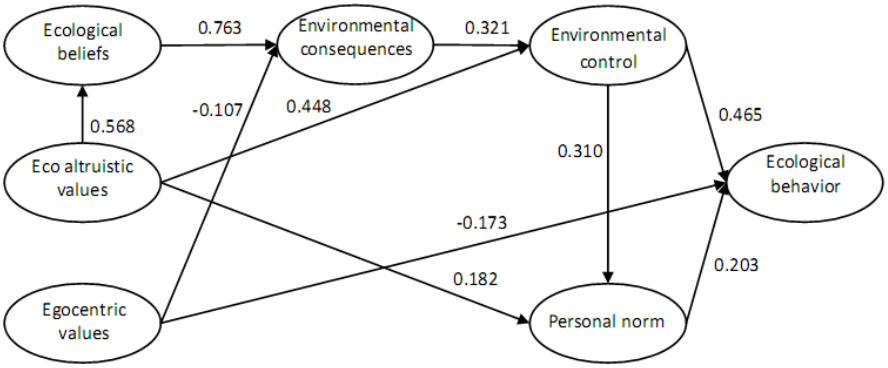

Fig-5: SEM model of ecological behavior of the citizens of Cochabamba

Table 6 shows the direct and indirect paths and total effects between different constructs of the model.

Table-6: Effects standardized of the model of ecological behavior

Construct	Paths	VPECO	VPEGO	CE	CA	CAM	NP
CE	Direct	0.568					
	Indirect						
	Total	0.568					
CA	Direct		-0.107	0.763			
	Indirect	0.433					
	Total	0.433	-0.107	0.763			
CAM	Direct	0.448			0.321		
	Indirect	0.139	-0.034	0.245			
	Total	0.587	-0.034	0.245	0.321		
NP	Direct	0.182				0.310	
	Indirect	0.182	-0.011	0.076	0.099		
	Total	0.364	-0.011	0.076	0.099	0.310	
CEC	Direct		-0.173			0.465	0.203
	Indirect	0.347	-0.018	0.129	0.169	0.063	
	Total	0.347	-0.191	0.129	0.169	0.528	0.203

The conclusions to be drawn from the analysis of the effects of the different constructs of the model are:

- Ecological beliefs: There is a significant positive effect of eco altruistic values over ecological beliefs.

Awareness of environmental consequences:

- There is a positive effect of beliefs about ecological awareness of environmental consequences. Citizens of Cochabamba who agree with the manifest of ecological beliefs become more aware of the harmful consequences that cause ecological deterioration for the ecology of Cochabamba.
- The eco altruistic values have a positive influence of the awareness of the environmental consequences of the inhabitants of Cochabamba but indirectly through ecological beliefs.
- The egocentric values influence negatively on the awareness of the environmental consequences, but to a lesser magnitude eco altruistic values.

Environmental control:

- The eco altruistic values of the citizens of Cochabamba have both a direct and indirect positive effect (through beliefs ecological and environmental consequences) on environmental control.
- The ecological beliefs have an indirect positive effect on the environmental control through the environmental consequences.
- The environmental consequences have a direct positive effect on environmental control.
- The negative indirect effect of egocentric values is practically insignificant on environmental control.

Form eco altruistic values, identification with ecological beliefs about the relationship between human beings and the environment of Cochabamba and be aware of the harmful consequences of ecological deterioration, are fundamental to explain the environmental control, that is, the confidence that own

shares can improve the environmental quality of Cochabamba.

Personal norm:

- Environmental control of the inhabitants of Cochabamba has a positive effect on Personal norm.
- The eco altruistic values of the citizens of Cochabamba have a direct and indirect positive effect (through environmental control) on personal norm, and are the largest of the effects.

Citizens of Cochabamba maintaining eco altruistic values and personal confidence that their actions can improve the quality of the environment have a greater sense of obligation to carry out protective behaviors and environmental protection, which is the personal norm.

