# Environmental attitude and ecological behavior: the key of climate change to win the sustainable development challenge

Lamia Boukaya[1,*], Sahar Saoud[2]

[1]ENCG-UIZ, ERTISED Agadir, Morocco

[2]FSA-UIZ, Ait Meloul / ENCG-UIZ, ERTISED, Agadir, Morocco

**Abstract.** In this article, we are shining lights on the ecological transition, as a switch from a societal model that prioritizes economic growth towards a model that supports environmental sustainability as well economic prosperity at the same time. We will develop, in an approach foresight, which highlights all the dimensions influencing the role of each individual with respect to his behavior and ecological responsibility. This paper will also identify the determinants of consumer's ecological behavior in the Moroccan context. It aims to describe a consumer's ecological behavior by taking a responsible decision that guarantees its social responsibility. The innovative benefit of our perception is to integrate the ecological aspect into the dimensions chosen in order to define and further explain a responsible ecological behavior.

## 1. INTRODUCTION

The protection of the environment is an increasingly felt responsibility by all consumers. Lately, the consumers have become fully aware of the fragility of the environment and its effects of ecological damage. Social responsibility is as much as necessary to the competitiveness of the green products in the strategy planning system long-term ecological challenges that drive organizations to put in place ecological policies as a major performance component. Psychology has gone from the science of mental life to the science of behavior and mental processes that they relate to individuals while taking into account the different determinants (biological, contextual, social, cultural heritage, etc.). Psychology has become a discipline in its own right. Now it can present itself from several ways. Human behavior is the most delicate thing to control because of its complexity; this is why the human brain is one of the most incomprehensible mysteries of the universe. In addition, the study of human psychology is understood with regard to the individual as the heart of a society and/or of a group. The human being is a social being, it is a reality indisputable, and it is of such a difference from one personality to another that the study of behavior becomes very delicate. Nevertheless, exciting in the same time.

## 2. General context of dimensions influencing the behavior of a consumer

### 2.1 Definition of the ecological dimensions of consumer

In this part, we want to make clear the definition of the ecological dimensions of any consumer. Such an observation makes it possible to affirm that the protection of a country's environment concerns the attitude of human being that is at the base of the sustainable development. The main objective of this article is to identify the determinants of the Moroccan consumer's ecological behavior by emphasizing. More precisely, we are looking for potential variables intervening in modelling the ecological of their behavior .Problems such as the deterioration of the natural environment, the decrease in non-renewable resources, energy and overpopulation are grouped under one only theme that is "ecological problems". Its key factor is simply the human being as much as organism inserted into the ecosystem that uses and manipulates the environment to survive but to its logic and logics differ from race to another. In this sense, the human should assume its ecological responsibility and to be able to leave without seriously affecting the ecosystem ensuring its survival. On the other hand, that the human being but also the companies should assume this ecological responsibility since they are trying to dominate the environment and they do it for essentially financial purposes. The dimensions responsible for environmental problems are not exhaustive; they may be political, social, cultural and / or economic. At this point, we will have to highlight the ecological dimensions that manipulate the human being himself, we will start with:

- Psycho-ecological dimensions

According to Lamia Abdmouleh on her article "Citizen Ecological Awareness: Awareness to the participation of environmentally friendly actions": Ecological psychology is interested as well the effects of environmental conditions on behavior, cognition and emotions of the individual than the way in which he or she perceives or acts on the environment. Environmental psychology is based on better understanding and taking into account the complex interrelationships between the individual and the environment, whether conscious or not. As an individual perceives, feels, represents and projects in "his"

* Corresponding author: lam.boukaya@gmail.com

environment, positively or negatively depending on the case. This environment, with its real or fantasized peculiarities, the way in which it is invested and shaped by the individual participates in the identity of the individual and of a group, and gives meaning to their behavior. To master this dimension, we will call for two qualitative variables namely: consciousness and aptitude.

