

## How to get more electric cars on the road: Slovenian consumer's perspective

**Matjaz Knez, Bojan Rosib Matevz Obrecht**

*a,b,c University of Maribor, Faculty of Logistics*

*Mariborska cesta 7, 3000 Celje, Slovenia*

*1 Corresponding author: Matjaz Knez, matjaz.knez@um.si, Tel.: +38634285336*

**Keywords:** Electric cars, purchasing behaviour, strategies, car industry

**ABSTRACT:** Development of electric cars is nowadays the most dynamic and developing technological innovation in both private and freight transportation. Nowadays the studies of green technologies, especially in the area of green transport, are interesting for policy makers, vehicle producers, customers and energy suppliers. Electric cars represent a promising energy- and carbon-efficient alternative to internal combustion engine cars. However, as mobility behaviour is highly habitual, convincing people to switch from conventional cars to electric is challenging. In our research, which we carried out in the past years, in Slovenia, we tried to find out what influences the buying habits of people and what would motivate them. It turned out that the most relevant factor for not purchasing electric cars is firstly: total car price, which is once too high and secondly: short driving ranges. Different studies as well as results from our research have revealed that there is no single measure, which would dramatically increase demand for electric cars. Results have revealed that the most relevant factor for purchasing low emission car is still a total car price.

### INTRODUCTION AND THEORETICAL BACKGROUND

Road transport is responsible for almost 72% of total greenhouse gas emissions in the EU in 2016 (European Environment Agency, Report on - Final energy consumption by mode of transport, 2018) and such a big energy consumption impacts on climate change and highly affects ecosystems, the economy, human health and wellbeing. Greenhouse gas emission is a problem of common concern

to everyone, which requires a global response, to limit the risks and impacts of climate change. That is why alternative transportation technologies and alternative fuels are reliable and the best long-term solution to these problems.

According to Ward auto's research (2014), global car registrations jumped from 980 million units in 2009 to 1.015 billion in 2010. The world population exceeded 7 billion on March 12, 2012 and every seventh person now owns a car, which in all likelihood is powered by an internal combustion engine. Worldwide,

18 million barrels of oil is consumed each day by the automobile sector. Annually, the cars emit 2.7 billion tonnes of CO<sub>2</sub> (IEA, 2012).

---

Inevitably, from a climate change perspective the release of such large amounts of CO<sub>2</sub> will need to be examined. Therefore replacing internal combustion engine cars with electric cars has the potential to greatly reduce greenhouse gas emissions from the transportation sector. Electric cars currently make up a small fraction of the marketplace, and researchers are interested in understanding what it would take to make car buyers more enthusiastic about going electric (Anthropocene, 2017). High purchase costs and short driving ranges have been considered the main factors, which impede people's decision to buy electric cars (Knez et al., 2014, Degirmenci and Breitner, 2017).

It is recognised that any population is made up of individuals with varying levels of susceptibility towards changing their behaviour (Anable, 2005; Carreno & Welsch, 2009). Results of Xiuhong and his colleagues study (Xiuhong et al., 2018) indicate that the EV purchase intention can be explained 57.1% variance by consumer perception and personality. Two types of personality, such as personal innovativeness and environmental concern, significantly affect EV purchase intention directly. They are also significantly mediated by two kinds of perceptions (i.e. positive and negative utilities).

The results (Wang et al., 2018 ) shown that consumer's knowledge about EVs is positively and significantly related to perceived usefulness, attitude and intention to adopt EVs, but negatively and significantly related to perceived risk. Perceived risk negatively affects perceived usefulness, attitude and intention to adopt EVs. Meanwhile, perceived usefulness has a positive effect on adoption intention and attitude, and attitude is positively related to the intention to adopt EVs.

There are several factors for the purpose to find out drivers and barriers against consumer EV adoption. They can be categorized into three sets (Bjerkkan et al., 2016; Sierzchula et al., 2014), namely: (1) technological factors that include car ownership costs, driving range, and charging time. (2) consumer characteristics that involve demographics and personality. The former includes a series of personal characteristics such as age, gender, education and experience. The latter reflects personal inner feelings and values to events, people, and situations in their lives. For example, traits such as dogmatism, risk-taking propensity, and anxiety level are typical personality variables. (3) context factors, such as government incentives, fuel price and charging infrastructures.

