

## **Environmental Behavior and Water Saving in Spanish Housing**

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**ABSTRACT:** Environmental matters are becoming a question of great importance and the increased attention to such matters has helped to make businesses, politicians and society in general consider the environment a matter of priority concern. Environmental concern, taken to mean an attitude favourable to the environment, has become widespread in different environmental aspects, such as energy saving, water consumption reduction, or rubbish separations. However, economic and political interests are sometimes confronted with environmental interests, so a change in society's behavior with regard to the use of natural resources is necessary to ensure their future and that future generations can enjoy them, in order to fulfil the concept of sustainability introduced by the Rio summit of 1992. So the aim of this study is to analyse the water-saving behavior of Spanish households and identify the variables influencing its development.

**Key words:** Environment, Water saving, Behavior, Awareness, Lifestyle, Spain

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### **INTRODUCTION**

The environment and nature have long been matters taken into account by the different scientific disciplines; however, the idea of limitless progress and technological development prevalent in recent centuries has kept the environment out of conventional economic analysis and so become an aggressor against the environment, causing serious harm to ecosystems and jeopardizing life on earth, so putting individual interests before those of society. In spite of the fact that economic activity originally arose as a response to the limitations of the natural environment in fully satisfying human needs, it is definitively accepted that human beings cannot dispense with the environment, which fulfils at least three functions relevant from the economic point of view (Pulido, 2004):

1. It is involved in the production function of many economic assets.
2. It is part of the function of usefulness of individuals.
3. It is the recipient of waste produced by human activities of production and consumption.

Consequently, over-exploitation of the environment hampers the carrying out of these functions, affects the feasibility of production processes, the health of human beings and their quality of life, so efficient

performance of these functions requires the interaction between human activity and the environment to be controlled.

Consumers and companies are aware that their actions should take these environmental concerns into account and try to have positive effects on the environment, and so changes to the behavior of both companies and consumers are caused. Environmental responsibility is thus a task shared fundamentally by the administration, companies, consumers and the media which, through the information they give out, they put pressure on in favour of environmental protection. The roots of environmental problems lie in human behavior, so the solution could lie in changing the behavior of organizations and groups and so in cultural and lifestyle changes, i.e., environmental awareness is needed from the point of view of both supply and demand. In this sense, authors Maloney and Ward (1973) consider the ecological crisis to be the "crisis of poorly adapted behavior."

The main aim of this study is to formulate a structural model to explain the environmental behavior of Spanish households, identifying the relationships between personal factors (lifestyle), environmental awareness (environmental attitudes) and water saving (environmental behavior).

