

**CLIMATE RESILIENT PATHWAY FOR DEVELOPING
NATIONS: CASE STUDY OF ELECTRIC VEHICLE
MARKET IN NEPAL**

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**Author: Abarta Pandey
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Supervisor: Dr. Stefan Baumeister**



**JYVÄSKYLÄN YLIOPISTO
UNIVERSITY OF JYVÄSKYLÄ**

ABSTRACT

Author Abarta Pandey	
Title Climate Resilient Pathway for Developing Nations: Case Study of Electric Vehicles Market in Nepal	
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<p>The IPCC Special report emphasized the climate crisis we are heading towards exceeding the 1.5-degree limit at the current path. All the emerging reports suggest that we are not doing enough to transform our economy and society to fight the ongoing climate crisis. In the next decades, this crisis is bound to be more challenging with developing economies striving towards economic development. Hence, this reflects the urgent need for the climate resilient pathway for development. One of the main sectors with available alternative technology is the transportation sector which has a huge potential to curb the GHG emissions. The transportation sector directly accounted for 14% of the total GHG emissions in the world in 2014 excluding the energy use and its corresponding GHG emissions. The availability and accessibility of Electric Vehicles all around the world is a positive indication to strive towards zero emission mobility. The developing nations are at a crucial point in the fight against climate change as they are striving towards economic growth. The role of all stakeholders is crucial in this change from governments to consumers.</p> <p>The research is carried out on consumers from the least developed and land locked South Asian nation of Nepal to understand the consumer behaviour towards Electric Vehicles. The survey reflected a hidden demand for the EV automobile market in Nepal with lack of implemented government policies, lack of EV infrastructure and also the lack of supply of EVs as major obstacles to carry out the transformation. The research also highlights the lack of active population to initiate the transformation of the market with the huge problem due to the ongoing brain drain in the developing nations.</p> <p>The research concludes with lack of government coordination, and efforts to introduce and implement the policies to move towards the climate resilient pathway towards development. This is especially tricky for developing nations as they must omit short term economic gains hence requiring added international financing to execute these transformations.</p>	
Key words: Climate Resilient Pathway, Environmental Leapfrogging, Developing nations, Electric Vehicles, Nepal, Consumer Behaviour	
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1 INTRODUCTION

Human induced warming reached approximately 1 degree above pre-industrial level in 2017, increasing at 0.2 degrees per decade (Allen, et al., 2018). Climate change is the most pressing global issue of the present time. The 20 warmest year on earth has taken place in the past 22 years with top four in the past four years (World Meteorological Organisation, 2018). Climate related risk to health, livelihood, food security, water supply, human security and economic growth are projected to increase with global warming of 1.5°C and increase further with 2°C (Masson-Delmotte, et al., 2018). Our ability to maintain the temperature of our planet will determine the future in the coming years. However, this is particularly challenging for developing and under developed countries as they need to find the right strategies and, in many cases, sacrifice the short-term economic gains and might have to compromise the objectives of Sustainable Development Goals. This is a very complex situation specially for the least developed countries as compromising economics goals is not an alternative.

Least Developed Countries (LDCs) is the category comprising of low-income developing countries that are subject to growth barriers including economic and low level of human capital (UN, 2008). To add to this complexity, Least Developed Countries (LDCs) suffers the worst impacts of climate change despite bearing little responsibility for carbon emissions now affecting our climate. The lack of resources and technologies to adapt and mitigate to the climate change impacts has hampered LDCs ability to recover from disasters, erasing economic development and increasing further vulnerability.

Although, the need of assistance for developing countries was recognised as early as 2001, the Adaptation Fund was established in 2007 and was fully operational in 2010 under the Kyoto Protocol of UNFCCC to finance concrete adaptation projects and programmes in developing countries that are particularly vulnerable to effects of climate change (Chandani, Harmeling, & Kaioga, 2009). The climate conditions have got worse in the past decade and much more drastic efforts are required to maintain the healthy state of planet along with achieving other important SDGs such as tackling hunger, poverty, food security and health. This has created a significant gap also on achieving the targets for the Sustainable Development Goals.

This is where the emergence of climate resilient pathway for development comes into the picture as an important aspect of a sustainable and prosperous future. Climate Resilient Pathway are development trajectories that combine adaptation and mitigation to realise the goal of sustainable development (IPCC, 2018). Climate Resilient pathway is not a new concept and can be traced back to the theory of Leapfrog Development or Environmental Leapfrogging. Environmental leapfrogging implies a development strategy for industrialising countries to bypass the “dirty” stages of economic growth through the use of modern technologies that uses fewer resources or generates less pollution (Perkins, 2003).

The purpose of this research is to analyse the literature on theories of climate resilient pathway, environmental leapfrogging and consumer perspective on pro-environmental decision making in addition to a case study on the market of Light Duty Electric Vehicles (LDEVs) in a low-income developing country of Nepal. The research aims to demonstrate the way forward for LDCs to adopt a climate resilient pathway ensuring economic, social and environmental development.

The internal combustion has dominated the transportation market for the past century. However, the benefits of Electric Vehicles have been slowly penetrating the market in the past decade with over 1 million Electric cars sold and 3 million electric cars on the road worldwide in 2017 (International Energy Agency, 2018). This trend has many start-ups and established big brands investing hugely in the Research and Development of EVs. With new players in the market like Tesla with an annual revenue of \$21.461 billion in 2017 (Tesla, 2018), more and more companies are joining the race to meet the rising demands for EVs. Volvo CEO and President Hakan Samuelson announced that all Volvo cars in 2019 will have an electric motor powering the car and unveiled their plan to sell over 1 million electrified cars by 2025 (Volvo Cars, 2018).

The study of Electric Vehicles market in Nepal will therefore create a path to environmental leapfrogging by creating a climate resilient pathway and demonstrating an example for others to consider.

There has been previous research on topics of electric vehicles in Nepal. The previous researches on the subject are: "Electric Vehicle Technology in Kathmandu, Nepal: Look at its Development" (Maharjan, 2002); "Institutional Responses to Electric Vehicle Promotion in Nepal" (Baral, Parajuli, & Aryal, 2000); "A pre-feasibility study on deploying electric buses in Kathmandu valley" (Global Green Growth Institute, 2018) and "Analysis of HMG Policies And Regulations Affecting Electrical Vehicles" (Kathmandu Electric Vehicles Alliance, 2003).

However, the previous researches have not taken into consideration the consumer perspective towards EVs in Nepal. This thesis aims to understand the consumer behaviour and perspective towards electric vehicle and draw a conclusion combining results of the survey, previous studies, prevalent policies, study of the case country to present a pathway for transformation towards zero emission mobility.

1.1 Purpose of the Study

The IPCC Special Report published in October 2018 by scientist from around the world warned on the rising impacts of climate change and the urgent need for action to maintain the rise in global temperature well below 1.5 degrees within the next decades to avoid catastrophe (Masson-Delmotte, et al., 2018). The warming of the climate is unequivocal with observed changes in rise in atmospheric and oceanic temperature, diminishing snow caps and rising sea

level (Sims, et al., 2014). The effects of climate change will have the most adverse effects on Least Developed Countries, who are the most vulnerable. According to the United Nations Committee for Development Policy, Nepal is one of the 47 LDC (UN Committee for Development Policy, 2018). Coming from an LDC, the main reason for me to choose this topic is not only to create a strategy on a climate resilient pathway for the transportation sector in Nepal but also to establish an inspiring example for other developing countries to follow the path adjusting to their needs and establish a proactive approach to gain economic, social and environmental prosperity.

According to the Climate Change Vulnerability Index (CCVI), Nepal ranks fourth most vulnerable country to the impact of climate change over the next 30 years. This is mainly due to the dependence of Nepalese economy in agriculture. The agriculture sector of Nepal contributes to 30% of the total GDP of the country and supports the livelihood of more than 86% of the population (Climate Change Network Nepal, 2011).

Economically, Remittance; Agriculture; Service (mainly Tourism) and International Aid are the main sources of the GDP of Nepal. However, the pollution is on the rise following the prevalent traditional footsteps of economic prosperity. According to the 2018 Yale University Environment Performance Index, Nepal ranks 149th on the overall Environmental Performance Index and 177th in the Air Quality Index (Yale center for Environmental Law and Policy, Yale University, 2018). With severe climate effects the process of establishing of climate resilient pathway will require transformational changes to ensure development without disruptions.

According to the World Health Organisation (WHO, 2016), 91% of the world's population live in places where air quality exceeds WHO guidelines limits with estimates of 4.2 million premature worldwide deaths in 2016, with the highest number in South East Asia and Western Pacific regions (World Health Organisation, 2018). Although, Air pollution has been continuously causing widespread environmental and health hazards it has not received much focus. Road Transport powered by fossil fuels are one of the major contributors of air pollution. The exhaust tailpipe of the internal combustion engine produces harmful gases such as Nitrous Oxide (NO_x), Particulate Matters (PM), Hydro Carbons (HC), Carbon monoxide (CO), Sulphur Dioxide (SO₂) and other harmful GHGs.

The problem of changing climates, rising air pollution, lack of resources and technology and lack of capacity with LDCs to neutralise the health and environmental hazards is a major intensifying problem. Hence my focus will be on presenting a strategy for modernising and transforming the Light Duty Automobile market of Nepal which will present a scenario to address the environmental, social and economic problem at its early stage and show the pathway to climate resilience development.

1.2 Research aim and objectives

The aim of this research is to provide insight into developing a climate resilient pathway emphasizing its importance for the Least developed and the most vulnerable countries. The main objective of this research is to understand the practicality of developing the Electric Vehicle market in Nepal. The research results are drawn through the combination of analysis of climate resilient pathway theories, existing policies of EVs in Nepal, the case study of automobile market in Nepal and a survey to understand the perspective and behavior of consumers towards EVs.

The research questions the thesis aims to answer are:

- How is the consumer perspective and behaviour towards Electric Vehicles in Nepal?
- What changes in policies, infrastructures, strategy and consumer behaviour is required for developing country like Nepal to strive on the road to sustainable transportation?
- How can a developing country like Nepal adopt a climate resilient pathway to benefit from it economically and environmentally in the long-term?

1.3 Thesis Structure

The thesis follows the following structure:

Introduction

The thesis starts with the introduction part which shows the correlation between the transportation sector and our uphill battle on tackling climate change. It reflects the contribution of the transportation sector towards increased GHG emissions and contrast and compares the ongoing trends in developing and developed nations.

Theoretical Framework

The theoretical framework presents theories on climate resilient pathway and environmental leapfrog development along with the literature on rising concepts such as the new green market and sustainable marketing.

Case study

The thesis presents the case study of the least developed nation of Nepal to understand the market and collect information. The study of the case country, Nepal was conducted with focus on the transportation industry and its impact on climate change.

Data and Research Method

This section discusses the data collection method and the explains the process of the research.

Research Findings

The finding is presented by collecting, analysing and correlating the data with few assumptions and use of existing data on the subject and in parallel with the literatures. A result is drawn reflecting the current status, the obstacles and the pathway for a climate resilient future of clean mobility.

Discussion

A discussion is initiated based on the research findings, current situation at the policy level and consumer awareness along with present obstacles for achieving a zero-emission transportation future with results from previous studies on the area of research.

Conclusion

A conclusion is drawn based on the present status of the climate crisis, the theoretical framework of environmental leapfrogging, climate resilient pathway and sustainable consumption, the correlation between transportation and climate change, introduction of the case country and its current policies and framework to support the transformation towards clean mobility. The conclusion then presents and correlates the data collected through the survey and reflects on the consumer behavior on EVs in Nepal, major obstacles facing the transformation and the pathway forward for the developing country towards a climate resilient future.

2 THEORETICAL FRAMEWORK

2.1 Environmental Leapfrogging and Climate Resilient Pathway

The concept of environmental leapfrogging can be traced back as early as 1955, from an economist Simon Kuznets in a hypothesis that as an economy develops, the marketplace first increases then decreases the economic inequality (Kuznets, 1955). The concept of leapfrogging have since also been used to describe a market competition where a new comer have an added advantage through multi stage Research and Development process to leapfrog and compete with the established monopolies which lacks the desire and need to research and innovate (Fudenberg, Gilbert, Stiglitz, & Tirole, 1983). However, since the 1990s, Kuznets Curve have been used as a standard feature in technical literature of environmental policy with the hypothesis of the relation between various indicators of environmental degradation and per capita income (Stern D. , 2014). Figure 1 below reflects the modified Kuznets curve adjusted to reflect its technical use in the environment policies and classified as Environment Kuznets Curve (EKC).

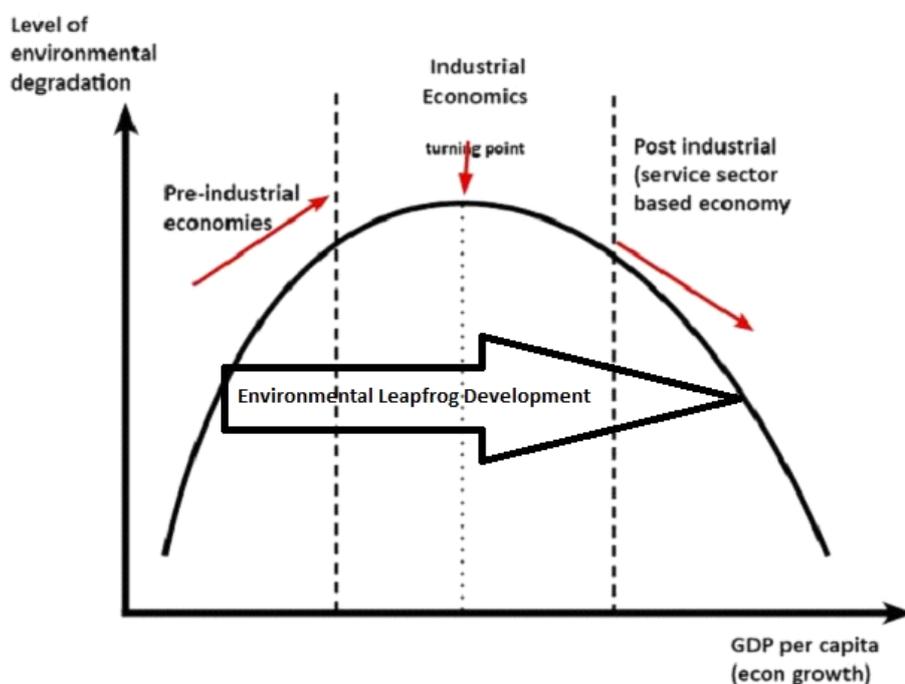


Figure 1: Modified Environment Kuznets Curve (Kuznets, 1955; Stern D. , 2014)

Figure 1 demonstrates the pre-industrial economies have an option to tunnel towards environmentally friendly route for economic development through the use of advanced technology, innovation and financial support. This need has been recognized at an international stage through the Kyoto Protocol

where agreements has been made to financially assist developing countries particularly vulnerable to climate change (Chandani, Harmeling, & Kaioga, 2009). There has been criticism on the EKC especially in relation to various forms of pollution and its implication differences in different countries with many conservationists arguing the removal of EKC from the academic circles (Stern D. I., 2004; Czech, 2008). The EKC was not properly able to reflect cases of biodiversity and its implication on countries for instance countries whose economy is dependent on petroleum products (Mills & Waite, 2009).

With fading hypothesis of the EKC, in 1992, the United Nations Framework Convention on Climate Change (UNFCCC) formed Article 2 of the climate treaty: The ultimate objective of this Convention and any related legal instruments that the Conference of the Parties may adopt is to achieve, in accordance with the relevant provisions of the Convention, stabilization of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system. Such a level should be achieved within a timeframe sufficient, to allow ecosystems to adapt naturally to climate change, to ensure that food production is not threatened and to enable economic development to proceed in a sustainable manner (United Nations Framework Convention on Climate Change, 1992).

Article 2 of the United Nations Framework Convention on Climate Change defines Climate-resilient pathways as development trajectories of combined mitigation and adaptation to realize the goal of sustainable development that help avoid “dangerous anthropogenic interference with the climate system” (United Nations Framework Convention on Climate Change, 1992). Climate resilient pathway is a combination of adaptation and mitigation to reduce climate change and its impacts (Denton, et al., 2014). Climate change adaptation is an opportunity for social reforms that requires resilience, transition and transformation to question the development path that drives inequality and unsustainable relationship with the environment (Pelling, 2011).

Climate-resilient pathways include two overarching attributes: (1) actions to reduce climate change and its impacts, including both mitigation and adaptation, and (2) actions to ensure that effective risk management institutions, strategies and choices can be identified, implemented, and sustained as an integrated part of development processes (Edenhofer, et al., 2012).

2.2 Transportation Sector and Climate Change

According to the report from IPCC (2014), Transportation accounted for 14% of the annual GHG emission around the world. The transport sector produced 7.0 GtCO₂eq of direct GHG emissions (including non-CO₂ gases) in 2010 and hence was responsible for approximately 23% of total energy-related CO₂ emissions (6.7 GtCO₂). Transport demand per capita in developing and emerging economies is far lower than in Organisation for Economic Co-operation and Development (OECD) countries but is expected to increase at a much faster rate

in the next decades due to rising incomes and development of infrastructure (Sims, et al., 2014).

With the world moving towards globalisation the GHG emission from the sector is following its path. The world GHG emissions from transportation rose by 250% in 1970 to 2010 with about 80% of the total emission increase coming from road transportation (International Energy Agency, 2012).

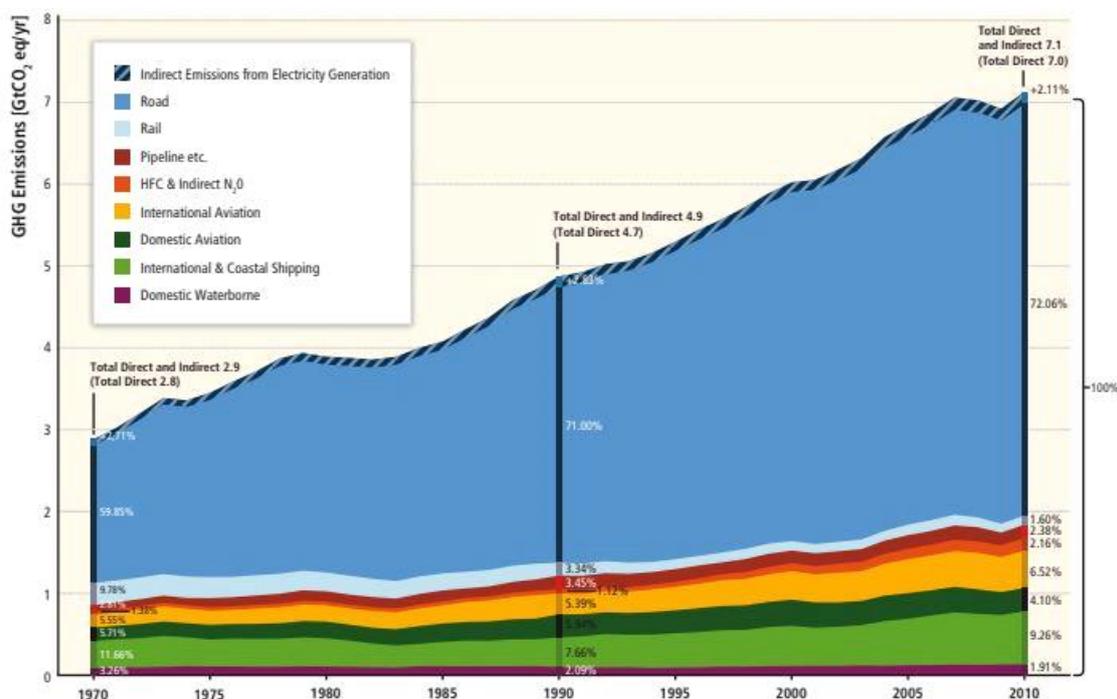


Figure 2: Direct GHG emissions of the transportation sector (Sims, et al., 2014)

Transportation has been evolving over the years as a basic need for human race and de-carbonizing the transport sector might be our biggest challenge. There has been an incremental demand for transportation since 1970s and with growing economies around the world the demand is expected to increase more. Road transportation as shown in figure 2 above accounts for the largest share of GHG emissions. The demand is more and more likely to grow as the purchasing power in developing countries growing fast. According to the traffic bureau of Ministry of Public Security (2017) the number of registered vehicles in China reached an all-time high of 300.3 million up from 62 million in 2009 (Zheng, 2017).