The influence of taxation and other policy measures upon car purchasing decisions will thus also vary and need to be accounted for in future policy decisions. Governments across the world have proposed a variety of policy

---

mechanisms and invested billions of dollars to support EV development (Du and Ouyang, 2017).

The Accenture's survey (Gigaom 2011) offers an interesting glimpse of what potential buyers are thinking about when it comes to purchasing and driving electric cars. It shows private and government-marketing efforts are working to instil the idea that electric cars are better for the environment and perhaps even cheaper to own and operate in the long run. However, the survey also confirms several key concerns by utilities that consumers could end up driving up electricity demand during hours when power use already is high, such as in the afternoon on a hot day or in the early evening when people return home and use their TVs and appliances. Accenture's survey also showed that 51 percent of people would buy electric if they know that the cost of owning the car over time is lower than cars that run on gas.

Du et al. (2018) present three main findings of who buys new energy cars in China. First, there is an "awareness-behaviour gap" whereby low-carbon awareness has a slight moderating effect on purchasing behaviour via psychological factors. Second, subjective norms has a stronger influence on intention to purchase new energy cars than other social-psychological factors. Third, acceptability of government policies has positive significant impact on adoption of new energy cars, which can provide reference potential template for other countries whose market for new energy cars is also in an early stage.

There are many reasons from technology to societal preferences behind our slow take-up of electric cars, but the poor choice of available electric cars also plays a part. Many countries have policies and targets for going electric and we are starting to see considerable momentum from car manufacturers towards electric

cars. However, looking at the sales of electric cars in general, we still have a long way to go and lot of barriers to overcome before we achieve an all-electric car stock. The reasons have to do with both car technology and broader societal norms and preferences. Without a doubt, price and car range still have a role to play, but the issue of slow electric car uptake goes beyond this. People are heterogeneous, which is economic-speak for saying, we are all

different (RTE, 2017).

## **METHODOLOGY**

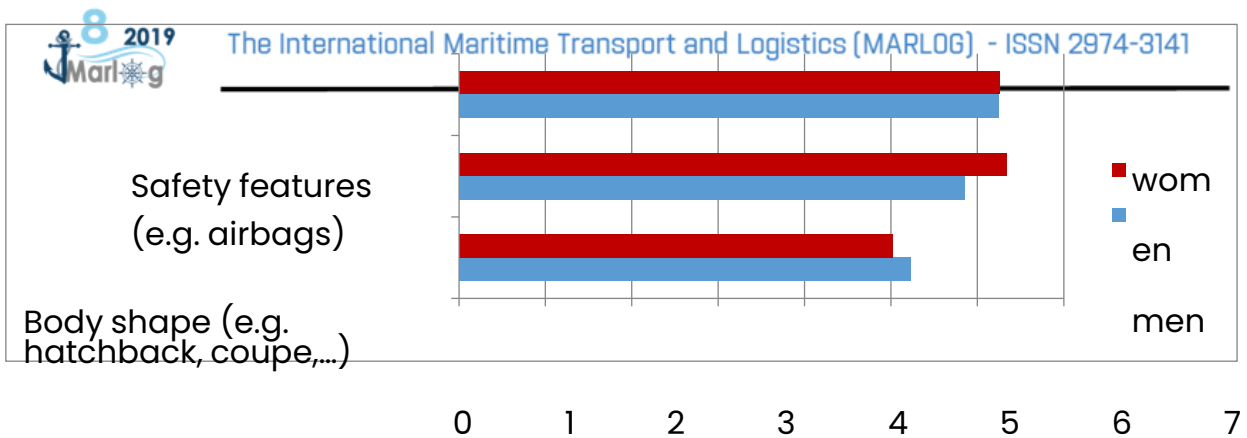
The study presented in this paper is a research study, which explores factors that convince / discourage people from buying an electric car, done in Slovenia in year 2013. The population of this survey are households that currently own a car and people that currently do not own a car or do not have daily access to a car when they require it. Sample was represented by 681 participants (52% of participants were women and 48% were men).

The collected data was processed and analysed with statistical software programme SPSS for statistical analysis. The secondary data were collected with compilation method from various scientific and professional papers, researches and different project reports focused on examined research topic. There were also a few limitations of the study, such as a limited period and subjectivity of peoples' personal opinions, which can be dynamic and can vary through time. Another is a statistical sample, which may not actually represent the whole population.