Ecological behavior:

- The eco altruistic values have no direct effect on the ecological behavior, but a positive indirect effect (through various mediators preceding it) of 0.347.
- The egocentric values have a direct negative effect on the ecological behavior of -0.170 and a very small negative indirect effect.
- The ecological beliefs have no direct effect on the ecological behavior but a positive indirect effect through mediators, with a value of 0.129.
- The environmental consequences have no direct effect on the ecological behavior, but an indirect positive effect (0.169) through the environmental control and personal norm.
- Environmental control has a greater positive direct effect (0.465) on ecological behavior with respect to indirect effect (0.063) through personal norm, which is very small.
- The personal norm provides only a positive direct effect on the ecological behavior of 0.203.

It can be seen, for the total effects that the antecedents that contribute to a greater extent predict or explain the ecological behavior of the citizens of Cochabamba are environmental control, eco altruistic values and personal standards. The antecedents that contribute to a lesser extent are egocentric values, environmental impacts and ecological beliefs.

We conclude that the citizens of Cochabamba, who have the confidence that their actions will improve the environment, maintain feelings of moral obligation to perform behaviors ecological protection and maintaining eco altruistic values, be involved more in the implementation up of ecological actions.

Assessment of fit

For the model to be valid in order to express the complex reality of environmental concern to the citizens of Cochabamba, it is necessary that the model has a present good explicative power and good rates of goodness of fit.

The explicative power of the model is 37.3%, meaning that the antecedents explain or predict 37.3% of the ecological behavior of the inhabitants of Cochabamba, being 62.7% of the variability of the ecological behavior without explaining or be explained by other constructs that have not been included in the model. Although the model does not present a good explicative power, it was possible to get a better explicative power compared to González model [11], which was 21.3%.

Table 7 shows the rates of goodness of fit.

Table-7: Indices of goodness of fit of ecological behavior

Group	Índice	Independent model	Model analyzed
Goodness of fit	Chi-square	13740.760	6057.085
	g.l.	3070	3160
	Sig.	0.000	0.000
Comparative fit indexes	NFI	0.000	0.559
	IFI	0.000	0.720
	CFI	0.000	0.718
Indexes of proportion of variance	GFI	0.305	0.706
	AGFI	0.287	0.690
Indexes based on residues	RMR	0.195	0.090
	RMSEA	0.092	0.049

The Chi-square statistic indicates that it cannot maintain the assumption of perfect fit between the observed and reproduced matrix from the analyzed model. The comparative fit indices and the variance ratio must be above 0.8 to indicate a good fit of the model. In this case none of them meets the requirement. Indices based on Residues should be below 0.1. In this case the model meets the suitability of waste.

These values indicate that the model does not have a good goodness of fit, but this maybe because the data does not meet the assumption of multivariate normality. González [11] fit indices performed better than those obtained in this research.

Comparative analysis of the model of González [11] with the model for citizens of Cochabamba

A comparison analysis between González model [11] (Figure 3) and that obtained in this study (Figure 5) shows the differences shown in Table 8.

Table-8: Differences between González model [11] and Cochabamba model

Constructs removed	Deleted paths		Added paths
NO (Denial of obligation)	$VPECO \rightarrow CA$	$CE \rightarrow NO$	$VPECO \rightarrow CE$
	$VPECO \rightarrow CEC$	$CE \rightarrow CEC$	$VPEGO \rightarrow CA$
	$VPEGO \rightarrow NP$	$CA \rightarrow NO$	$VPEGO \rightarrow CEC$
	$CE \rightarrow CAM$	$NO \rightarrow CEC$	$CAM \rightarrow CEC$

Based on the results of the above table, the following conclusions can be drawn from the comparison:

- In the Cochabamba model, the relationship between eco altruistic values (VPECO) on ecological beliefs (EC) was added. This relationship was suggested in González model [11]. It was also confirmed that the eco altruistic values (VPECO) affect environmental control (CAM) and personal norm (NP), but do not affect the environmental consequences (CA) or the ecological behavior (CEC).
- In the Cochabamba model, egocentric values (VPEGO) do not affect personal norm (NP) as they do on the model of González [11], but they affect the environmental consequences (CA) and ecological behavior (CEC).
- In the Cochabamba model, ecological beliefs (EC) affect the environmental consequences (CA) as they do on the model of González [11], but do not affect the denial of the obligation (NO), environmental control (CAM) or ecological behavior (CEC).
- In the Cochabamba model confirms that the environmental consequences are related to environmental control (CAM) as they do in González model [11], but has no connection with the denial of the obligation (NO).
- According to the Cochabamba model, environmental control (CAM) is related to personal standard (NP) as in the model of González [11] but also is directly related to ecological behavior (CEC).
- In the Cochabamba model, denial of the obligation (NO) was removed for not having any significant direct or indirect relationship with the ecological behavior (CEC).
- Finally the relationship of personal norm (NP) with ecological behavior (CEC) is confirmed.

These differences between the two models indicate that the inhabitants of Cuenca and Cochabamba have different mechanisms by which they form their ecological behavior. The Cuenca forms their ecological behavior from their ecological beliefs, personal norm, eco altruistic values and their denial of the obligation (which negatively influences). Instead, the inhabitants of Cochabamba acquire its ecological behavior from environmental control, ecoaltruistic values, personal norm and egocentric values (negatively influence).

Comparison of the model of ecological behavior of the hypotheses regarding the model of the Cochabamba-citizens

González [11] postulated a hypothetical model of ecological behavior raised in Figure 1. Table 9 different routes between cognitive model obtained in this investigation for citizens of Cochabamba with the hypothesis raised shown.

Table-9: Differences between the hypothesized model compared to the model of Cochabamba

Constructs removed	Deleted paths		Added paths
NO (Denial of obligation)	$VP \rightarrow CA$	$CA \rightarrow NO$	$VP \rightarrow CAM$
	$CA \rightarrow CEC$	$NO \rightarrow NP$	
	$CE \rightarrow NP$	$NO \rightarrow CEC$	

The differences between the hypothetical model and the Cochabamba are:

- In the model of Cochabamba, denial of the obligation (NO) with all its relations with other constructs was removed.
- In the model of Cochabamba was significant relationship between personal values with environmental control.
- In the model of Cochabamba were no significant effects of personal values with environmental consequences, the environmental consequences to ecological behavior and denial of obligation, ecological beliefs with personal rule and the denial of obligation with personal norm and ecological behavior.

All other relations were confirmed. These differences suggesting that the model is sensitive to cultural differences and context and cannot be obtained generalizations.

CONCLUSIONS

There has been an empirical study in the city of Cochabamba in order to replicate a model of ecological behavior proposed by González [11]. For this purpose, information was collected first conducting a survey of 400 citizens of Cochabamba containing appreciations of various constructs of environmental concern.

It was determined that the measuring instruments for the constructs of environmental concerns involved in the investigation (eco altruistic values, egocentric values, ecological beliefs, environmental consequences, environmental control, denial of obligation, personal norm and ecological behavior) have a robust factor structure, a good explicative power, relevant items, and have adequate construct validity (predictive) and reliabilities.

Using analysis of variance, and performing the multiple range test of minimum significant difference, it was determined that the demographic profile of the inhabitant of Cochabamba concerning environmental concern is the older (55-85 years), widowed or divorced, who has medium-high, medium and medium-low class, female and he has made higher education.

By modeling of structural equation modeling (SEM) were verified the significance and direction of the relationships between constructs model of ecological behavior, so it was found that the mechanism by which citizens of Cochabamba held its ecological behavior is different compared to that of the inhabitants of the city of Cuenca (Spain) in which González [11] conducted its investigation. Specifically the Cochabamba through eco altruistic values formed in his life acquires a confidence that their actions can improve the environmental quality of Cochabamba; it achieves a greater sense of obligation to carry out protective behaviors and environmental protection to finally get more involved in the implementation of ecological behavior. It was proven that the model of ecological behavior follows the causality suggested by Stern [40] of values, beliefs, norms and behaviors. The model of ecological behavior achieved a predictive power of 37% and a goodness of fit is not very suitable.

With regard to the model proposed in the hypothesis, the model of the inhabitants of Cochabamba is not significant for construct denial of obligation and shows some differences and similarities, confirming that in general a model of ecological behavior differs with culture.