Transport accounts for 14% of the total GHG emissions which relies on petroleum that supplies of the total energy used by worlds transport. Road transportation accounts for 74% of the total CO₂ transport emissions (Ribeiro, et al., 2007).

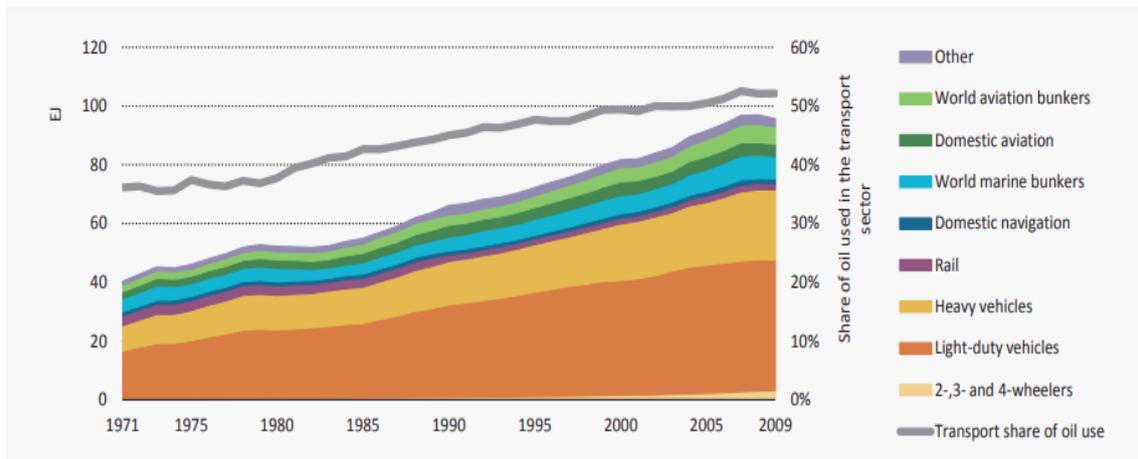


Figure 3: World transport use by mode (International Energy Agency, 2012)

The United Nations (2011) estimated that more than half of the world lives in cities and urban areas which is predicted to reach 75% by 2050. This has a huge implication especially in the transport sector, its energy use and its contribution to rising GHG emissions. Figure 3 above shows significant rise in the use of Light Duty Vehicles (LDVs) in correspondence to the rise in urban population resulting in severe congestion and increased air and noise pollution.

The number and the demand for passenger LDVs have significantly increased in the last decade in developing countries. China has the clearest example of this with 20 times increase in passenger LDV sale from 500,000 in 2000 to 12 million in 2010 (International Energy Agency, 2012). In 2015, new registered LDVs were evenly spread between OECD countries, 51% and non-OECD countries 49% (up from 33% in 2010) (Global Fuel Economy Initiative, International Energy Agency, 2017).

Transportation has wide scale of impacts on the environment as well as human health. According to the new data from WHO (2018), 9 out of 10 persons breathe air with high level of pollutants. The highest ambient air pollution levels are in Eastern Mediterranean Region and in South East Asia with Annual mean level often exceeding 5 times WHO limits (World Health Organisation, 2018). In addition to the direct emission, the transportation sector accounts for various indirect emissions. According to EIA (2018), petroleum products accounted for 92% of transportation energy use in the US. There are huge emissions which take place during these processes for example during energy and fuel generation, manufacturing processes, transportation of finished goods and materials.

However, in recent years more and more countries are taking actions to promoting clean mobility. One of the earliest debate at the policy making level was the Clean Car debate which started in 1990 in California when the California Air Resources Board (CARB), mandated that beginning in 1998, 2% of all vehicles offered for sale in California should be zero emission vehicles with the mandate to be raised to 10% by 2003 (Orski, 1998).

According to the Asian Development Bank (2018), in order to reduce the growing GHG emissions South Asian countries (Bangladesh, Sri Lanka, Bhutan, Nepal and Maldives) must prioritize investment with the following scope: (i)

promotion of energy efficiency and development of renewable energy; (ii) low carbon transport infrastructure; (iii) urban services including employing and cost effective and income generating waste management mechanism; (iv) energy efficient building and other infrastructures; (v) energy efficient irrigation. (Shrestha, Ahmed, Suphachalasai, & Lasco, 2012)

In comparison to the rest of the developed world, little or no progress is happening for the investment of low carbon transport in these emerging markets for LDVs. Although, in recent years countries are taking more and more actions to switch towards clean mobility. Table 1 below shows examples of the ambitious targets and objective set for Electric Vehicles from around the world.

Country	EV 30@30 ¹	2020-2030 EV Targets or Objectives
China	✓	<ul style="list-style-type: none"> • 5 million EVs by 2020, including 4.6 million PLDVs, 0.2 million buses and 0.2 million trucks. • New energy vehicle (NEV)² mandate: 12% NEV credit sales of passenger cars by 2020.³ • NEV sales share: 7-10% by 2020, 15-20% by 2025 and 40- 50% by 2030.
European Union		Post 2020 proposed CO2 targets for cars and vans include benchmarks: 15% EV sales by 2025 and 30% by 2030 (exceeding these benchmarks allows for less stringent specific emissions targets to be met by OEMs).
Finland	✓	<ul style="list-style-type: none"> • 250 000 EVs by 2030
India	✓	<ul style="list-style-type: none"> • 30% electric car sales by 2030. • 100% BEV sales for urban buses by 2030.
Ireland		<ul style="list-style-type: none"> • 500 000 EVs and 100% EV sales by 2030
Japan	✓	<ul style="list-style-type: none"> • 20-30% electric car sales by 2030
Netherlands	✓	<ul style="list-style-type: none"> • 10% electric car market share by 2020. • 100% EV sales in PLDVs by 2030. • 100% electric public bus sales by 2025 and 100% electric public bus stock by 2030.
New Zealand		<ul style="list-style-type: none"> • 64 000 EVs by 2021.
Norway	✓	<ul style="list-style-type: none"> • 100% EV sales in PLDVs, LCVs and urban buses by 2025. • 75% EV sales in long-distance buses and 50% in trucks by 2030.
Korea		<ul style="list-style-type: none"> • 200 000 EVs in PLDVs by 2020.
Slovenia		<ul style="list-style-type: none"> • 100% electric car sales by 2030
United Kingdom		<ul style="list-style-type: none"> • 396 000 to 431 000 electric cars by 2020
United States (selected states: Cali-		<ul style="list-style-type: none"> • 3 300 000 EVs in eight states combined by 2025.⁴ • ZEV⁵ (zero emission vehicles) mandate in ten states⁶: 22% ZEV credit sales in passenger cars and

California, Connecticut, Maryland, Massachusetts, New York, Oregon, Rhode Island, Vermont)	<ul style="list-style-type: none"> light-duty trucks by 2025. California: 1.5 million ZEVs and 15% of effective sales by 2025, and 5 million ZEVs by 2030⁷.
Other European Union ⁸	<ul style="list-style-type: none"> 450 000 to 760 000 electric cars by 2020. 5.42 million to 6.27 million electric cars by 2030

Table 1: Announced EV Target and objective for EV deployment, 2020-2030 (International Energy Agency, 2018).

Notes to Table: 1. The countries that joined the EV30@30 Campaign set a collective aspirational goal to reach a 30% sales share for EVs by 2030, which encompasses PLDVs, LCVs, buses and trucks (CEM-EVI, 2017).
2. "New energy vehicles" include BEVs, PHEVs and FCEVs.
3. The 12% sales mandate includes multipliers depending on vehicle technology and range. Most current models are eligible for multipliers between 2 and 4.
4. California, Connecticut, Maryland, Massachusetts, New York, Oregon, Rhode Island, Vermont.
5. ZEV = zero emission vehicle. In the case of California's programme, ZEV refers to vehicles that produce zero exhaust emissions under any possible operational modes or conditions. Nevertheless, the standard also allows for Transitional Zero Emission Vehicles- including PHEVs respecting tight evaporative and tailpipe emission controls - to generate ZEV credits.
6. Eight above-cited States plus Maine and New Jersey, who joined in 2016.
7. The 22% sales mandate includes multipliers depending on vehicle technology and range. Most current models are eligible to receive credits between 0.5 and 3.
8. This entry summarises the EU country targets stemming from submission for the AFI Directive 2017 for countries that submitted a target and are not covered elsewhere in this table. These include: Austria, Belgium, Bulgaria, Czech Republic, Hungary, Italy, Latvia, Lithuania, Luxemburg, Poland, Portugal, Slovak Republic and Spain.

2.3 Consumer Beliefs and Behaviour

The increase in demand for flexibility and mobility in the labor market along with increasing labor participation and the demands for modern life results in higher perceived necessity to be mobile all the time which is known as perceived mobility necessity (PMN) (Haustein & Hunecke, 2007). PMN explains the ever-increasing demand for LDVs in the developing markets around the world today.

Consumption behaviour are strongly linked to the growing GHG emissions and increased climate change. The buying behaviour and the patterns of the end consumers defines the resources used and the life cycle process of a product or a service. Consumer behaviour is the study of the process when individuals make selection, usage or disposal of products and services during purchase in order to meet their needs and fulfil their desire (Solomon, Bamossy, Hogg, & Askegaard, 2010). Consumer behavior includes all the activities associated with the purchase, use and disposal of goods and services, including the

consumer's emotional, mental and behavioral responses that precede or follow these activities (Kardes, Cronley, & Cline, 2010).

Our behaviour as individual consumers are having unprecedented impacts on our natural environment (Stern P. C., 2000). Encouraging Sustainable consumption requires a thorough understanding of consumer behaviour and attitudes. Although, ethical consumption has been a highlight in consumer behaviour over the past decades it has been limited to Consumers Ethics Scale to study broad ethical practices (Muncy & Vitell, 1992). Despite constant urge from scientist and environmentalist, eco-friendly consumer practice remains rare in the field of ethical consumerism (Chan, Wong, & Leung, 2008). The need to move towards a low carbon society and the importance of green behaviour have been identified as a topic of pressing strategic importance to the entire society (Kronrod, Grinstein, & Wathieu, 2011). However, this concept is not yet widespread in developing markets resulting in fewer efforts and actions to commit towards a low carbon society.

Understanding consumer behaviour is an important aspect of addressing global environmental challenges. According to Stern (2000) review, the economics of climate change, the overall cost and risk of climate change will be equivalent to losing 20% of the GDP each year by 2020. In contrast, the cost of action would be a mere 2% of the GDP. Consumer behaviour is a complex and multi-dimensional phenomenon further complicated by the inclusion of sustainability.

Consumer beliefs and behaviour is one of the major influencing factors for green consumption. Consumer belief is a measure of a consumer's cognition and attributes about a specific product or service that gives rise to consumer attitudes towards a good or a product (Solomon M. R., 2016). The concept of green behaviour has given rise to normative "citizen consumer" who are a responsible consumer, a socially aware consumer, a consumer who thinks ahead and tempers his or her desire by social awareness, a consumer whose action should be morally defensible and who must occasionally be prepared to sacrifice (Gabriel & Lang, 1995). The values and belief of a consumer influences the purchasing decision and plays a key value in pro-environmental behaviour.

In addition to consumer behaviour and beliefs, incentives and supporting policies also play a major role in the buying behaviour of consumers. The study conducted by Zhang, et al. (2018) revealed that perceived economic benefits, environmental benefits and perceived risks plays a primary role in influencing the adoption of Electric Vehicles (Zhang, Baia, & Shang, 2018).

2.4 Green Consumerism, Sustainable Consumption and the rise of the Green Market

Green Consumption was discussed as early as 1972 in Stockholm in the UN Conference on Human Environment. Green Consumption is a concept which ascribes to consumers (or producers) responsibility for environmental

problems through adoption of environmentally friendly behaviour that is compatible to safeguard the environment for present and future generations (Connolly & Prothero, 2008).

With rising awareness of environmental problems and the issue highlighted on the global scale, environmental agenda has risen as a strong decision-making agenda for consumers, companies and law makers alike (Kronrod, Grinstein, & Wathieu, 2011). This revolution successfully created a green consumerism.

The construction of green consumerism is both influenced by and an outcome of wider social, economic, political and environmental process that are formed relationally in place and across time. Green consumerism refers to wide variety of consumer behaviour based on principal idea of lowering consumption, consuming more sustainably and limiting the negative social and environmental effects of consumption. (Mansvelt, 2010)

Agenda 21, the action plan for sustainable development adopted by 179 heads of state at the 1992 Rio Earth Summit introduced the term Sustainable Consumption in an international policy for the first time (UNCED, 1992). Agenda 21 proposes that governments should develop a new concept of wealth and prosperity with less dependence of the Earth's finite resources and in line with the carrying capacity of the Earth (United Nations, 1992) The concept of voluntary engagement in recent decades in consumer practices that are viewed as environmentally friendly are labelled as sustainable consumption and the actors are referred to as green consumers (Michheleti & Stolle, 2005).

Green consumerism has wide implications to all the stakeholders in the society ranging from individual consumers to producers to governments (Sharma & Joshi, 2007). A green consumer is aware of their obligation to protect the planet and acts accordingly by purchasing green products and services by maintaining life style that does not compromise the future of the planet (Young, Hwang, McDonald, & Oates, 2009). These consumers often use alternative source of information and decision-making criteria to make decisions on products and services.

This change in the market not only made the companies aware of the changes required but gave rise to a new green product market. Green Consumerism have increased the need and demand for green products and services. Green Products are the products designed or manufactured minimizing the environmental impact during production, distribution and consumption (Tomasina, Pereira, Borchardt, & Sellitto, 2013). The characteristics of green products are: easily reused, made using natural /renewable resources, contains recycled content, readily recycled, biodegradable and durable with low maintenance required (Tseng & Hung, 2013). In response to this growing demands many firms from around the world are bringing into practice environmentally responsible practice and launching of green marketing campaigns with added benefit of promoting brand awareness among green consumers in addition to profit. There is a directly proportional relationship between green products and a brand name (Yi, 2017).

This change in consumer behaviour provides companies with a challenge of understanding the buying patterns and tapping on the new consumer segment (Solomon M. R., 2016). In an interview with Motor Trend in June 2006, General Motors, the then largest auto mobile manufacturer admitted to “axing the EV1 electric car program and not putting the right resources into hybrids” as his worst decision which took a toll on the company’s image (Wagoner, 2006). Wagoner (2006) reflected the future of the green products in this case the electric vehicles in the automobile industry. Producers must change the marketing patterns to meet the needs of this new consumer segment. Figure 4 below reflects the issues marketers’ have to take into consideration to successfully sell their products. The marketers must take into account similar issues to expand to the new green market. The rising awareness among consumers also give companies opportunity to fulfil their social and environmental responsibility which also have a directly proportional relationship with the brand image.

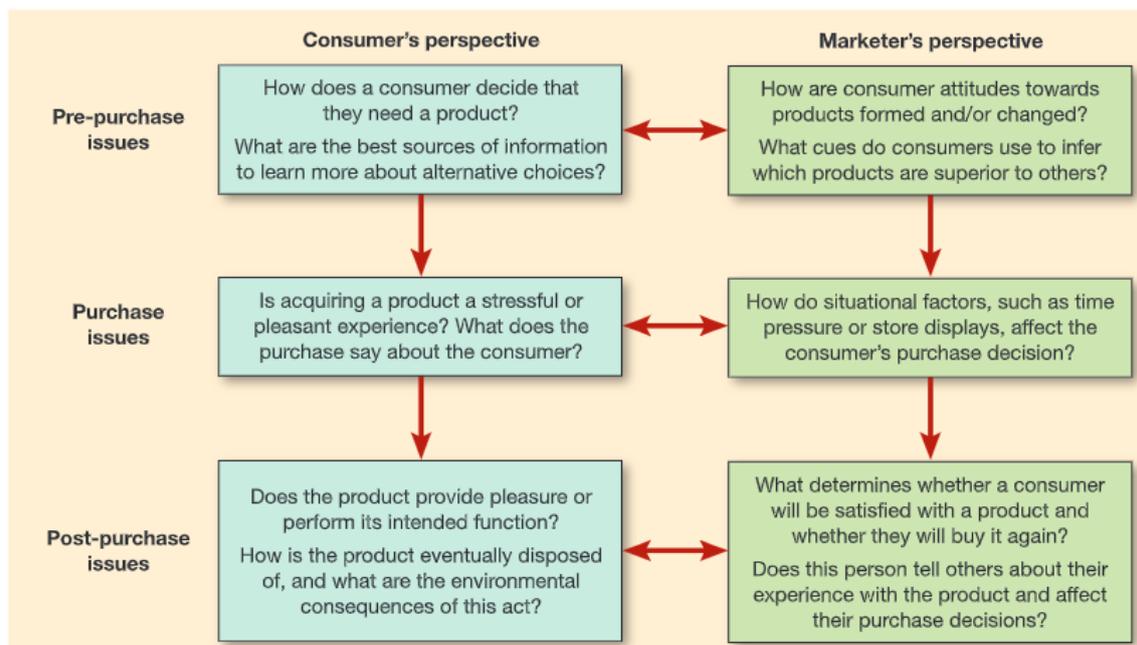


Figure 4: Issues during the consumption process (Solomon M. R., 2016)

Few companies are taking advantage of these new trends and changes in consumer behaviour in the market though Sustainable marketing. According to the Brundtland Report, Sustainable marketing calls for socially and environmentally responsible marketing that needs the present needs of consumers and businesses while also preserving or enhancing the ability of future generation to meet their needs (UN Commission for Environment and Development, 1997).

Sustainable marketing is the process of creating, communicating and delivering value to customers in such a way that both natural and human capital are preserved or enhanced throughout (Martin & Schouten, 2013). Sustainable marketing not only targets the green customers but increases its competitive

advantage in the automobile market with predicted increase in the size of green market over the years.

In response to the changing consumer market, there have been changes in international policies, the biggest being the 2015 Paris Climate Agreement. Climate change has been gaining international momentum from political agendas to individual consumer choices. The rise of the German Greens Party in the recent 2019 European election from 10.7% in 2014 to 20.5% reflects the importance of climate crisis in the global politics (Sullivan-Thomsett, 2019). According to the Eurobarometer survey (2017), 9 out of 10 European citizens consider climate change to be a serious threat ranking third after poverty and terrorism and 90% of the respondents stating that they have taken actions to fight climate change at individual level (European Commission, 2017). This shift has changed the markets in recent years especially in developed countries with the rise of ethical or green consumers. However, the number of environmentally conscious consumers is also on the rise in developing nations in Asia and around the world as reflected by studies of green consumerism in Malaysia, China, India, Pakistan Hongkong, Egypt and Indonesia which reflected favourable attitude and intentions towards green purchase to also encourage green business in the developing world at local and international level (Achchuthan, 2017; Tantawi, O'Shaughnessy, Gad, & Ragheb, 2009; Handriana & Tanti, 2016).

According to the green investment media service: Ethical Markets, \$6.22 trillion has been invested since 2007-2015 in the global green market (Brittlebank, 2015). The change in habits of the consumers based on the environmental impact of product and services have urged not only the policy makers but the companies to take a step towards this revolution. The companies with changes to meet the demands of the sustainable market will have competitive advantage not only through the understanding of the market but also to stay ahead of the predicted environmental regulations, advanced research and development and innovations for a more efficient and sustainable product.

3 INTRODUCTION OF THE CASE COUNTRY

Nepal is a small mountainous landlocked South East Asian country surrounded by India and China. Nepal is passing through a transformative phase in its economy. Historically, the economic growth rate of Nepal has been meagre, with annual growth rate for the last 50 years floating between 2% to 5%. However, the proportion of people living in absolute material poverty has dropped from 49% in 1992 to 23% in 2015 (Asian Development Bank, 2017). Nepal is also extremely vulnerable to climate change. Figure 5 below shows the climate projections for Nepal with the increase of temperature from 1.6°-2.2° C by 2050.