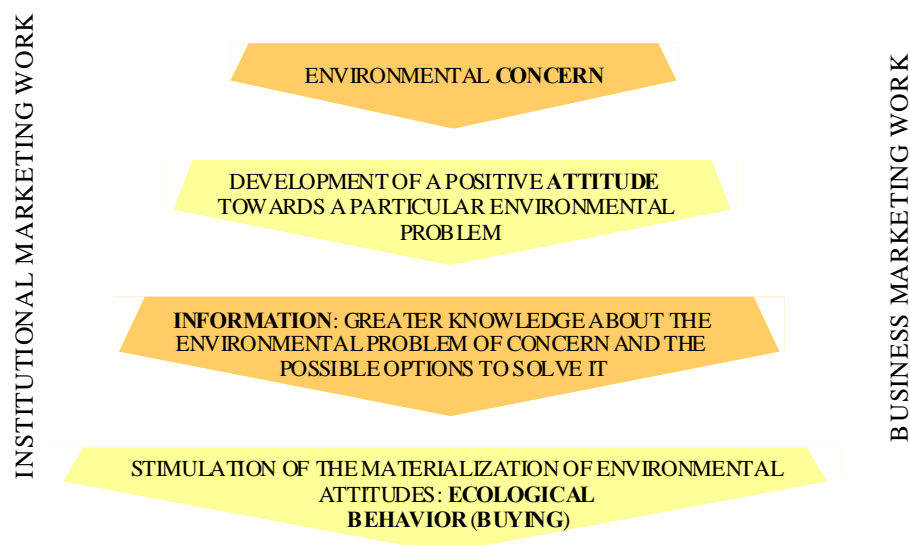
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Concern for the environment is a matter of importance to the public, because of the direct and indirect impact their actions may cause to the environment and because of the future repercussions on all aspects of life: health, climate change, the quality of food products, waste management, traffic congestion, etc. So it can be seen that society makes ecological demands, sometimes represented by social pressure groups. Today's consumers are very demanding, requiring not only quality and functionality but also adaptation to their environmental concerns, which vary from one consumer to another, i.e., ecological consumers not only have rational (economic) motives, but also altruistic reasons of solidarity, i.e., internal and external motives to the individual (Burn and Oskamp, 1986; Stern, Dietz and Black, 1986; De Young, 1986; Simmons and Widmar, 1990; Stern Dietz and Dalof, 1993; Taylor and Todd, 1995; Duron, 2000; Calomarde, 2000; Rivera Vilas, 2000; Albardiaz, 2000). Study of the behavior of ecological consumers is a wide subject, and some authors have examined interest in ecological products and environmental protection (Kinnear and Taylor, 1973; Kinnear, Taylor and Ahmed, 1974; Grunert and Rohme, 1992); others have focused on the consumer's attitude towards pollution elimination programmes (Ramsey and Rickson, 1976); environmental responsibility has been studied more recently (Sánchez, Grande, Gil and Gracia, 1998); and other authors have concentrated on consumers' degree of commitment to the environment (Guagnano, Stern and Dietz, 1995; Calomarde, 1995; Ling-yee, 1997). MacEvoy thinks that achieving ecological behavior is not something immediate, but the result of a slow process of change, which he sums up in four stages (Fig. 1).

1. Awareness, concern and consciousness-raising environmental problems (Sia, Hungerford and Tomera, 1985-86; Cañadas, Montoro and Fuentes, 1997).
2. Development of environmental attitudes, both positive and negative, depending on the concern.
3. If the attitude is favourable, consumers seek information about the matters which are of concern to them, consumers to be guided in the right direction (MacEvoy, 1992).
4. The three previous elements do not guarantee the development of ecological behavior, because factors which restrain such behavior may exist, such as adequate economic resources, consumer confidence and credibility, among others. So if ecological behavior is reached in the end, this may change for the same consumer depending on his particular circumstances at any time, and may also be different from the behavior of other consumers at the same time.

Many variables have been used in this study of the behavior of the ecological consumer and can be grouped into socio-demographic variables and psychographic and knowledge variables. Although they are considered not very relevant to explain consumer behavior in a specific situation, such as ecological behavior, some studies have shown that a certain relationship does exist between some of these variables and consumers' ecological behavior (Table 1). In general, it is considered that socio-demographic factors are not good predictors of ecological behavior; this is explained by the fact that environmental concern is already widespread among all segments of the population and is not a concern exclusive to a particular social group (Aguirre, Aldamiz-Echevarría, Charterina and Vicente, 2003).



Source: Aguirre, Aldamiz-Echevarría, Charterina and Vicente (2003), MacEvoy (1992)

**Fig. 1. Process of change towards ecological behaviour**

**Table 1. Socio-demographic variables**

<b>Variables</b>	<b>Most important results</b>
<b>Sex</b>	Women participate more in voluntary environmental protection activities (Arcury and Johnson, 1987).
<b>Age</b>	Younger people show more interest in environmental principles (Buttel, 1974). And older people participate in ecological activities more (Van Liere and Dunlap, 1980).
<b>Education and social class</b>	People with a high level of education and social class have a greater relationship with consumption of ecological products and greater participation in recycling containers (Zeidner and Shechter, 1988).
<b>Social status</b>	Married people show more concern for the conservation of future resources (Neuman, 1986).
<b>Number of children</b>	Families with children are less disposed to pay more for ecological products (Jackson, 1983).
<b>Place of residence</b>	People who live near natural spaces show greater concern about nature (Rankin, 1983).
<b>Income</b>	The higher the consumer's income level, the greater his saving attitude (Balderjahn, 1988).

