

Citizens motivation towards solar energy in the context of the smart city, the case of Casablanca Morocco

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Abstract. The protection of the environment is one of the major concerns of individuals who seek to satisfy their needs without exploiting the reserve of future generations according to the principle of sustainable development. Nevertheless, any Smart City project requires the protection of the environment, the responsibility of citizens in its realization and a desire to encourage their participation in the various issues and dimensions of the creation of a smart city. Our research question aims to determine the extent to which the residents of the city of Casablanca are ready to support the Smart City project by adopting a responsible purchasing behavior towards their environment through the use of renewable energies. In order to achieve our goal we have resorted to the positivist paradigm by adopting deductive logic based on an existing theoretical model illustrated by the literature review which is the theory of self-determination. We opted for a questionnaire distributed to the profile of Internet users and the processing of the results obtained is done using the SPSS software. The analysis of the data collected showed that the majority of citizens are interested in the use of renewable energies and are ready to collaborate in the Smart City project.

Index Terms—Environment, Motivation, Renewable Energy, SDT, Smart Citizen, Smart City, Sustainable Development.

1 Introduction

The use of renewable energies and especially solar energy and among the pillars of environmental protection that must be adopted by every individual to ensure the proper exploitation of natural resources and serve sustainable development (United Nations General Assembly 2015). On the theoretical side, our study combines several concepts namely sustainable development, Smart City and motivation. Indeed, the emergence of the concept of sustainable development was first provoked in the Brundtland Report, also known as the report of the World Commission on Environment and Development in 1987. To achieve sustainable development, it is necessary to "meet the needs of the present without exploiting the capacity of future generations to meet their own needs", says the CMED report in 1987. Subsequently, sustainable development has focused on advancing adaptive capacity to create opportunities for desirable social, economic and ecological systems for the benefit of present and future generations (S. Dhahri , S. Slimani , A. Omri, (2020). In order to support sustainable development, it is recommended to launch smart city projects.

The Smart City can be defined as the user-friendly fusion of physical, IT, social, human and business infrastructure systems to achieve collective intelligence and make appropriate use of all available interconnected information, enabling better understanding, monitoring

and control of operations and better value for money (Department of Business Innovation and Skills, 2013). Anthopoulos et al (2019), define smart cities simply as innovations rather than information and communication technologies mainly based on the coordination and management of the six dimensions of urban space (mobility, environment, economy, people, government and life). In the same vein, Zanella et al. (2014), also suggested that the adoption of smart cities can lead to better use of public resources, a better quality of life and the services provided, while reducing the operating costs of public administrations from which comes the importance of motivation and integration of the citizen in their implementation process.

According to Graham (2020), motivation is the study of how individuals behave, or it is the explanation of the behavior of individuals to know why they react in one way and not another. In recent years, the concept of motivation has become an indispensable element in psychology and has been the subject of several research studies. One of the most popular theories in this context is the theory of self-determination (SDT). Indeed, this theory has inspired thousands of studies and improved the understanding of the concept of motivation (Deci & Ryan, 1985). The theory distinguishes autonomous and controlled motivation according to the factors that drive this motivation and the feelings that drive the individual to act. According to Deci and Ryan, there are several types of motivation, and the type of motivation is more important than the outcome, and they are interested in an individual's mental health. Their theories cover a wide variety of phenomena and deal with all concepts significant to humans, and have been applied in several fields. However, ADP is not only a theory of motivation but also a theory of personality, social development and mental health (Ryan & Deci, 2000).

Our study aims to determine the elements that underlie consumer motivation for the use of renewable energies with the aim of exploiting these elements to encourage citizens to benefit from natural sources, namely solar energy. In other words, our study seeks to assess the willingness of Casablanca citizens to adopt responsible purchasing behavior towards their environment in order to support the Smart City project by engaging in the use of renewable energies. The interest of our study is to develop a research paper that can be considered as a document of quantitative, qualitative and verifiable data that can be used by other researchers or used for other research. In this sense, our research problem is the following: to what extent are the citizens of the city of Casablanca ready to adopt a responsible purchasing behavior towards their environment in order to support the Smart City project? What is the role of the different Smart City stakeholders in motivating citizens to use solar energy?

The community concerned by this research work is first and foremost the citizens of the city of Casablanca as well as a fundamental pillar of the smart city project and secondly all the entities that have a direct relationship with the success of this project through the encouragement of the use of natural resources, namely environmental protection associations, distributors of solar panels government and public administrations.

