NEAR EAST UNIVERSITY
INSTITUTE OF GRADUATE STUDIES
DEPARTMENT OF POLITICAL SCIENCE

EXPLAINING THE ADOPTION OF EV POLICIES IN OIL-RICH COUNTRIES

M.A. THESIS

Yedidia OWUSU ACHIAW

Nicosia

January, 2022

YEDIDIA OWUSU ACHIAW EXPLAINING THE ADOPTION OF EV POLICIES IN OIL-RICH COUNTRIES MASTER THESIS 2022

NEAR EAST UNIVERSITY
INSTITUTE OF GRADUATE STUDIES
DEPARTMENT OF POLITICAL SCIENCE

EXPLAINING THE ADOPTION OF EV POLICIES IN OIL-RICH COUNTRIES

M.A. THESIS

Yedidia OWUSU ACHIAW

Supervisor
Assoc. Prof. Dr. Direnç KANOL

Nicosia

January, 2022

Approval

We certify that we have read the thesis submitted by Yedidia Owusu Achiaw titled "**Explaining the Adoption of EV Policies in Oil-Rich Countries**" and that in our combined opinion, it is fully adequate, in scope and in quality, as a thesis for the degree of Master of Arts, Political Science.

Examining Committee	Name-Surname	Signature
Head of the Committee:	Prof. Dr. Nur KÖPRÜLÜ	……..
Committee Member	Asst. Prof. Dr. Gülay UMANER	……..
Supervisor:	Assoc. Prof. Dr. Direnç KANOL	……..

Approved by the Head of the Department

….. /….. / 20…

……..
Prof. Dr. Nur KÖPRÜLÜ
Head of Department

Approved by the Institute of Graduate Studies

…../ …../ 20…
Prof. Dr. Kemal Hüsnü Can BAŞER
Head of the Institute

Declaration

I hereby declare that all information, documents, analysis and results in this thesis have been collected and presented according to the academic rules and ethical guidelines of Institute of Graduate Studies, Near East University. I also declare that as required by these rules and conduct, I have fully cited and referenced information and data that are not original to this study.

Yedidia OWUSU ACHIAW

…../…../2022

Day/Month/Year

Dedication

I dedicate this thesis work to my family and friends. Special thanks of course go to my parents for their support in diverse ways. I would not have come this far without them. And to my aunty, Abigail Nana Antwiwaah, God bless you for stepping in anytime I called on you.

I also dedicate this thesis to my friend Andrews Sarkodie for your support and countless advice.

Acknowledgement

I would like to thank Associate Professor Dr. Direnç Kanol for his invaluable guidance and insights leading to the writing of this thesis. I cannot forget the few occasions you sent follow-up emails to know the progress of the work and I am grateful for that.

Yedidia OWUSU ACHIAW

Abstract

Explaining the Adoption of EV Policies in Oil-Rich Countries

Owusu Achiaw, Yedidia
Masters, Department of Political Science
Supervised by Assoc. Prof. Direnc KANOL
January 2022, 62 pages

Electric Vehicles (EVs) may be regarded as a better alternative to Internal Combustion Engine (ICE) vehicles; as such, few countries including oil-rich ones have begun implementation of policies that will favour its uptake and render ICE vehicles less attractive to purchase or use. However, our understanding of how oil-rich countries may contend with the adoption of EV policies is limited.

We argue that oil as a natural resource cannot by itself hinder the adoption of EV friendly policies and that one has to look elsewhere like economic and governance elements to explain policy adoption. In this study, we consider two oil-rich countries (United Arab Emirates and Nigeria) to explain EV policy adoption.

Keywords: electric vehicles, oil-rich countries, UAE, Nigeria, policy adoption.

Öz

Petrol Zengini Ülkelerde Elektrikli Araçlari Teşvik Eden Yasalari Açiklayan Faktörler

Owusu Achiaw, Yedidia
Yüksek Lisans, Siyaset Bilimi Bölümü
Doç. Dr. Direnç KANOL
Ocak 2022, 62 sayfa

Elektrikli Araçlar (EV'ler), İçten Yanmalı Motorlu (ICE) araçlara daha iyi bir alternatif olarak kabul edilebilir; bu nedenle, petrol zengini ülkeler de dahil olmak üzere çok az ülke, onun alımını destekleyecek ve ICE araçlarını satın almak veya kullanmak için daha az çekici hale getirecek politikalar uygulamaya başladı. Bununla birlikte, petrol zengini ülkelerin EV politikalarının benimsenmesiyle nasıl başa çıkabileceğine dair anlayışımız sınırlıdır.

Bu çalışmada petrolün doğal bir kaynak olarak kendi başına EV dostu politikaların benimsenmesini engelleyemeyeceğini ve bu politikalarin benimsenmesini açıklamak için ekonomik ve yönetişim unsurları gibi başka faktorlere bakmak gerektiğini savunuyoruz. Bu tezde, EV politikasının benimsenmesini açıklamak için petrol zengini iki ülkeyi (Birleşik Arap Emirlikleri ve Nijerya) ele alıyoruz.

Anahtar Kelimeler: elektrikli araçlar, petrol zengini ülkeler, BAE, Nijerya, siyasa adaptasyonu.

Table of Contents

List of Tables

List of Abbreviations

DEWA: Dubai Electric and Water Authority

DRTA: Dubai Roads and Transport Authority

EU: European Union

EV: Electric Vehicle

EVI: Electric Vehicle Initiative

GCC: Gulf Cooperation Council

GDP: Gross Domestic Product

HOV: High Occupancy Vehicle

ICE: Internal Combustion Engine

NGOs: Non-Governmental Organisation

NNPC: Nigerian National Petroleum Corporation

OPEC: Organisation of Petroleum Exporting Countries

UAE: United Arab Emirates

USA: United States of America

ZEV: Zero Emission Vehicle

CHAPTER I
Introduction

Background of the Study

Global transport policy is currently going through a revolution as Electric Vehicles (EVs) are taking over the Internal Combustion Engines (ICEs), mainly due to the increasing concern about climate change (Rietmann & Lieven, 2019; Figenbaum, 2017; Zhou & Zhang, 2013). Although, China, Europe and North America are leading the way in this revolution, countries in other regions are following suit (Jacobs, 2020). Promising as this revolution may seem, there are still a good number of countries that are yet to emulate these other countries who have far advanced with the implementation of various EV policies and a number of reasons have been put forward to explain this outcome (Styczynski & Hughes, 2019; Wesseling, 2016; Zimm, 2021).

All forms of electric cars can be propelled by a single or multiple electric motors that use electric battery as energy source (Zerfass & Helmers, 2019). This is why some sources refer to all electric vehicles as battery electric vehicles because it is the batteries in them that propels it (EVs) and the batteries can be charged using electricity from designated charging centres (US Department of Energy, 2019; Zerfass & Helmers, 2019). Internal Combustion Engine Vehicles are the normal liquid-fueled cars that are propelled by internal combustion engines (Wilken, Oswald, Draheim et al., 2020).

Electric Vehicle (EV) policies could be many and recent as well. The more popular types of EV policies include financial or economic incentives, High Occupancy Vehicle (HOV) lane access, charging infrastructure, carbon pricing, Zero Emission Vehicle (ZEV) sales mandate, and low-carbon fuel standard (Melton, Axsen, & Moawad, 2020). Financial incentives are deemed to be most effective of all EV policies (Li et al, 2020). Policies such as fuel taxes, feebates, bans, and road pricing that tend to push away ICE vehicles and override the old system do not usually sink down well with the public, rather, incentivising policies like tax rebates and subsidies win over the support of car consumers and further boost the uptake of EVs (Khurana, Kumar & Sidhpuria, 2020).

Oil is the most traded commodity in the world and it gives undue economic and geopolitical power to countries gifted with it (Twin & Li, 2021; Deshmukh, 2021). There are eighteen (18) major oil-rich countries; each with at least 0.5 percent (0.5%) share of the world's proven oil reserves (BP Statistical Review of World Energy, 2021). On a world scale, many of these oil-rich countries feature prominently in the list of countries that have adopted electric vehicles into their transport system. For instance, United States and China alone constitute about sixty-five percent (65%) of global EV users (Rajper & Albrecht, 2020).