IMPLICATIONS FOR MANAGEMENT

Knowledge of the mechanism by which the inhabitants of Cochabamba form their eco altruistic and self-centered values, ecological beliefs, their awareness of the environmental consequences, the certainty that their actions influence the quality of the environment, their sense of obligation to improve environment and to take you to make ecological behavior, is very important because through him they may perform specific actions for the improvement and monitoring of various aspects that contribute to environmental improvement in Cochabamba:

- Approval, regulation and control of environmental laws must be more dynamic, easy to use, effective and forceful.
- Design awareness programs for the reduction of environmental damage, more in line with reality and the possibility of the inhabitant of Cochabamba.
- Assign human and material resources to projects that use these mechanisms as a means to achieve greater environmental benefits.
- Promotion of education that is effective for the formation of eco altruistic values and ecological beliefs.

The findings have important implications for environmental management in Cochabamba. All who want to develop plans should focus to achieve in the Cochabamba eco altruistic values, rather than self-centered values, the awareness that their actions if they can make a difference and increase their sense of obligation to the environment of Cochabamba.

Finally it was noted in the demographic profile which groups of people of Cochabamba least concerned about the environment are. Good management should direct its efforts to these groups, in order to include that population if the profile that cares about the environment.

SUGGESTIONS FOR FUTURE RESEARCH

Since in this and many investigations have shown that the models designed to study pro-environmental behaviors represent a low percentage of variance explained [42, 24, 40, 11], which it is about a third of the variance of the environmental behavior [43], it is proposed to include in the models to investigate in the future other constructs antecedents [49] to achieve a better explicative power, as the following:

- The past behavior of individuals [50].
- The biospheric values [51].
- Orientation towards sustainability [43].
- Happiness [26].

It was found that the instruments to measure ecological beliefs and ecological behavior are not one-dimensional, but requested in the exploratory factor analysis to converge on a single factor. It could analyze the resulting dimensions of these two constructs and if they agree with some theory, you could propose a model where the design constructs as multidimensional second order with a reflective or formative approach. Another option is to try the dimensions of these constructs as antecedents. This is a line of investigation that so far has not been explored.