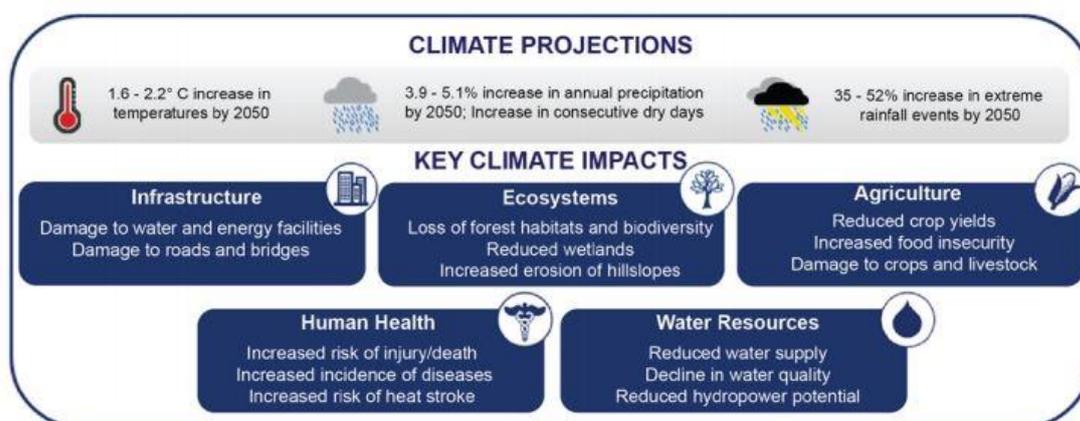


Figure 5: Climate Change and its impact on Nepal (US AID Climate Change Intergration Support, 2017)

Road Transportation is considered as one of the main sources of urban air pollution and consumption of energy in a large number of growing urban cities in South Asia (Bajracharya & Bhattarai, 2016). According to the World Bank (2014), Kathmandu Valley with the population of 2.5 million is one of the fastest growing metropolitan cities in South Asia. In Nepal, transportation consumes about 63% of the total imported petroleum with majority consumed in Kathmandu valley (Water and Energy Commission Secreteriat, 2010). According to the statistics from the Ministry of Physical Infrastructure and Transport, Government of Nepal in the fiscal year 2016/17 the total number of vehicles registered that year amounted to 444, 239 with the total registered vehicles in the country reaching 2,783,428 (Department of Transport Management, GON, 2017).

Nepal has a population of 28.98 million people in 2016 with 42% of the population living in and around the urban centres (Ministry of Finance, GON, 2016). With high population density along with ever increasing number of vehicles the growth has been haphazardly urbanized. Kathmandu, the capital city of Nepal which according to the Numbeo Pollution Index 2018, Kathmandu with the pollution index of 95.78 is ranked as the fifth most polluted city in the world (NUMBEO, 2018). The concentration of fine particulate matter PM25 total in

2014 for Nepal was 74.3 micrograms per m³ while the concentration of PM 10 was 109.95 micrograms per m³ in 2011 (UNEP Live, 2012).

Considering the annual standard set by the Environment Protection Agency of PM 2.5 at 15mg per m³ and PM10 at 50mg per m³ as annual standards the PM 2.5 and PM 10 level in urban areas of Nepal exceeds the standard by a big margin (Environment protection Agency, 2017). Air pollution is one of the major causes of death in Nepal today surpassing violence and natural calamities (National Planning Commission, Government of Nepal, 2017).

Nevertheless, due to its huge hydropower potential Nepal has a huge comparative advantage to replace fossil fuels and move towards clean mobility. This climate resilient pathway will not only have environmental but economic implications as well. According to Nepal Rastra Bank (2018) in the fiscal year 2017-18 Nepal imported fuel worth approximately US\$ 1.5 billion (NPR 170.13 billion) which has widened the trade deficit (Nepal Rastra Bank, 2018).

Hydropower plays an important role not only in Nepal's economic future but with its clean energy use with an estimated 40,000 MW economically viable hydro capacity in the country (International Hydropower Association, 2017). According to the Nepal Electricity Authority (NEA), presently there are 88 hydro power in operation with the total generation capacity of 967.85MW.

With further 113 hydropower plants with the total generating capacity of 3.090 MW in construction contributing to the economy, the Government of Nepal have predicted the economic growth in the next fiscal year to increase to 7.5% (Kantipur, 2018) With the availability of hydro-electricity, Nepal is a good case to study on the possibility of implementing a climate resilient pathway by developing the Electric Vehicle market and achieving environmental leapfrog development. EV market development in Nepal will provide a cleaner, greener and quiet alternative; it will benefit the consumers economically in the long run compared to internal combustion engines and the market will be dependent on the domestic energy source. According to the Ministry of Finance (2018) the government has allocated a total budget of approximately US\$ 83 million for the development of the energy sector in the next fiscal year (Poudel, 2018).

With growing GHG emissions and exponentially increasing environmental problems in a country with large hydro-electricity potential this is a crucial moment to develop a climate resilient pathway and achieve leapfrog development for this developing nation.

3.1 Source of income and price of cars

Nepal has an average per capita income of \$1003.641 according to the data from the CEIC Data (CEIC Data, 2018) and an average Adult literacy rate of 64.7% in 2016 (World Bank Group, 2017). Although there has been growing GDP over the past years this is mainly due to increase in Remittance, which accounted for more than 30% of the GDP in Fiscal Year 2016 from 2% of GDP in Fiscal year 2000 (Cosic, Dahal, & Kitzmuller, 2017).

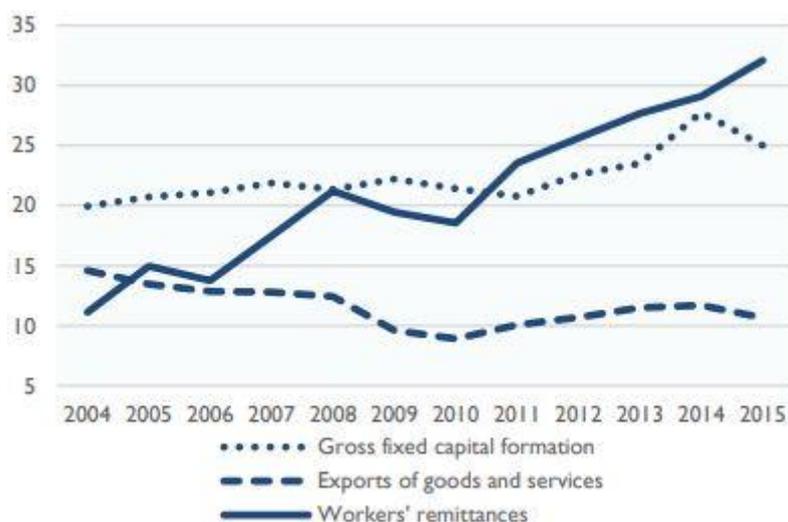


Figure 6: Export, Investment and Remittance 2004-2015 (% of GDP) (Central Bureau of Statistics Nepal, 2015)

Figure 6 clearly shows that Remittance has been a major source of income at an increasing rate over the past decade contributing to higher per capita income and rise in GDP of Nepal. Although, according to the world bank senior economist for Nepal, Damir Cosic “Large-scale migration is not a sign of strength but a symptom of deep chronic problem and a right balance between job creation at home and export of labor is required to break this vicious cycle” (Cosic, Dahal, & Kitzmuller, 2017). This means, although the country was successfully able to half its poverty rate in seven years and significantly decreased the income inequality the model is unsustainable with no development at the public sector.

With rise in the middle class the public have had access to purchase high end vehicles in Kathmandu. The prices of car in Nepal is ever increasing with growing middle class and high demand for urban vehicles the streets of the urban especially Kathmandu is increasing exponentially in the past few years. Table 2 below reflects the current prices of car in Nepal in 2018:

Company	Model	Engine Capacity	Price in NPR (Rs.)	Price in US\$ (1USD = 107.054 NPR)
Chery	A1	1300cc	Rs. 1799000	US\$ 16,811.79
Chery	Tiggo 2.0	2000cc	Rs. 3675000	US\$ 34,334.95
Daihatsu	Sirion 1000	998cc	Rs. 2050000	US\$ 19,152.83
Daihatsu	Terios 4WD	1495cc	Rs. 5900000	US\$ 55,112.85
Fiat	Punto Pure	1200cc	Rs. 2389000	US\$ 22,316.03
Fiat	Punto Evo	1400cc	Rs. 3180000	US\$ 29,704.89

Suzuki	Omni	796cc	Rs. 1039000	US\$ 9,703.388
Suzuki	Alto Standard	796cc	Rs. 1549000	US\$ 14,465.27
Suzuki	Swift	1197cc	Rs. 2769000	US\$ 25,585.18
Honda	City 1.5 VX CVT	1497cc	Rs. 5300000	US\$ 49,493.81
Honda	Brio EMT	1198cc	Rs. 2480000	US\$ 23,170.86
Honda	Mobile 1.5 SMT	1497cc	Rs. 3800000	US\$ 35,503.74
Mazda	Mazda 3	1600cc	Rs. 6750000	US\$ 63,064.66
Mazda	CX-5	1998cc	Rs. 10500000	US\$ 98,100.587
Nissan	Micra XI	1198	Rs. 2599000	US\$ 24,281.67
Nissan	X -Trial	2488	Rs. 9000000	US\$ 84,084.29
Nissan	Navara	2488	Rs. 6000000	US\$ 56,044.87

Table 2: Prices of Cars in Nepal (ktm2day, 2018)

3.2 Background data of Electric Vehicles in Nepal

The history of Electric Vehicles dates back as early as 1975 in Nepal. The first Electric Vehicle was introduced in Nepal (Kingdom of Nepal then) in 1975 in form of state-owned trolley bus service, a 13km route. The project was developed with the assistance of technical expertise and financial grant by the Chinese Government. With its popularity and number of passengers increasing over the years the Nepal Trolley Bus Service (NTBS) was a role model public corporation in Nepal with continuous incremental profits over the years. (Surakhsya, 2015).



Figure 7: Trolley bus (Shanghai SK541, 1993) Tripureshwar - Suryabinayak (Rijal, 2019)

However, due to poor governance, corruption and political interference the NTBS went bankrupt in 2001 and the electric bus service was formally stopped in 2009 (Shrestha S. , 2015). Another important step in the direction of EVs in Nepal came in 1993 as a result of fuel crisis caused due to the trade embargo imposed by India. Seven diesel run 3-wheelers were converted into EVs and run through the streets of Kathmandu as public vehicles. This project was funded by Global Research institute and USAID (Baral A. , 2000). In 1996, further 600 electrically powered Tuk-Tuks, replaced the diesel run three wheelers in Kathmandu valley. These tuk-tuks were called “Safa Tempo” safa meaning clean and tempo a three-wheeler. The estimated number of Safa Tempos is currently roaming the streets of Kathmandu is 1200 (Global Resources Institute, 1998).

In August 2013, Mahindra Reva Electric Vehicles (MREV), a subsidiary of Mahindra and Mahindra launched Mahindra e20, a fully electric car in Nepal with the slogan of facilitating sustainable “zero-emission society” (India Today, 2013). This was considered an important step towards the future of EVs in Nepal with the Mahindra e20 priced at USD 20,060.85 (NRs. 21,50,000). However, the lack of infrastructure for EVs, charging time of 6hrs, estimated distance of 100kms, lack of environmental awareness among consumers and most importantly the available of cheaper internal combustion engine cars in the market made it impossible for the e20 to compete in the automobile market.

According to the Electric Vehicle Association of Nepal (EVAN), in 2017 the total number of EVs were around 21000 which is negligible compared to millions of internal combustion engine vehicles (Bhatta, 2018). In December 2018 National Planning Commission (NPC) of Government of Nepal became the first government agency to purchase an electric vehicle in an effort to encourage the use of EVs to replace fossil fuel-based vehicles among Government agencies. This initiative was led by the then vice-chairman of NPC Mr. Swarnim Wagle. NPC also installed a charging station at its premises. However, only after couple of months later with change in government the Board of National Planning Commission changed and there was lack of continuity to the initiative.

3.3 Policies and Taxation for Electric Vehicles in Nepal

The policies for encouraging the use of Electric Vehicles in Nepal were established early in 1997. The then Government of Nepal published EV Tax in the National budget with 23% import tax levied, which was 211% lower than the vehicles run through petroleum products whose import tax was at 234% (Shahi, 2017). Despite the tax policies for EVs set at 10% in 2002, the internal combustion engine lobbyists were successfully able to revert the decision of the government with the same import tax of 240% (then) levied in line with other vehicles (Shahi, 2017). This was a big step backward to the future of Electric Vehicles in Nepal with new internal combustion engine cars introduced at the same time. These cars dominate the Nepalese Automobile Industry until today.

It took the Government of Nepal further 13 years to reinstate the tax policies for EVs adopted in 1997. The 2016/17 Budget of Nepal reduced the reinstated the import tax for private EVs to 10%, reduced the tax to 1% on public EVs and no tax on for import of all types of large EVs to be used for public transportation (Ministry of Finance, GON, 2016). According to the Transportation Management Department of Government of Nepal, the taxation for Electric Vehicles would be exempted. The taxation for cars running from petrol/diesel acquire a yearly tax rate of NPR 8,000 to NPR 15,000, depending on the engine (Transportation Management Department, 2017).

Nepal has one of the highest automobile import duty in the world at 238%. Industry involved in disposal of used battery and reproduction shall be exempt from VAT and only 1% of custom shall be levied. The import tax for private Electric Vehicles is set at 7.5% from South Asian Association for Regional Cooperation (SAARC) this includes India, Bangladesh, Sri-Lanka, Pakistan, Bhutan, Maldives and Afghanistan. Whereas, the import tax for private electric vehicles from rest of the world is set at 10%. Large electric vehicles to be used as public transportation shall be exempted from excise duty and the applicable custom duty shall only be 1%. (Upadhyya, 2016)

4 DATA AND RESEARCH METHOD

The thesis used the survey method to collect primary data through the questionnaires distributed through public weblink and email link. Survey is the most widely used form of research usually producing quantifiable form of data which can be presented in various ways for competitive analysis (Chapman, 2005). The survey questionnaires method was selected to better understand the consumers' behavior towards EVs in Nepal and to shed light on the way forward towards sustainable mobility. The survey method produces a large amount of data to better portray the results, to give the respondents anonymity, to extract suitable answers and to collect significant data that can contribute to answer the research question within a limited time span (Denscombe, 2010).

A theoretical framework was established with the description of existing literatures on the research topic. A theoretical framework is an important aspect of all researches as they are needed to study prior research, theories. Literature review helps the researcher identify key issues, show route for effective research design and build on previous contribution and works in the field (Chapman, 2005).

A case study of the research country, Nepal was conducted which involved the study of the EV history of Nepal, the present automobile market, government policies regarding EV and the obstacles facing the transformation to clean mobility. A case study makes an important contribution to the knowledge on the area of research and helps in understanding the present situation and the results presents the best ways forward depending on the topic and the research area (Chapman, 2005).

A research strategy was then drawn framing the survey questionnaires to produce a quantitative primary data to better understand the consumers perspective and behaviour towards EVs in Nepal. A research strategy is the link between philosophy and subsequent choice of methods to collect and analyse data (Denzin & Lincoln, 2005). This section discusses the research design used, the collected data, method for its treatment and analysis of the thesis.

4.1 Research Design

The research used online questionnaires titled: "Case Study of EV Market in Nepal" using random sampling technique. The survey was conducted through public weblink and email survey distributed through emails and majorly through social media platforms to collect quantitative data from Nepalese nationals to understand their views and consumer perspective towards Electric Vehicles in Nepal. The target group of the survey were Nepalese nationals. The survey was designed through Webropol Oy software.

The survey consisted of multiple-choice questions to produce the data that can be better treated, classified and quantified to produce more reliable results. The questionnaires started with questions aimed at better understanding the group of respondents starting with their gender, age, educational level, their monthly income. The survey questions then sought to collect the information on the respondent's participation in the automobile market and their transportation habits for travelling in short distances and sharing rides. The questionnaires then asked questions to understand the view of the consumers towards Electric Vehicles, their views on the EV future in Nepal including possibility and timeframe for the transformation. The survey through conditional questions (assuming there is adequate availability of electricity and infrastructure) also sought answers on the prospective consumer's willingness to invest in EV, their motivation behind their investment. The survey then sought to collect information on obstacles present in the current EV market, the respondent's perspective on locally manufactured EVs (considering it is available), their willingness to invest extra for the development of EV infrastructures and their preferred vehicle choice from the list of existing and most successful EVs in Nepal. Figure 8 below reflects the survey design below.

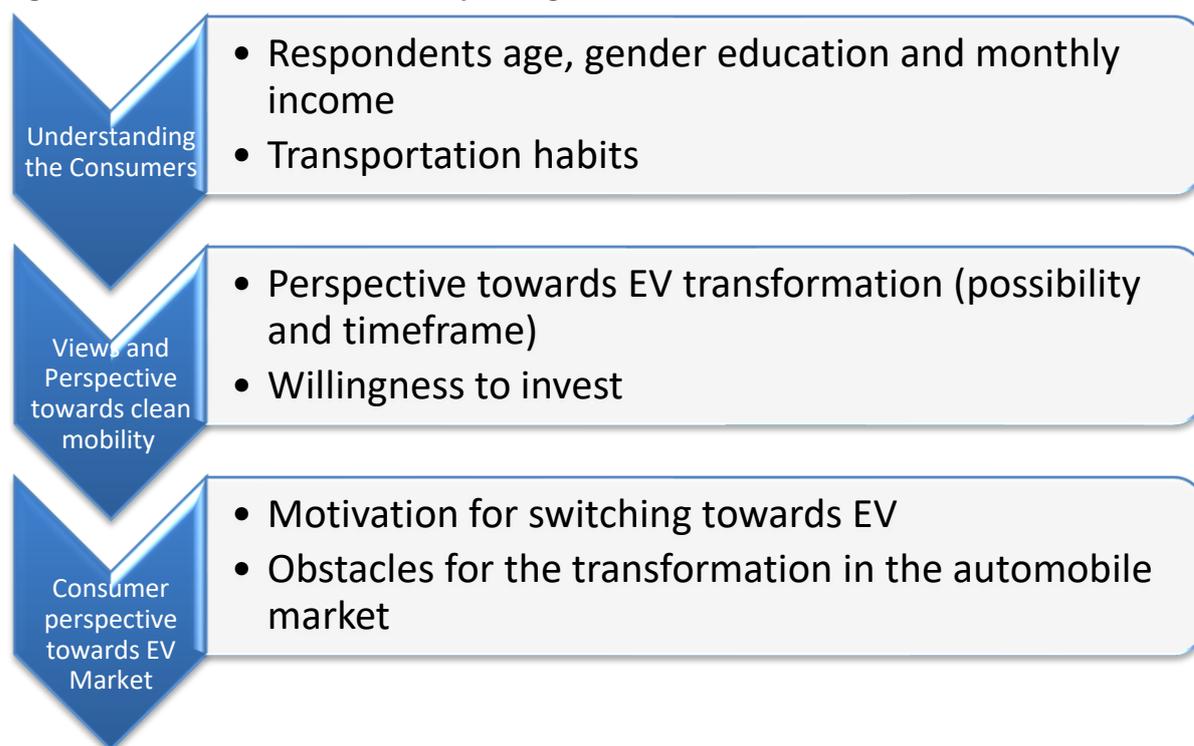


Figure 8: Survey Design

The survey was able to reflect their views on the possibly of introducing electric vehicles in Nepal, the constraints the market currently face and the future of the industry in their views. The online survey basic report is presented below in the Appendixes.

4.2 Data Collection and Analysis

The survey data from 82 respondents were collected and analysed to reflect the consumer behaviour towards EV, to understand the market in developing countries for zero emission mobility and to draw and suggest the pathway towards a climate resilient development.

The thesis gathered all the data and answers from the survey conducted among 82 respondents titled "Case Study of Electric Vehicle Market in Nepal". The respondents were very diverse from age group below 20 to 60+, although all the data were from Nepalese nationals the country of residence differed with 23 out of 82 respondents specifying their current residence abroad from Nepal. The respondent's incomes ranged from below \$100 with 49% earning \$800 or more per month with educational qualification of high school graduates to PhD holders. Majority of the respondents were already a part of the automobile market with 88% owning a vehicle.