## **RESULTS AND DISCUSSION**

The study was designed to reveal the underlying factors that affect the purchasing habits of people. The results have revealed new perspective of purchasers and which factors are the most important for the purchase of a LEV. Three non-financial factors are crucial when deciding for a car purchase – 1st: “overall condition and mileage of car (if you buy a used car)”, – 2nd: “safety features” and – 3rd. “body shape of the car” (Figure 1). Other very important factors are car size (exterior), style/ appearance/ colour and fuel type.

Overall condition and mileage of car

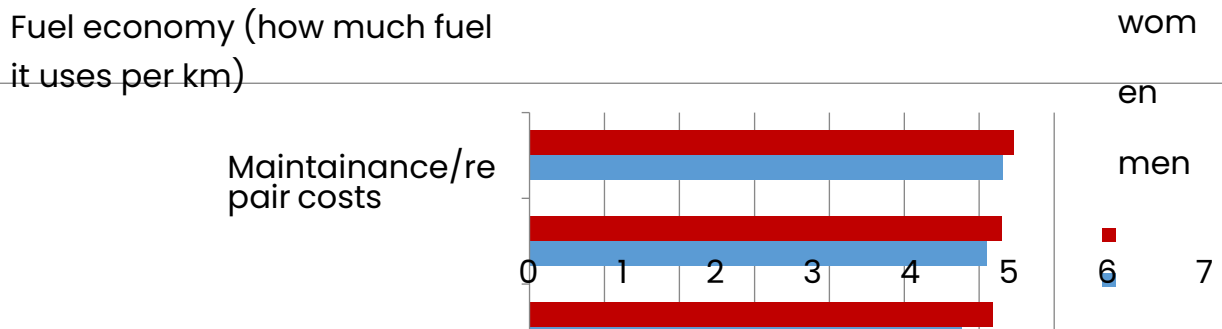


**Figure 1.** The three most important car performance factors (On the scale from 1 to 7 where 1 means NOT IMPORTANT and 7 means VERY IMPORTANT)

The results indicate that there are some differences between male and female population, especially when examining safety features, acceleration and fuel type. Safety on one hand is more important for women and acceleration and fuel type on the other is more important for men.

When it comes to financial features, most important thing seems to be the total price of the car. Second feature, also very important, is fuel economy (Figure 2). Especially now, when gas prices are high and are still increasing, information about fuel consumption is crucial. People also put emphasis on repair costs and on value/money ratio.