Source: Fraj and Martínez (2002)

Kinnear, Taylor and Ahmed (1974) have shown that socio-demographic variables (age, sex, income, etc.) are not as important as psychological variables to explain the behavior of the ecological consumer; Hines, Hungerford and Tomera (1987) consider that the only important socio-demographic variables are age, education and income level. These are the psychological variables such as values and principles, lifestyles, character and attitudes. Numerous studies sustain that an individual's values and principles, together with his lifestyle (way of dressing, places frequented, free time, etc.) allow his behavior in society to be discovered; the most important contributions in environmental matters are these (Table 2).

In addition, the literature sustains that people who save energy and water and those who recycle may have similar lifestyles, different from those of less active people (Gilg and Barr, 2006). The relationship be-

tween consumers' character or personality and behavior has been studied by a large number of authors who have reached different conclusions, because personality is a unique variable specific to each individual. Authors like Kassarian (1971), Greeno, Sommers and Kernan (1973), Shank and Langmeyer (1994), Church and Burke (1994) prove that there is no relationship between these variables; however, others such as Brooker (1976), Lasovicka and Joachimsthaler (1988), Briggs (1992), Bilsky and Schwartz (1994), Ramanaiah and Sharpe (1997), among others have found a relationship between character and behavior. These are some of the most noteworthy environmental conclusions (Table 3).

Attitude is the social psychology variable with the most relationship with consumer behavior, in general, and ecological consumer behavior in particular; attitude is developed through continuous processes

**Table 2. Studies of values and lifestyles**

<b>Authors</b>	<b>Most relevant results</b>
Gibbons and Wicklund (1982) Badson, Bolen, Cross and Neuringer-Benefiel, (1986)	Altruistic principles of help and realization are more related with positive behavior in social matters in general.
Lievers, Serra and Watson, (1986)	People with active religious participation have a positive attitude towards society.
De Young (1985-86)	Satisfaction with living austerely is associated with positive behavior towards recycling of paper and glass and re-use of containers.
Granzin and Olsen (1991)	They reach the conclusion that personal values are closely related with environmental help behavior patterns (product discrimination, recycling). They also declare that personal values are very useful in explaining people's attitudes towards environmental protection.
Grunert and Rohme (1992)	Their conclusion is that affinity with environmental problems is what most affects discrimination of whether a consumer is more or less interested in these problems.

Source: Fraj and Martínez (2002)

of socialization and shows a tendency to evaluate action towards the environment as favourable or unfavourable. In some other cases, it is considered that the attitude variable is not reflected in consumer behavior, as in the case of Balderjahn (1988); however, authors like Homer and Kahle (1988), McCarty and Shrum (1994), Guagnano (1995), Kotchen and Reiling (2000) and Chan (2001), among others, have found relationships between attitude and ecological behaviors. Some of the most important contributions are shown here (Table 4). Maloney and Ward (1973) developed a scale to measure the attitude of individuals in three dimensions: affective involvement, verbal commitment and actual commitment.

As a result of some studies (Shrum, McCarty and Lowrey, 1995), the ecological consumer could be characterized as being a young, well educated consumer with a medium-high level of income. He seeks information about products, exchanges opinions with other

consumers, is not liable to impulse buying, not loyal to brands and mistrusts advertising. Another study, carried out by Fraj and Martínez (2002) establishes a profile of ecological consumers based on various socio-demographic, psychographic and information or knowledge variables, which determine different kinds of consumer behavior according to their characteristics. They distinguish in this way between consumers who recycle, those who buy ecological products, those willing to buy ecological products which are more expensive than non-ecological ones, and consumers with a positive attitude or with a real commitment to the environment.

This study establishes as its conclusion the characteristics of ecological consumers:

✎ Although socio-demographic aspects are not very significant, the study finds that younger individuals participate more in environmental events, and those with a medium to high level of education recycle more

**Table 3. Studies of personality**

Authors	Most relevant results
Brooker (1976)	Relate the personality variable with socially aware consumer behavior and obtain a positive relationship.
Ramanaiah and Sharpe (1997)	Analyse two types of personality, and get the result that each defines different types of behavior.
Ramanaiah, Clump and Sharpe, (2000)	Find that individuals with different levels of environmental responsibility have different personality profiles.