REFERENCES

1. Corraliza J, Berenger J, Moreno M, Martín R; La investigación de la conciencia ambiental. Un enfoque psicosocial. Persona, Sociedad y Medio Ambiente, 2004; 7: 106-120.
2. Lehman PH, Geller S; Behavioranalysis and environmentalprotection: accomplishments and potentialfor more. Behavior and Social Issues, 2004; 13: 13-32.
3. Corral-Verdugo V; Contribuciones del análisis de la conducta a la investigación del comportamiento pro-ecológico. Revista Mexicana de Análisis de la Conducta, 2006; 32(2): 111-127.
4. Álvarez P, Vega P; Actitudes ambientales y conductas sostenibles. Implicaciones para la educación ambiental. Revista de Psicodidáctica, 2009; 14(2): 245-260.
5. Aragonés JI; Actitudes proambientales: algunos asuntos conceptuales y metodológicos. En R. García-Mira, C Arce y JM Sabucedo (Comps.), Responsabilidad ecológica y Gestión de los recursos ambientales, A Coruña, España: Diputación Provincial de A Coruña, 1997: 137-146.
6. Oskamp S, Harrington MJ, Edwards TC, Sherwood DL, Okuda SM, Swamson DC; Factors influencing household recycling behavior. Environment and Behavior, 1991; 23(4): 494-519.
7. García-Mira R, Real-Deus E; Valores, actitudes y creencias: hacia un modelo predictivo del ambientalismo. MedioAmbientey Comportamiento Humano, 2001; 2(1): 21-43.
8. Kaiser FG, Hübner G, Bogner FX; Contrasting the theory of planned behaviour with value-belief-norm model in explaining conservation behaviour. Journal of Applied Psychology, 2005; 35(10): 2150-2170.
9. Martínez-Soto J; Comportamiento proambiental. Una aproximación al estudio del desarrollo sustentable con énfasis en el comportamiento persona-ambiente. Red Theomai, Argentina, 2006.
10. Ortega J; Revisión bibliográfica analítica sobre los antecedentes motivacionales y cognitivos de la conducta proambiental en el consumidor a partir de modelos psicológicos correlacionales y explicativos publicados en los últimos 10 años (1996-2006). Tesis doctoral. Universidad del Norte, Departamento de Psicología, 2007: 1-246.
11. González A; La preocupación por la calidad del medio ambiente. Un modelo cognitivo sobre la conducta ecológica. Tesis doctoral. Universidad Complutense de Madrid. Departamento de Psicología Social, España, 2002: 1-215.
12. Bolzan C, Pol E; Sistemas de Gestión Ambiental y comportamiento ecológico: una discusión teórica de sus relaciones posibles, Aletheia, 2009; 29: 103-116.
13. Suárez E; Problemas ambientales y soluciones conductuales. En JI Aragonés y M Amérigo (Eds.), Psicología Ambiental, Pirámide, Madrid, 2000; 303-327.
14. Castro R; Naturaleza y funciones de las actitudes ambientales. Estudios de Psicología, 2000;22: 11-22.
15. Vozmediano L, San Juan C; Escala Nuevo Paradigma Ecológico: propiedades psicométricas con una muestra española obtenida a través de internet. Medio Ambiente y Comportamiento Humano, 2005; 6(1): 37-49.
16. Corraliza JA, Martín R; Estilos de vida, actitudes y comportamientos ambientales. MedioAmbiente y ComportamientoHumano, 2000; 1(1): 31-56.
17. Kaiser FG, Gutscher H; The proposition of a general version of the theory of planned behaviour: predicting ecological behaviour. Journal of Applied Social Psychology, 2003; 33: 586-603.
18. Kaiser FG, Wilson M; Assessing people´s general ecological behavior: A cross-cultural measure. Journal of Applied Social Psychology, 2000; 30(5): 952-978.
19. Pato CML, Tamayo A; A Escala de comportamento ecológico: desenvolvimento e validação de un instrumento de medida. Estudos de Psicologia (Natal), 2006; 11: 289-296.
20. Corral-Verdugo V; Comportamiento proambiental. Una introducción al estudio de las conductas protectoras del medio ambiente.Santa Cruz de Tenerife, Resma, España, 2001.
21. Castro R; Naturaleza y funciones de las actitudes ambientales. Estudios de Psicología, 2001; 22(1): 11-22.
22. Pato CM; Comportamento ecológico: relaçõescom valores pessoais e crençasambientais.Tese de Doutorado, Universidade de Brasília. Brasília, DF, 2004.
23. Stern PC, Oskamp S; managing scarce environmental resources. In D. Stokols& I. Altman (Eds.), Handbook of Environmental psychology.John Wiley & sons, New York, EE.UU, 1987; 1043-1088.
24. Stern PC; Psychological dimensions of global environmental change. AnnualReview of Psychology, 1992; 43: 269-302.
25. López J, García J; Valores, Actitudes y Comportamiento Ecológico Modelados con una Red Bayesiana. Medio Ambiente y Comportamiento Humano, 2007; 8(1 y 2): 159-175.