The collected data were then analysed using the "Professional Statistics" feature through Java Oracle of Webropol 2.0 using the basic algorithm and different variable of different questions to draw the results from the data. The results were then combined and compared with few assumptions understand the consumer behaviour towards EVs, the major obstacles for transforming the automobile industry and the way forward for developing nations.

After collection of the primary quantitative data from the survey, the thesis compares and contrast the existing secondary data from the automobile market in Nepal and puts it into the theoretical framework drawn in the thesis to draw a conclusion.

4.3 Method

The objective of the thesis was to understand the consumer behavior towards Electric Vehicles and the obstacles facing developing countries like Nepal to move towards sustainable transportation. Understanding the consumer behavior and perspective requires collection of qualitative data. Hence, primary qualitative data were collected through the survey along with secondary data from the study of the case country and the theoretical framework is presented as a background to support the findings.

A survey was conducted to understand the relationship between pro-environmental behaviour analysing the socio economic and psychological behaviour of the consumers. Before publishing the survey, a trial survey was conducted through private email link and results were collected to analyze the correlation between the research questions and the survey data. After this few changes were made to the questions to tailor the requirements of the research questions.

A case study involves an in-depth study of a single example using a range of research methods. A case study makes an important contribution to the knowledge on the area of research and helps in understanding the present situation and the results presents the best ways forward depending on the topic and the research area (Chapman, 2005). The thesis used the case study of the least developed nation of Nepal to better understand the market and collect information. The study of the case was conducted with focus on the transportation industry and its impact on climate change. Through the study, the research was able to collect crucial secondary data which provided a base and directed the path towards achieving the research goals. The potential and the progress for harnessing abundantly available hydro-electric power is discussed. The correlation between the potential for high supply of electricity in the coming years and the viability and benefits of EVs is demonstrated. Electric Vehicle is not a new concept and was introduced as early as 1975 in the form of government owned Nepal Trolley Bus Service (Shahi, 2017). The research also studies the prevalent policies in the sector and the policies that government have passed as a positive stride although never implemented.

A theoretical framework was established with the description of existing literatures on the research topic. According to Chapman (2005), Literature review helps the researcher identify key issues, show route for effective research design and build on previous contribution and works in the field. The thesis discussed the literature on environmental leapfrogging, climate resilient pathway and sustainable consumption to identify key issues on the research topic. The literature also helped design an effective research design and support the results from the survey to draw a robust conclusion.

5 RESEARCH FINDINGS

The research findings are presented along with the analysis of the data collected from the survey. The research findings are shown using statistical and visual data to answer the research questions.

Figure 9 below reflects the demographics of the respondents. The respondents ranged from different age groups with 42% majority of respondents from age group 21-29 years closely followed by 34% from the age group 30-39 years. As the survey was targeted towards the Nationals of Nepal, all the respondents were Nepalese nationals residing mostly in Nepal. However, 28 out of 82 (22.96%) of the respondents were residing abroad. The respondents were 30% female and 70% were male.

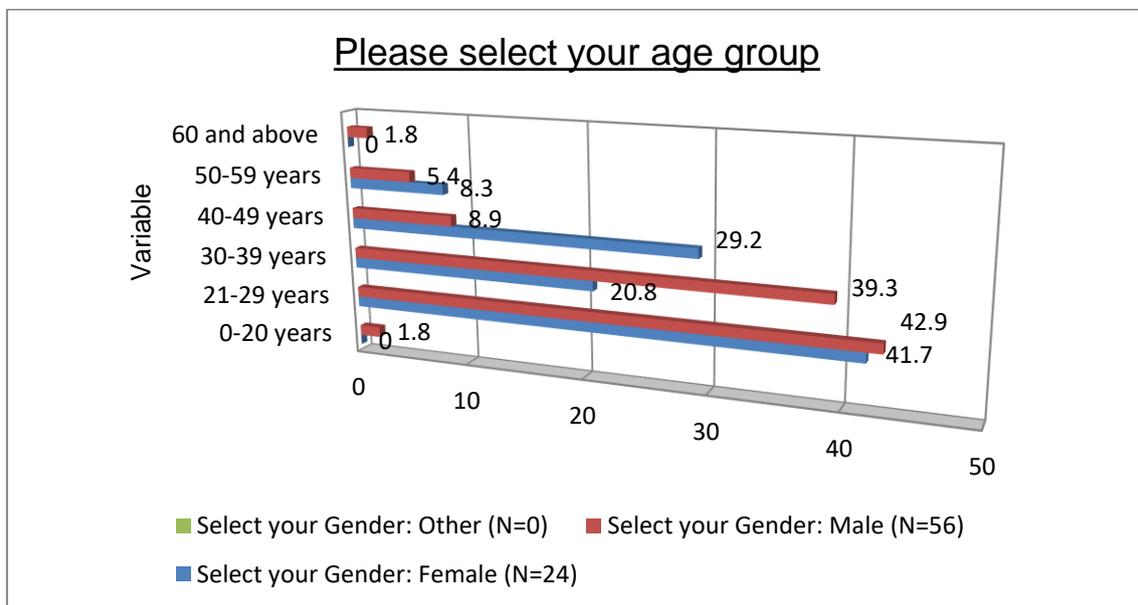


Figure 9: Demographics information of the respondents

Figure 10 below shows that 43.9% of the respondents had completed their masters' degree and 31.7% their bachelors' degree followed by 14.6% high school graduates and 9.8% PhDs.

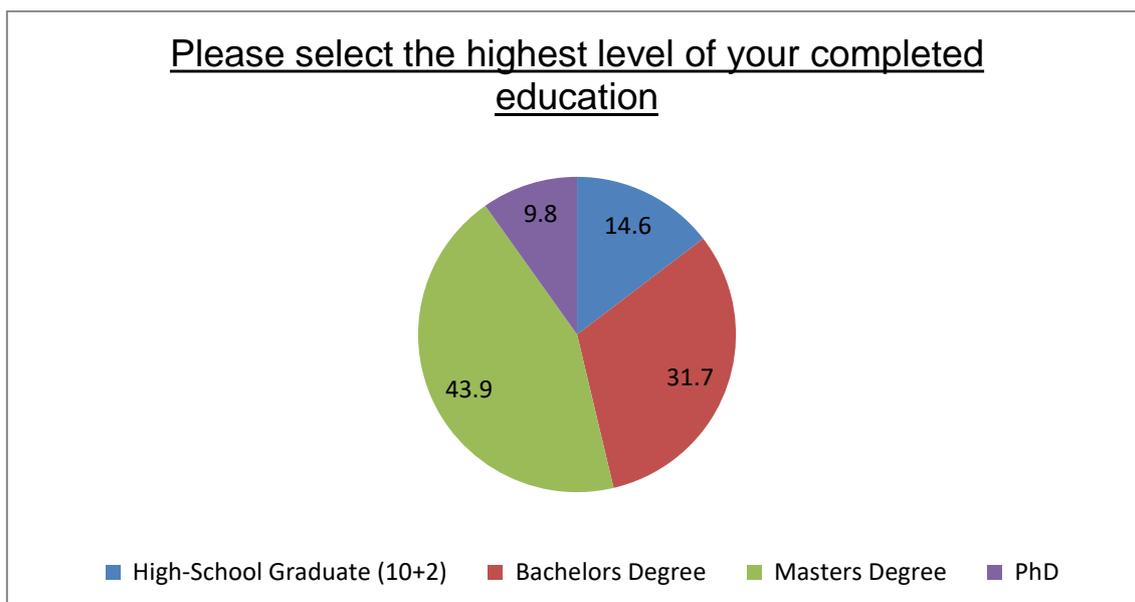


Figure 10: Highest level of Education completed

The income range collected through the survey is shown in figure 11 below which echoes the sign of increase in remittance in recent times. The results demonstrate 49.4% of respondents earn more than NPR 80,000 (US\$ 800) per month followed by the range of NPR 26,000 - NPR40,000 (15.2%).

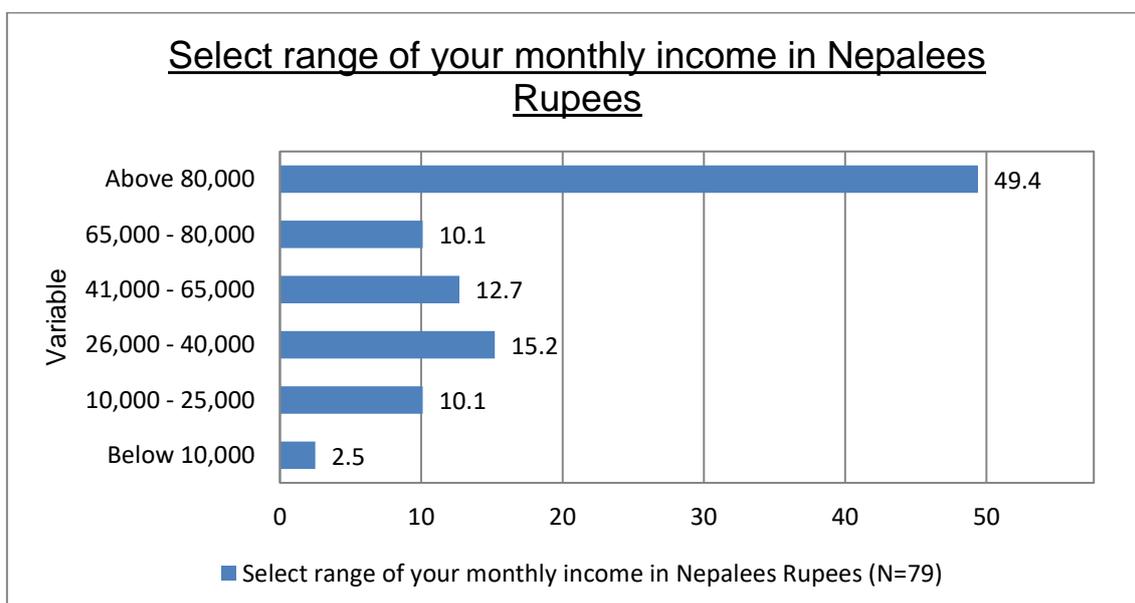


Figure 11: Monthly income range

The survey data reflects the profile of the respondents have higher literacy rate and higher net earnings than the average Nepali population. Along with a clear 88% of respondents stating either them or their family own a vehicle.

Exactly half of the respondents (50%), demonstrated that they prefer to walk a distance of 1km with occasional sharing of vehicle during regular commute. Furthermore, Figure 12 reflects the correlation between commuting and ride sharing habits which shows the respondents with the habit of walking

smaller distances 46.3% always and 49.9% occasionally share their rides with either family, friends or colleagues.

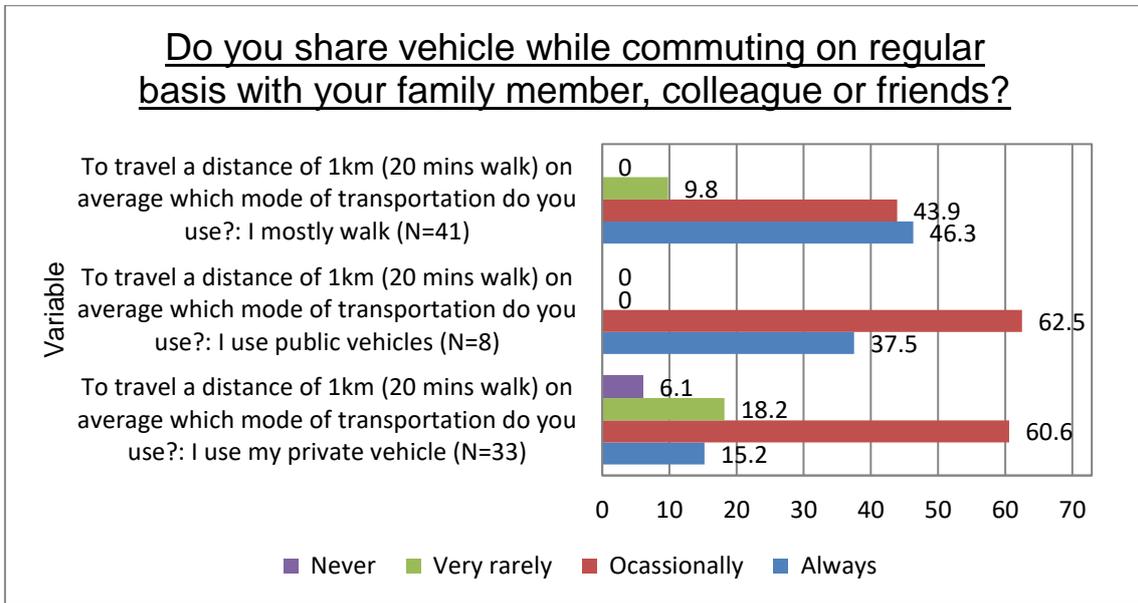


Figure 12: Correlation between travelling habits and vehicle sharing

Figure 13 below reveals that the majority of the respondents indicate the uncertainty over the future of Electric Vehicles in Nepal with 51% of respondents uncertain and 7% of the respondents indicating they do not foresee EVs progressing in the automobile industry citing lack of awareness as the major obstacle for the market. Though, 40% of respondents believe in the transition, the average time frame expected ranges from 10 (30%)- 15 (31%) years.

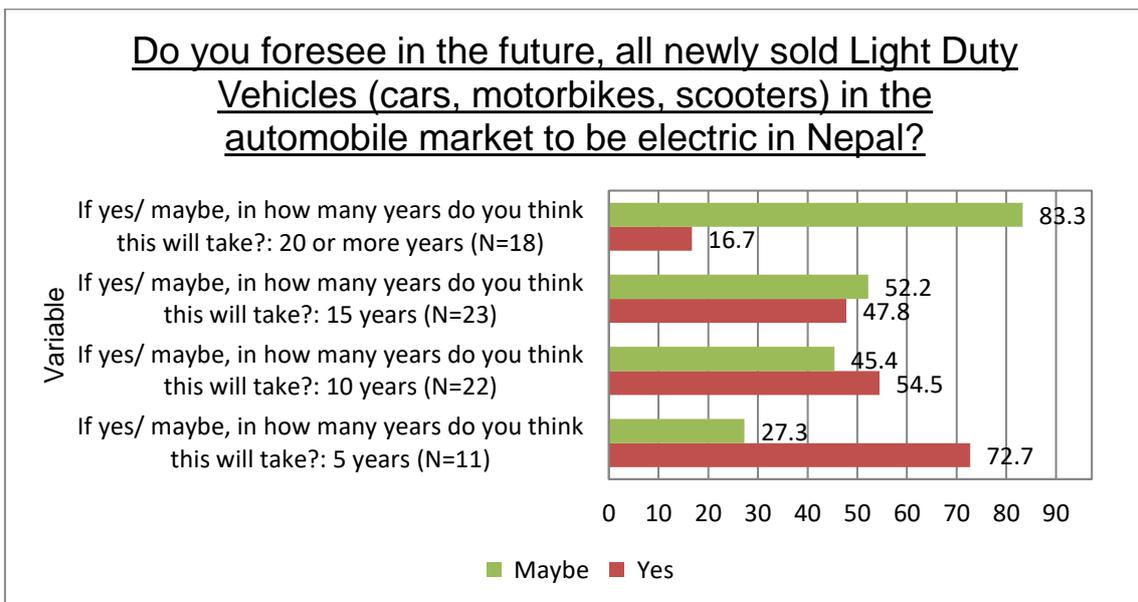


Figure 13: The hopefuls of EVs and the estimated time frame for all new vehicles in the market to be electric

The survey then provided a conditional question given there is availability of proper infrastructure for EVs, 92.7% are willing to transition towards

green transportation with 88.9% willing to buy locally manufactured EVs with figure 14 exhibiting the suppressed demand for EVs.

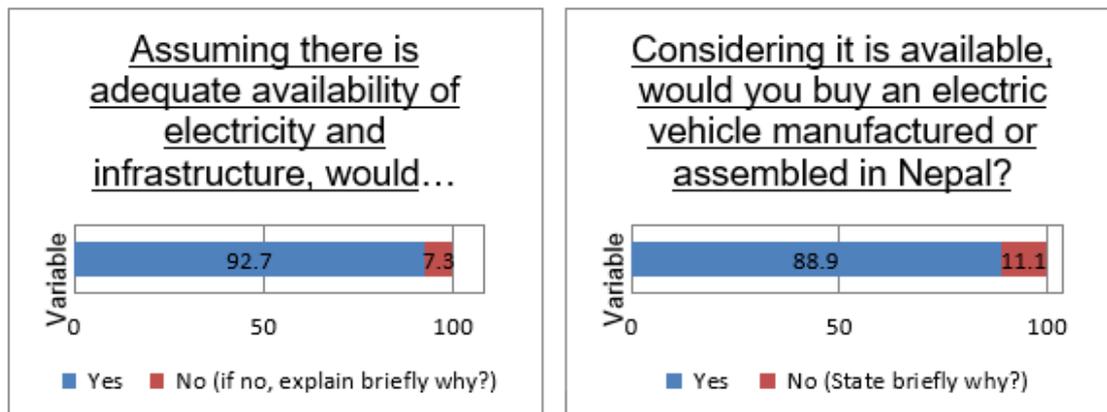


Figure 14: Suppressed demand for locally manufactured and international EVs

Following up to the high suppressed demand, the respondents cited from top environmental consciousness (sustainable consumption), air pollution, cost and shortage of petroleum products and to decrease trade deficit as major motivating factors demonstrated in figure 15. The prospective consumers have a very positive attitude towards contributing as well as developing the infrastructure required to shift towards electric mobility as 83% of the respondents willing to invest a 5% extra on the total cost for the development of required infrastructure. This reflects the hidden and suppressed demand for clean mobility prevalent in the general public of Nepal.

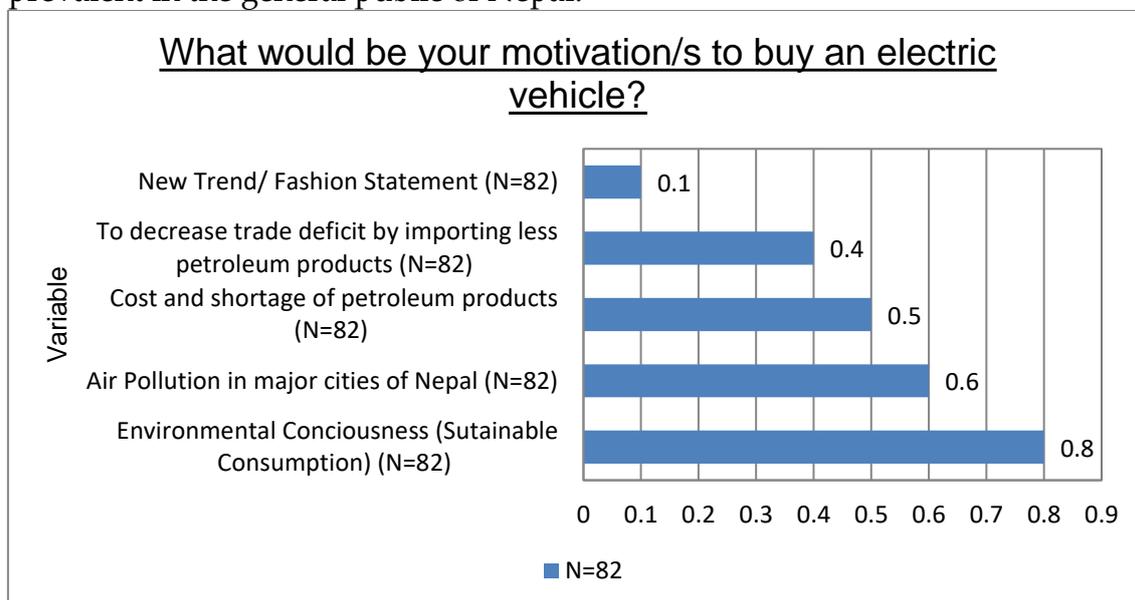


Figure 15: Motivation for purchasing or switching to EVs

However, in addition to 7% not opting to purchase or convert to EVs it is worth pointing out that 11% would opt not to buy a locally manufactured EV, citing doubts over the quality of the locally manufactured product and 17% are not willing to make extra investment for infrastructural development.