Source: Fraj and Martínez (2002)

**Table 4. Studies of attitude**

Authors	Most relevant results
Kinnear and Taylor (1973)	Studied the relationship between ecological interest and brand perception, considering not only individuals' attitude towards the ecological (ecological interest as a dependent variable), but also their behavior.
Ramsey and Rickson (1976)	Studied the relationship between attitudes and knowledge relevant to environmental principles.
McCarty and Shrum (1994)	In this study, a theoretical and practical contribution was made towards understanding the determinant factors in recycling behavior.
Guagnano, Stern and Dietz (1995)	A simple model taking attitude factors and a combination of external factors as its starting point to show their influence of recycling behavior.
Sánchez and Etxaniz (1996)	The subject dealt with in this study is the extent to which price or attitude hinder growth of the ecological market.
Ling-yee (1997)	The strength of the relationship between group orientation and actual environmental commitment, and the relationship between ecological attitude and actual environmental commitment.
Chan (1999)	Studying environmental attitudes and behavior in China, finding that in spite of the lack of concern for the ecological, cultural values determine strong feelings in favour of ecological principles.
Kotchen and Reiling (2000)	Relate attitudes with willingness to pay more for something in the knowledge that the extra price is to be dedicated to environmental improvement.
Chan (2001)	Influence of psychological factors such as orientation towards nature, level of collectivism, ecological affectiveness and ecological knowledge on the attitude towards green buying, through buying intention variables.

Source: Fraj and Martínez (2002)

and are more willing to be ecological products although they are more expensive.

✍ In terms of lifestyle, individuals with greater capacity for initiative, who lead a healthy life and collaborate in environmental improvements show clearly ecological behavior. Those who are more inclined to follow fashion and trends show a willingness to pay a higher price to consume ecological products and have a real commitment to the environment.

✍ Depending on personality, those with more solidarity recycle more and participate more in environmental events; creative consumers with a higher intellectual level are willing to pay extra for ecological products; and more stable consumers take part in environmental events.

✍ Attitude, verbal commitment (interest in using means of transport which pollute less) and affective involvement (concern about environmental pollution) determine consumers' ecological behavior.

✍ Consumers' level of knowledge about environmental matters does not determine their ecological behavior to a great extent.

One of the aspects of ecological behavior which society centres its attention on most is water saving. Earlier research has examined the profile of water-saving individuals according to two types of variable:

- Socio-demographic variables, such as income, level of education, political affiliation, family size, type of home (ownership or rented), among others (Hamilton, 1983; Hines, Hungerford and Tomera, 1987; Berk, Schulman, McKeever and Freeman, 1993; De Oliver, 1999). However, various studies show that the weakness of the relationships found supports the hypothesis that socio-demographic factors are not, in general, good predictors of ecological behavior.

- Attitudinal variables: price and economic incentives, threat to the environment, social desirability, perception of water rights, intrinsic motives and satisfactions (Berk, Cooley, La Civita, Parker, Sredi and Brewer, 1980; Syme, Seligman and Thomas, 1990-1991; Syme, Nancarrow and Seligman, 2000; Hamilton, 1983; Kantola, Syme and Nesdale, 1983; Baldassare and Katz, 1992; Sadalla and Krull, 1995; Nancarrow, Smith and Syme, 1996-1997; Lam, 1999; De Young, 1996).

However, the different studies have sometimes produced contradictory results.