United Arab Emirate (UAE) and Nigeria are part of the few oil-rich countries that make up about ninety-six percent (96%) of the world's proven oil reserves (BP Statistical Review of World Energy, 2021). As of 2020, UAE was the seventh exporter of oil in the world and the eighth on the list of countries worldwide with proven oil reserves (Twin & Li, 2021; BP Statistical Review of World Energy, 2021). Nigeria on the other hand has a vast oil reserve - second in rank on the continent of Africa-, but oil production is comparatively lower on a global scale due to internal security challenges that hampers the large scale production of oil in the country (Twin & Li, 2021). This situation leaves Nigeria with large oil reserves unexploited (Twin & Li, 2021).

UAE and Nigeria, despite their oil wealth, may have at a point in time experimented with EV policies and might have attained various degree of success in their attempts. This research explains EV policy adoption in oil-rich countries using UAE and Nigeria as selected cases to gather empirical evidence on the topic.

Statement of Problem

Previous studies have looked at policies aiming at increasing the adoption of EVs among consumers (Kumar & Alok, 2020; Rietmann & Lieven, 2019; Styczynski & Hughes, 2019). Some studies even tried to categorise these policies that have so far been used by countries to promote and increase the uptake of EVs (Melton et al., 2020; Bruckmann & Bernauer, 2020; Kotilainen et al., 2019; Li et al., 2019). Other research sought to highlight the various factors that explain the adoption of EV friendly policies across countries (Altenburg et al., 2015; Rajper & Albrecht, 2020; Wesseling, 2016; Zimm, 2021). However, our understanding of how oil resources affect EV policies is still limited. Particularly, the question of whether oil-rich countries may adopt EVs or not is still unresolved. Natural resources can be a double-edge sword for countries as they give a head start to countries to use these resources and prosper, they can also stall innovations as explained by the resource curse theory (Ross, 2015; Venables, 2016; Auty, 1993; Brunnschweiler & Bulte, 2008). At the moment, there is a paucity of research on how oil-rich countries may grapple with the adoption of EV policies. This study therefore attempts to explain the adoption of EV Policies in oil-rich countries.

Proposition

Oil as a natural resource cannot by itself hinder the adoption of EV friendly policies and that one has to look elsewhere like economic and governance elements to explain policy adoption.

Main Research Question

Does oil resource alone determine the adoption of electric vehicle policies in oil-rich countries?

Method

This research is a qualitative one and uses the inductive analysis approach in analyzing qualitative data. According to Thomas (2006), many researchers employ the inductive analysis approach when they want to establish a clear relationship between research objectives and summarized textual data or to develop a framework based on the underlying pattern that are evident in the data. The inductive analysis approach enabled the researcher to put together his numerous raw textual data into concise, meaningful format and establish the link between the data and the main research question. The researcher read and interpreted the textual data, recognized the patterns within the data, and formed themes out of them to be used in the report writing of the work. At some point, pre-determined themes were used to organize and give focus to the discussion in the work. Primary and secondary (books and journal articles) data sources were used in this work. Policy papers, statistics, and news websites were treated as primary data in this study. The primary data were retrieved from internet sources and the secondary data were mainly drawn from the online academic database, Google Scholar.

Selection of Cases

This study was a small-N as such two cases (UAE and Nigeria) were compared and analysed to reach a conclusion. Small-N studies are usually employed to qualitatively analyse a small number of cases where large observations can be done on them (Mahoney, 2000; Smith & Little, 2018) The selection of UAE and Nigeria is justified on the grounds that these two countries took on an oil economy around the same time period – in the latter part of the twentieth (20^{th}) century (Hundeyin, 2020). And during those times UAE and Nigeria began producing oil, they had similar infrastructural and educational challenges (Hundeyin, 2020). What is more, both are members of the cartel group OPEC (Organisation of the Petroleum Exporting Countries) and have a say in determining the world's oil price. In the Middle East, UAE is often regarded as the country with the most diversified economy and technologically inclined too (Jacobs, 2020). UAE, irrespective of its oil-richness, has so far outperformed its neighbours in terms of implementing EV policies that many compare to the likes of United States, China, and Europe that are well advanced with EV policy implementation (Jacobs, 2020). On the African continent, Nigeria currently produces more oil than any other African country, but it has been relatively slow in implementing or adopting EV policies (Nigerian National Petroleum Corporation (NNPC), 2021; Agunbiade & Siyan, 2020). In fact, UAE's oil resources are more than Nigeria's when factoring in the population size and area, yet UAE may have outperformed Nigeria in terms of EV policy implementation on a wider scale. These commonalities and differences make UAE and Nigeria befitting cases for this study.

Significance of the Study

This research explains the adoption of EV policies in oil-rich countries. It will thus be significant in the following ways:

1. Add to the few existing literature on the topic.
2. Clarify policy debates on the adoption of EV policies among oil-rich countries.

Limitations of the Study

This study was a small-N type and conclusions derived from it may not be easily transferrable to other cases. It studied two cases and as such generalizations from it should be done with caution. Also, there were only few prior researches done on the topic and this can be attributed to the recent nature of the topic.

Thesis Structure

The foregoing discussion is the introductory part of this thesis. The introduction comprises the background of the study, the statement of problem, proposition, the main research question, the method employed in this study, the selection of cases, significance of the study, the limitations of the study, and finally, the thesis structure. Subsequent discussions in this thesis are organized into three chapters. Chapter one is the literature review part that discusses relevant issues such as policies that exist to promote EV uptake, why countries may decide to adopt or reject EV policies, and how oil-rich countries have grappled with the implementation of EV policies and the influencing factors. Chapter two brings forth the results of comparing the cases used in the study. This chapter touches on the current state of EV policies in United Arab Emirates (UAE) and Nigeria under separate headings. It then compares these policies in both countries to understand the motivations for adopting them, the implementation challenges and how the conclusion can be applied to almost any oil-rich country. Finally, chapter three ends the thesis by first discussing and interpreting the results or findings of the study in relationship to other empirical findings. A summary of the main findings follows, then how this study has contributed to the resource-curse theory. The limitations of the study and recommendation for future research were captured in the final chapter as well.

CHAPTER II
Literature Review

This chapter focuses on reviewing the literature and information from internet sources that are related or relevant to the topic of study.

Adoption of EV-Friendly Policies

Policies which promote EVs increase adoption among consumers (Kumar & Alok, 2020; Rietmann & Lieven, 2019). Similar policy instruments exist across countries to promote adoption among consumers (Styczynski & Hughes, 2019), yet not all countries have adopted such instruments and a number of factors have been suggested to influence this variance among countries (Wesseling, 2016; Zimm, 2021). Before delving into why countries may or may not adopt EV policies, it will be critical to know the numerous policies that exist to promote EV uptake.

Various policies to support and promote EV adoption have been implemented in different parts of the world. Researchers and analysts have tried to categorise these recent and manifold policies in various and compatible manner (Melton et al, 2020; Bruckman & Bernauer, 2020; Kotilainen et al., 2019; & Li et al., 2019). We will adopt the classification done by Kotilainen et al (2019) because of its flexibility and adaptability. To them, they could discern four types of pro-EV policies developed so far across literatures. They are the regulatory instruments; economic instruments; education and information instruments; and management and planning instruments.

The regulatory instruments include regulations such as carbon emission regulations, restrictions/regulations for certain types of vehicles, technology and performance standards, feed-in tariffs, and tradable certificates. Second, economic instruments comprise emission trading schemes, public investments, tax credits, government funding, and subsidies. Again, education and information instruments encompass, for example, information campaigns or voluntary schemes. Finally, management and planning instruments or policies can be tailored to promote EVs.

Table 1 summarises the various EV policies that are widely known under the classification adopted for this study.

Table 1. Classification of Available EV Policies

Regulatory Instruments	**Economic Instruments**	**Education and Information Instruments**	**Management and Planning Instruments**
Unrestricted access to High Occupancy Vehicle (HOV) lanes for EVs	Reduce costs of Electric Vehicles (EVs) and infrastructure	Information requirements on cars' energy consumption	Charging station planning
Minimum sale of Electric Vehicles (EVs)	Rebate programs for Electric Vehicles (EVs)	Battery swapping model option	Low emission zone planning
Vehicle emissions standard	Tax exemptions		Funding for technology demonstrations
Low-carbon fuel standards	Tax credit		charging facilities for new homes and companies
Internal Combustion Engine (ICE) bans	Government subsidies		Parking space privileges
parking restrictions for Internal Combustion Engines (ICEs)	Public charging facilities		Dedicated license plate
Public procurement in favour of Electric Vehicles (EVs)	Carbon tax		Registering priority policy
No purchasing restrictions for Electric Vehicle (EV) buyers	Feebates for Internal Combustion Engines (ICEs)		Vehicle registration fee exemption
	Charging discount		Dedicated registration channel
	Subsidy of private charging piles		vehicle inspection fee exemption
	Circulation tax		Dedicated inspection channel
	Free tolls and ferries for Electric Vehicles (EVs)		
	Insurance discounts		

Source: (Kotilainen et al., 2019)

A careful consideration of table 1 shows that diverse EV policies aim at addressing the needs of potential consumers starting from the purchasing of EVs through registering, driving, and charging of these vehicles. However, education and information instruments are less developed and may need more government and stakeholder efforts and research to broaden its scope.