Total car price

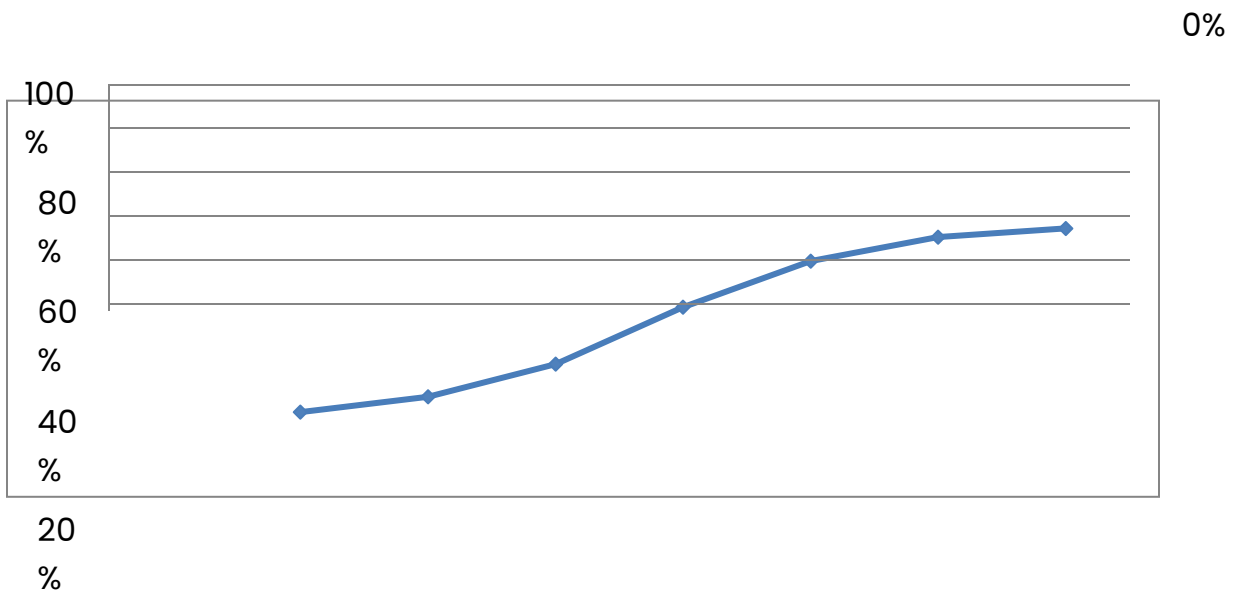


**Figure 2.** The three most important financial considerations (On the scale from 1 to 7 where 1 means NOT IMPORTANT and 7 means VERY IMPORTANT)

Based on the results from this research we did not find any significant differences between males and females in financial considerations. Average grade for individual financial factors was almost the same.

The respondents were asked about petrol and diesel prices too. If the gas prices would, increase for 30%

58% of people would start thinking about buying an electric car. The results are presented on Figure 3.



P

KNING ABOUT BUYING a car running on alternative  
fuels if fuel prices INCREASE by different  
percentage

e  
r  
c  
e  
n  
t  
a  
g  
e

0%	10%	20%	30%	40%	50%
60%					

o  
f

p  
e  
o  
p  
l  
e

S  
E  
R  
I  
O  
U  
S  
L  
Y

T  
H  
I

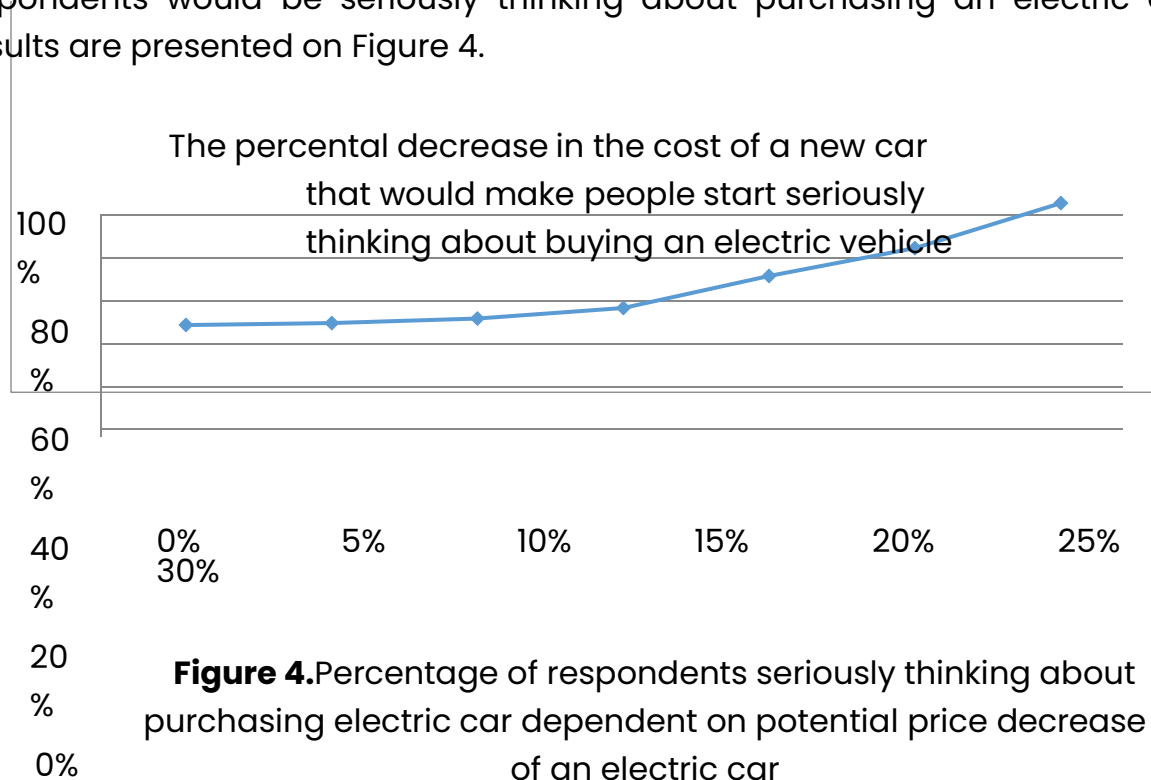


It is clearly seen on Figure 3 that increasing fuel prices are a motivating factor for people to start thinking about buying an electric cars.