Gilg and Barr (2006) carried out a study on behavior with regard to water saving, the results of which show that the socio-demographic characteristics of those most committed to water saving at home are more aged individuals, who own their home, with democratic and liberal political ideas and who are members of community groups. This contrasts with non-ecological individuals who tend to be young men, with low incomes and a low level of education, who are less involved with the community and politically apathetic. With re-

gard to the environment-attitudinal variables, earlier research shows that the four main groups of attitudinal variables are perception of water rights, environmental threat, social desirability and De Young's satisfaction indices (Gilg and Barr, 2006; De Young, 1996). These variables not only affect water-saving behavior but are also common to energy saving, green consumption and recycling behavior patterns. The results of this study show that individuals with non-ecological behavior are more jealous of their rights, together with the belief that environmental problems are not a threat to social welfare. In contrast, individuals who think that environmental matters are a threat to personal welfare are more inclined to save resources, in the belief that resources cannot be used exhaustively.

With regard to social desirability, this refers to whether helping the environment is socially desirable or not. This study shows that ecologists are more inclined to declare that their neighbours and friends in general help the environment. Non-ecologists are less inclined to declare that they know someone who helps the environment and so are less inclined to believe that helping the environment is socially acceptable and desirable. With regard to De Young's satisfaction indices, indulgence (benignity, compassion, tolerance) and luxury are more valued by individuals who are less inclined to participate in actions in favour of the environment, and the value of frugality (moderate acquisition of goods and services) and a simple lifestyle are highly appreciated by those disposed towards actions on behalf of the environment.

The present framework defining the new environmental paradigm establishes that the values and ideas of society lead to a particular attitude which directs the behavior of society (Gómez, Noya and Paniagua, 1999). The main theories (Kalantari and Asadi, 2010) consider that environmental behavior must be analysed in terms of a structural model of cause and effect which depends on attitudinal components and certain exogenous variables arising from individuals' social and own conditions.

The environmental consciousness of individuals is the result of two general attitudes (Barreiro, López, Losada and Ruzo, 2002):

- The concern suggesting protection of the environment.
- Related with individuals' awareness of who is really responsible for that protection and that they should make decisions and take action to solve those problems.

Individuals with an attitude favourable to the environment are more inclined to commit themselves to environmental activities than those who have less favourable attitudes (Aguirre, Aldamiz-Echevarría, Charterina and Vicente, 2003); i.e., attitudes favourable towards environmental protection predispose towards ecological behavior and so can predict environmental

behavior. Another psychological variable which some studies have shown to have an influence is lifestyle; it is also shown that certain factors such as the amount of balance between private and professional life, concern about health, awareness of environmental matters (Sánchez, Gil and Gracia, 1998), individuals' dependence on possession of goods or social status (Scherhom, 1993) predispose them in favour of or against environmental behavior. Social class as an indicator of education, income and profession also predispose towards ecological behavior among the upper social classes (Balderjahn, 1988; Garcés, Pedraja and Rivera, 1995).

## MATERIALS & METHODS

This study was prepared using the Survey on Homes and the Environment 2008, prepared by Spain's *Instituto Nacional de Estadística*, National Statistics Institute, the purpose of which was to study the customs consumption patterns and attitudes of Spanish households in relation with the environment, with a sample size of 26,689 homes.

Among the main results, it should be stressed that 76.9% say they are very concerned about the environment and 96.4% of the public would agree to take certain measures to protect the environment. With regard to water saving, 96.9% of Spanish households has adopted a water-saving habit.

These environmental consciousness percentages increase with income and education. By sex, women are more concerned than men, and young people and

the elderly are those least interested (Table 5). The measures most accepted are reduction of the noise from main roads (with anti-noise panels or sound reducing road surfaces: 85.6% of those surveyed), restrictions on the abusive use of water (81.3%) and installation of a renewable energy farm in their municipality (74.7%), in spite of the effect on the scenery. In contrast, 23.1% would pay more for the use of alternative energy.

The main actions carried out to reduce water consumption were these (Table 6). Examining water-reduction measures with a specifically environmental purpose, it can be stressed that water recycling is more highly considered in regions with a water deficit and less so in regions with a surplus.

By type of municipality, it is notable that the lower the number of inhabitants, the fewer the water-saving habits or devices used. In contrast, the larger the household, the greater the effort made to reduce water consumption. Looking at households' mean net income, those with income below 1,100 Euros a month are those which adopt fewest measures in the matter of water saving. These were the items used to measure lifestyle (Table 7).