Among the limitations of our research we can mention the lack of government framing of the various stakeholders responsible for monitoring the Smart City project so our sample is limited to the level of the city of Casablanca since it is the only Smart City project launched in Morocco. From our analysis of previous studies on the Smart City, we note that there is negligence on the human side, that is to say that there is no research work that has studied the role or impact of the citizen in the success of the smart city project through his acts of purchase or commitment to his environment.

To achieve our objectives mentioned above, we will opt for a field study to illustrate the set of determinants of motivation that can push a citizen to install solar panels. To this end, we will carry out a quantitative study based on a survey for the inhabitants of the city of Casablanca. The value of our research work lies in raising citizens' awareness of the importance of using renewable resources in order to solicit their willingness to collaborate in

the Smart City project. To achieve this goal, any company must communicate an effective ecological message based on a marketing plan that can be built on the basis of the results of our research work in order to ensure a strong usefulness for a motivation, awareness and information program.

The architecture of this article is as follows, we will begin with a description of the methodology adopted as well as the target population. We then propose an interpretation of the main results obtained from our investigation. Afterwards, we begin a discussion on the consequences of our questionnaire and conclude our study with an overall conclusion of work.

2 Methodology

The methodology chosen in our research work is based primarily on a literature review of the general framework of our study which is motivational theories and particularly the theory of self-determination developed by Deci and Ryan in 1985. In a parallel section, our empirical study is based on the construction of a conceptual model developed through fundamental concepts of our literature review. In this way, our research work is part of a deductive logic, which follows a positivist paradigm based on existing theoretical models. For the implementation of our empirical part, we opt for a quantitative study that revolves around a survey based on an illustrated questionnaire of the conceptual model constituted. This questionnaire is distributed to the citizens of the city of Casablanca to measure their interest and motivation to use solar energy and collaborate in the smart city project. In a final step, we will recite and analyze all the results obtained from our dissemination of the questionnaire while trying to reveal revisions and possible suggestions. Due to the size of the market, we will choose the probability sampling method, so that different types of consumers have the opportunity to participate and complete our questionnaire. Our population is mainly the citizens of the city of Casablanca since it is the city concerned by the Smart City project.

2.1 Data collection

To begin the analysis, it is essential to collect data. To this end, a questionnaire consisting of 22 questions was developed and presented to respondents. The selected questions were formulated in a transparent manner so that participants understood their purpose. Closed-ended questions were preferred, with different types of formulation: some require a binary answer (yes or no), others require choosing a single answer from several proposals, while still others allow you to tick one or more answers. The dissemination of the questionnaire was using networks, through numerous Facebook pages and sent by WhatsApp and email during a three-month response collection period. The choice of this mode of administration is explained by the nature of the target population which is the citizens of a smart city and among the characteristics of the latter is the use of ICT and the digitalization of the various services, it is also called the connected city. For the analysis of the data we used the SPSS software. After entering all the collected data, we started analyzing the results provided by the software.

2.2 Data analysis

At this level of our article we will present the main results obtained from the data collection of our disseminated questionnaire.

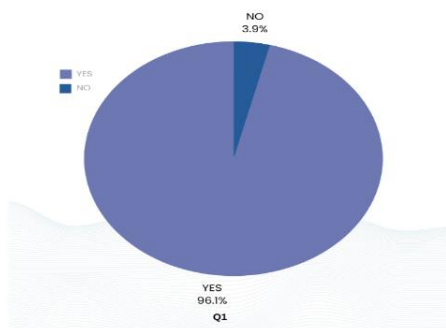


Fig. 1. Q1 - Are you interested in the use of renewable energies, specifically solar energy?

The results show that 96.08% of our population are interested in using renewable energy while just 3.92% who say they are not interested. This demonstrates that our population has a strong preference for the use of natural resources.

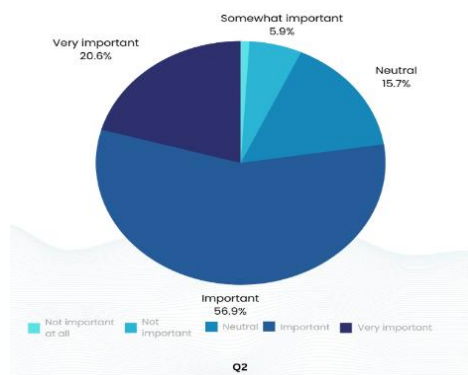


Fig. 2. Q2: At what level do you consider the use of renewable energies such as solar energy to be important?

From the diagram, we notice that more than half of our sample considers that the use of renewable energies is very important with a rate of 56.86% of the responses, while 20.59% consider it important, 15.69% are neutral and almost 6% of our population do not give importance to this use.

