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# Understanding citizens' environmental concern and their pro-environmental behaviours and attitudes and their influence on energy use

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**Abstract**

The analysis of the prime political ideologies that affect human behaviours and how these make people interact with their habitat is most necessary for policy making. The objective of the present research is to analyse the relationship between an individual's political ideology and his/her environmental concern and pro-environmental behaviours and attitudes, and how these last two influences on pro-electrical consumption attitudes. To achieve the objective, we based the research on information from two surveys effectuated two years apart. A total of 3,395 household heads were interviewed (84.5% from 2019 and 15.5% from 2021). Four hypotheses were launched and only one validated through our study which proved the relationship between environmental concern and pro-electrical consumption attitudes. However, the study additionally shows a gradual decrease in environmental concern and pro-environmental behaviours and attitudes from centre ideology to the extreme left and right, being the values of the left-wing (extreme left and left-centre) higher than those of the right-wing (extreme right and right-centre). Additionally, a strong influence of environmental concern in pro-environmental behaviours and attitudes was found, meaning that environmental knowledge is necessary to develop greener attitudes and behaviours. These results shed light on citizens environmental policy preferences, making clear the discussion about the effects of political ideology on pro-environmental behaviours and attitudes.


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*Keywords:* Attitudes; Behaviours; Concern; Political ideology; Pro-environmental; Pro-electrical

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## 1. Introduction

The concept of circular economy and efficient resource use worldwide has obtained a rising awareness due to the decrease of natural resources as well as increasing pollution, obliging governments to make efforts that support the creation of sustainable development models. As many other developing countries, Ecuador is suffering the increasing generation of municipal solid waste (MSW) and the continuous growing demand for electricity, due mainly to its population's development and growth, improvement in life conditions, and migration of rural people into the big urban cities [1]. Waste management for the country of Ecuador has been focused on collecting and removing residues from the urban communities; the waste was then disposed in remote locations to protect public health. Nevertheless, waste disposal in landfills can have a range of off-site impacts, such as and not limited to, global warming gas liberation, possible contamination of groundwater and exposure of neighbouring communities to bad odours, dust, litter, and vermin.

Globally, it is well known that household electricity demand accounts for 30 percent of the total generation [2]. Economic activities along the whole supply chain are triggered by household significant drivers. Families themselves, represent a big part of energy resources, such as electricity [3]. Ecuador's electric power system has a net capacity of nearly 8200 MW. Over 60% of this capacity is hydropower, approximately one-third of the capacity is fossil-fuel-fired, and the remaining 2% comes from non-hydro renewables (biomass, biogas, wind, and solar). However, up to 2019, most of the electricity produced in the country was done by fossil fuels with 52%. From the demand side of the equation, the industry sector occupies first place with 39%, the residential sector is second with 29%, and thirdly the commercial sector takes 27% of the total demand [4]. One lead step forward for the design and implementation of laws and policies of any country is the identification of the factors and determinants that best predict waste generation and electricity consumption. We can find previous efforts on finding correlations between many exogenous variables, such as demographic, socioeconomic, and behavioural patterns with waste generation and electricity demand, with information gathered from surveys and using tools such as ordinary least squares regressions or classification algorithms. But a low 10% of variability has been explained with these models, making necessary new research on the behaviours of Ecuadorian households [5–8].

A considerable number of studies have shown that people with serious environmental concerns and good pro-environmental behaviours and attitudes are more likely to reduce their waste generation and electricity demand. A well-proven global strong waste management framework strategy comes with the application of the 3R's (reduction, reuse, and recycling). Reducing and reusing require changes in consumption habits and some lifestyle adjustment, making them harder to achieve than recycling behaviours. However, collecting, transporting, and reprocessing these recyclables items requires an intensive energy use. Some external influences, such as incentives and penalties, become significant factors that impact pro-environmental behaviours and attitudes. Environmental concern is defined as the level to which people worry about the impacts that their actions cause on the environment, other people, and the biosphere [9]. Pro-environmental behaviours and attitudes include different kinds of operationalized behaviours, such as recycling, transport use, waste management, energy consumption, the purchase of green products, and electrical appliances [10].