## RESULTS & DISCUSSION

The structural equation model used to verify the hypotheses posed was estimated by the partial squared minima method using the application SmartPLS 2.0, the results of which are shown in Fig. 2. The arrows indicate the regression relationships which show the rela

**Table 5. Environmental consciousness (%)**

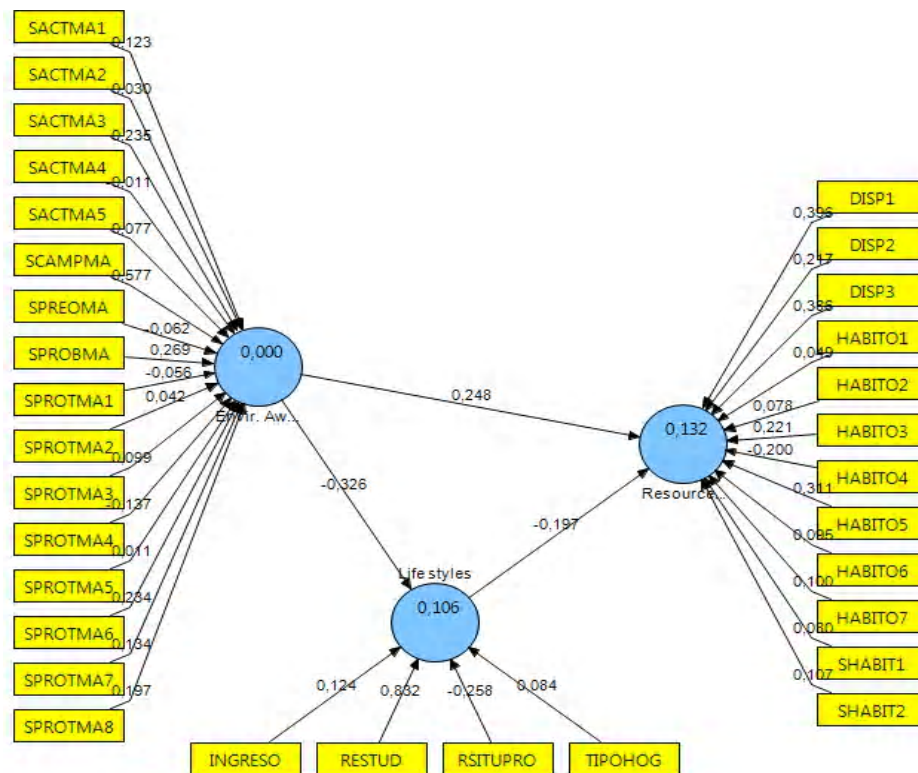
Variables	Description	%	
SPREOMA	Very concerned about the environment	76.9	
SCAMPM	Knows about an environment-related awareness-raising campaign (water, energy, recycling, etc.)	59.2	
SPROBMA	Has noticed an environmental problem in his situation during 2007	27.9	
Participation in environment-related activities during 2007: 19.1	SACTMA 1	Collaborating with an environmental protection organization	4.2
	SACTMA 2	Participating as an environmental volunteer	3.0
	SACTMA 3	Signing against situations harmful to the environment (urban development or specific projects of any kind)	13.2
	SACTMA 4	Demonstrating against a situation harmful to the environment	5.4
	SACTMA 5	Personally reporting a problem he has identified	3.4
Would agree to take certain steps to protect the environment: 96.4	SPROTMA 8	To reduce the noise on main roads (noise-prevention panels, noise-reducing pavement)	85.6
	SPROTMA 2	Regulating or restricting abusive consumption of water in households	81.3
	SPROTMA 6	Installing a renewable energy farm (wind, solar power) in his municipality, in spite of the effect on the landscape	74.7
	SPROTMA 3	Establishing an environmental tax for more polluting fuels	64.4
	SPROTMA 1	Obliging separation of domestic rubbish, under threat of fine	53.5
	SPROTMA 4	Establishing restrictions on the use of private transport	46.9
	SPROTMA 5	Establishing an ecological tax on tourism	34.7
SPROTMA 7	Paying more for use of alternative energy	23.1	