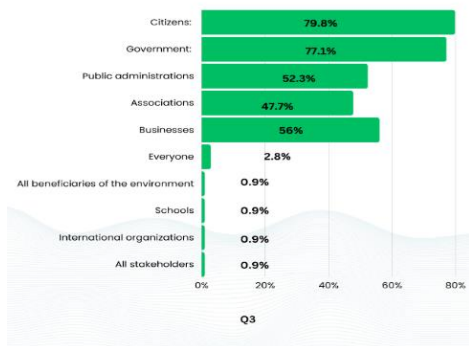
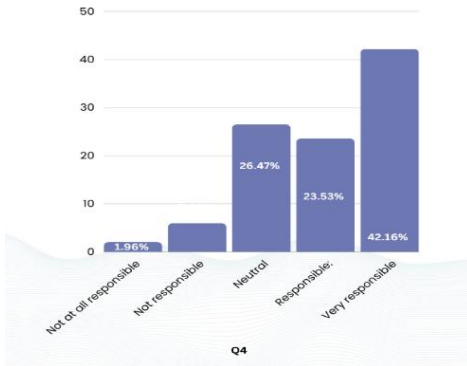


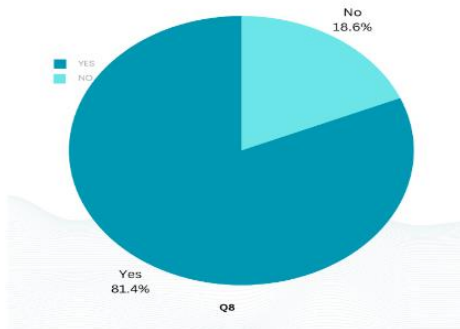
Fig. 3. Q3: In your opinion, who is responsible for environmental protection?

Respondents mention that environmental protection is primarily the responsibility of citizens with a rate of 80.4%, followed by the government with 77.5%, industrial companies 56%, public administrations 52% and 48% environmental protection associations.



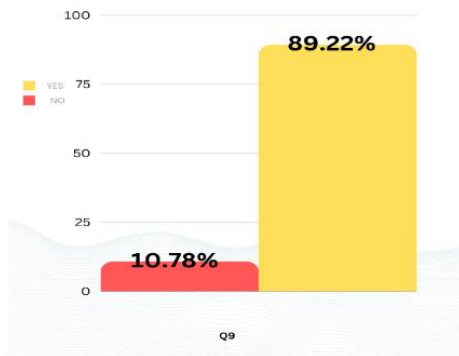
The description of the data collected shows that 42.16% of our population qualify as very responsible towards their environment, 23.53% responsible, 26.47% neutral and less than 8% not responsible. These results show that the people of our country have a strong awareness of their responsibilities and the importance of rational exploitation of natural resources.

Fig. 4. Q4: To what extent do you consider yourself responsible towards the environment?



The analysis of the findings gathered shows that 81.4% of those questioned maintain that it is necessary to satisfy basic needs before thinking about the installation of solar panels in reciprocal 18.6% persist the opposite.

Fig. 5. Q8: To what extent do you consider yourself responsible towards the environment?



Most of our targeted population expresses that they are ready to support the Smart City project with a rate of 89.22% or 10.78% who get the opposite. In other words, the vast majority of our target population has shown willingness to support the Smart City, which can increase the success of this project.

Fig. 6. Q9: Are you willing to support the Smart City project and contribute to its success?

3 Results

The results obtained demonstrate a strong interconnection between the fundamental theoretical concepts that we presented in the introduction and motivation. In other words, to ensure the success of a smart city project, it is necessary to focus on the human, the citizen, and to integrate it into all phases of the project by encouraging its use of natural resources to protect the environment. Respondents expressed a strong sense of responsibility towards the

environment and stated that citizens and government are the main actors in environmental protection. In the next section, we present the results of the cross-analysis of the questions asked, as well as an overview of the main data collected.

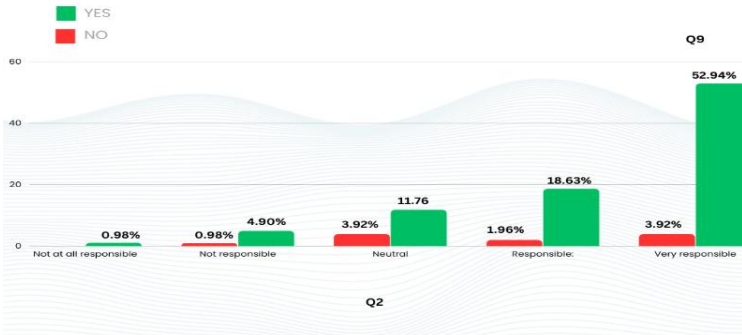


Fig. 7. Q2 x Q9: At what level do you consider the use of renewable energies such as solar energy to be important? Are you willing to support the Smart City project and contribute to its success?