Currently, the EV owners have to pay equal import tax as petroleum cars. To support this suppressed demand the consumers were also asked on what has been the major obstacles for little or no progress in the automobile industry in past decades shown in figure 16 below. The survey points out to the lack of supporting government policies and lack of infrastructure as main obstacles for the EV market in Nepal. The lack of initiative in the market and the power of petroleum lobbyist are also pointed out as the major obstacles with a variable of 40.2.

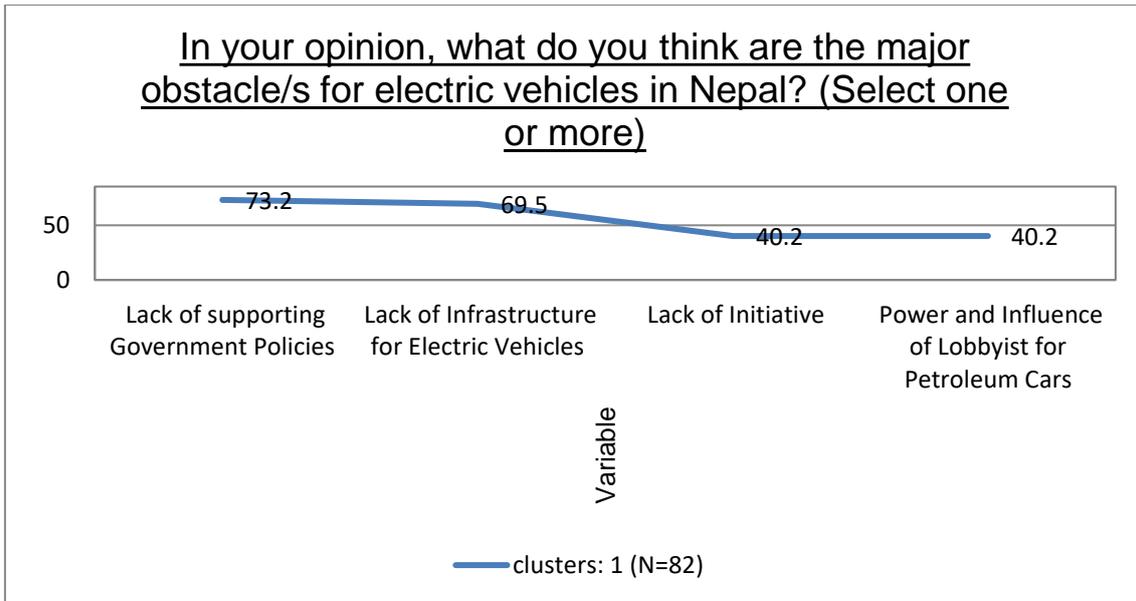


Figure 16: Major Obstacles for EVs in Nepal

The survey as shown in figure 17 below reflects the demand evenly spread for the electric vehicles available in the Nepalese market. The Mahindra Reva e20 hatchback is the most popular option closely followed by Super Soco TS electric motorbikes, BYD e6 (SUV), Oreva electric scooter and Kia soul EV in decreasing order. The survey data also reflects the importance of appearance of the vehicle in contrast to performance and charging time. The figure reflects the about equal demand for two wheelers as compared to cars. This is a rising market especially considering the convenience in the congested and small roads in Kathmandu.

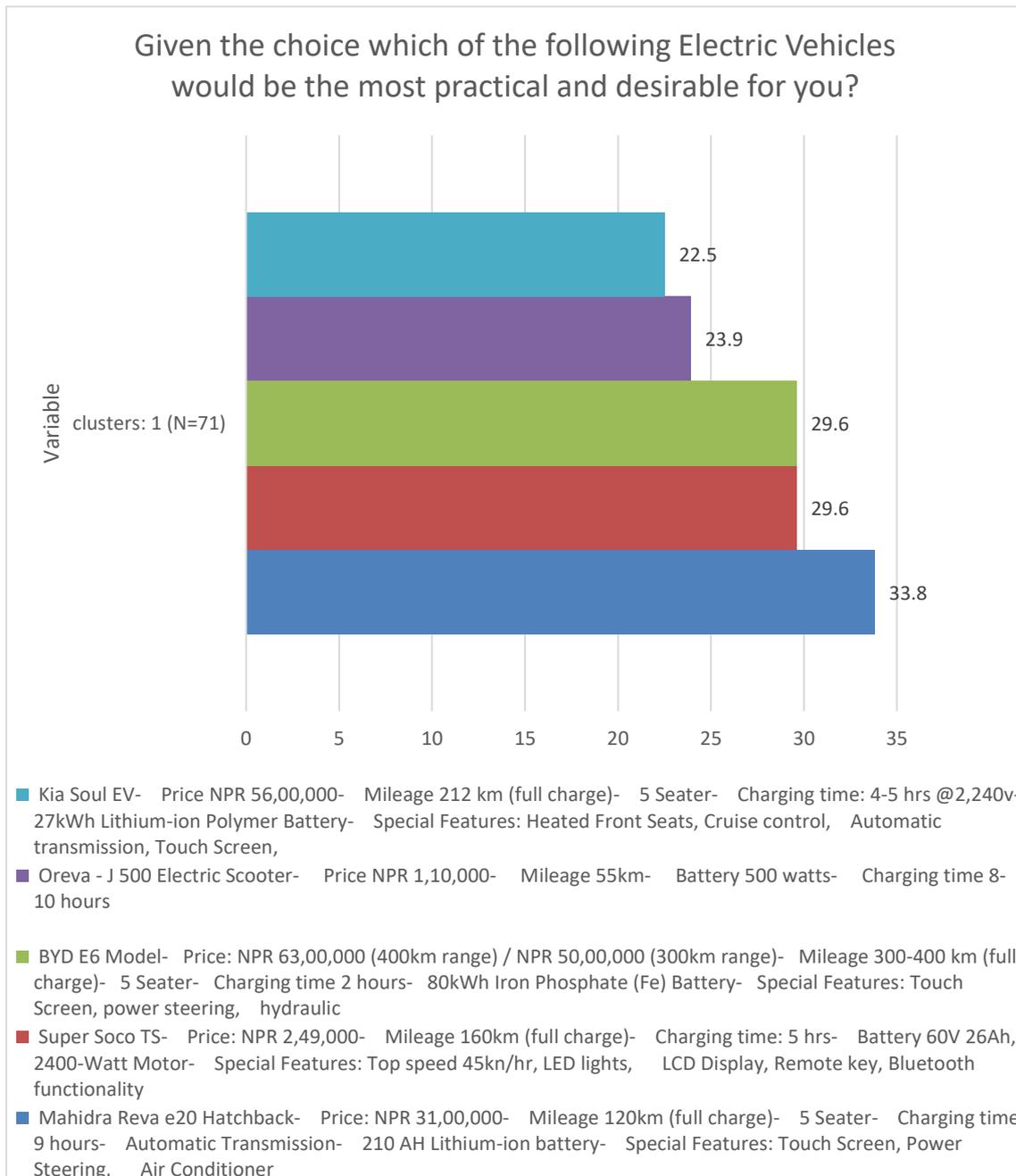


Figure 17: Desired choice of EVs from the options available in Nepal

The data collected through the survey were able to reflect high level of suppressed demand for EVs among Nepalese consumers. This is specially reflected by the willingness of the 93.7% respondents to switch to EVs given there is availability of electricity and infrastructure for EVS as shown in figure 13.

The motivations for purchasing electric vehicles among the respondents is dominated by Environmental consciousness (sustainable consumption), closely followed by air pollution problems in major cities along with regular shortage of petroleum products and the trade deficit. However, more than half of the respondents state high level of uncertainty and some (7%) respondents see no future for the EV market in Nepal citing lack of awareness as the major

problem. The respondents who have high hopes for the EV future predict on average it is going to take at least 10-15 years to make this transition.

The cumulative data reflects there is high level of consumer awareness on the impacts of internal combustion engine (ICE) vehicles and their impact on the environment. The respondents are also well aware of the environmental problems we are facing today and have understood the positive role EV can play to curb the pollution. There is a willingness to make the transformational changes given the condition of proper availability of electricity and infrastructure for the EVs. The data also shows 93% of the respondents are willing to buy a locally manufactured EV if its available and even willingness to invest in a scheme (5% extra) during purchase to contribute towards its infrastructure.

Nevertheless, there is high level of scepticism for the transformation of the automobile market in Nepal towards sustainable mobility, expressing lack of supporting policies, unavailability of infrastructures, lack of proper initiatives and the lobbying for petroleum automobiles as major obstacles.

The overall results show high level of understanding and positive perception towards the EV market in Nepal. The consumers are aware of the impacts the current (ICE) automobile market have been making in the country environmentally and economically. Although, there is scepticism and uncertainty over the transformation of the automobile market, consumer behaviour and perspective are overwhelmingly positive. With relevant supporting policies and infrastructures, the potential consumers for the EV automobile market is significant and has the demand to push the market towards a climate resilient pathway in the automobile industry.

6 DISCUSSION

Nepal made a policy to support EVs in as early as 1997 and reinstate it again in 2016/17 nevertheless, the implication of these policies is non-existent (Shahi, 2017). This signals to the weakness in the government, which lacks coordination, knowledge and most importantly a clear strategy to implement the passed bills. The thesis was able to present the finding on lack of supporting government policies for EVs and lack of infrastructures as major obstacles for EV market transformation in Nepal. This lack of strategy on implementing policies to support electric mobility and building of EV infrastructure should be considered a priority by the Government of Nepal to transform and move towards zero emission mobility.

A developing country like Nepal should raise awareness and encourage the path towards a climate resilient pathway. As the thesis results stated above, there is a high level of scepticism on the future of electric mobility market in Nepal. All the stakeholders must be aware that the petroleum product-based automobile market is a highly unsustainable model and requires major transformation to raise public awareness and take transformative actions to achieve a climate resilient pathway. The concept of climate resilient pathway is especially important in these developing countries as the development models currently prevalent are emission and energy intensive development which has the potential to cause huge environmental crisis. Thus, developing nations must understand and make a transition towards climate resilient development to drive and achieve long term sustainable goals.

Another important aspect for these developing nations is the long-term economic benefits of striving towards climate resilient pathway. The thesis finds the widening of trade deficit and 100% dependency on imported petroleum, causing shortages and price surges are secondary motivation for the consumers to switch towards EV. Nepal does not have any petroleum reserve and hence is 100% dependant on imported petroleum. This contributes significantly to the trade deficit of the country which amounted to approximately US\$4.54 billion in 2018 with imported fuel alone accounting for US\$1.6 billion (Trade and Export Promotion Centre, 2018). On the other hand, it has an estimated 40,000 MW of economically viable hydro electricity generation potential (International Hydropower Association, 2017). The new market of Electric Vehicles has the potential to create new economic opportunities through the creation of green collar jobs, local manufacturing, increase in local electricity consumption along with significant decrease in the country's trade deficit.

Even with multiple laws and policies introduced by the Government of Nepal to support the transformation of the automobile market, the thesis finds lack of government supporting policies as the biggest obstacle for electric mobility transformation. This reflects the problem is at the implementation stages with the lack of coordination within the government seen as the major problem for the implementation of the policies made to support the transformation (Das,

Bhave, Puppala, & Byanju, 2018). In the recently announced budget, the government slashed the import duty of private electric vehicles to 10% with no excise duty (Government of Nepal, 2019). However, there has been no mandates or targets in any of those policies. In addition to the encouraging supporting policies, the government should create a clear strategy for putting policies into practice. This means identifying and clearly stating the roles of different authorities at local, regional and national level regarding the market.

Nepal Electricity Authority (NEA) have announced the plan to set up 10 charging stations in Kathmandu Valley within 2019 and expand further in other major cities to promote the government's plan to support electric mobility (The Himalayan Times, 2019). Although, this is a good starting point the government should be more aggressive in facilitating the infrastructures for electric vehicles. This is especially important, as the thesis result echoed the high hidden demand for electric vehicles and lack of proper infrastructure as a primary obstacle at the consumer level. The government should recognize this, to successfully implement their plans and achieve the objective of the policies presented in the newly unveiled budget.

There is a lack of aggressive policies and implementation through the Government and its related authorities to promote electric mobility. The missing urgency can be seen in lack of incentives and promotion for encouraging import or manufacturing of electric vehicles. This lack of incentives discourages initiatives to be made on the EV market, which the thesis result showed as secondary obstacles for the EV market in Nepal. The communication strategy is non-existent to attract the consumers and investors in the sector. The government should also explore the successful cases of electric vehicle market like Norway where the government policies and incentives were instrumental in achieving 49.1% market share of EVs in 2018 (Norwegian Road Federation (OFV), 2018). As the study on Institutional response to EV promotion in Nepal concluded, Nepal should create a grassroot level advocacy with demand driven initiatives and implement strict regulation to restrict ICE vehicles to achieve zero emission mobility in their major cities (Baral, Parajuli, & Aryal, 2000).

Electric mobility creates a lot of opportunity for developing countries environmentally, socially and economically. For instance, in Nepal the exponential increase in environmental pollution especially air quality in major urban areas over the years have had major impacts to the environment. Air pollution is one of the major motivators for consumers to switch towards EV according to the findings of the thesis. The pollution is not only damaging the environment but is responsible the adverse effect on health of the population. The fine particulate matters were 140ug/m³ on average in urban areas of Nepal which is 10 times higher than the desirable value (World Health Organisation, 2018). This pathway has the potential to significantly contribute to lowering health cost and social benefits due to reduced diseases related to air pollution, which has seen exponentially increased over the years.

A pre-feasibility study conducted by Global Green Growth Institute in 2018 on electric buses found that switching to electric will bring financial and environmental benefit with a single replacement of the ICE bus with an electric

one in a 17km route will reduce 43 tonnes of CO₂ annually and are cheaper by 24-39% over a lifetime (Global Green Growth Institute, 2018). Especially with ever rising middle class urban population, growing economy and degraded environmental conditions this is a crucial period for a developing country like Nepal to transition towards electric mobility. This will not only benefit the country environmentally but will also create social and economic benefits.

7 CONCLUSIONS

The climate crisis is deteriorating all over the world with maximum consequences faced by the least developed and developing nations. The effects are parallel in Nepal with people from rural areas affected the most with changes in weather patterns and natural disasters like flood, drought, landslides, unseasonal rainfall directly affecting the livelihood of the people especially the population reliant on agriculture. The booming population, high demands and the increasing in purchasing power have worsened the crisis. On March 2019, Nepal experienced an unknown and unprecedented Tornado in the plains of southern Nepal killing 25 people and injuring more than 700 people which is an alarming signal.

Air pollution has been getting worse by the day in urban areas in addition to overpopulation, deforestation and lack of safe drinking water. According to WHO (2018), the fine particulate matters was 140ug/m³ on average in urban areas of Nepal which is 10 times higher than the desirable value (World Health Organisation, 2018). Air pollution is responsible for 7 million annual deaths all over the world and this is reflected in the urban areas of Nepal with an alarming increase in diseases like chronic obstructive pulmonary diseases (COPD) (Saud & Paudel, 2018). Kathmandu Valley, the capital and the most densely populated area of the country suffers the adverse impacts of air pollution due to factors such as its bowl-shaped topography restricting wind movement, atmospheric climate and increase in transportation. The administrative region of Bagmati zone has seen significant rise in the number of vehicles and accounts for 38% of the pollution in Kathmandu valley alone (Nepal Health Research Council, Government of Nepal, 2015).

The adoption of sustainable model of transportation is an utmost need for developing countries to achieve a climate resilient pathway for development. The encouraging news is that there is a suppressed demand from consumers, who are environmentally aware and understand the crisis we are currently facing. The consumers are not the only ones aware but the government whose policies reflect but have not been able to realise the crisis.

The policies for encouraging the Electric Vehicles was introduced in Nepal as early as 1997 with 23% import tax set for EVs 90% lower than regular vehicle import tax. This was later revised to 10% in 2002 which was immediately changed to no exemptions on tax for EVs with lobbyist and politicians supporting the petroleum vehicles. It took the government another 13% to introduce similar policies on encouraging EVs. Despite all these laws the implementation of this policies has never started. This clearly demonstrates the government's weakness to implement the laws to encourage the use of EVs.

The government lacks clear strategy to adopt a climate resilient pathway towards zero emission mobility with a least developed nation with high pre-

dicted electricity generation in the coming years. The government also lacks coordination among different ministries and authorities to implementing the existing policies. For instance, the continual changes in ministries responsibilities with the government is a huge setback as the Ministry responsible for Environmental affairs has been shifted from Ministry of Science, Technology and Environment to Ministry of Forest and Environment. In addition to this, the Ministry of Science, Technology and Environment had the responsibility to set the standards and laws related to pollution which set the standards to meet Euro III standard however, Department of Transport Management is responsible for inspection lacking technological knowhow and still uses Euro I "in use vehicle: standard (Das, Bhave, Puppala, & Byanju, 2018).

Another major obstacle to transitioning towards zero emission mobility is the lack of infrastructures for Electric Vehicles. The market for electric vehicles is unlikely to rise with the unavailability of accessible charging stations. Developing infrastructure will not be a priority for a country with a limited budget to invest thus additional financing and technological assistance is required from entities such as Green Climate Fund (GCF) and Global Environment Facility (GEF) to achieve the goal of developing infrastructure for electric mobility and leapfrogging towards a climate resilient development. Furthermore, pressure groups such as Energy Development Council (EDC) have been lobbying and presenting information pressuring the government to support the transformation towards EV.

In addition to the lack of support from the government on implementing policies or building infrastructure, the survey participants also point out to the lack of initiative as a major obstacle for transformation. This problem can be linked with Nepal's highest revenue source, Remittance. With more and more people living the country for education and work abroad, the brain drain rate is massively high in Nepal. The total number of Nepalese students who were issued a no objection letter/certificate to study abroad amounted to 67,226 in 2017 alone and these trends has been growing exponentially (Ministry of Science, Technology and Education, Government of Nepal, 2017). This shows brain drain in developing countries as a major concern for moving towards a sustainable future.

There is a huge potential for initiating the clean automobile market especially considering the taxes and high prices for all the imported petroleum-based vehicles. Considering, the government policies gets implemented, the possibility and the opportunity is boundless. This would not only be able to create environmental benefits but long term economic and sustainable benefits to all the stakeholders.

Majority of the developed countries focus their policies in downstream in the value chain targeting the consumers through incentives such as tax exemption and access to express ways which has resulted in significant increase in demand. The developing countries should follow this model with starting steps with the government's support and implementation of policies. In addition to this, the government should also bring in policies to build infrastructures mostly charging stations. Although, there is a hidden demand more awareness cam-

paigns and communication should be carried out through various media outlets with like national televisions, alternative media sources popular among green consumers, electronic and social media. There should also be policies made to encourage investment in the electric automobile industry for example supporting policies for start-ups and tax breaks for investment in the EV sector.

7.1 Limitations

There were limitations to the survey conducted. The survey was conducted among 82 Nepalese respondents who do not reflect the view of the entire population. The survey was conducted through social media and hence the survey was reachable to the people with access to internet and social media who are the middle class in case of Nepal.

The data collection methods were standardised, and the best options were provided to ensure efficiency. There were few open-ended questions which might limit the respondents to present their view in response to the available options.

7.2 Implications for Further Research

Although the study reflects the overview of the consumer behaviour towards EVs in Nepal, a larger survey must be conducted to achieve more accurate information. A more extensive interview surveys will better reflect the behaviour of the consumers. The researcher should compare and contrast other developing nations likely to stride or have the need to strive towards zero emission mobility. More research should be carried out to understand the lack of implementation for the government's ambitious policies.