**Table 6. Actions to reduce water consumption**

Variable	Description	%
SHABIT 2	Showering instead of taking a bath	96.6
SHABIT 1	Turning the tap off while cleaning teeth or lathering	90.6
HABITO 3	Defreezing food in advance of use	86.6
HABITO 5	Using full washing and washing-up machines	81.9
DISP 1	Single thermostatic tap	67.4
HABITO 2	Keeping a bottle of water in the fridge to have cool water at all times	64.2
HABITO 7	Putting a waste-paper bin in the bathroom in order not to use the toilet for rubbish disposal	54.7
HABITO 4	Filling the kitchen sink(s) before washing up	38.8
DISP 3	Mechanisms to restrict cistern discharge, including placing a bottle full of water or other object in the cistern	32.2
HABITO 6	Semi-closing the stopcock to reduce the flow to taps	30.8
HABITO 1	Water recycling	22.9
DISP 2	Other water-economization devices (aerators, sprays, flow reducers, infra-red sensors, timer buttons)	14.6

**Table 7. Water consumption reduction actions (%)**

Variable	Description
RESITUPRO	Professional situation
RESTUD	Level of education
TIPOHOG	Home type
INGRESOS	Net monthly income of the household



**Fig. 2. Estimated structural equation model**

**Table 8. Comparison of hypotheses**

	B standardised	t Bootstrap
Environmental awareness → Lifestyle	-0.3258**	50.9957
Environmental awareness → Resource saving	0.2480**	26.9735
Lifesyle → Resource saving	-0.1972**	24.0150

\*\* p<0.01; \*p<0.05



tionships of the items with latent factors (measurement model) and among latent factors (structural model).

Because of the size of the sample, the estimated model gives a power or probability of the null hypothesis being rejected when it is false of 100%.

The estimated model has a good global fit, the  $R^2$  coefficient having a value greater than 0.10 (according to the criterion of Falk and Miller, 1992) for the two latent dependent variables (0.106 for lifestyle and 0.132 for water resource saving). In addition, for all dependent latent variables, the  $Q^2$  indicator of predictive relevance (Stone, 1974; Geisser, 1975) has a positive value, showing the worth of the fit model and indicating that the error committed using all the model's information is lower than if that information is not taken into account, i.e., the model has predictive relevance, because it reduces errors of estimation. Concentrating on the significance of the structural relationships proposed by the model, the hypotheses posed therein can be compared (Table 8).

Based on these results from the estimation, the working hypotheses have been empirically proved from the answers to the Survey of Homes and the Environment 2008. These show the significance of the structural relationships proposed between the variables. However, in two of the three structural relationships proposed, the effect produced is the opposite of what was expected, i.e., environmental consciousness has a negative influence on lifestyle, and lifestyle has a negative influence on water saving behavior.

## CONCLUSION

In this study, the water resource-saving behavior of Spanish households and the influence of an ecological consciousness or attitude and lifestyle on the resource-saving actions carried out in them has been analysed.

The empirical evidence of the study carried out confirms the dependence of water saving behavior on variables of attitude and lifestyle, as is seen in review of the literature; however, results opposite to the expected were found in two of the three proposed relationships. On one hand, the significant, positive effect of environmental consciousness on water-saving behavior, i.e., the greater the environmental awareness, the greater the disposition to do things to save water is confirmed.

On the other, the results confirm the significant effect of lifestyle on water saving behavior and of environmental awareness on lifestyle, but negatively, i.e., lifestyle is inversely related to saving behavior, so that a bigger income or higher education does not lead to water-saving behavior patterns. And environmental awareness does not determine a better, more comfortable lifestyle, but a simpler one. The overall effect both

directly and indirectly of environmental awareness water-saving behavior is thus positive, so it can be concluded that greater environmental consciousness encourages commitment to the environment, by performing activities to protect it and its resources.

Therefore, increased effort and investment by both public and private organizations to raise awareness among society of the importance of protecting the environment and saving resources would lead to greater commitment and, finally, more participation in actions to protect the environment.

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