To this end, how do we account for why certain countries adopt EV policies and others fail in doing that? First of all, research has indicated that proximity of countries encourages the adoption of similar policies and cooperation on issues affecting them all (Kestera et al., 2018). This is seen in the case of the five Nordic countries where they share similar stance on policies affecting climate change and transportation (Kestera et al., 2018). Even in this instance, the authors reveal that the countries involved have different policy mechanisms when it comes to the actual transition away from fossil fuel powered ICEs.

Debatably, the single most challenging factor confronting countries that want to design and carry out EV policies is opposition by stakeholders including owners of ICE vehicles (Bruckmann & Bernauer, 2020). The degree of resistance by opposing forces and actor groups can determine whether a country adopts EV policies or not. Zimm (2021) in her recent comparative study of countries that are early adopters and late adopters of EV policies came out with the finding that countries with large-size local automotive industry like Brazil are late adopters whilst those with a small-sized local automotive industry, Norway for instance, are early adopters. The early adopters face little or no resistance from an existing automotive industry and that makes it easier for them to adopt EV policies than the late adopters who have a lot of considerations and adjustments to make in their local automotive industry (Zimm, 2021; Bruckmann & Bernauer, 2020).

Also, wealthier nations implement EV policies quicker than developing nations; the reason being that the adoption of EV policies requires greater spending and long term investments that only wealthy nations can afford in the shortest time (Zimm, 2021).

Furthermore, Bruckmann, Willibald, & Blanco (2021) in their study revealed that countries with EV manufacturing capacity such as Germany and China have strong support for EV policies than countries lacking the know-how in that field.

Rietmann (2019) concluded in his study that climate targets adopted either at the national or supranational levels can explain why a country adopts EV policies or not. Usually, countries that are members of the European Union (EU) are somewhat pressured to implement the common climate goals set by the organization (Rietmann, 2019). Supervision and monitoring by the EU organisation translates into the adoption of cleaner measures and environmental-friendly modes of transportation by its members. Same cannot be said about countries that do not fall directly under the EU's umbrella. Even among countries that voluntarily adopt climate targets differ in their individual implementation of the climate goals (Rietmann, 2019). For instance, Norway is keen on implementing its nationally adopted climate goals whilst Brazil is relaxed in reaching its climate targets (Rietmann, 2019). Rietmann (2019) argues that the nature of climate goal or target can drive certain countries to be more active in implementation than others. This explains why certain countries adopt EV policies as a way of reducing carbon emissions whilst others may not.

To help round up the many factors responsible for the differences in the adoption of EV friendly policies among countries, Zimm (2021) puts forward three broad themes that make an analysis of this sort concise and comprehensible: 1. State characteristics, 2. State capacity, and 3. State impediments. Here, we understand state characteristics to mean the social, political, and economic factors such as demand conditions, political priorities, energy and economic system of a country. We also see state capacity to mean a country's manufacturing capacity and technological readiness. Finally, state impediment implies opposition from the civil society, actor groups or stakeholders who may be against the roll-out of EV policies.

What is more, Zimm (2021) mentions how international or external factors can foster or hinder the uptake of EV policies across countries. Influential countries, country groups, or global and regional blocs can adopt mechanisms that will keep subordinate or member countries in conformity with global climate policies (Zimm, 2021). Subordinate countries respond to international pressures through imitation, learning, and emulation (Zimm, 2021). The international actors are able to influence the domestic practices of subordinate countries through coercion or sanctions (Zimm, 2021). Competition and proximity are other external mechanisms that can help explain why countries may or may not adopt EV policies (Zimm, 2021).

Table 2 summarises the factors responsible for the differences in the adoption of EV policies among countries.

Table 2. Factors Responsible for the Variance among Countries Adopting EV Policies

General Factors Responsible for the Variance among Countries	
Internal Factors	External Factors
State Characteristics a. Political Priorities b. Demand Conditions c. Economic System d. Energy Sector Characteristics (energy security, major oil producers, grid over-supply, etc) e. National Climate Targets	a. Coercion b. Imitation c. Learning d. Emulation e. Proximity f. Competition g. Supranational Climate Targets
State Capabilities a. Technological Readiness b. Manufacturing Capacity	
State Impediment a. Opposing Forces (i.e. stakeholders, actor groups)	

Sources: (Zimm, 2021; Wesseling, 2016; Altenburg et al, 2015; Rietmann, 2019).

Referring to table 2; Zimm (2021) hints that the energy sector characteristic of a state should not be heavily relied on in explaining the EV policy adoption of a country. In her study, the assertion that oil-rich countries will be more reluctant in adopting EV policies could not be confirmed. In other words, there was little or no evidence to prove the validity of that assertion. The popular assertion that oil-importing countries are more likely to implement EV policies in time could not be confirmed in the same study. She therefore argued that other factors such as the existence of a local automotive industry, political prioritisation of EVs, and meeting climate targets may have more bearing on the topic than energy-related characteristics.

EV Policies in Oil-Rich Countries

It is suggested that reliance on oil can accelerate adoption of policies which promote EVs. Therefore, oil importing nations are expected to prioritize these policies compared with major oil-producing nations. However, comparative statistical empirical evidence does not confirm this argument suggesting that the impact of oil resources is not well understood (Zimm, 2021).

This part discusses the adoption of EV policies in oil-rich countries. The analysis in this section will be done thematically, and the themes will be taken from table 2 for analysis purpose.

Political Priorities

Under this theme, some research studies cite political roles as explanatory element to the adoption of EV policies in oil-rich countries. Eccarius and Lu (2019) argue that government policies play a major role in the adoption of EVs in a country. Governments or political leaders initiate or prioritise EV policies because of the need to harmonise climate preservation, advancement of novel technologies, growing mobility demands, and energy dependence (Eccarius & Lu, 2019). They however argue that in the design and implementation of EV policies, regulators should be mindful of the use of cash incentives as that may not always generate the desired results. Politicians could adopt measures such as banning of ICEs, preferential parking for EVs, preferential license plate issuance, and to mention a few to induce support and uptake of EVs (Eccarius & Lu, 2019).

Between 1998 and 2002, Figenbaum (2017) explains that the Norwegian government introduced a set of policies and incentives to improve the sales of EVs when the patronage of such vehicles was low as at that period. Despite the fact that Norway produces and exports oil in large quantities, it is currently regarded as the land of EVs. The possible explanation for Norway's fame with EVs is its political commitment to control pollution and reverse the effects of climate change even if that will cost them the largest contributor to its Gross Domestic Product (GDP) (Duffer, 2019).

Wesseling (2016) indicates that a number of oil-rich countries spend a great deal of their GDP on EV policies as a matter of political prioritisation. For instance, Wesseling (2016) found that Norway spends a chunk of its GDP on EV policies due to a very high sales incentive put in place by the government. Similarly, authorities in the Middle East bloc use their oil-wealth to fund various EV incentive policies; Saudi Arabia and UAE for instance are currently championing the adoption of EV policies in the region (Jacobs, 2020).

Altenburg and Chaudhary (2015) admit that various governments implement EV policies for different reasons. In their study, they indicated that a country like China adopted EV policies mainly to mitigate the effects of air pollution in its urban areas and that the government was committed to whatever means to attain that outcome. That necessitated the widespread implementation of EV policies across China.

Furthermore, Zhou and Zhang (2013) introduce to the discussion action-oriented policies which the Chinese government implemented in the years between 2009 and 2011. Many of those policies sought to test the energy efficiency performance of EVs. In this regard, the Chinese authorities selected few cities in a pilot programme where EVs will be introduced and its energy efficiency level observed (Zhou & Zhang, 2013). That did not end there; the government further revised its local automotive industry policy to enhance the production of more EVs and to streamline the manufacturing requirements or standards of the same. For instance, the Chinese government decided on a production target of 0.5 million EVs for the years between 2009 and 2012 (Zhou & Zhang, 2013). The Chinese authorities again introduced EVs into its fleet of public vehicles to promote energy efficiency in the sector and public charging infrastructure was also put up by the government along with subsidies to encourage private persons to own EVs (Zhou & Zhang, 2013).