REFERENCES

- Achchuthan, S. (2017, January). Green Consumerism in Cross Cultural Perspective: Review of Literature. *International Journal of Applied Business and Economic Research*, 15(5), 517-530. Retrieved from file:///C:/Users/Admin/Desktop/CEM%20Thesis%2021.10.2019/Final%20Documents/finalonewordpdf.pdf
- Allen, M., Dube, O., Solecki, W., Aragón-Durand, F., Cramer, W., Humphreys, S., . . . Zickfeld, K. (2018). *Chapter 1: Framing and Context, IPCC Special Reporting : Global Warming of 1.5'c*. International Panel for Climate Change. Retrieved from https://www.ipcc.ch/site/assets/uploads/sites/2/2019/02/SR15_Chapter1_Low_Res.pdf
- Asian Development Bank. (2017). *Macroeconomic Update: Nepal*. Kathmandu: ADB. Retrieved from <https://www.adb.org/sites/default/files/institutional-document/366826/nepal-macroeconomic-update-201709.pdf>
- Bajracharya, I., & Bhattarai, N. (2016, January). Road Transportation Energy Demand and Environmental Emission: A Case of Kathmandu Valley. *Hydro Nepal*(18), 30-40.
- Baral, A. (2000, November). Electric Vehicles in Kathmandu. *Home Power Magazine*(79), pp. 74-78.
- Baral, A., Parajuli, R., & Aryal, B. (2000, June). INSTITUTIONAL RESPONSES TO ELECTRIC VEHICLE PROMOTION IN NEPAL. *Studies in nepali History and Society*, 1, pp. 89-125. Retrieved from http://www.martinchautari.org.np/mc/files/3_%20Anil%20Baral.Ramesh%20Paraju.pdf
- Bhatta, S. (2018, September 11). Mainstream electric vehicles with law. *My Republica*. Retrieved from <https://myrepublica.nagariknetwork.com/news/mainstream-electric-vehicles-with-law/>
- Brittlebank, W. (2015, April 30). Global green economy hits \$6.2 trillion. *Climate Action*. Retrieved from http://www.climateaction.org/news/global_green_economy_hits_6.2_trillion
- CEIC Data. (2018, 10 1). CEIC Data.
- Central Bureau of Statistics Nepal. (2015). *Nepal in Figures*. Kathmandu: Government of Nepal.
- Chan, R. Y., Wong, Y. H., & Leung, T. K. (2008, june). Applying Ethical Concepts to the Study of "Green" Consumer Behavior: An Analysis of Chinese Consumers' Intentions to Bring their Own Shopping Bags. *Journal of Business Ethics*, 79(4), 469-481. doi:10.1007/s10551-007-9410-8

- Chandani, A., Harmeling, S., & Kaioga, A. O. (2009). *The Adaptation Fund: a model for the future?* IIED. Retrieved from <https://pubs.iied.org/17068IIED/>
- Chapman, S. (2005). *Research Methods* (3rd ed.). Taylor and Francis Group.
- Climate Change Network Nepal. (2011). *Governance of Climate Change Adaptation Finance in Nepal*. Kathmandu: Oxfam.
- Connolly, J., & Prothero, A. (2008). Green Consumption: Life-politics, risk and contradictions. *Journal of Consumer Culture*, 8, 117-145. doi:10.1177/1469540507086422
- Cosic, D., Dahal, S., & Kitzmuller, M. (2017). *Climbing higher : toward a middle-income Nepal*. Washington DC: World Bank Group. Retrieved from <http://documents.worldbank.org/curated/en/358501495199225866/Climbing-higher-toward-a-middle-income-Nepal>
- Czech, B. (2008, December 3). Prospects for Reconciling the Conflict between Economic Growth and Biodiversity Conservation with Technological Progress. *Conservation Biology*, 22(6). doi: <https://doi.org/10.1111/j.1523-1739.2008.01089.x>
- Das, B., Bhave, P. V., Puppala, S. P., & Byanju, R. M. (2018, October). A GLOBAL PERSPECTIVE OF VEHICULAR EMISSION CONTROL POLICY AND PRACTICES: AN INTERFACE WITH KATHMANDU VALLEY CASE, NEPAL. *Journal of Institute of Science and Technology*, 23, 76-80. doi:: <https://doi.org/10.3126/jist.v23i1.22199>
- Denscombe, M. (2010). *Research Guide for small-scale research projects* (Fourth ed.). New York: Open University Press. doi:ISBN-13: 978 0 335 24140 8
- Denton, F., T.J.Wilbanks, Abeyasinghe, A., Burton, I., Gao, Q., Lemos, M., . . . K.Warner. (2014). *Climate-resilient pathways: adaptation, mitigation, and sustainable development*. Cambridge University Press.
- Denzin, N. K., & Lincoln, Y. S. (2005). *The SAGE Handbook of Qualitative Research*. SAGE.
- Department of Transport Management, GON. (2017). *Vehicle Registration Data*. Kathmandu: Government of Nepal.
- Edenhofer, O., Wallacher, J., Lotze-Campen, H., Reder, M., Knopf, B., & Müller, J. (2012). *Climate Change, Justice and Sustainability: Linking Climate and Development Policy*. Springer.
- Environment protection Agency. (2017). What are the Air Quality Standards for PM? New England, United States of America.
- European Commission. (2017). *Special Eurobarometer 459, Climate Change Report*. European Union. doi::10.2834/92702
- Fudenberg, D., Gilbert, R., Stiglitz, J., & Tirole, J. (1983). *European Economic Review*, 22(1), pp. 3-31. doi:10.1016/0014-2921(83)90087-9
- Gabriel, Y., & Lang, T. (1995). *The unmanageable consumer : contemporary consumption and its fragmentation*. California: Sage Publications.
- Global Fuel Economy Initiative, International Energy Agency. (2017). *International Comparison of Light-Duty Vehicle Fuel Economy 2005-2015*. London: Global Fuel Economy Initiative.

- Global Green Growth Institute. (2018). *Deploying Electric Buses in the Kathmandu Valley: A Prefeasibility Study*. Kathmandu: GGGI. Retrieved from http://gggi.org/site/assets/uploads/2018/07/GGGI-Nepal_Pre-Feasability-of-Electric-Buses.pdf
- Global Resources Institute. (1998). *PROMOTING ELECTRIC VEHICLES IN THE DEVELOPING WORLD*. San Jose: GRI. Retrieved from <http://www.grilink.org/ev.htm>
- Government of Nepal. (2019). *Budget 2019/20*. Kathmandu: Ministry of Finance. Retrieved from https://mof.gov.np/uploads/document/file/%E0%A4%AC%E0%A5%8D%E0%A4%AF%E0%A4%AF%20%E0%A4%85%E0%A4%A8%E0%A5%81%E0%A4%AE%E0%A4%BE%E0%A4%A8%E0%A4%95%E0%A5%8B%20%E0%A4%B5%E0%A4%BF%E0%A4%B5%E0%A4%B0%E0%A4%A3%20%E0%A5%A8%E0%A5%A6%E0%A5%AD%E0%A5%AC_20190603123023.
- Handriana, & Tanti. (2016, May). Mapping of Green Buying Perception in Developing Country. *Mediterranean Journal of Social Sciences*, 7(3), 19-30. doi:10.5901/mjss.2016.v7n3p19
- Haustein, S., & Hunecke, M. (2007). Reduced Use of Environmentally Friendly Modes of Transportation Caused by Perceived Mobility Necessities: An Extension of the Theory of Planned Behavior. *Journal of Applied Social Psychology*, 37(8), 1856-1883. doi: <https://doi-org.ezproxy.jyu.fi/10.1111/j.1559-1816.2007.00241.x>
- India Today. (2013, August 16). Mahindra e20 launched in Nepal to facilitate sustainable `zero-emission society`. *India Today*.
- International Energy Agency. (2012). *Energy Technology Perspective 2012: Pathways to a Clean Energy System*. Paris.
- International Energy Agency. (2012). *International Energy Agency 2012 Annual Report*. Paris: IEA.
- International Energy Agency. (2018). *Global EV Outlook 2018: Towards cross-modal electrification*. IEA.
- International Hydropower Association. (2017). *Hydropower Status Report*. London: IHA.
- Is environmental degradation an inevitable consequence of economic growth: tunneling through the environmental Kuznets Curve. (1999). *Ecological Economics*, 29, 89-109. doi:10.1016/S0921-8009(98)00062-7
- Jato. (2019). 2018 (Full Year) International: Worldwide Car Sales and Global Market Analysis. Retrieved from <https://www.best-selling-cars.com/global/2018-full-year-international-worldwide-car-sales-and-global-market-analysis/>
- Kantipur. (2018, March 18). *Kathmandu Post*. Retrieved from <http://kathmandupost.ekantipur.com/news/2018-03-18/hydro-powered-dreams-20180318082906.html>
- Kardes, F. R., Cronley, M. L., & Cline, T. W. (2010). *Consumer Behavior*. Ohio: Southwestern Cengage Learning.

- Kathmandu Electric Vehicles Alliance. (2003). *ANALYSIS OF HMG POLICIES AND REGULATIONS AFFECTING ELECTRICAL VEHICLES*. Washington: KEVA Secretariat under USAID Nepal. Retrieved from <http://www.energyhimalaya.com/directories/books-and-articles/ev/HMG%20policy%20analysis%20final%20report.pdf>
- Kronrod, A., Grinstein, A., & Wathieu, L. (2011, August 17). Enjoy! Hedonic Consumption and Compliance with Assertive Messages. *Journal of Consumer Research*, 39(1), 51-61. doi:<https://doi.org/10.1086/661933>
- ktm2day. (2018, 05 01). Car Prices in Nepal. Kathmandu, Nepal. Retrieved from www.ktm2day.com
- Kuznets, S. (1955, March). Economic Growth and Income Inequality. *The American Economic Review*, XLV(1), 1-28. doi:[10.2304/10.199](https://doi.org/10.2304/10.199)
- Maharjan, S. (2002). *Electric Vehicle Technology in Kathmandu, Nepal: A Closer Look at its Development*. Massachusetts: Massachusetts Institute of Technology. Retrieved from <https://pdfs.semanticscholar.org/c927/223f16f3f3710bf0b832a3cec785ca8441.pdf>
- Mansvelt, J. (2010). *Green Consumerism : An A-to-Z Guide*. California: Thousand Oaks, CA : SAGE Publications.
- Martin, D., & Schouten, J. (2013). *Sustainable Marketing*. (International, Ed.) Essex: Pearson.
- Masson-Delmotte, V., Zhai, P., Pörtner, H. O., Roberts, D., Skea, J., Shukla, P. R., . . . Waterfield, T. (2018). *IPCC Special Report Global Warming of 1.5°C. Summary for Policymakers*. Geneva: World Meteorological Organisation. Retrieved from https://www.ipcc.ch/site/assets/uploads/sites/2/2018/07/SR15_SPM_version_stand_alone_LR.pdf
- Michheleti, M., & Stolle, D. (2005). What motivates Political Consumers? *Forschungsjournal neue soziale Bewegungen*, 4.
- Mills, J. H., & Waite, T. A. (2009, May 15). Economic prosperity, biodiversity conservation, and the environmental Kuznets curve. *Ecological Economics*, 68(7), pp. 2087-2095. doi:<https://doi.org/10.1016/j.ecolecon.2009.01.017>
- Ministry of Finance, GON. (2016). *Budget: Fiscal Year 2016/17*. Kathmandu: GON.
- Ministry of Finance, GON. (2016). *Economic Survey*. Kathmandu: Government of Nepal.
- Ministry of Science, Technology and Education, Government of Nepal. (2017). *Education in Figures 2017*. Kathmandu: GON. Retrieved from https://moe.gov.np/assets/uploads/files/Education_in_Figures_2017.pdf
- Muncy, J. A., & Vitell, S. J. (1992). Consumer Ethics: An Investigation of the Ethical Beliefs of the Final Consumer. *Journal of Business Research; New York*, 24(4), 274. Retrieved from <https://search-proquest-com.ezproxy.jyu.fi/docview/196321588?accountid=11774>
- National Planning Commission, Government of Nepal. (2017, December). *Nepal's Sustainable Development Goals: Status and Roadmap 2016-2030*. Kathmandu, Nepal.

- National Planning Commission, Government of Nepal and Oxford Poverty and Human Development Initiative, University of Oxford. (2018). *Nepal's Multidimensional Poverty Index: Analysis Towards Action*. Kathmandu: Government of Nepal.
- NBSM and Associates. (2017). *Nepal Budget 2074/75: Highlights from Tax Perspective*. Kathmandu: NBSM and Associates.
- Nepal Health Research Council, Government of Nepal. (2015). *Situation Analysis of Ambient Air Pollution and Respiratory Health Effects in Kathmandu Valley*. Kathmandu: Government of Nepal. Retrieved from <http://nhrc.gov.np/wp-content/uploads/2017/06/ambient-air-pollution-book.pdf>
- Nepal Rastra Bank. (2018). *Macroeconomic Report*. Kathmandu: NRB. Retrieved from https://www.nrb.org.np/ofg/current_macro-economic/CMEs%20Annual%20Nepali%202074-75%20Final.pdf
- Norwegian Road Federation (OFV). (2018). *Bilsalget i 2018*. Oslo: OFV.
- NUMBEO. (2018, 03 12). Pollution Index 2018. Retrieved from <https://www.numbeo.com/pollution/rankings.jsp>
- Orski, K. C. (1998). The Great Electric Car Debate. *The Urban Lawyer*, 30(3), 525-535. Retrieved from <https://www.jstor.org/stable/27895127>
- Pelling, M. (2011). *Adaptation to Climate Change: Resilience to Transformation*. London: Routledge.
- Perkins, R. (2003). Environmental leapfrogging in developing countries: A critical assessment and reconstruction. *Natural Resources Forum*(27), pp. 177-188. Retrieved from http://personal.lse.ac.uk/PERKINSR/NRF_Leapfrogging_27%202003.pdf
- Pettinger, T. (2015, September 11). *Economics Help*. Retrieved from <http://www.economicshelp.org/blog/14337/environment/environmental-kuznets-curve/>
- Poudel, U. (2018, May 30). Infrastructure projects get priority: Federal Budget 2019-2020. *The Himalayan Times*. Retrieved from <https://thehimalayantimes.com/business/infrastructure-projects-get-priority/>
- Ribeiro, K., S, K., M., B., J, G., D, G., DS, L., . . . R, W. (2007). *Transport and its infrastructure*. In *Climate Change 2007: Mitigation. Contribution of Working Group III to the Fourth Assessment of IPCC*. Cambridge: Cambridge University Press. Retrieved from <https://www.ipcc.ch/site/assets/uploads/2018/02/ar4-wg3-chapter5-1.pdf>
- Rijal, P. (2019, May 11). Despite action plans and ambitious targets, Nepal lags behind in e-mobility transition. Kathmandu, Nepal. Retrieved from <http://kathmandupost.ekantipur.com/news/2019-05-11/despite-action-plans-and-ambitious-targets-nepal-lags-behind-in-e-mobility-transition.html>

- Saud, B., & Paudel, G. (2018). The Threat of Ambient Air Pollution in Kathmandu, Nepal. *Journal of Environmental and Public Health*, 7. doi:<https://doi.org/10.1155/2018/1504591>
- Sauter, R., & Watson, J. (2008). *Technology Leapfrogging: A review of Evidence*. Sussex: University of Sussex.
- Shahi, P. (2017, June 5). Electric Vehicles in Nepal: What you need to know. *Onward Nepal*.
- Sharma, A., & Joshi, S. (2007). Green consumerism: Overview and further research directions. *International Journal of Process Management and Benchmarking*, 7. doi:10.1504/IJPMB.2017.083106
- Shrestha, R. M., Ahmed, M., Suphachalasai, S., & Lasco, R. (2012). *Economics of Reducing Greenhouse Gas Emissions in South Asia: Options and Costs*. Mandaluyong City, Philippines: Asian Development Bank. Retrieved from <https://www.adb.org/sites/default/files/publication/30186/economic-s-reducing-ghg-emissions-south-asia.pdf>
- Shrestha, S. (2015, November 25). Electrified transportation: The blockade should be a wakeup call for the government to actively promote electric transport. *Nepali Times*. Retrieved from <https://archive.nepalitimes.com/article/nation/implementation-on-ev-friendly-policy-nil,2689>
- Simpson, M., Gössling, S., & Scott, D. H. (2008). *Climate Change Adaptation and Mitigation in the Tourism Sector: Framework, Tools and Practices*. UNEP, University of Oxford, UNWTO, WMO. Paris: Oxford University Press. Retrieved from <file:///C:/Users/Admin/Desktop/CEM%20Thesis%2021.10.2019/Resources/UNEP%20Climate%20Change%20Manual.pdf>
- Sims, R., Schaeffer, R., Creutzig, F., Cruz-Núñez, X., D'Agosto, M., Dimitriu, D., . . . Kobayashi, S. (2014). *Fifth Assessment Report on Intergovernmental Panel on Climate Change*. Cambridge: Cambridge University Press. Retrieved from https://www.ipcc.ch/pdf/assessment-report/ar5/wg3/ipcc_wg3_ar5_chapter8.pdf
- Solomon, M. R. (2016). *Consumer Behaviour : A European Perspective*. Pearson.
- Solomon, M. R., Bamossy, G., Hogg, M. K., & Askegaard, S. (2010). *Consumer Behaviour: a European perspective*.
- Stern, D. (2014). *The Environmental Kuznets Curve: A Primer*. Crawford: The Australian National University. Retrieved from <https://ideas.repec.org/p/een/ccepwp/1404.html>
- Stern, D. I. (2004). The Rise and Fall of the Environmental Kuznets Curve. *World Development*, 32(8), pp. 1419-1439. doi:doi:10.1016/j.worlddev.2004.03.004
- Stern, P. C. (2000). New Environmental Theories: Toward a Coherent Theory of Environmentally Significant Behavior. (407-424, Ed.) *Journal of Social Issues*, 56(3).
- Sullivan-Thomsett, C. (2019, May 29). How Germany's Green party took on the far right to become a major political force. *The Conversation*. Retrieved

- from <http://theconversation.com/how-germanys-green-party-took-on-the-far-right-to-become-a-major-political-force-117927>
- Surakhshya, A. (2015, April). Why the Trolley Bus Phased Out. *Business360 Nepal*.
- Tantawi, P., O'Shaughnessy, N., Gad, K., & Ragheb, M. A. (2009, March). Green Consciousness of Consumers in a Developing Country: A study of Egyptian Consumers. *Contemporary Management Research*, 5(1), 29-50. Retrieved from <file:///C:/Users/Admin/Desktop/CEM%20Thesis%2021.10.2019/Final%20Documents/1149-Article%20Text-13064-1-10-20090225.pdf>
- Tesla. (2018). *Tesla Annual Report*. California.
- The Himalayan Times. (2019, May 6). NEA plans to set up 10 electric vehicle charging stations in Valley. Kathmandu, Nepal. Retrieved from <https://thehimalayantimes.com/business/nea-plans-to-set-up-10-electric-vehicle-charging-stations-in-valley/>
- The Yale Center for Environmental Law and Policy. (2016). *Global Metrics for the Environment*. The Yale Center for Environmental Law and Policy.
- Tomasina, L., Pereira, G. M., Borchardt, M., & Sellitto, M. A. (2013, May). How can the sales of green products in the Brazilian supply chain be increased? *Journal of Cleaner Production*, 47, 274-282. doi:<https://doi.org/10.1016/j.jclepro.2013.01.028>
- Transportation Management Department. (2017). *Vehicle Taxes*. Kathmandu: Government of Nepal.
- Tseng, S., & Hung, S. (2013). A framework identifying the gaps between customers' expectations and their perceptions in green products. *Journal of Cleaner Production*, 174-184.
- UN Commission for Environment and Development. (1997). *Our Common Future*. Oxford University Press.
- UN Committee for Development Policy. (2018). *List of Least Developed Countries*. UN. Retrieved from https://www.un.org/development/desa/dpad/wp-content/uploads/sites/45/publication/ldc_list.pdf
- United Nations. (1992). United Nations Conference on Environment & Development. *UNited Nations*. Rio De Janerio: United Nations.
- United Nations Framework Convention on Climate Change. (1992). <https://unfccc.int>. Retrieved from <https://unfccc.int/resource/docs/convkp/conveng.pdf>
- Upadhya, T. (2016). *Nepal Taxation*. Kathmandu: Institute of Chartered Accountants in Nepal.
- US AID Climate Change Intergration Support. (2017). *Climate Risk in Nepal: Country Risk Profile*. US AID. Retrieved from https://www.climatelinks.org/sites/default/files/asset/document/2017_USAID%20CCIS_Climate%20Risk%20Profile_Nepal.pdf
- Virtanen, A. (2009). Accounting, gender and history. The life of Minna Canth. *Accounting History*, 14(1-2).