The diagram shows that regardless of the level of importance given to the use of renewable energy, the majority of our population is ready to support the smart city project. After analyzing the data collected, we see that the people who have a great tendency towards supporting the Smart City project are those who give great importance to the use of renewable resources.

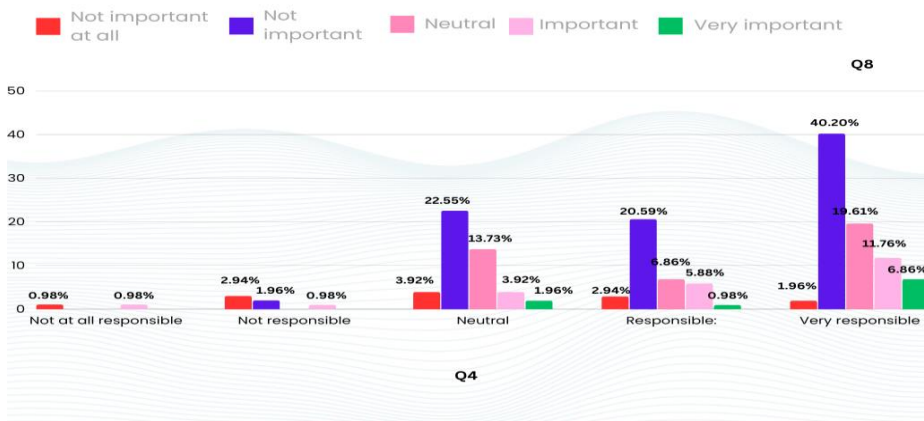


Fig. 8. Q4 x Q8 : To what extent do you consider yourself responsible towards the environment? Do you consider it necessary to fulfill basic needs before considering the installation of solar panels?

Following the graph generated from our survey, we can say that people who consider themselves responsible and very responsible towards their environment are determined to make a budgetary investment for the installation of solar panels in order to benefit from renewable resources. Taking into account the level of responsibility in our sample towards their environment, the people who are ready to support the smart city are those who feel responsible or very responsible towards their environment and even those who are neutral.

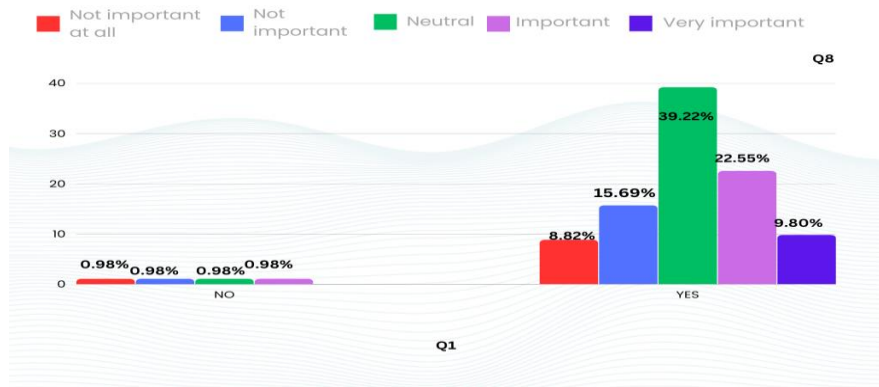


Fig. 9. Q1 x Q8- Are you interested in the use of renewable energies, specifically solar energy? Do you consider it necessary to fulfill basic needs before considering the installation of solar panels?

Following the percentages shown on the diagram at the top, we can specify that the people who have shown their interest in the exploitation of renewable energies are dispatched as follows: 22.55% are interested in planning a budgetary investment for the installation of solar panels, 9.8% are very interested and 39.22% are neutral while 24.51% express that they are not interested in said investment. In other words, even if residents are in favour of using renewable energy, they are not prepared to allocate a considerable financial investment to integrate it.

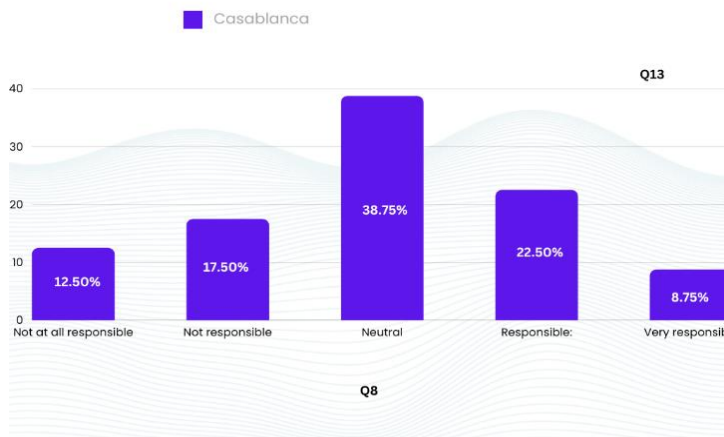


Fig. 10. Q8 x Q13 : Do you consider it necessary to fulfill basic needs before considering the installation of solar panels? What is your city of residence?