Yang (2010) contends that the boom in electric bike market in China was largely driven by policy. According to Yang (2010), Chinese authorities implemented certain policies to control the usage of fuel-based motorcycles that had become so popular among road users in the country. They did that for reasons of easing traffic congestions in the cities, putting air pollution under check, and for safety concerns that were posed by the usage of these motorcycles (Yang, 2010). What was interesting about the Chinese motorcycle policy was that the policies so designed did not place any restriction on the use of electric bikes and that caused many people in the country to adopt that means of transport (Yang, 2010). For instance, China's annual sales of electric two-wheeled vehicles catapulted from fifty-six thousand (56 000) sales record in 1998 to over twenty-one million (21 000 000) annual sales in 2008 (Yang, 2010). Yang (2010) considers this phenomenal turn around as being influenced by policy – policy accident. Yang (2010) recommends that restrictive policies on ICEs should be prioritised and implemented alongside other lenient policies that are aimed at boosting EV uptake.

Climate Targets

Climate change and its looming effects may serve as a basis for many governments to initiate sustainable transportation measures. In this regard, Figenbaum (2017) argues that climate issues chiefly explain Norway's decision to adopt EV policies since 2009. He added that in the bid to meet national climate targets, Norway initiated incentives for citizens to buy EVs, and then in 2012, the country officially adopted a policy document on EVs. Further steps were taken by Norway authorities to discourage the use of fuel-powered vehicles through the introduction of hefty taxes and other purchase restrictions (Figenbaum, 2017).

Wesseling (2016) explains that countries such as Canada, United States, and Norway justified their huge investments in EVs on the basis that it will benefit their natural environment and help bring down harmful emissions from ICE vehicles that are contributing to global rise in temperature.

Altenburg et al (2015) adds that for countries that are part of the European Union (EU), their prime motivation for introducing EVs may be a high-order policy directive instructing its members to cut down on carbon emissions and one way of achieving that is to adopt EV policies and incentives. The European Union as a regional body owns about 0.3% share of global oil reserves (BP Statistical Review of World Energy, 2021). Tiny as their statistic may be, oil still benefits the region, yet European countries may be shifting more towards electromobility.

One of the key motivations for EV adoption in China according to Zhou and Zhang (2013) is the tackling of air pollution that has bedevilled the country for a while. Chinese authorities have crafted policies to ensure the usage of efficient or environment-friendly vehicles beginning in the major cities of China as that is where air pollution is concentrated most (Zhou & Zhang, 2013).

Energy Sector Characteristics

Rajper and Albrecht (2020) argue that electricity power structure and transmission has a vital role to play in the adoption of EVs especially between the developed and the developing world. They contend that whilst the developed world may mostly source their electric power from clean sources such as hydro-electric dams and nuclear power plants, the developing world may resort to thermal means of generating electricity. Thermal means are high in carbon emissions and may not be efficient in generating enough power for the country; talk less of reserving some to power up EVs.

Across Europe, electricity charges are cheap compared to fuel prices (Figenbaum et al., 2015a; b as cited in Figenbaum, 2017). So it makes sense why many European states are shifting to electrified means of transport. Electricity production in the European region is chiefly sourced from hydroelectric dams or plants hence making electricity generation less costly (Figenbaum et al., 2015b as cited in Figenbaum, 2017). The authors again add that a country like Norway generates excess electric power from its hydroelectric dam that makes it easier for it to adopt electric vehicles without experiencing the negative effects of grid overload.

Zhou and Zhang (2013) in their study on China determined that one of the reasons China is adopting EV related policies is to reduce the additional importation of oil into the country and to clamp down on the demand for it locally. Chinese authorities seek to provide security for its energy sector and the EV approach is one of the means to satisfy this objective.

Demand Conditions

Rajper and Albrecht (2020) have argued that there is a high demand for gasoline-based vehicles in developing countries and thus accounting for why there is a low uptake of EVs in such places. For instance, in China, there is a higher demand for gasoline-based motorcycles than any other vehicle (Rajper & Albrecht, 2020). They contend that unless EVs come with a special offer or an added value, the taste for fuel-based vehicles may not subside.

Altenburg et al (2015) argue that the demand conditions prevailing in a country may explain the adoption or not of EV policies and even determine the nature or specifics of an EV technology to adopt. In China for instance, Altenburg et al (2015) explain that there is a high demand for simple electric vehicles like scooters and motor-cycles (two-wheeled vehicles), and rickshaws (three-wheeled vehicles). This has led to a massive production of these kinds of vehicles in China. The adoption of sophisticated four-wheeled cars may be uncommon in China as these kinds of vehicles are not preferred in the region (Altenburg et al., 2015). They explain further that countries that were early adopters of EVs like Norway have car consumers who are environment-friendly but lovers of smart and fancy technologies. This may prompt the production of sophisticated electric vehicles such as the four-wheeled type. The inappropriateness of a technology type to a region may call for its widespread boycott.

Figenbaum (2017) states that Norway does not locally produce fuel-powered vehicles as such there is no high demand for ICE cars and that makes the transition to EVs easier.

Opposing Forces

Here, Figenbaum (2017) explains the introduction of EVs into the Norwegian market received less resistance from various actor groups such as dealers and businessmen who were directly involved in the sale of ICE vehicles. In other words, there were limited opposing forces to EV policy implementation in the country - Norway. Actor groups in the country including sub-government agencies, Non-Governmental Organisations (NGOs), and private businesses lobbied the Norwegian government for incentives to experiment with EVs (Figenbaum, 2017). The Norwegian case was such that existing autodealers and automakers did not see the introduction of EV policies as a threat but rather as an opportunity to diversify their portfolio and to attract new customers who may be interested in EVs (Figenbaum, 2017). On fewer occasions did EV policies receive criticisms and that was even from the academic circles (Figenbaum, 2017). It can therefore be said that the successful introduction of EVs into the Norwegian transport system is largely attributable to the welcoming attitudes of stakeholders and actor groups in the country.

Competing interests on the implementation of environmental-friendly policies can sometimes stagnate the uptake of EVs in oil regions or countries (Calef & Goble, 2007; Hawkins, 2020) To exemplify this, the implementation of ZEV mandate (specific measures to achieve zero emissions from fuel-powered vehicles) in California to boost EV diffusion was strongly opposed by the oil companies and the existing car manufacturing industries whilst groups (environmental NGOs and public health officials) that were in favour of the mandate persistently fought for its implementation (Calef & Goble, 2007). The end result was that the ZEV mandate despite its eventual implementation in the 1990s failed to put enough EVs on the road and slowed down the rate of EV diffusion in California (Calef & Goble, 2007).

Public and private firms in oil-rich places with capitalist economies or systems may be less willing at the early stages to invest more into research and development of eco-friendly technologies like EVs due to uncertainties and perceived lower profit returns (Arrows, 1963 as cited in Sierzchula et al., 2014). This may affect the rapid development of electric mobility policies in these oil regions and can slow EV uptake among car consumers (Sierzchula et al., 2014).

Manufacturing Capacity

A number of the oil-rich countries may also be a car manufacturing country. As revealed by an empirical finding, oil resources in these countries do not preclude them from advancing with EV policies (Wesseling, 2016). In fact, some of these countries have made investments in automotive research development programmes, as an EV policy measure, with the hope that progress in such an area will boost and enhance the manufacturing capabilities of their existing automotive industries. In places like China and the United States of America (USA) despite their vast oil reserves already support their automotive industries with free money and loans for research purposes (Wesseling, 2016). However, oil-rich countries with weak car manufacturing strengths prefer to invest in EV sales incentive programmes that may profit their local automotive industries (Wesseling, 2016). Norway, for instance, has adopted sales incentive approach as a means of ensuring EV diffusion in the country (Wesseling, 2016). Their approach may be due to its weak car manufacturing know-how and capacity.

Altenburg et al (2015) admit that differences exist in national technological or manufacturing capabilities and that is why certain countries will embrace EVs early and others late. China may have progressed with car manufacturing but have limitations especially with the making of electrified vehicles that may be good enough for commercial consumption (Altenburg et al., 2015). For instance, Chinese automakers are yet to come out with efficient car batteries that can power electric vehicles for long hours (Altenburg et al., 2015). Manufacturing limitations may affect how a country chooses to advance with EV policies.