Another key result of this research has shown that when people are buying a car, they are more interested in the total price of the car and not in different taxes. Two percent of respondents are already thinking about buying an electric car despite their relatively high prices. If the prices of electric cars would decrease by

10%, 5% of all research participants would be seriously thinking about purchasing an electric car. If prices would decrease by 20%, 25% of all respondents would be seriously thinking about purchasing an electric

car and if prices would decrease by 30%, more than half (59%) respondents would be seriously thinking about purchasing an electric car. Results are presented on Figure 4.



## CONCLUSIONS

This study provides both a theoretical and practical contribution to understanding of factors that influence car-purchasing decisions of people in Slovenia and around the world. Many studies as well as results from our study have revealed that there is no single measure, which would dramatically increase demand for electric cars. The solution is to combine different measures or strategies like “Top – Down” and “Bottom – Up”, where both government and car industry should come across.

Due to the results of our study and regarding, the main important factors which influence car purchasing decisions of people we could expose two of them; 1st – The purchasing price of electric cars, which is still too high. However, when we are talking about the costs of using an electric car, which are just a few cents/km for an electric car, and for a comparable conventional car, a few dozen cents/km – it is different. The fact is that an electric car is cheaper at the time of use. Already today, there are quite a few electric models on the market. The number of electric cars will rise and rise; all EU countries offer subsidies to buy an electric car (also Slovenia); countries are adopting policies to limit polluting cars, etc. We believe that this is an additional pressure on the purchase price of electric cars, which will only fall. We believe that various stakeholders involved in the promotion of electric cars should have more emphasis on promoting the costs at the time of their use. This way, people would know (when and how) to buy an electric car, when it is a turning point – when all the costs of an electric car (car price plus the cost of use) are equal to the cost of a conventional car etc. It would be necessary to elaborate and segment the needs of people and to clearly link correlation types of electric cars, which would further demonstrate the rationale and justification of purchasing an electric car. However, since this is not yet the case, potential buyers cannot explain this, they first see the excessive purchase price, which discourages them from purchasing.

The second most important factor, which influence electric car purchasing

decisions of people, is short driving ranges of electric cars. Many researches around the world, as well as our own research shows that the average daily travel distance of most people is between 30 and 50km. Large percentage of other family cars, in major European cities, never leave the city ring. Today, most of the new electric cars, even in winter conditions, with a single charge "can drive" 150km and more. We agree that an electric car cannot "satisfy" everyone and satisfy all requirements. People have different travel needs and habits, but with great certainty, we can claim that most of us belong into that group with an average driving habits. Our prediction is that an electric car will be (very soon) an alternative to many second, family cars, which are on average used only within cities.

The electric car is really (still) too expensive and may not yet "satisfy" purely all drivers, but - it is a nice car, quiet, ever-more beautiful shapes and colours, with great acceleration and good driving characteristics

- and at the same time very environmentally friendly.

Moreover, all dealers who, beside conventional cars, sell also electric cars should change some marketing tactics. Like - an electric car should be their additional offer, their extra opportunity to get closer to new (green) customers. They should also start educating their sales staff, get closer and introduce electric cars to all customers as a possible alternative, start using new innovative approaches etc. Maybe today electric car is a small marginal "trend" that will soon turn into something bigger and could be a strategic advantage and a business opportunity for sellers.

Certain government institutions are carrying out various policies for promoting the use of electric cars; however their reports present effects of each project, but every report is just a piece of the puzzle and there is a lack of connection between these projects. How can we know where we are on the road to implementation of electric cars? Review of policies for promoting the use of electric cars is very important, because this is an efficient action to review past activities, point out current perspective and successful and unsuccessful policies and determine future measures for greater implementation of electric cars.

In summary – the major contribution of this study is the investigation of different factors, which affect purchasing decisions, what people convince (or not persuade) to buy an electric car or, at least seriously, start thinking about it. The results of this exploratory study represent only the beginning of the future research in a domain growing in theoretical and practical importance. The authors also propose the EV is a solution to reducing CO<sub>2</sub> emissions in the transport sector in moving towards a more sustainable future as it is the second largest contributor of these harmful gases after the energy generation sector.