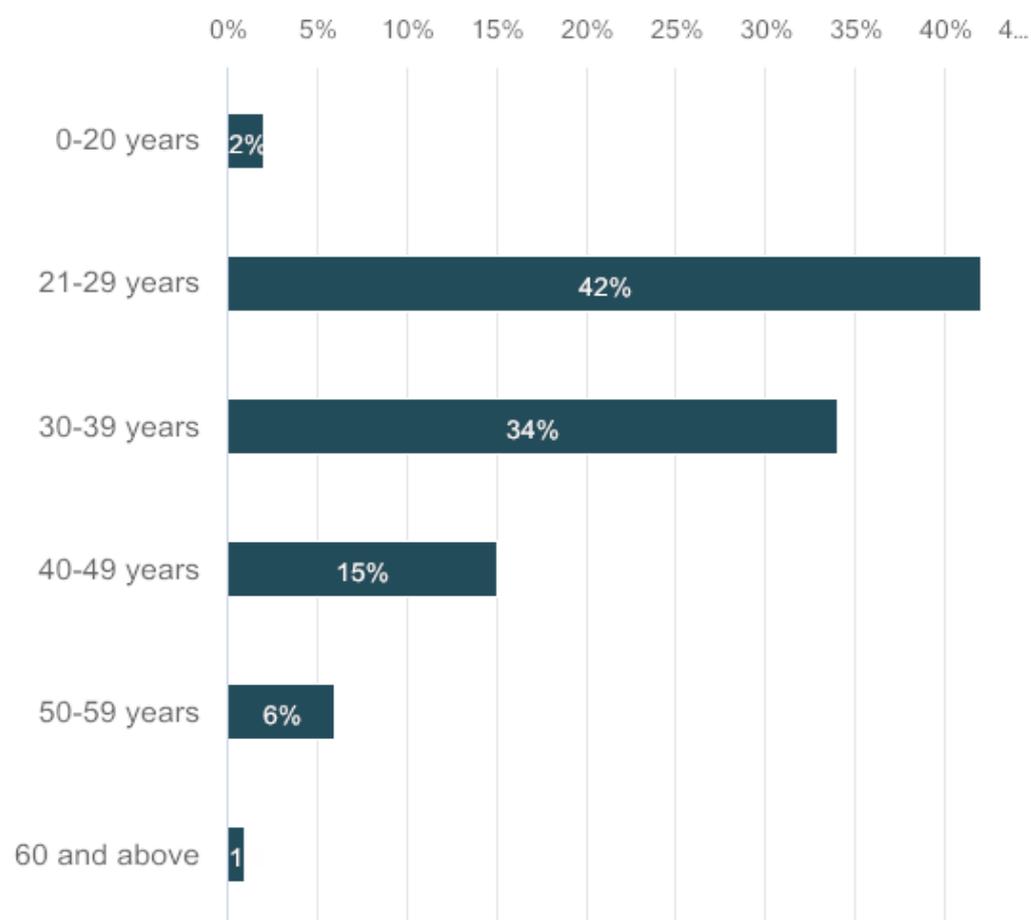
- Volvo Cars. (2018). *Volvo Cars*. Retrieved from <https://www.volvocarslondon.co.uk/news/volvo-electric-cars-2019/>
- Wagoner, R. (2006, July 25). INTERVIEW: RICK WAGONER, GENERAL MOTORS CO. (M. Trend, Interviewer) Retrieved from <https://www.motortrend.com/news/rick-wagoner-general-motors/>
- Water and Energy Commission Secreteriat. (2010). *Energy Sector Synopsi Report*. Kathmandu: Water and Energy Commission Secreteriat. Retrieved from <https://www.weecs.gov.np/uploaded/snyopsis.pdf>
- World Bank Group. (2017, June 14). World Bank Edstats.
- World Health Organisation. (2018, May 02). 9 out of 10 people worldwide breathe polluted air, but more countries are taking action. Geneva. Retrieved from <https://www.who.int/news-room/detail/02-05-2018-9-out-of-10-people-worldwide-breathe-polluted-air-but-more-countries-are-taking-action>
- World Health Organisation. (2018). *Ambient Air Quality and Health*. WHO. Retrieved from [http://www.who.int/news-room/factsheets/detail/ambient-\(outdoor\)-air-quality-and-health](http://www.who.int/news-room/factsheets/detail/ambient-(outdoor)-air-quality-and-health)
- World Meteorological Organisation. (2018). *WMO Provisional statement on the State of the Global Climate in 2018*. Geneva: World Meteorological Organisation. Retrieved from http://ane4bf-datap1.s3-eu-west-1.amazonaws.com/wmocms/s3fs-public/ckeditor/files/Draft_Statement_7_February.pdf?5.6rzIGwBm5lwDSTPbgprB2_EgrjzRVY
- Yale center for Environmental Law and Policy, Yale University. (2018). *Environmental Performance Index*. Connecticut: Environmental Performance Index. Retrieved from <https://epi.envirocenter.yale.edu/downloads/epi2018policymakerssummaryv01.pdf>
- Yi, C. Y. (2017). Consumer Behavior towards Green Products. *Journal of Economics, Business and Management*, 160-167. doi:10.18178/joebm.2017.5.4.505
- Young, W., Hwang, K., McDonald, S., & Oates, C. (2009, March). Sustainable Consumption: Green Consumer Behaviour when Purchasing Products. *Sustainable Development*, 18, 20-31. doi:10.1002/sd.394
- Zhang, X., Baia, X., & Shang, J. (2018). Is subsidized electric vehicles adoption sustainable: Consumers' perceptions and motivation toward incentive policies, environmental benefits, and risks. *Journal of Cleaner Production*, 192, 71-79. doi:<https://doi.org/10.1016/j.jclepro.2018.04.252>
- Zheng, S. (2017, April 20). China now has over 300 million vehicles ... that's almost America's total population. Beijing, China. Retrieved from <https://amp.scmp.com/news/china/economy/article/2088876/chinas-more-300-million-vehicles-drive-pollution-congestion>

APPENDIX: BASIC REPORT ON CASE STUDY OF ELECTRIC VEHICLE MARKET IN NEPAL

Total number of respondents: 82

1. Please select your age group

Number of respondents: 82



	n	Percent
0-20 years	2	2.44%
21-29 years	34	41.46%
30-39 years	28	34.15%
40-49 years	12	14.63%
50-59 years	5	6.1%

60 and above	1	1.22%
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2. Please state your Nationality:
Number of respondents: 82

Responses
Nepal
Nepalese
Nepali
Nepal
Finland
Nepali
nepali
Nepali
Nepalk
Nepali
Nepali
Nepali
Nepali
Nepal
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Nepalese
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Japan
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Nepalese
France
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Nepal
Nepalese

3. Your Country of Residence:
Number of respondents: 82

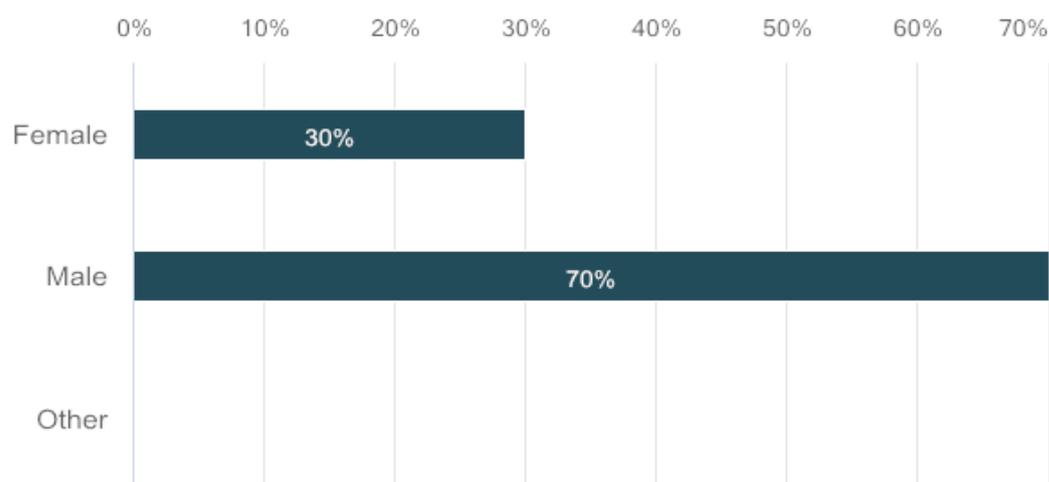
Responses
Finland
Japan
Syangja
Nepal
Finland
Finland
finland
Norway

Nepal
Japan
Japan
Japan
Finland
Nepal
Nepal
Kathmandu
Finland
Nepal
Finland
Nepal
Nepal
Finland
Finland
Nepal
Norway
Finland
Nepal
Nepal
Finland
finland
Nepal
japan
Nepal
Nepal
Kenya
Nepal
Kenya
Kenya
Kenya
Nepal
Nepal

UK
Neopal
Nepal
Nepal
Nepal
Nepal
Kenya
Nepal

4. Select your Gender

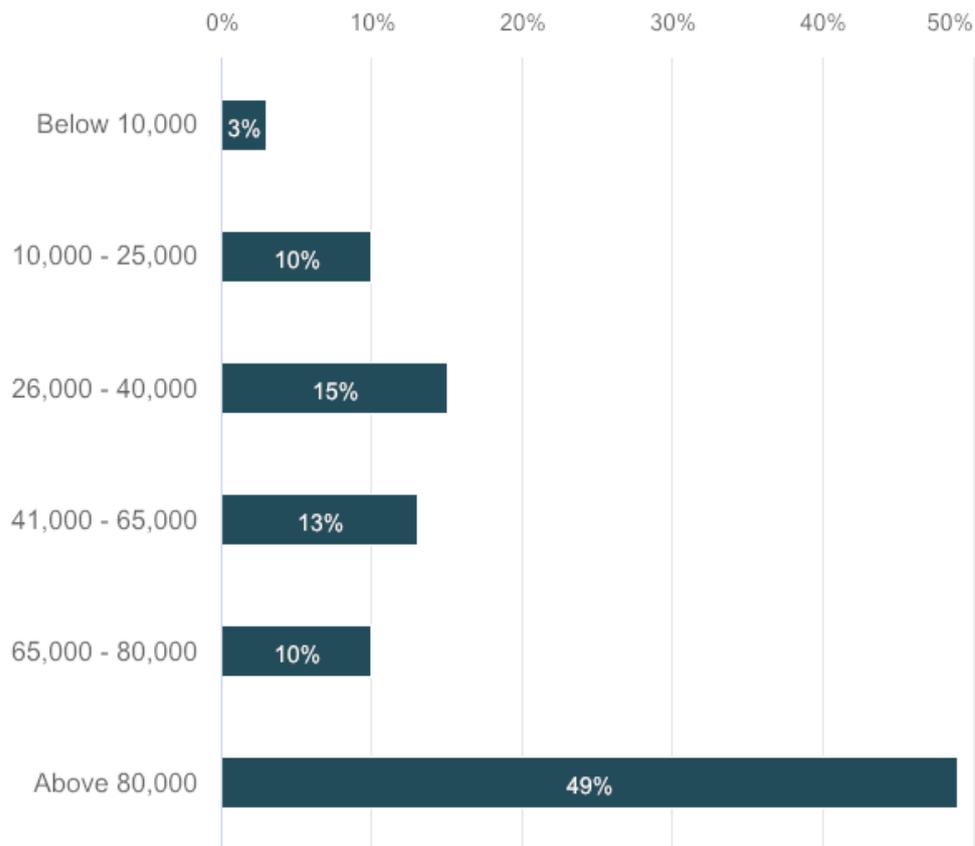
Number of respondents: 80



	n	Percent
Female	24	30%
Male	56	70%
Other	0	0%

5. Select range of your monthly income in Nepalees Rupees

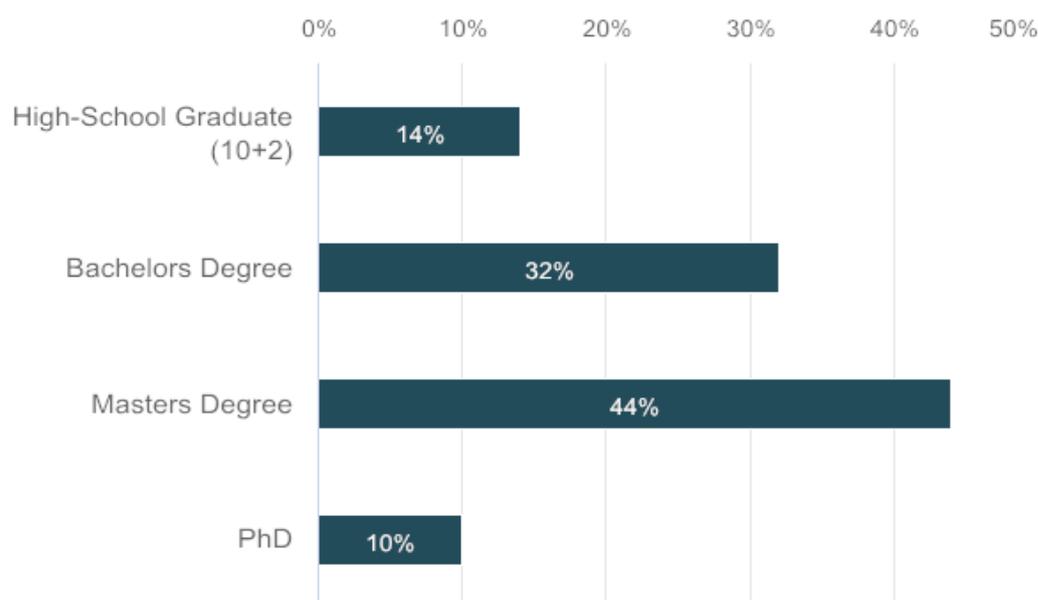
Number of respondents: 79



	n	Percent
Below 10,000	2	2.53%
10,000 - 25,000	8	10.12%
26,000 - 40,000	12	15.19%
41,000 - 65,000	10	12.66%
65,000 - 80,000	8	10.13%
Above 80,000	39	49.37%

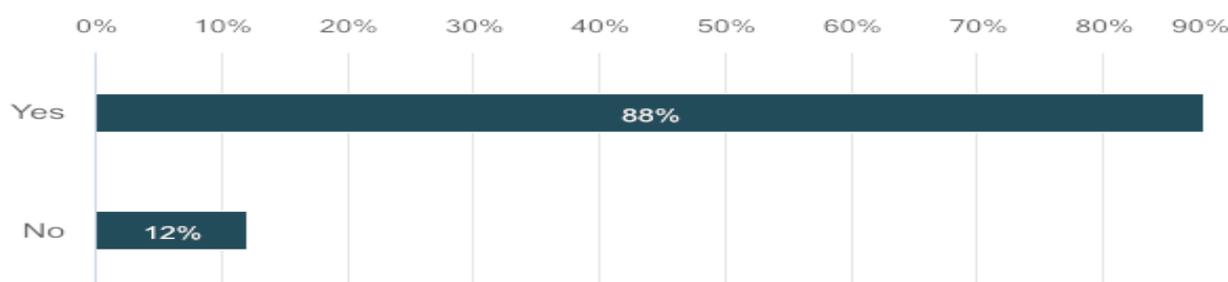
6. Please select the highest level of your completed education

Number of respondents: 82



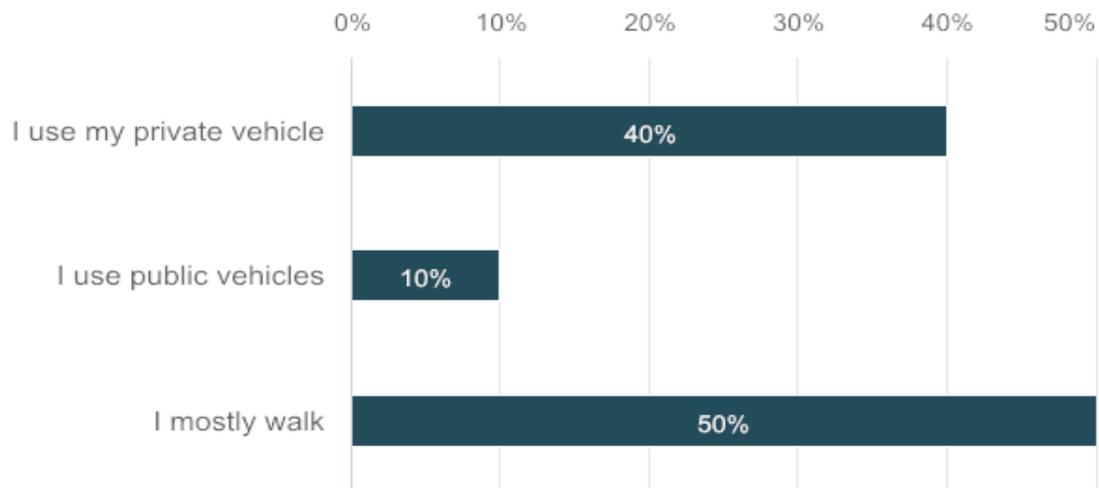
	n	Percent
High-School Graduate (10+2)	12	14.63%
Bachelors Degree	26	31.71%
Masters Degree	36	43.9%
PhD	8	9.76%

7. Do you or your family own a vehicle (car, motorbike, van)?
Number of respondents: 81



	n	Percent
Yes	71	87.65%
No	10	12.35%

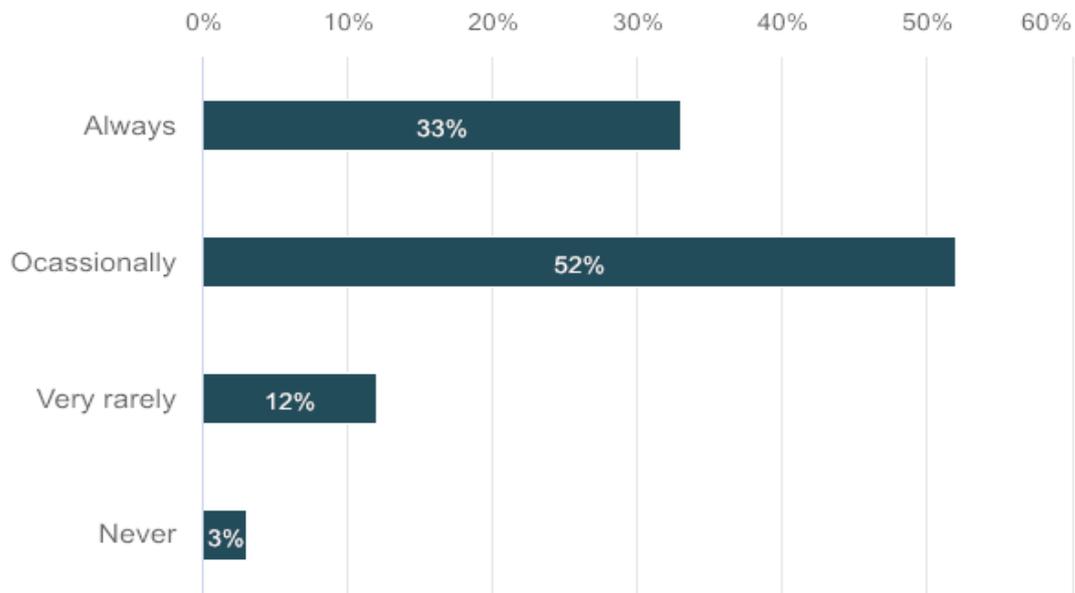
8. To travel a distance of 1km (20 mins walk) on average which mode of transportation do you use?
Number of respondents: 82



	n	Percent
I use my private vehicle	33	40.24%
I use public vehicles	8	9.76%
I mostly walk	41	50%

9. Do you share vehicle while commuting on regular basis with your family member, colleague or friends?

Number of respondents: 82

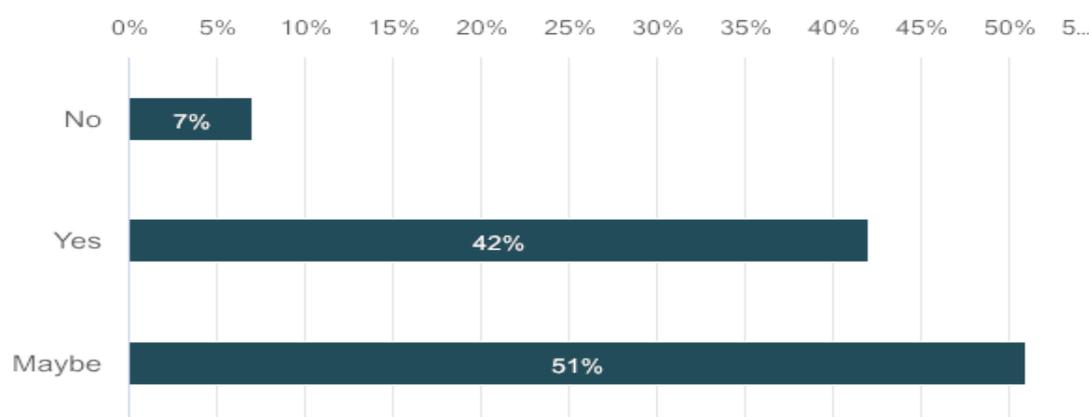


	n	Percent
Always	27	32.93%

Occasionally	43	52.44%
Very rarely	10	12.19%
Never	2	2.44%

10. Do you foresee in the future, all newly sold Light Duty Vehicles (cars, motorbikes, scooters) in the automobile market to be electric in Nepal?