Technological Readiness

Under this theme, Rajper and Albrecht (2020) argue that the developed world, given the level of their technological and infrastructural development, may be in the position to accommodate EVs more successfully than the developing world. There are ongoing investments into EV infrastructure and technology in the developed world, but very few of such could be said to be happening in the developing regions (Rajper & Albrecht, 2020). They add that the developing regions may be reluctant in shoring up its EV infrastructure and technologies because such investments may benefit the few rich and not the larger population.

Eccarius and Lu (2019) also argue that the putting up of charging stations and battery swapping centres may be challenging for many developing countries; they have not developed the technology to do so, and there are little investments in that respect as well. They further argue that in many places in Asia, electricity network and road technologies to support EVs are not well-developed. The industrialised economies have far advanced in these technologies, thus EV deployment in these regions can be conducted to a larger degree (Eccarius & Lu, 2019).

According to Yeh (2007), oil-rich countries have much concern for the environment and it is one reason why countries like Brazil, China, and the United States chose to adopt natural gas vehicles as a clean alternative to diesel and gasoline-based vehicles. The author further argues that the transition to natural gas vehicles became easy because these countries (Brazil, China, and United States) had the technology and infrastructural setup to accommodate natural gas vehicles. By extension, the adoption of cleaner modes of transport such as EVs can be made possible when countries are prepared and have the infrastructure to support such innovations (Yeh, 2007).

Economic System

Rajper and Albrecht (2020) agree with the rest of scholars who contend that government's intervention in EV market creation is the surest way to boost EV diffusion in many countries including oil-rich ones. The Chinese government has intervened in many ways to ensure that EVs have a market in its economy (Rajper & Albrecht, 2020). It started with the Chinese government banning the sales and use of fuel-based two-wheeler vehicles and then providing purchase-incentives for electric two-wheeler vehicles (Rajper & Albrecht, 2020). According to Rajper and Albrecht (2020), the government of China progressively rolled out incentive plans and other policies to ensure that EVs have a place in the transport economy of the country.

According to Wesseling (2016), the type of market economy may partly account for differences in EV policy adoption and approaches among countries. He argues that statist economies are likely to invest in EV infrastructure than any other type of a market economy. He further explains that governments with liberal economies like the United States that favours a free market system will sometimes intervene when it comes to the introduction of EVs into their market domain. However, Wesseling (2016) found out in his study that the penetration of EVs into any market structure or economy may take an arbitrary path; it was only in the exceptional case of a statist economy where the state heavily championed EV policies and that was even in the area of providing infrastructure to support EV roll out.

Altenburg et al (2015) argue that there are market failures inherent in many national economies and how these nations address the market failures may differ in approaches. As a result, in order to introduce EVs into markets ridden with much inefficiency may require government or state support or intervention and these may differ at national levels (Altenburg et al., 2015). Specifically, what governments may subsidise and how they plan on dealing with coordination failures may differ according to a country (Altenburg et al., 2015). Because of this, China provides generous purchase subsidies to start an EV market (Altenburg et al., 2015). Norway took similar path in 2009 when the sale of EVs or patronage was low (Figenbaum, 2017). According to Figenbaum (2017), the Norwegian transport sector is a heavily taxed one ridden with high taxes on car registration, yearly taxes, fuel taxes, and many toll roads. He contends that in order to create a market for EVs and boost its

uptake, Norwegian authorities had to reduce the tax burden for EV users plus other incentives that encouraged more people to purchase EVs.

External Factors

Technologists argue that major technologies seem to follow a revolutionary path to its adoption; hence a major technology like EVs may not require initial government decision and authorisation as the adoption of EVs may happen naturally everywhere (Rowlatt, 2021). For instance, the growth and dominance of major technologies like the internet, photography, steam engine, and even ICE vehicles followed a revolutionary path and had little to do with prior political decision by a country to adopt or not (Rowlatt, 2021). Technologists postulate that the adoption of a principal technology like EVs will occur gradually, grow at an exponential rate, and get to the mature stage where growth will slow down again, and this process is normally represented in an S-Curve (Rowlatt, 2021). Again, Ben Pullen - CEO & co-founder of Global EVRT- is on record to have said that not even the oil-rich countries will be spared from the technological revolution to adopt EVs; they have no means to dodge or resist this tide of change (Enel Foundation, 2018).

External influences may greatly shape the policy direction of a sovereign nation. Figenbaum (2017) argue strongly that there were ongoing developments in the international space that served as a motivation for countries like Norway to carry on and expand its EV adoption policies. He argues that already there were stringent policies adopted by regional blocs like the European Union to cause its members to reduce carbon emissions, several global climate policy negotiations had been initiated, and there were other car manufacturing companies like Nissan and Tesla joining the race to be the first to manufacture electric vehicles that could outperform fuel-powered vehicles. These external developments summed up led to an increasing number of electric vehicles on the global market and subsequently made EV adoption in Norway an easy choice (Figenbaum, 2017).

Wu and Zhang (2017) argue that the effects of recent oil price fluctuations in the global economy and the need to protect the environment (reduce carbon emissions) are two important factors driving the adoption of EVs among many countries including oil-rich ones. Concerns of this nature have ensured that countries put in place policy measures aimed at influencing EV uptake. For instance, oil producing nations such as Russia and China, due to these external factors as aforementioned, have all acted through policy means to create EV market in their economies (Wu & Zhang, 2017). Russia tows the direction of setting up EV infrastructure and to boost EV uptake through policy measures like tax exemptions and many more (Wu & Zhang, 2017). China is a bit more elaborate in crafting and implementing EV policies alike. China, apart from introducing subsidies and incentives to encourage the purchase and use of EVs, have gone further to introduce EVs into government or public fleets of vehicles, set up fast charging infrastructure for EVs in many areas and established a giant automobile industry focusing on EV production at unprecedented rates (Wu & Zhang, 2017).

There are also global initiatives such as the Electric Vehicle Initiative (EVI) that is aimed at providing a common platform for the discussion and cooperation on EV development and deployment across the diaspora. EVI was started by two oil-rich nations – USA and China – and has since received the support of many countries (Zhou & Zhang, 2013).A meeting was convened in Shanghai, China by EVI members in 2011 to discuss issues regarding EVs and a Shanghai Declaration was adopted (Zhou & Zhang, 2013). China has already taken wider steps in implementing various provisions agreed on in the Shanghai declaration. It is hoped that other member-countries will act in accordance to the provisions established in the proposal.

Under this theme, factors such as coercion from regional blocs such as the EU, emulation, competition among multi-national EV manufacturing companies, uncertainties of the global oil economy and supranational climate targets have ensured that many countries, including oil-rich ones, adopt EVs and the policies to accelerate its uptake.

CHAPTER III
Results

In this part, we highlight the electric vehicle policies adopted by UAE and Nigeria and compare these policies and the various factors shaping implementation in these two cases. UAE has been experimenting with EV friendly policies whereas Nigeria is a laggard compared with UAE. Both countries are major oil producing nations; in fact, UAE's resources are more than Nigeria's when factoring in the population size and area. Therefore, we expect that this variation be attributed to factors other than oil reserves.

Current State of EV Policies in UAE

UAE has a wide range of green policy initiatives that may enhance the uptake of EVs: Dubai Green Mobility Strategy 2030 ensures that the number of EVs in Dubai is shored up by 2030; and Dubai Carbon Abatement Strategy 2021 which looks at reducing carbon emissions from the transportation sector (Dubai Electricity and Water Authority (DEWA), 2019) Generally, UAE's adoption of EV policies is far-reaching and comprehensive. One could see that there is a conscious attempt by the Emirates to keenly embrace the EV idea and gradually phase out ICE vehicles. We deem it necessary to throw more light on pro-EV policy initiatives in UAE:

To begin with, UAE has adopted a regulation that is concerned with the general requirements for electrical motor vehicles; it includes requirements for setting up charging stations, guidelines for dealing with electrical vehicles after been involved in an accident, and performance evaluation of these vehicles (Emirates Authority for Standardization and Metrology). Furthermore, through government announcements, the people of Dubai have been urged to patronise EVs over ICE vehicles, and the Dubai Supreme Council of Energy has issued a directive to ensure that ten percent (10%) of all cars are eco-friendly by 2030 (Berdikeeva, 2020). Again, the Dubai Electric and Water Authority (DEWA) has set up close to one-hundred (100) electric vehicle charging stations (Mahroogi & Narayan, 2019). Non-commercial EV owners can charge for free at all DEWA public charging stations till December 2021 (Gulf News, 2019). There are currently about 650 charging points in UAE (Unger & Cronin, 2020). The Dubai Roads and Transport Authority (DRTA) intends to operate almost fifty percent (50%) of passenger taxicabs using hybrid technology by 2021 (Plotz, Funke, & Jochem, 2018). Likewise, Dubai and Abu Dhabi have together launched electric scooters in their region to ease traffic congestions (Brank, 2020).