For the consumption of electricity, values and environmental concern due to an individual's personality traits and general environmental attitudes are principal determinants. Additionally, consumers engagement in conservation behaviour is intrinsically linked with the concern about the environment and society [11]. Other determinants that influence people's energy saving behaviours and electricity usage can be found in several environmental bibliography [12,13], such as environmental beliefs and attitudes [14], environmental concern and altruism [15]. However, other studies have found evidence that pro-environmental behaviours and attitudes, combined with environmental concern do not necessarily lead to pro-electrical consumption attitudes (understood here as a favourable attitude to save electricity by making consumption more responsible and efficient) for an individual. For example, Wang et al. [16] and Ohler and Billger [17], found no evidence that environmental awareness induces energy saving behaviours.

Most importantly, if an individual perceives that the government is engaging in reducing waste generation and electrical demand, he/she tends to increase their environmental responsibility. In this context, an individual's political ideology can describe where someone falls on the spectrum of political beliefs, ranging from strongly conservative (extreme right) to strongly liberal or anarchists (extreme left). These different ideological positions are marked by diverging perceptions about the state of the world and the government's role in addressing societal issues [18]. It is important to understand the influences of political ideology on environmental concerns, behaviours, and attitudes regarding local environmental policies and issues [19,20]. Empirical evidence from many research studies reveals

that people with liberal political ideology (left-wing) are more concerned about environmental issues than are people with conservative ideology (right-wing) [21–25]. Additionally, political ideology directly affects environmental policy measures; however, it can vary substantially between different policy tools [26].

To reduce the amount of waste from households that reach the landfill and the quantity of electricity demanded from the residential sector, it is necessary to understand citizens' environmental concern and their pro-environmental behaviours and attitudes. Additionally, we are interested in knowing if an individual's political ideology influences these and affects their pro-electrical consumption behaviours. This could help policymakers understand whether a law to support sustainable models for waste generation and household electricity demand can expect approval from the population [27]. Thus, the present study aims to examine the relationship between an individual's political ideology and his/her environmental concern and pro-environmental behaviours and attitudes and their influence in pro-electrical consumption habitudes.

To obtain the results, we used information from two surveys conducted in 2019 and 2021. The first one, which was conducted on 2869 household heads, had the objective to correlate environmental concern and pro-environmental behaviours and attitudes with pro-electrical consumption habitudes. The second survey, which was taken to 526 household heads due to the difficulty imposed by the pandemic, had the purpose to correlate political ideology and environmental concern and pro-environmental behaviours and attitudes. In the following sections, we start with an introduction of our research model and preconceived hypothesis. Following this, we describe the questionnaire items and how data was collected. Next, we present the main results and findings of our analysis. In the final section, we present the conclusions of the study.

## 2. Research model and hypothesis

As shown in the previous section, political ideology (PI) has been proven as a significant predictor that influences both direct and indirect pro-environmental behaviours and attitudes (PEBA) and environmental concerns (EC). Additionally, these two influence pro-electrical consumption attitudes (PECA). Therefore, this study defines four hypotheses:

- **Hypothesis 1 (H1).** An individual's political ideology will influence his/her EC.
- **Hypothesis 2 (H2).** An individual's political ideology will influence his/her PEBA.
- **Hypothesis 3 (H3).** An individual's environmental concern will influence his/her PECA.
- **Hypothesis 4 (H4).** An individual's PEBA will influence his/her PECA.

Multiple linear regression models are the best option to correlate dependent with independent variables, due to their reliability and track recording in previous studies:

$$Y = \alpha + \beta_1 X_1 + \beta_2 X_2 + \ldots \beta_{n-1} X_{n-1} + \beta_n X_n + \varepsilon \tag{1}$$

In Eq. (1), Y is the dependent variable EC for hypothesis 1, PEBA for hypothesis 2, and PECA for hypothesis 3 and 4; X (1, 2, …, n − 1, n) are the independent variables (i.e. PI for hypothesis 1 and 2, EC for hypothesis 3, and PEBA for hypothesis 4). The other terms in Eq. (1) are the intercept $\alpha$, the slopes $\beta$ (1, 2, …, n − 1, n, indicating the average dependent variable change), and the average random error $\varepsilon$.