- Socio-ecological dimensions

For these dimensions, they consist in studying the species by privileging relations and social interactions between them. A socio-ecology means an ecologically inspired discipline, which analyzes the form of social behavior as an active adaptation to the constraints of the environment. This approach allows the development of environmental promotion actions taking into account the various factors influencing the environment (individual, social, ecological, political ...). Indeed, in recent years, many the data highlighted the influence of social determinants and about the way of life and the state of the environment of individuals. A teacher-researcher will present the theoretical framework and three illustrations will be proposed from the work coordinated by Inpes (physical activity, age well and early childhood and parenthood)

- Eco-economical dimensions

Our objective always is to understand the environmental behavior of the consumer and to pass of a polluting consumption to an environmental consumption but this, by accident, depends on two primordial variables: income and power of purchase on which we decided to name it ecological.

## 3. The selection of the variables composing the ecological dimensions of the economic agent

### 3.1. Determination of the scale of measurement of the explanatory variables

| The items of the ladder of ecological Awareness | |
|---|---|
| Item.1.1 | I am ready to participate in actions of protection of environment |
| Item.1.2 | If they install garbage cans of sorting of waste near me, I am going to sort out my waste |
| Item.1.3 | I accept that my bought products are wrapped pasteboard or paper and not plastic |
| Item.1.4 | If I have the choice, I will buy products that the packing is recyclable |

**Table 1.** The items of the ladder of environmental aptitude

| The items of the ladder of ecological suitability | |
|---|---|
| Item.2.1 | A product is said ecological when he does not call manures and chemical pesticides |
| Item.2.2 | The most important problem which threatens environment is urbanization as noise, atmospheric pollution and household refuses |
| Item.2.3 | A century is needed so that a plastic sachet degrades in nature |
| Item.2.4 | I am aware of harmful effects of the plastic waste thrown in sea |

**Table 2.** The items of the ladder of ecological suitability

| The items of the ladder Gender | |
|---|---|
| S.3.1 | Male |
| S.3.2 | Female |

**Table 3.** The items of the ladder Gender

| The items of the ladder of Civil Status | |
|---|---|
| S.4.1 | I am Single |
| S.4.2 | I am Married |
| S.4.3 | I am Divorced |
| S.4.4 | I am Widow (er) |

**Table 4.** The items of the ladder of Civil Statutes

| The items of the ladder of monthly income: | |
|---|---|
| E.5.1 | Between 1500 MAD And 6000 MAD |
| E.5.2 | Between 6001 MAD And 12 000 MAD |
| E.5.3 | Between 12 001 MAD And 20000 MAD |
| E.5.4 | 20001 MAD And Plus |

**Table 5.** The items of the ladder of monthly income

| The items of the ladder of Ecological purchasing power | |
|---|---|
| E.6.1 | I agree to pay a little more a lot for a green product |

| | |
|---|---|
| E.6.2 | I have tendency to buy the respectful products for environment up to 50 % of my monthly purchases |
| E.6.3 | I would be ready to pay 5 % on top of that for environmental products |
| E.6.4 | I am ready to dedicate more than 50 % of my power of purchase for farm produce bio. |

**Table 6.** The items of the ladder of Ecological purchasing power

### 3.2 The measurement of the explanatory variables composing the ecological dimensions

Due to the nature of the social sciences, which are the subject of uncertainty intervals, the mathematical and statistical methods used to measure the models variables are not fully validated. Consequently, we will opt for the Fuzzy Logic created by Lotfi ZADEH in 1965. This explain the notion of the belonging degree in the verification of a condition. An affiliation allowing being in the other state than true or false that makes it possible to take into account imprecision and uncertainty. This mathematical method is based on the fuzzy subsets theory, which allows creating a decision matrix based on fuzzy operators. The purpose is to obtain the variables' belonging degree in a set by using mathematical methods such as the mean maxima method (MM) and the center of gravity method (COG). For our model, we will keep for the ecological awareness the psycho-ecological scale already known in the literature. Furthermore, for the other variables we will use the fuzzy logic due to their linguistic and qualitative nature. Therefore, we will create a decision matrix by using fuzzy operators in order to assign to each variable an interval, then we will proceed to the defuzzification step of the variables in order to obtain the belonging degree. A reason that allowed us to choose the fuzzy logic that will attribute to this variable its degree of belonging in terms of ecological behavior other than zero and one, an observation that cannot be identified by other theories. At this level, we will refer to fuzzy logic to measure our variables. It is a logic where the truth-values of the variables - instead of being true or false - are real between zero and one. In this sense, it extends the classical Boolean logic it consists in taking into account various numerical factors for to arrive at a decision which one wishes acceptable but above all logical. This method of measurement makes it possible to make measurable any qualitative variable (which is the case of our study.) Therefore, concerning the variables of the psycho-ecological dimension, we will use this logic as well as for the variables of the economic-ecological dimension; on the other hand, those of dimension are quantitative variables.