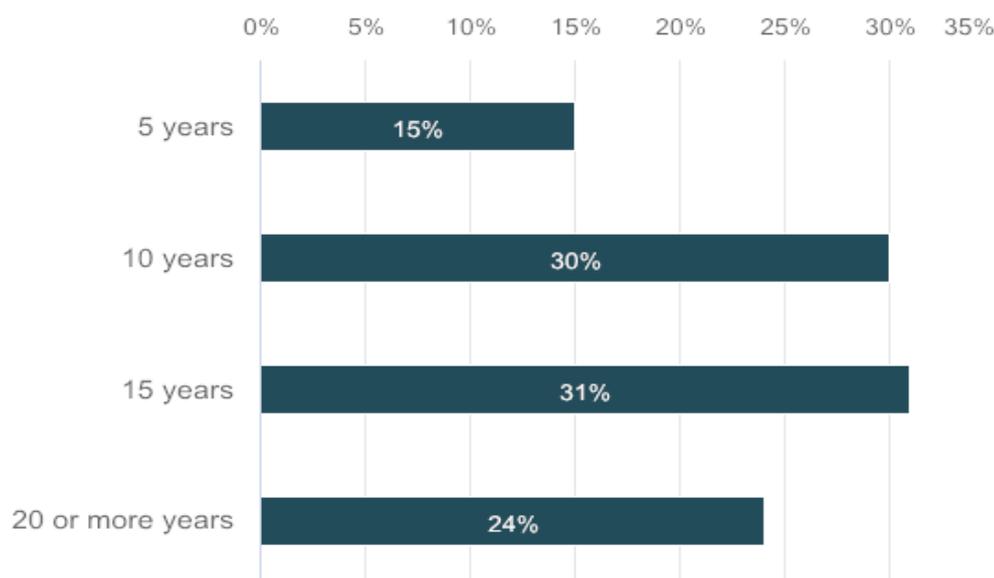
Number of respondents: 82



	n	Percent
No	6	7.32%
Yes	34	41.46%
Maybe	42	51.22%

11. If yes/ maybe, in how many years do you think this will take?

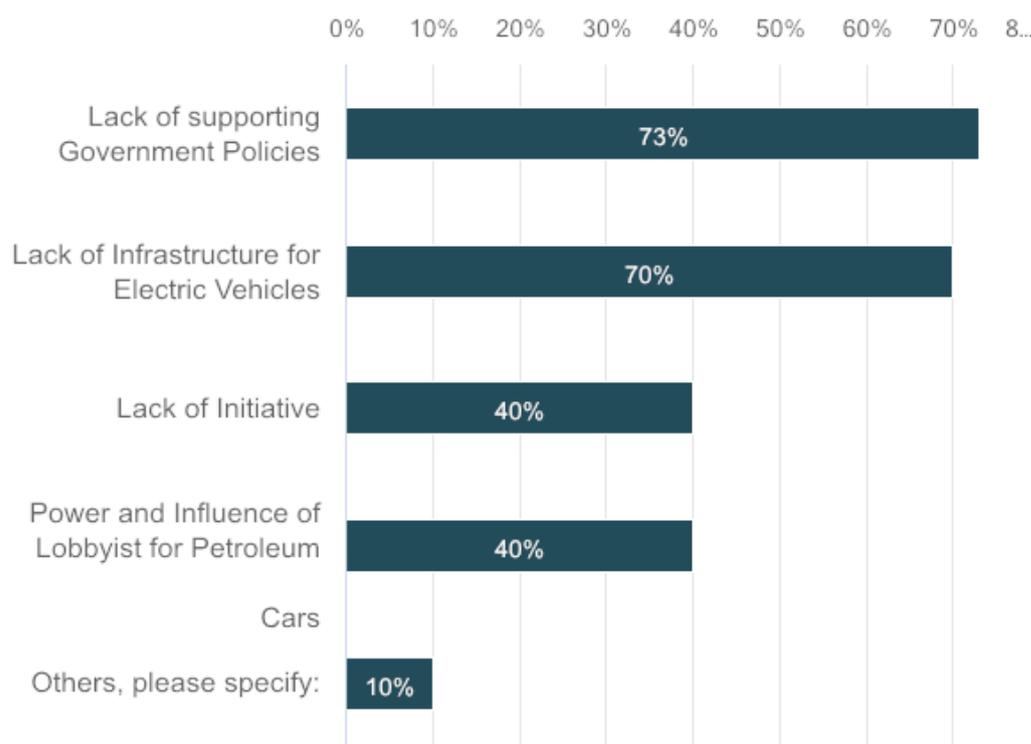
Number of respondents: 74



	n	Percent
5 years	11	14.87%
10 years	22	29.73%
15 years	23	31.08%
20 or more years	18	24.32%

12. In your opinion, what do you think are the major obstacle/s for electric vehicles in Nepal? (Select one or more)

Number of respondents: 82, selected answers: 191



	n	Percent
Lack of supporting Government Policies	60	73.17%
Lack of Infrastructure for Electric Vehicles	57	69.51%
Lack of Initiative	33	40.24%
Power and Influence of Lobbyist for Petroleum Cars	33	40.24%
Others, please specify:	8	9.76%

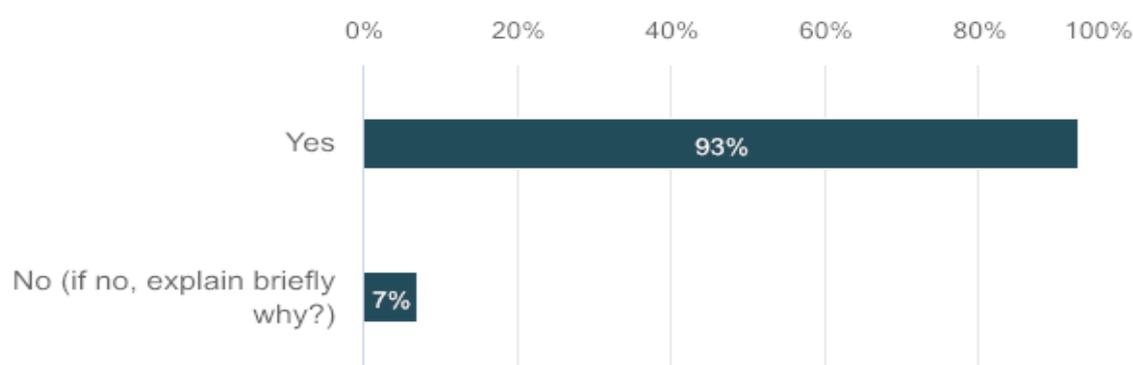
Answers given into free text field

Option names	Text
Others, please specify:	Awareness
Others, please specify:	Not much awareness about environmental degradation and the benefits of using e-vehicles.
Others, please specify:	corruption. politics and more.
Others, please specify:	lack of information on electric vehicle e.g. maintenance, servicing
Others, please specify:	Load shedding
Others, please specify:	All of above

specify:	
Others, please specify:	In the present context lack of public priority and believe for electric vehicles
Others, please specify:	People's mindset that electric cars are less powerful than the petrol/diesel cars

13. Assuming there is adequate availability of electricity and infrastructure, would you buy or replace your vehicle with an electric one?

Number of respondents: 82



	n	Percent
Yes	76	92.68%
No (if no, explain briefly why?)	6	7.32%

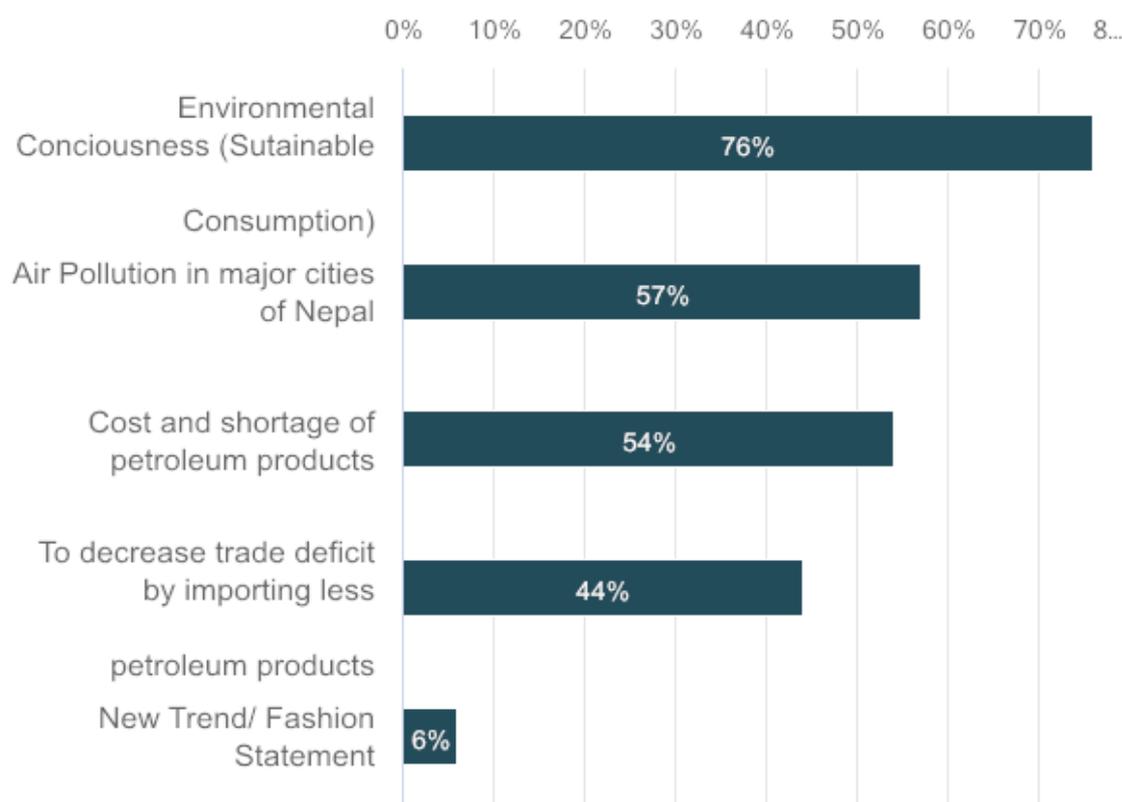
Answers given into free text field

Option names	Text
No (if no, explain briefly why?)	vehicle quality matters in terms of engine power and the charge durability.
No (if no, explain briefly why?)	depend on the cost
No (if no, explain briefly why?)	Not yet I think. I have strong believe that ekectrical vehicles are in still in the development phase and the technology is not mature yet. Example is the energy that battery can store. Looking at all the researches

	around electric vehicle, I think in 5 years or so, the technology will be mature enough to spend my money there.
No (if no, explain briefly why?)	depends on option for existing vehicle
No (if no, explain briefly why?)	Not until wholly depreciated

14. What would be your motivation/s to buy an electric vehicle?

Number of respondents: 82, selected answers: 194

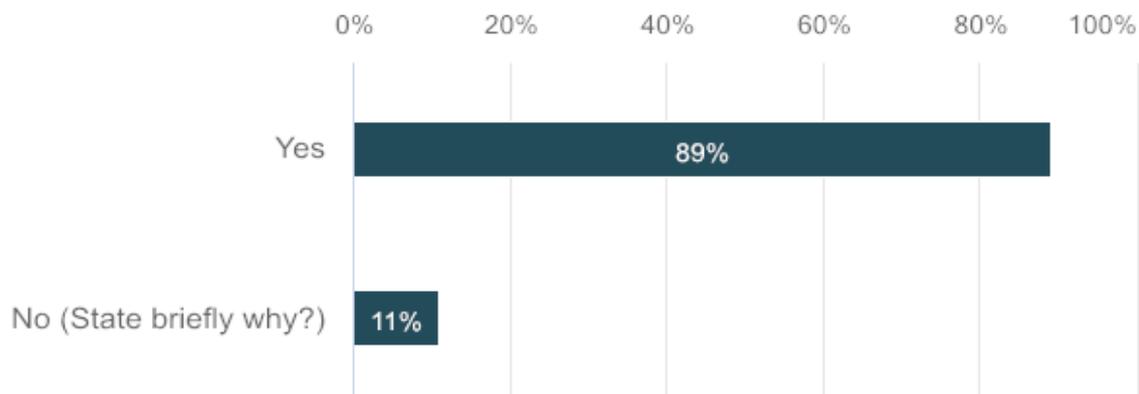


	n	Percent
Environmental Consciousness (Sustainable Consumption)	62	75.61%
Air Pollution in major cities of Nepal	47	57.32%
Cost and shortage of petroleum products	44	53.66%

To decrease trade deficit by importing less petroleum products	36	43.9%
New Trend/ Fashion Statement	5	6.1%

15. Considering it is available, would you buy an electric vehicle manufactured or assembled in Nepal?

Number of respondents: 81



	n	Percent
Yes	72	88.89%
No (State briefly why?)	9	11.11%

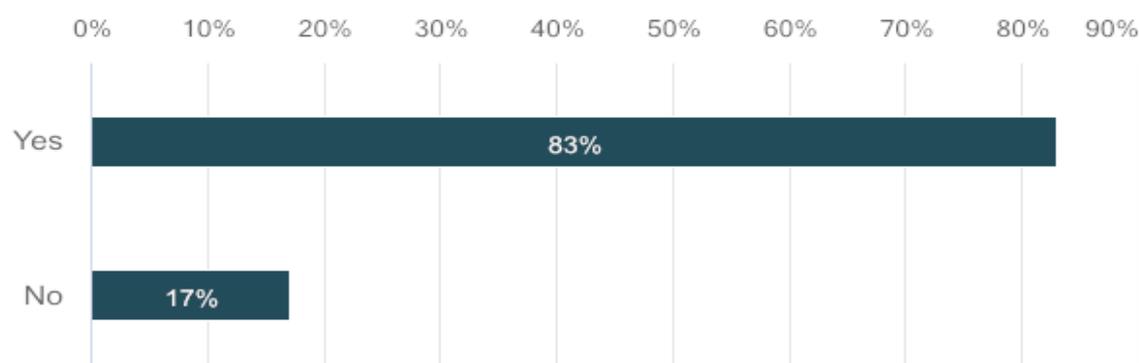
Answers given into free text field

Option names	Text
No (State briefly why?)	It's hard for me to believe that an electric car meeting the required standard would be assembled/manufactured here in Nepal. We can take the example of Gas Tempo of Nepal.
No (State briefly why?)	Depending on its quality and my needs.
No (State briefly why?)	It should match the quality provided by other players in the field
No (State briefly why?)	No reliability of quality
No (State briefly why?)	quality and support viz-a-viz international suppliers

why?)	
No (State briefly why?)	e vehicle doesnt have proven tech yet
No (State briefly why?)	Doubt the quality.
No (State briefly why?)	Quality issues. Even if available, I doubt electric vehicles manufactured in Nepal will be comparable to those manufactured with years of research and gradual improvements.

16. During your purchase of an Electric Vehicle would you be willing to invest 5% of the total cost on Infrastructure development of the EVs in Nepal? (This includes charging station, special parking spaces, etc.)

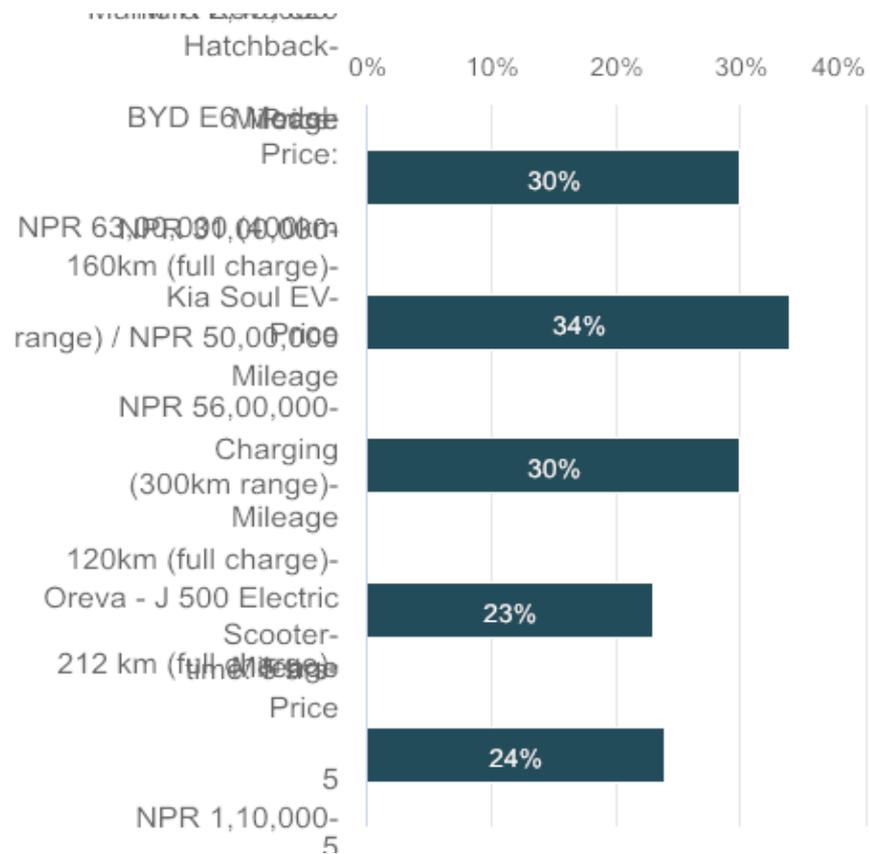
Number of respondents: 82



	n	Percent
Yes	68	82.93%
No	14	17.07%

17. Given the choice which of the following Electric Vehicles would be the most practical and desirable for you?

Number of respondents: 71, selected answers: 99



	n	Percent
Super Soco TS- Price: NPR 2,49,000- Mileage 160km (full charge)- Charging time: 5 hrs- Battery 60V 26Ah, 2400-Watt Motor- Special Features: Top speed 45kn/hr, LED lights, LCD Display, Remote key, Bluetooth functionality	21	29.58%
Mahidra Reva e20 Hatchback- Price: NPR 31,00,000- Mileage 120km (full charge)- 5 Seater- Charging time 9 hours- Automatic Transmission- 210 AH Lithium-ion battery- Special Features: Touch Screen, Power Steering, Air Conditioner	24	33.8%
BYD E6 Model- Price: NPR 63,00,000 (400km range) / NPR 50,00,000 (300km range)- Mileage 300-400 km (full charge)- 5 Seater- Charging time 2 hours- 80kWh Iron Phosphate (Fe) Battery- Special Features: Touch Screen, power steering, hydraulic brake assist (HBA), Cruise control, vehicle fault diagnosis system	21	29.58%
Kia Soul EV- Price NPR 56,00,000- Mileage 212 km (full charge)- 5 Seater- Charging time: 4-5 hrs @2,240v- 27kWh Lithium-ion Polymer Battery-	16	22.54%

Special Features: Heated Front Seats, Cruise control, Automatic transmission, Touch Screen, reverse camera system		
Oreva - J 500 Electric Scooter- Price NPR 1,10,000- Mileage 55km- Battery 500 watts- Charging time 8-10 hours	17	23.94%