According to Mahroogi and Narayan (2019), the government of Dubai has incentive schemes in place such as allocating free parking spots in forty (40) different locations to owners of EVs. Also, EV users in Dubai enjoy discounted car registration and renewal, toll exemptions, bonus warranty for EVs, and incentives for local businesses to begin using EVs (Berdikeeva, 2020). As part of the incentives to boost EVs, Sharjah offers free charging for EV owners till 2025 (Brank, 2020).

Proceeding further, there are private or individual initiatives that enhance EV's prospect in UAE:

1. The Al-Futtaim Group based in UAE has released the first expensive hybrid vehicle in the GCC and the Middle East**;**
2. Lexus also offers hybrid models in the UAE (Mahroogi & Narayan, 2019).

According to Mahroogi (2019), UAE's policy makers do not want to be at a disadvantage especially when there are fluctuations in oil prices lately, this has caused policy makers in the country to resort to alternative technologies like renewable energy resources and electric and hybrid automotive systems in order to diversify and make the economy more resilient.

In light of the foregoing policies and measures to boost the uptake of EVs in UAE, there are lingering challenges that lower the potency of these measures such as, limited car models that would appeal to the large consumer base or driving population in UAE, delay that comes with charging of EVs, limited knowledge and advertisement of EVs, and addictiveness to ICE vehicles (Unger & Cronin, 2020).

Current State of EV Policies in Nigeria

Nigeria has been lax in embracing green automobile technology and accompanying policies. The level of preparedness to adapt to the changing trend towards electro-mobility or EVs is not noteworthy. Even if there has been actions taken to introduce EVs in Nigeria, it has been frustrated by opposing forces in government. A telling example is the electric cars bill of 2019 – sponsored by Senator Ben Murray-Bruce - which was rejected by the Nigerian parliament. Agunbiade and Siyan (2020) explained that the bill failed because the law makers thought it would hurt the Nigerian economy so bad since it was a major oil producer, and again, it will be difficult shifting from the use of ICE vehicles to EVs.

On the 7th of September, 2019, Nigeria showcased its first home-made electric car to the world; this was accomplished by the University of Nigeria, Nsukka (Onyilo et al, 2020). The electric car can be charged from any electric socket and can reach a distance of 30 kilometres when it is fully charged (Pulse, 2019). Despite efforts to encourage the production of EVs in the country, there is currently nothing done to realise mass production of electric vehicles. This claim is supported by Onyilo et al (2020), who assert that there is no manufacturing or production of green automobiles in Nigeria.

There is still a glimmer of hope in that one could perceive the enthusiasm that certain foreign and local car manufacturing companies demonstrate towards further enhancing EV uptake in Nigeria. The Stallion Motors of Nigeria and Hyundai Motors have together launched the Hyundai-Kona EV in November 2020, an event that was welcomed by the EV community in Nigeria (Iruoma, 2021). We can also make mention of a local firm, Nigus Enfinity and its Chinese partner (Build your Dreams), that promised to introduce EVs into the Nigerian automobile market in 2018 and set up a local assembly plant for EVs by 2020 (Onyilo et al., 2020; Nigerian Investment Promotion Commission, 2017). PSC industries limited of Nigeria has arranged to introduce EV chargers for electric vehicles in Nigeria and in some parts of West Africa (Ebele, 2019). Again, a Slovak-based company, Sirieco, has come public with its plans to establish a plant in Calabar, Nigeria that will assemble electric cars (TNAP, 2019). Onyilo et al (2020) finally hint that there are ongoing trainings and workshops for potential employees for the green automobile industry in Nigeria and that gives hope for the eventual realisation of EVs in Nigeria.

Nonetheless, authors or researchers who have tried to explore the Nigerian case with regards to its adoption of EV policies have all concluded that Nigeria at the moment is not prepared to embrace EV technologies (Onyilo et al, 2020; Agunbiade & Siyan, 2020). This assertion is valid in many ways:

At the domestic level, many energy experts have argued it will take decadeslong to experience widespread diffusion of EVs in Nigeria (Iruoma, 2021). It is worth noting that Nigeria has a general auto policy in place but it does not include clear-cut guidelines on a seamless shift to EVs (Nigeria Energy, 2021). Additionally, Nigeria is faced with several challenges in the roll out of EVs: Importation of second-hand ICEs into the country is predominant; the few domestic motor manufacturing companies prioritise the production of ICEs over EVs, and poor electricity power supply (Iruoma, 2021; Onyilo et al., 2020).

At the comparative regional level, Cape Verde happens to be the only African country to have taken bold steps to halt the import of ICE vehicles by 2035 (Gaventa, 2021). Nigeria is yet to come out with specific plans to phase out ICEs. Africa’s ongoing preference for used cars, power generation concerns in Africa, and the unattended infrastructure deficit does not make it clear when EVs can penetrate its automobile market (Gaventa, 2021; Iruoma, 2021).

Comparing EV Policies in United Arab Emirates (UAE) and Nigeria

To this end, we argue that the existence of large oil reserves does not necessarily stall adoption of EV friendly policies. Whilst the UAE seems to be closing in on countries in Europe, North America, China, and the Scandinavian region in terms of EV policy adoption or implementation, Nigeria is still struggling to pick up speed. Both are major oil-producing countries, but why this variance?

Findings indicate that UAE's adoption of newer technologies like EVs is as a result of a political commitment by its leaders (Dubai Electricity and Water Authority (DEWA), 2019; Berdikeeva, 2020). Authorities in UAE want to diversify the country's economy through the adoption of newer technologies like EVs that may have the potential to affect economic growth positively. For this reason, the government of UAE and its institutions has taken it up to introduce certain incentive policies that will induce its citizens to patronize EVs (Mahroogi & Narayan, 2019). UAE authorities have tried to vary these policies and to make it all-embracing, as such, they have and are still investing in EV infrastructure and incentive programmes that will attract more people to adopt this new technology. There are incentive schemes like free parking spots for EV users, discounted car registration and renewal, toll exemptions, bonus warranty for EV users, free charging for EV owners, and favours for local businesses that use EVs (Berdikeeva, 2020; Brank, 2020; Mahroogi & Narayan, 2019).

The Emirates have introduced safety and performance regulations for car makers and vehicle importers to follow in order to put quality EV models on the market for potential consumers (Emirates Authority for Standardization and Metrology). UAE authorities have also endorsed EVs openly for their citizens to have confidence in the new technology (Berdikeeva, 2020). As another way of boosting public confidence in EVs, regulators and heads of ministries in the country have introduced EVs into government fleets of vehicles (Dubai Electricity and Water Authority (DEWA), 2019; Berdikeeva, 2020; Plotz, Funke, & Jochem, 2018). In the bid to ease traffic congestions, make public transportation attractive for their citizens, and gradually phase out ICE vehicles, the Emirates decided to introduce electric scooters and taxicabs that emitted less carbon in order to revolutionise the transport sector in UAE (Plotz, Funke, & Jochem, 2018; Brank, 2020). These developments are typically a political decision to enhance the uptake of EVs in UAE.

UAE can be said to be technologically prepared to adopt EVs. The necessary technological setup to make EV roll out successful may be available and accessible by everyone who chooses to adopt EVs. There are functional charging points installed in many areas in the country; electricity supply may not be a hindrance to EV deployment as supply is adequate to support such a programme; finally, the leaders of UAE have demonstrated susceptibility to the EV idea that can be easily imparted to citizens and inhabitants through various policy mechanisms (Mahroogi & Narayan, 2019; Unger & Cronin, 2020; Berdikeeva, 2020).

Arguably, UAE has one of the supportive, progressive, and innovative actor groups and stakeholders in the Middle East region. The activities of interest groups such as car manufacturers, autodealers and other stakeholders make EV adoption much more realisable in the region. They have shown little resistance to the numerous EV policies implemented across UAE. Ultimately, their continued support and innovativeness have ensured the consolidation of EV policies in the country. For instance, AL-Futtaim Group of UAE is supplementing government's effort of boosting EV uptake through the manufacturing and promotion of luxurious hybrid EVs that may suit the taste of many Arab car consumers (Mahroogi & Narayan, 2019). Also, citizens who may be key stakeholders have so far exhibited little resistance to the numerous EV policies implemented in the country.