26. Moyano-Díaz E, Cornejo F, Gallardo I; Creencias y conductas ambientales, liberalismo económico y felicidad. Acta Colombiana de Psicología, 2001; 14(2): 69-77.
27. Amérigo M, González A; Preocupación medioambiental en la población escolar. Revista de Psicología Social Aplicada, 1996; 6(1): 75-92.
28. Aragonés JI, Amérigo M; Un estudio empírico sobre las actitudes ambientales. Revista de Psicología Social, 1991; 6: 223-240.
29. De Castro R; Estamos dispuestos a proteger nuestro medio ambiente? Intención de conducta y comportamiento proambiental. Medio Ambiente y Comportamiento Humano, 2002; 3: 107-118.
30. Pato C, Ros M, Tamayo A; Creencias y comportamiento ecológico: un estudio empírico con estudiantes brasileños. Medio Ambiente y Comportamiento Humano, 2005; 6: 5-22.
31. Corral-Verdugo V, Zaragoza F; Bases sociodemográficas y psicológicas de la conducta de reutilización: un modelo estructural. Medio Ambiente y Comportamiento Humano, 2000; 1(1): 9-29.
32. Amérigo M, González A; Los valores y las creencias medioambientales en relación con las decisiones sobre dilemas ecológicos. Estudios de Psicología, 2000; 22(1): 65-73.
33. Palavecinos M, Amérigo M, Muñoz J; Preocupación y Conducta Ecológica Responsable en estudiantes Universitarios: El rol de la Universidad en la Educación Ambiental. Congreso Iberoamericano de Educación METAS 2021, Departamento de Psicología. Universidad de la Frontera, Temuco, Chile, 2010: 1-16.
34. González A, Amérigo M; Actitudes hacia el medio ambiente y conducta ecológica. Psicotherma, 1999; 11(1): 13-25.
35. Dunlap RE, Van Liere KD, Mertig AG, Jones RE; Measuring endorsement of the New Ecological Paradigm: A revised NEP scale. Journal of Social Issues, 2000; 56: 425-442.
36. Blamey R; The Activation of Environmental Norms. Extending Schwartz`s Model. Environment and Behavior, 1998; 30(5): 676-708.
37. Hines JM, Hungerford HR, Tomera AN; Analysis and Synthesis of Research on Responsible Environmental Behavior: A Metaanalysis. Journal of Environmental Education, 1986;2(18): 1-8.
38. De Young R; Expanding and evaluating motives for environmentally responsible behavior.Journal of Social Issues, 2000; 56(3): 509-526.
39. Stern PC, Dietz T, Abel T, Guagnano GA, Kalof L; A value belief-norm theory of support for social movements: The case of environmentalism. Human Ecology Review, 1999; 6(2): 81-97.
40. Stern PC; Toward a coherent theory of environmentally significant behavior. Journal of Social Issues, 2000; 56(3): 407-424.
41. Schwartz SH; Normative influences on altruism. In L. Berkowitz (Ed.), Advances in experimental social psychology, 10, Random House, New York, EE.UU, 1977: 221-279.
42. Berenguer JM, Corraliza JA; Preocupación ambiental y comportamientos ecológicos. Psicothema, 2000; 12(3): 325-329.
43. Corral-Verdugo V, Tapia C, Frías M, Fraijo B, González D; Orientación a la Sostenibilidad como base para el Comportamiento Pro-Social y Pro-Ecológico. Medio Ambiente y Comportamiento Humano, 2009; 10(3): 195-215.
44. Stern PC, Dietz T, Kalof L; Valueorientations, gender and environmentalconcern. Environment and Behavior, 1993; 25(3): 322-348.
45. Martínez-López FJ, Gázquez-Abad JC, Sousa CMP; Structural Equation Modelling in Marketing and Business Research: Critical Issues and Practical Recommendations, European Journal of Marketing, 2012; 47(1): 1-33.
46. Uriel E, Aldás J; Análisis multivariante aplicado. Thomson, Madrid, 2005.
47. Martínez R; Psicometría: teoría de los test psicológicos y educativos. SíntesisPsicología S.A., Madrid, 1995.
48. Jones RE, Dunlap RE; The social bases of environmental concern: Have they changed over time? Rural Sociology, 1992; 57(1): 28-47.
49. González A, Amérigo M; Relationship among values, beliefs, norms and ecological behavior, Psicothema, 2008; 20(4): 623-629.
50. Aguilar M, Monteoliva A, García J; Influencia de las normas, los valores, las creencias proambientales y la conducta pasada sobre la intención de reciclar. Medio Ambiente y Comportamiento Humano, 2005; 6(1): 23-36.
51. Aguilar M, García J, Monteoliva A, Salinas J; El modelo del valor, las normas y las creencias hacia el medio ambiente en la predicción de la conducta ecológica. Medio Ambiente y Comportamiento Humano, 2006; 7(2): 21-44.