At the level of the point of view of the citizens of the city of Casablanca vis-à-vis the realization of an investment for the installation of solar panels, We realize that 31.25% are interested or very interested, 30% are not interested in not at all interested and 38.75% prefer to be neutral or not yet decided. In other words, only a third of the citizens of the city of Casablanca are interested in installing solar panels, and this does not necessarily correspond to their level of interest in the use of natural resources that have expressed high or very high.

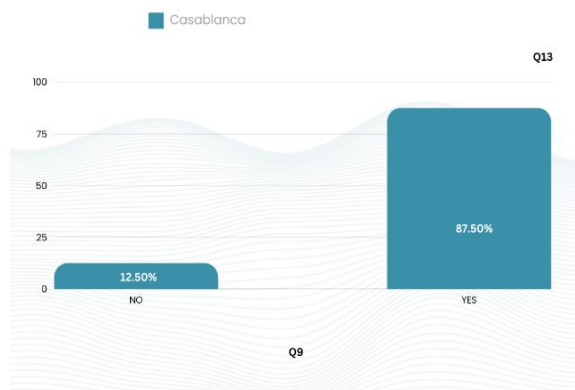


Fig. 11. Q9 x Q13: Are you willing to support the Smart City project and contribute to its success? What is your city of residence?

As mentioned in Figure 11, 87.5% of citizens of the city of Casablanca express their willingness to support Smart City project and collaborate in its success, as opposed to 12.5% of residents say the opposite. This proves the willingness of Casablanca residents towards involvement in a smart city that uses renewable energy to protect the environment.

4 Discussion

The data collected proves that our sample has a great tendency towards the use of natural resources and specifically solar energy also that the level of responsibility towards the environment is very high among the respondents. These results testify to the strong sense of responsibility and awareness of our population with regard to the importance of a judicious exploitation of natural resources, which means that it is possible to generate responsible purchasing behavior in the same population. In the same context, those who answered our questions say that citizens and the government are primarily responsible for protecting the environment. However, they consider that the satisfaction of basic needs is paramount before thinking about the installation of solar panels. We also illustrate the results shown that almost 90% of the population consulted reveals its willingness to support the Smart City project and considers it interesting or even very interesting and at the same time it exposes a strong interest in the exploitation of renewable energies to collaborate in its success. This demonstrates the tendency of Casablanca residents to get involved in a smart and innovative city, which values the exploitation of natural resources to guarantee the protection of the environment. Taking into account the degree of environmental responsibility of our sample, it appears that people who feel very responsible towards their environment, as well as those who have a neutral attitude, are the most likely to support the smart city project. On the other hand, although residents are in favour of the use of renewable energies, they are not prepared to make a significant budgetary investment to install them.

The consequences detected demonstrate the robust combination between our basic theoretical concepts defined in our introduction, which are sustainable development, smart city and motivation. In other words, to guarantee the success of the Smart City project, it is essential to focus on the human aspect that is the citizen and integrate it into the different phases of the project and motivate him to use natural resources to protect the environment and maintain the principles of sustainable development. However, new research can be launched to complete this article to fill the gaps in the proposed problem, namely the role of the various stakeholders of the Smart City in the motivation and integration of citizens in the realization of the project.

5 Conclusion

To close our article, we would like to recall the primary objective of our research work which is to stimulate the will and commitment of the inhabitants of the city of Casablanca to collaborate and participate in the success of the City Smart project by being an intelligent citizen and responsible towards his environment. The results obtained from our study showed that the majority of the targeted population expresses a strong interest in the use of natural resources and more specifically solar energy with a strong desire to cooperate in the success of the Casablanca Smart City project by becoming an intelligent citizen and responsible for its purchasing behavior through the protection of its environment.

In this sense, training and warning citizens about the importance of using renewable energies and its positive impact on the environment are key success factors for smart city projects. To achieve this goal, any company must communicate an effective ecological message based on a marketing plan that can be built on the basis of the results of future research for the various stakeholders of the Smart City project in order to ensure a strong usefulness for a motivation, awareness and information program.

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