## 4 Climate Change : the ecological behavior of an individual is the key of climate change to win the sustainable development challenge

Climate change will contribute to the disruption of the earth's natural ecosystems, potentially leading to the extinction of indigenous wildlife. In Morocco, it is mainly the impact of climate change on habitat and ecosystems that will dictate the changes of biodiversity. Several studies show impressively how climate change can seriously disrupt Moroccan habitat, health, behavior and economic growth. However, the provision of climate information should be able to reduce costs but only if it is available in a timely manner. From an economic perspective, it is quite reasonable to invest in adaptation in order to limit or eliminate the anticipated negative impacts while exploiting the new opportunities that will arise. The risks of climate change and natural disasters and recurrent climatic disturbances are, moreover, only contributing to the weakening of ecosystems and the degradation of natural resources, with serious impacts on economic and social development. The relationship between biodiversity and the functioning of ecosystems is one of the most current issues of ecology today. In addition to the intellectual challenges of understanding and simulating the dynamics of ecosystems, since the end of the 1980s, crucial environmental issues have emerged. Indeed, there is a positive link between biodiversity and ecosystem health that has been expressed in terms of biological insurance: the more species there are, the more likely it is that one or more of them adapted to the new environment induced by an exceptional or extreme event. It is for this reason that Morocco has engaged a participatory process in a long-term strategy that will enable it to meet its international obligations in this area. Morocco has initiated several programs for the rational management of water, the fight against desertification, the protection of biological diversity and the initiation of an energy policy promoting energy efficiency and the use of renewable energies. Insufficient efforts to support the ecological transition. It will be necessary to focus on institutions and programs of monitoring, prevention and disaster management, mitigation and adaptation to climate change, development of natural and cultural resources as well as targeted communication strategies and activities. Sensitization and mobilization of the population, taking into account the different needs and perspectives of men and women in these areas.

## Conclusion

Finally, the environment here is not seen as a mere scenery surrounding the individual or group, or even just as a source of ecological services, but rather our main element of debate. The mistake is to believe that the ecological transition is a simple industrial issue that is transparent to the people. That is why it is essential to associate the population to the ecological transition,

whose impact on their way of life it will accept only if they understand its harmful effects. Our vision was clear from the start; it is actually to focus on the different variables influencing the behavior and ecological responsibility of individuals. The study plan that we have put in place use a diverse sample of the Moroccan population while relying on the fuzzy logic to measure our unquantifiable variables to extract corrective and preventive actions to correct this behavior and direct it towards a healthier and more correct consumption for an assured sustainable development. The use of fuzzy logic in the analysis of collected data will refine and avoid the general problems of qualitative variables. This work will allow Moroccan companies to improve their irresponsible behavior and boost them towards a good ecological transition of the Moroccan economy and to understand especially behavior of its consumers. Questions arise and open up other perspectives for scientific research. In summary, this paper we proposed a model for describing the process of ecological transition in Morocco. It is therefore a scientific base and a reference for any new research in the field. It will also allow modeling this transition via mathematical methods that have already given satisfaction in other domains. It is an essential decision-making tool for all stakeholders with regard to climate change and sustainable development. At the strategic level, an integrated modelling will favor originality and creativity from a climatic and ecological perspective; it will thus help in the implementation of thoughtful actions for the Moroccan territory. That is why we decided to put in place a general model that guarantees an ecological transition to a stable state.