## 3. Questionnaire design and data collection

A total of 2869 and 526 family responses were achieved both in the years 2019 and 2021, respectively. Both questionnaires were composed following pro-environmental literature; however, local adaptations were made based on the local context. To measure EC and PEBA, both questionnaires accounted 14 items, as shown in Table 1 and were measured with a Likert scale.

Additionally, to measure the pro-electrical consumption attitudes, the 2019 questionnaire accounted 6 items, as shown in Table 2, and responses were also measured using a Likert scale, however changing the options. To identify the political ideology of every participant, a single question was used in 2021 questionnaire ("How would you define your political orientation?")– going from 1 (extremely left) to 5 (extremely right). To calculate each individual EC, PEBA, and PECA, an average of every response was taken to give a final value between 1 and 5.

**Table 1**. Environmental concern and pro-environmental behaviours and attitudes 2019 and 2021 questionnaire items.

| EC | PEBA | Options |
|---|---|---|
| A. Do you think that your daily activities and those of your family pollutes the environment? | H. Would you be willing to pay a tax on your bills for recycling services in your area? | 1. Strongly disagree<br>2. Partially disagree<br>3. Neutral<br>4. Partially agree<br>5. Strongly agree |
| I. Do you consider yourself a person who cares about the environment? | I. Would you agree to fine policies for exceeding the maximum kg of waste per person or per family? | |
| J. Does your home reuse/recycle products such as plastic covers, bottles, spoons, etc.? | J. Would you be willing to walk up to two blocks to deposit your recyclable waste in a container established by the municipality? | |
| K. Does your home carry out any product reuse process, such as using plastic bags for various purposes? | K. Would you be willing to develop actions to protect the environment, even if it means dispensing with some comforts? | |
| L. Do you consider that each family should be responsible for their environmental impacts? | L. Would you agree to family recycling, applying precise and straightforward policies? | |
| M. Are you concerned with improving and protecting the environment? | M. Do you dispose of household waste on the day, place and time indicated by the municipality? | |
| N. Do you consider that the responsibility with the environment is a duty? | N. Do you take care of the green areas of the parks? | |

**Table 2**. Pro-electrical consumption attitudes 2019 questionnaire items.

| PECA (How often in your household do you.) | Options |
|---|---|
| O. Turn off all electronic devices and electrical appliances when not in use? | 1. Never |
| P. Turn of the lights when leaving a room? | 2. Almost never |
| Q. Avoid introducing hot meals in the fridge? | 3. Sometimes |
| R. Iron the most clothes as possible? | 4. Almost always |
| S. Take advantage of direct sunlight by opening curtains and windows? | 5. Always |
| T. Buy energy saving electrical appliances? | |

## 4. Results

In terms of political ideology for the 2021 survey (Fig. 1), right-centre participants make up the largest group (31,56%), followed by respondents stating a centre political orientation (27,95%). Among the respondents, 25,86% stated to be left-centre, 9,32% associated themselves with the extreme left. Only 5,32% of the respondents stated an extreme right orientation. Fig. 2 lists the results derived from the analysis of the proposed model. Centre ideology families have the highest scores in both environmental concern (EC) and pro-environmental behaviours and attitudes (PEBA) with 4.26 and 3.96, respectively. Additionally, the extreme right shows slightly higher values than the extreme left ideology; however, the left-centre values are much higher than those of the right-centre ideology are. Given the more significant representation of these two parties in the sample, it can be concluded that the left-wing is friendlier with the environment than the right-wing.

**Table 3**. Regression values for the study.

| Independent variables | Dependent variables | $\beta$ | t-value | p-value |
|---|---|---|---|---|
| PI | EC | −0,001966 | −0,083 | 0,934 |
| | PEBA | 0,03470 | 1,307 | 0,192 |
| EC | PECA | 0,03421 | 2,507 | 0,0122* |
| PEBA | PECA | 0,01293 | 0,744 | 0,457 |
| EC | PEBA | 0,62689 | 15,304 | 2e-16*** |

Regression's significance codes: 0 '***' 0,001 '**' 0,01 '*' 0,05.