If Slovenia wants to introduce electric cars in larger scale as soon as possible, competent authorities must prepare and adopt legislative framework for introduction of electric cars with representatives of car manufacturers, energy companies and local authorities. Experiences showed us that combination of legal regulation and financial grants is the best assurance for introduction of electric cars and the most effective form of policy for promoting the use of electric cars.

## REFERENCES

1. Anable, J., 2005. 'Complacent Car Addicts' or 'Aspiring Environmentalists'? Identifying Travel Behaviour Segments using Attitude Theory. *Transport Policy*. 12 (1) pp. 65-78.
2. Anthropocene, 2017. The key to convincing people to buy electric cars is clean energy. Available from: <http://www.anthropocenemagazine.org/2017/04/the-key-to-convincing-people-to-buy-electric-cars-is-clean-energy/> [Accessed 8 November 2018].
3. Bjerkan, K.Y., Nørbech, T.E., Nordtømme, M.E., 2016. Incentives for promoting battery electric car (BEV) adoption in Norway. *Transportation Research – Part Transp.*

- Environ., vol. 43, pp. 169-180.
4. Carreno, M., Welsch, J., 2009. MaxSem: Max Self Regulation Model: Applying theory to the design and evaluation of Mobility Management projects. Available from: [http://www.epomm.eu/docs/mmttools/case\\_studies\\_TA/MaxSem\\_applying\\_theory\\_to\\_MM\\_projects.doc](http://www.epomm.eu/docs/mmttools/case_studies_TA/MaxSem_applying_theory_to_MM_projects.doc) [Accessed 1 September 2013].
  5. Degirmenci, K., M.H., Breitner. 2017. Consumer purchase intentions for electric cars: Is green more important than price and range? Transportation Research Part D., vol. 51, pp. 250-260.
  6. Du, H., Liu, D., Benjamin K.Sovacoolce, B.K., Wanga, Y., Ma, S., Li, R.Y.M., 2018. Who buys New Energy Cars in China? Assessing social-psychological predictors of purchasing awareness, intention, and policy. Transportation Research Part F: Traffic Psychology and Behaviour, vol. 58, pp. 56-69.
  7. Du, J., Ouyang, D., 2017. Progress of Chinese electric cars industrialization in 2015: a review Appl. Energy, vol. 188, pp. 529-546.
  8. European Environment Agency, Final energy consumption by mode of transport, Available from: <https://www.eea.europa.eu/data-and-maps/indicators/transport-final-energy-consumption-by-mode/assessment-9> (accessed 10.01.2019.) [Accessed 10 January 2019].
  9. Gigaom, 2011. How to Convince Consumers to Buy Electric Cars: Free Parking. Available from: <https://gigaom.com/2011/05/18/how-to-convince-consumers-to-buy-electric-cars-free-parking/> [Accessed 8 November 2018].
  10. IEA (International Energy Agency), 2012. CO2 Emissions from fuel Combustion Highlights. Luxembourg: IEA Publications, 2012.
  11. Knez, M., Jereb, B., Obrecht, M. 2014. Factors influencing the purchasing

- decisions of low emission cars: a study of Slovenia. Transportation research. Part D, Transport and environment, ISSN 1361-9209, vol. 30, pp. 53-61.
12. RTE, 2017. Why are we not buying electric cars? Available from:  
<https://www.rte.ie/eile/brainstorm/2017/1114/919990-why-are-we-not-buying-electric-cars/> [Accessed 8 November 2018].
13. Sierzchula, W., Bakker, S., Maat, K., van Wee, B., 2014. The influence of financial incentives and other socio-economic factors on electric car adoption. Energy Policy, vol. 68, pp. 183-194.
14. Wang, S., Wang, J. Jinpeng, J.L., Wang, L., L., 2018. Policy implications for promoting the adoption of electric cars: Do consumer's knowledge, perceived risk and financial incentive policy matter? Transportation Research Part A: Policy and Practice. Vol. 117, pp. 58-69.
15. Wards Auto, 2014. World Car Population Tops 1 Billion Units. [Online] 2014. Available from:  
[http://wardsauto.com/ar/world\\_car\\_population\\_110815](http://wardsauto.com/ar/world_car_population_110815) [Accessed 25 April 2014].
16. Xiuhong, H., Wenjie, Z., Yingying, H., 2018. Consumer purchase intention of electric cars in China: The roles of perception and personality. Journal of Cleaner Production, vol. 204, pp. 1060-1069.