## References

1. MASSÉ Emmanuel,EDEM Robin "Livre Blanc sur le Financement de la TransitionÉcologique",Novembre 2013. Pages 5-38.
2. SAOUD Sahar, MAHANI Zouhir, DAADAOUI Latifa, "Climate Change-HumanBehavior:Towards Integrated Modeling" publié dans le International Journal of Science and Engineering Investigations, 2017. Pages 183-186.
3. L.BOUKAYA, O.RIAD, S.SAOUD Emergence and Evolution of Dimensions Impacting the Ecological Responsibility of Consumer
4. PICARD Fabienne, TANGUY Corinne, " Innovation et transition techno-écologique " ISTE
5. Edition: UK, Juin 2017. Pages 19-111.
6. YVES Livian " Initiation à Méthodologie de recherche en SHS ", Janvier 2015. Pages 3-80.
7. Lemos M.C, and B. J. Morehouse 2005 The co-production of science and policy in integrated
8. climateassessments. Global Environmental Change 15 (2005) 57–68 .
9. Fankhauser, S., J.B. Smith, and R.S.J. Tol, 1999:Weatheringclimate change: some simple rules
10. 10. Walker, B., Holling, C.S., Carpenter, S.R., Kinzig., A., 2004. Resilience, adaptability and
11. Transformability in social – ecologicalsystems, Ecology and Society, 9, 2,5.
12. LAOUINA Abdellah. Gestion Durable Des Ressources Naturelles et de la Biodiversité AUMAROC, Mars 2006. Pages 4-118.
13. Ostrom, E., Janssen, M.A., Anderies, J.M., 2007. Goingbeyondpanaceas, Proceedings of the
14. National Academy of Sciences, 104, 39, 15176-15178.
15. Liu, J., Dietz, T., Carpenter, S.R., Alberti, M., Folke, C., Moran, E., Pell, A.N., Deadman, P., Kratz, T., Lubchenco, J., Ostrom, E., Ouyang, Z., Provencher, W., Redman, C.L., Schneider, S.H., Taylor,W.W., 2007. Complexity of coupledhuman and naturalsystems, Science, 317, 5844, 1513-1516.
16. .L.Boukaya and S.Saoud, "The social Ecological System"Octobre SCA2018,Tétouane.
17. M Karsky and M. Adamo, "Application de la Dynamique des Systèmes and de la Logique Floue à la Modélisation d'un Problème de Postes en Raffinerie," Actes du Congrès de l'AFCET. Edition Hommes and Techniques. Tome 2, 1977, pp. 479-491.
18. Éric PERSAIS Université de Poitiers , L'écologie comme atout stratégique : une validation de l'approche ressources par la méthode PLS , Revue Finance Contrôle Stratégie – Volume 5, N° 3, septembre 2002, p. 195 – 230
19. Redman, C.L., Grove, J.M., Kuby, L.H., 2004. Integrating social science into the Long-TermEcologicalResearch (LTER) network: Social dimensions of ecological change and ecological dimensions of social change, Ecosystems, 7, 161-171.
20. .Bozonnet.J.P. (2007) « Conscience écologique et comportement environnementaliste », Pacte, CNRS et IEP de Grenoble ,vol. 39, n° 3, pp. 311-342.
21. Bagozzi, R.P., Tybout, A.M., Craig, C.S. and Sternthal, B. (1979), « The constructvalidity of the tripartite classification of attitude », Journal of Marketing Research, Vol. 16, February, pp. 88-95
22. Benoît Journé et Nathalie Raulet-Croset, La décision comme activité managériale située Une approche pragmatiste , Revue française de gestion 2012/6 (N° 225), pages 109 à 128
23. Pierre CABANE ,L'essentiel de la finance à l'usage des managers :Maitriser les chiffres de l'entreprise, 2004 Éditions d'Organisation Groupe Eyrolles(2ème édition)
24. Éric PERSAIS Université de Poitiers , L'écologie comme atout stratégique : une validation de l'approche ressources par la méthode PLS , Revue Finance Contrôle Stratégie – Volume 5, N° 3, septembre 2002, p. 195 – 230
25. Imed Zaiem, « Le comportement écologique du consommateur. Modélisation des relations et déterminants », La Revue des Sciences de Gestion 2005/4 (n°214-215), p. 75-88.
26. Bagozzi, R.P., Tybout, A.M., Craig, C.S. and Sternthal, B. (1979), « The construct validity of the tripartite classification of attitude », Journal of Marketing Research, Vol. 16, February, pp. 88-95
27. Persais E. (1998), La relation entre l'organisation et son environnement le cas de l'écologie, Revue Française de Marketing, n° 167, 2e trimestre, pp.27-44.
28. Pierre de Saint-Georges (1993) ,Les relations publiques face à la théorie Culture d'entreprise, communication interne et stratégies de changement.
29. Friedberg, Ehrard, L'analyse sociologique des organisations, in « Pour », n° 28, L'Harmattan, 1988.