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## Socio-economic Analysis of Electric Vehicles in Morocco

Aziza Chachdi<sup>\*ab</sup>, Bouchra Rahmouni<sup>a</sup>, Ghassane Aniba<sup>c</sup>

<sup>a</sup>Faculty of Juridical, Economic and Social Sciences, Km 3 route de Casablanca, B.P784, Settat, Morocco

<sup>b</sup>Research Institute for Solar Energy and New Energies IRESEN, 16 Amir Sidi Mohamed Street Souissi, Rabat, Morocco

<sup>c</sup>Mohammadia School of Engineers, Mohammed V University, Rabat, Morocco

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### Abstract

Conscious of the economic and environmental stakes, Morocco tries to reconcile durably the economic development and the climate protection. This reconciliation is performed by developing new alternative sources of energy, encouraging the new practices and improving the measures of "electric mobility"; and driven by reducing the fuel consumption of the road vehicles. Therefore, this paper exhibits the reasons influencing the Moroccan choices of transportation modes, in particular, those taken according to electric vehicles technologies. Our aim is, then, to investigate possible options to integrate this mode of green transport in the Moroccan context, while respecting their expectations and limits.

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*Keywords:* electric mobility; green transport; electric cars.

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### 1. Introduction

Transport is undoubtedly one of the most energy intensive sectors in Morocco. It represents a level of 41% of national final energy consumption, which causes significant emissions of pollution and greenhouse gases (GAS) to more than 23% in the atmosphere of the Kingdom [1]. The energy consumed by this sector comes mainly from petroleum products that are imported entirely from outside countries. This energy dependence is therefore largely responsible for the heavy weight of the energy bill, and therefore the balance of payments [2].

The negative impact caused by several means of transport is important on our environment. In order to reduce it, we have to profoundly review our mobility "needs" and learn more about the travel patterns of users. This step is

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\* Corresponding author. Tel.: +2126-53171185

E-mail address: [azizachachdi1@gmail.com](mailto:azizachachdi1@gmail.com)

considered essential in order to promote new modes of mobility more ecological and more environmentally friendly. It is in this context that electric mobility is developed as an alternative transport mode to the thermal vehicle [3].

The electric car is often advanced as a possible solution for these energy and economic stakes. If it exists for more than a century, it's only for less than a decade that it's brought back to light and one again becomes a real option for motorists [4].

In this sense, a survey was carried out in order to better understand the reasons which influence the choice of Moroccan modes of transport, and especially their attitude towards electric cars to ensure an adequate integration of this green mode of transport, while respecting the expectations of the Moroccan consumer. From this perspective, several questions emerge: are the Moroccan users ready to change their mode of transport and to opt for electric cars? To what extent would electric cars correspond to the expectations of these users?

To bring to a successful conclusion in this survey, we developed a questionnaire which we disseminated over the period from November 2016 to January 2017, mainly during the 22<sup>nd</sup> Conference of the Parties (COP22). The target of this survey is all Moroccan users, including all socio-professional categories. The data which we collected and the indicators which we built allow finer conclusions about the phenomenon studied.

The paper is organized as follows: Section II presents a general methodology of the survey. Once the survey data is collected, section III proposes a processing, analysis and interpretation of results. Conclusions and recommendations are drawn in Section IV.

## 2. General methodology of the survey

### 2.1. Collecting survey data: Strategies

The survey aimed to interview a representative sample of Moroccan households composed of major people of at least 18 years old. An online platform dedicated to questionnaires creation and sharing was opted: i)- to obtain major parts of survey questions answered by interviewees; ii)- to allow a fluidity both for the collection and for the posterior treatment; and iii)- to reach large numbers of respondents coming from different categories. The aforesaid platform is able to transfer the collected data to a statistical software (Xlstat, SPSS, Statview,...).

Data collection was conducted in two ways [5]:

- On-line: consist of structured and simple forms offering instantaneous collecting of mass answers, as well as simple manipulation tools;
- Face-to-Face: consist of physical interviews offering a realistic insight about the interviewee opinions as well as more detailed answers.

### 2.2. Sampling methods

In order to ensure a better representativeness of the sample in relation to the target population, we opted for the method of simple random sampling. Thus, all the possible combinations pulled of the population have the same chances to be selected. In other words, all the elements of the population have an equal probability to be a member of the sample [6]. The size of the theoretical sample was calculated according as follows:

$$n = \frac{Z^2 P(1 - P)}{d^2}$$

Where  $Z (= 1.96)$  represents the value given in the normal law table for a 95% confidence level;  $d$  is the sampling error or tolerated margin of error; and  $P$  is the proportion of people whose behavior is estimated. For an infinite population,  $P$  is estimated to be 0.5.

For  $P=0.5$ , a confidence threshold of 95% and an accepted margin of error  $\pm 5\%$  (0.05), the size of the theoretical sample is as follows:

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