Furthermore, there are economic factors that make EV policy adoption important and attractive to a major oil-producing nation like UAE. It is about achieving economic security and lessening the impacts of fluctuations in world oil prices on UAE's economy (Mahroogi & Narayan, 2019). UAE's vision to grow a more stable and thriving economy may have led its policy makers to want to bring diversification into its oil-dominant economy. Economic diversification programme will at least ensure that whenever there is an abrupt global shift to electrified mobility, they may be prepared and will not be on the receiving end of such technological revolution (Mahroogi & Narayan, 2019). The adoption of EV technology in UAE will ensure the country benefits from the economic advantages that come with EV adoption such as the creation of new employment opportunities and revenues that may be generated from EV users and investors.

EV adoption in UAE can be said to have been influenced by external factors as well. There is the influx of foreign car manufacturing companies into the country. For instance, famous car manufacturing companies such as Lexus and Tesla normally showcase their new EV models through their branches in the country and even lobby government agencies to patronise their products (Mahroogi & Narayan, 2019). Their activities could be said to have contributed to the wider adoption of EVs in UAE. By and large, the success story of UAE is as a result of the pivotal role of the government or authorities to place the EV agenda at the forefront of policy discussions and consideration.

The case of Nigeria is one that lacks government support and policy framework. Despite the private sector doing its part to support EV diffusion, there has been none recorded on the part of government to support this similar goal (Onyilo et al., 2020; Agunbiade & Siyan, 2020). There are no substantive policies directed at ensuring EV adoption in Nigeria. To reiterate, the government has shown very little commitment towards investing in the green automobile industry and has blatantly refused to consider any idea or policies that will prepare the grounds for EV diffusion in the country (Nigeria Energy, 2021; Agunbiade & Siyan, 2020). For instance, the refusal to pass the electric car bill for fears of hurting the oil economy is a clear indication of government's lack of support or disinterest in EV initiatives (Agunbiade & Siyan, 2020). Furthermore, the government of Nigeria lacks long-term planning and goals on EV adoption (Nigeria Energy, 2021). Unlike UAE that has come out with long-term plans and targets even at the national level in terms of regulations and procurement wise, same cannot be said about Nigeria. There are no set plans and targets by the government to adopt EVs now or in the future.

Also, there may be no fully-operational EV manufacturing industries in Nigeria; the few car manufacturing and assembling companies prioritise the production of ICEs over EVs (Onyilo et al., 2020; Iruoma, 2021). The establishment of EV manufacturing industries may go a long way to boost customer confidence in the new technology as their presence assures potential buyers of redress and guarantee on their products. The unavailability of green automobile manufacturing companies dims EV prospects in Nigeria. Potential buyers are therefore deprived of model choices from which they can patronise. UAE has gone a little further in advancing this idea and making it more attractive for electric car makers to site their plants in the country. In this sense, it can be said that Nigeria lacks the manufacturing capability to support the diffusion of EVs.

Nigeria has a crippling energy challenge in terms of electricity supply. The reality of this crisis makes EV diffusion almost impossible. Onyilo et al (2020) admit that Nigeria has insufficient power supply and that in a way limits consideration of ever settling for EVs.

As noted earlier on, car importation into Nigeria is mainly secondhand petrol vehicles (Iruoma, 2021; Onyilo et al., 2020). The taste for these cars is insatiable and that altogether makes EV penetration into the Nigerian market a hurdle. Car importers and consumers in Nigeria may not wish to change their preference for ICEs; a probable reason may be that they are less interested in EVs due to their limited exposure and trial of the new technology. Also, infrastructure to support EVs may be unavailable (Onyilo et.al, 2020; Agunbiade & Siyan, 2020). One can therefore argue that Nigeria is not technologically prepared to adopt EVs.

The operations and activities of foreign EV manufacturing companies in Nigeria may serve as a boost to the uptake of EVs in the country. For instance, the introduction of EVs and several proposals to establish EV assembling plants in Nigeria by the Stallion Motors and Slovak-based company, Sirieco, may serve as an external impetus to the adoption of EVs in Nigeria (Iruoma, 2021; TNAP, 2019). We can add that these external mechanisms are likely to shape the future of EVs positively in Nigeria.

There is a vibrant private sector in Nigeria that has embraced the idea of electromobility and is continuously advancing steps such as the establishment of EV assembling plant by Nigus Enfinity, introduction of EV chargers by the PSC industries, and capacity building for potential employees of the EV industry to make EV diffusion a widespread phenomenon in the country (Onyilo et al., 2020; Ebele, 2019; Nigerian Investment Promotion Commission, 2017) However, we caution that without the support and total commitment of the government to embrace EV ideas, the efforts of these well-meaning private agencies and other stakeholders may bear fewer fruits.

Table 3. Factors Responsible for the Difference in Adoption of EV Policies between UAE and Nigeria

UAE	Nigeria
State Characteristics a. Political Commitment b. Concern for Economic Security and Diversification c. Robust Grid System	State Characteristics a. Lack of Political Commitment b. High Demand for ICE Vehicles c. Insufficient Electricity Supply
State Capabilities a. Ample EV Infrastructure and Technology	State Capabilities a. Limited EV Infrastructure and Technology b. Limited EV Manufacturing Capacity
State Impediment a. Supportive Interest Groups and Stakeholders	State Impediment a. Supportive Interest Groups and Stakeholders
External Factors a. Influx of Foreign EV Manufacturing Companies	External Factors a. Influx of Foreign EV Manufacturing Companies

Source: Author's Summary

Table 3 sums up factors responsible for the difference in the adoption of EV policies between UAE and Nigeria. It emphasizes the need to consider the three broad themes (state characteristics, state capabilities, and state impediment) and an additional ‘‘external factors’’ to explain policy diffusion in oil-rich countries. The factors that explain the policy difference between UAE and Nigeria are various, defying the conception that oil resources alone determine the path to the adoption or not of innovative technologies like electric mobility. In UAE, factors other than their oil wealth played immense role in its adoption of EV policies. In Nigeria where EV-friendly policies are virtually absent, there were other factors besides their oil wealth that contributed to such outcome.

CHAPTER IV
Conclusion

In explaining the adoption of EV policies in oil-rich countries, we have argued that oil as a natural resource cannot by itself hinder the adoption of EV friendly policies and that one has to look elsewhere like economic and governance elements to explain policy adoption. In the two cases we studied, whereas the oil resource in Nigeria served as an obstacle to the adoption of EV friendly policies – take for instance, the declination to pass EV policy bill in parliament for fears that it may hurt the oil economy -, the same cannot be said about UAE and its adoption of EV policies. UAE and Nigeria are both oil-rich but in terms of EV policy adoption, there exist differences. Nigeria's refusal to adopt EV policies could be explained and understood from a viewpoint that it does not want to hurt its oil economy, but that of UAE and the numerous EV policies it has implemented can be properly accounted for by considering other factors as the existence of oil in the country could not stop its policy makers from adopting EV friendly policies. Even in the case of Nigeria, there were other indications besides the oil factor that altogether worked against any attempt at adopting EV friendly policies.

The findings and analysis in the work point to the fact that in explaining EV policy adoption in oil rich countries, our focus should not only be on oil resource as an explanatory element as other factors may also be helpful in explaining EV policy adoption in oil-rich places. Research has even shown that these other factors may be more pertinent than the oil resource factor when explaining EV policy adoption in oil rich countries. Zimm (2021) concluded in her study that pre-eminence should not be given to oil resource factor in explaining whether or not a country may adopt EV friendly policies; instead, we should look to other factors such as existence of car manufacturing industry, climate targets, politics and governance elements, and to mention a few. We conclude in similar fashion that the possession of oil by a country is insufficient in explaining the adoption or not of EV friendly policies.

Zimm (2021) was spot on with introducing three (3) broad themes (state capabilities, state characteristics, and state impediments) to consider when explaining EV policy adoption in oil-rich countries. The analysis on EV policy adoption in UAE and Nigeria could be synthesised into these three themes. On state capabilities, it could be said that UAE is technologically ready given its present technology installations and infrastructure to support EVs in the country. For instance, UAE has adequate charging centres spread across the country; and parking spaces have been expanded and dedicated to the use of EVs. Authorities and citizens may be susceptible to trying newer things and technologies like EVs. This makes the implementation of EV policies in UAE easily conceivable and less difficult to adopt. It first began with UAE authorities yielding to the idea of electromobility, and ever since, the purchase and usage of EVs by citizens or inhabitants have increased suggesting susceptibility and the fact that UAE may be a technology-savvy nation.