Regarding political ideology's influence on environmental concern, H1, Table 3 shows that EC diminishes when we move from extreme left to extreme right ($\beta = -0{,}001966$), and PEBA augment with the same displacement from left to right ($\beta = 0{,}0347$). However, both these values do not show enough significance to validate hypothesis

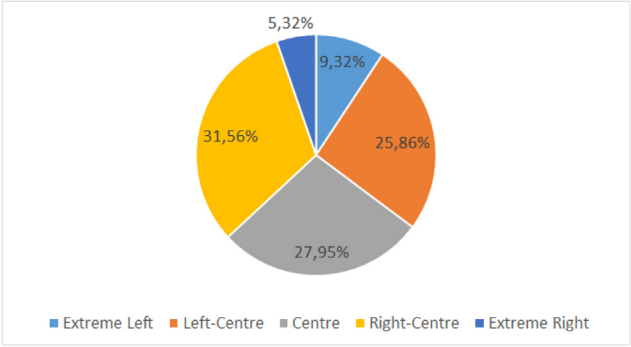


**Fig. 1.** Distribution of political ideology among participants.

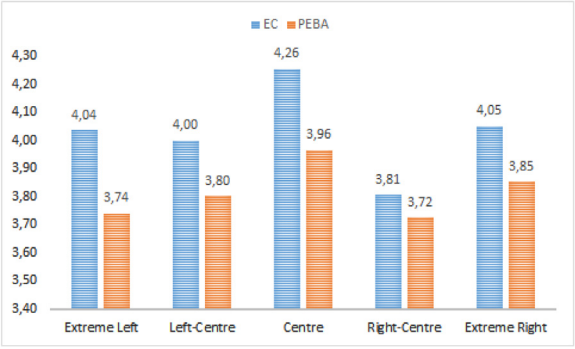


**Fig. 2.** Distribution of political ideology among participants.

1 and 2. This can also be seen in Fig. 2, where there is no linear relationship between them but more of a quadratic reaching the maximum at the middle (Centre PI). There is a strong positive relationship between hypothesis EC and PECA ($\beta = 0{,}03421$), and PEBA and PECA ($\beta = 0{,}01293$), meaning that an individual's environmental concern influences their pro-electrical consumption attitudes. Thus, we can validate hypothesis 3 because of the significance value. However, hypothesis 4 cannot be validated for the same reason. Additional information confirms a strong relationship between PEBA and EC ($\beta = 0{,}62689$), showing the highest significance value in all regressions. This means that environmental concern positively influences the development of pro-environmental behaviours and attitudes.

## 5. Conclusions

This work analysed the correlation between PI and EC and PEBA, jointly with their influence on PECA. There is a gradual decrease in EC and PEBA from centre ideology to the extreme left and right, being the values of the left-wing (extreme left and left-centre) higher than those of the right-wing (extreme right and right-centre). A strong influence of environmental concern in pro-environmental behaviours and attitudes was found, meaning that environmental knowledge is necessary to develop greener attitudes and behaviours. Environmental concern has also been shown to influence the pro-electrical consumption attitude. This paper presents the first empirical analysis of this issue for the country to the best of our knowledge. These findings make the discussion on the effects of political ideology on environmental concern and pro-environmental behaviours and attitudes clearer and contribute to the wider discussion on the policy preferences among the public.

## CRediT authorship contribution statement

**J. Hidalgo-Crespo:** Investigation, Formal analysis, Validation, Writing – original draft. **S. Coello-Pisco:** Writing – review & editing. **H. Reyes-Venegas:** Data curation, Writing – review & editing. **M. Bermeo-Garay:** Data

curation, Writing – review & editing. **J.L. Amaya:** Conceptualization, Supervision, Writing – review & editing. **M. Soto:** Conceptualization, Supervision, Writing – review & editing. **A. Hidalgo-Crespo:** Data curation, Writing – review & editing.

## Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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