On state characteristics, UAE is a major oil-producing country and that one would have envisaged that EV policies that may likely affect and reduce oil revenue would be abhorred by it, but that is not the case according to our findings. There is eagerness and political commitment to introduce set of EV policies into the country's transport sector that is already dominated by ICE vehicles. The reason for such political action in UAE may be to diversify the country's oil-dominant economy by introducing renewable, newer technologies like EVs. As such, policy measures and incentives that may boost EV uptake have been implemented variously by the government body. We conclude here that the present realisation of EVs in UAE could not have been achieved without the intervention of the government agency.

Still under state characteristics, there is the concern of attaining economic security in UAE. Global oil prices have seen fluctuations of late and major oil-producing nations like UAE suffer huge losses as a result. To avoid this situation in future time and achieve a more stable economy, economic diversification programme has been set into action to safeguard the economy from fluctuations in world oil prices. This includes the adoption of newer technologies like EVs that may have promising economic advantages and can stabilise UAE's economy in the long term.

Generally, opposition activities against the introduction of EV policies in UAE have not been disruptive suggesting usual stakeholder cooperation in the country. Actor groups and businesses that are into the sales of all types of cars and the citizenry body have been largely supportive of the idea of change in the existing mode of transport. Less opposition from these key stakeholders may have encouraged policy makers in UAE to keep up with their policy design of ensuring greater uptake of EVs in the country. This point may be classified under state impediment.

Finally, there are external factors that may have contributed to the successful adoption of EVs in UAE. Foreign car makers like Lexus and Tesla that produce EVs have made available different types of EVs with various functionalities in the country. This makes the procurement of these vehicles easy and less costly too. This might have encouraged potential buyers to try this new technology once they have them at their doorsteps.

Turning to Nigeria, under state characteristics, there are two key factors that make EV policy adoption in the country unsuccessful. First, there is the lack of political commitment to introduce policies that will boost EV uptake in the country. Leadership of the country is more concerned about protecting Nigeria's oil economy from any new thing that may usurp it. The country is therefore yet to come out with any substantive EV policy to revolutionise its domestic transport sector. And second, Nigeria is faced with perennial energy crisis in the sense that it is unable to generate and supply electricity in sufficient levels to boost its economy. Electricity is the main source of fuel for EVs and considering the poor supply of it in Nigeria makes implementation of EV policies impracticable.

About state capabilities, Nigeria is lacking in that sense. It is not a car manufacturing country and it is assumed that Nigeria may not have the know-how to make and produce these new kinds of vehicles – EVs. What is more, the few car manufacturing companies in the country specialises in the production of ICE vehicles and the expertise to make or produce EVs may be constrained to a large extent. Again, under state capability, Nigeria may be unprepared technologically to embrace EVs at this point in time. Nigeria lacks the needed infrastructure to support EVs such as the setting up of charging points and battery swapping centres. Key stakeholders such as car dealers and businesses and consumers of cars in the country continue to

import and use second-hand fuel-based vehicles despite the availability of EVs on the global market.

On state impediment, there seem to be calmness among the various actor groups in Nigeria probably because there is no known EV friendly policy in full force that can cause stir and mixed reactions among stakeholders or actor groups. Rather, what has been witnessed in Nigeria is ever growing local private initiatives that favour the uptake of EVs in the country. These initiatives range from introducing EVs into the Nigerian car market, establishing plants for assembling EV parts, and providing training programmes and expertise in the manufacturing, production and maintenance of EVs.

There are also external factors like the influence of foreign car manufacturing companies such as the Hyundai Company and Sirieco that are now producing EVs for the Nigerian market and setting up the needed infrastructure to run the electric mobility programme. Their activities over time may increase EV awareness and make possible the diffusion of EVs in the country.

We however conclude that the political role or government involvement will be key to promoting EV uptake now or in the near future. As we have observed in the cases of UAE and Nigeria, the political presence in boosting EV uptake in UAE was essentially effective whilst the absence of political initiative and involvement in the case of Nigeria is chiefly to blame for the failure of EV uptake in the country.

Contrary to the original understanding of the resource-curse theory - that the abundance of natural resources in a country brings undesirable effects which includes limited room for innovations like electric vehicles and technologies -, this research has shown that oil or natural resources can either promote or stall technological innovations rendering discussions on the resource-curse theory complex and context-specific. This research therefore expands the resource-curse theory to include the possibility of reaping positive outcomes from the possession of natural resources as seen in the case of UAE. According to Papyrakis (2017), there are growing number of evidences that suggest the resource curse is context-specific and a number of factors influence how natural resources impact on a country. The factors can be political, social, and even the nature of the resource itself (Papyrakis, 2017). In this study, there were several factors besides the oil factor that hindered or promoted the adoption of EV policies in UAE and Nigeria and these factors were endogenous to each of the two countries. The outcome of this study supports the current debate that

there is the need to shift from the simplistic understanding of the resource-curse theory (that natural resource wealth often comes with undesirable outcomes) as other factors besides natural resource wealth altogether determines the fate of resource-rich countries in unique ways.

This study was a small-N type and conclusions derived from it may not be easily transferrable to other cases. It studied two cases and as such generalizations from it should be done with caution. Also, there were only few prior researches done on the topic and this can be attributed to the recent nature of the topic.

This study should be regarded as a preliminary study to explain EV policy adoption in oil-rich countries. We recommend that similar study be conducted in future to add more insights to the topic.

References

Agunbiade, O. &Siyan, P. (2020). Prospects of electric vehicles in the automotive industry in Nigeria. *European Scientific Journal*, 1857-7431.

Altenburg, T., Schamp, E.W., & Chaudhary, A. (2015). The emergence of electromobility: Comparing technological pathways in France, Germany, China and India. *Sci. Publ. Pol.* 43 (4), 464–475.

Arrows, K. J. (1962). The economic implications of learning by doing, *The Review of Economic Studies*, Volume 29, Issue 3, June 1962, Pages 155–173, https://doi.org/10.2307/2295952

Auty, R. M. (1993). *Sustaining development in the mineral economies: The resource curse thesis*. Routledge.

Berdikeeva, S. (2020). *Electric vehicle markets emerge in oil-rich UAE and Saudi Arabia.* Retrieved from https://insidearabia.com/electric-vehicle-markets-emerge-in-oil- rich-uae-and-saudi-arabia/.

BP Statistical Review of World Energy (2021). *Statistical review of world energy.* Retrieved from https://www.bp.com/en/global/corporate/energy-economics/statistical-review- of-world-energy.html.

Brank, B. (2020). *The rise of electric mobility in the Middle East – Time to make the switch?* Retrieved from https://gulfbusiness.com/the-rise-of-electric-mobility-in-the- middle-east-time-to-make-the-switch/

Brückmann, G. & Bernauer, T. (2020). What drives public support for policies to enhance electric vehicle adoption? *Environ. Res. Lett.*, 1-13. https://doi.org/10.1088/1748- 9326/ab90a5.

Bruckmann, G., Willibald, F., & Blanco, V. (2021). Battery electric vehicle adoption in regions without strong policies. *Transportation Research Part D*, 1-18. https://doi.org/10.1016/j.trd.2020.102615

Brunnschweiler, C. N. & Bulte, E.H. (2008). The resource curse revisited and revised: A tale of paradoxes and red herrings**.** *J. Environ. Econ. Manag.*, 55 (3), pp. 248-264

Calef, D. & Goble, R. (2007). The allure of technology: How France and California promoted electric and hybrid vehicles to reduce urban air pollution. *Policy Sci* **40,** 1–34 (2007). https://doi.org/10.1007/s11077-006-9022-7

Deshmukh, A. (2021). *Which countries have the world's largest proven oil reserves?* Retrieved from https://www.visualcapitalist.com/ranking-the-countries-with-the- largest-proven-global-oil-reserves-in-the-world/.

Dubai Electricity and Water Authority (DEWA) (2019). *DEWA extends free electric vehicle charging till end of 2021 for non-commercial users.* Retrieved from https://www.dewa.gov.ae/en/about-us/media-publications/latest-news/2019/11/dewa- extends-free-electric-vehicle-charging-till-end-of-2021-for-non-commercial-users

Duffer, R. (2019). *Why Norway leads the world in electric vehicle adoption.* Retrieved from https://www.greencarreports.com/news/1123160_why-norway-leads- the-world-in- electric-vehicle-adoption.

Ebele, O. (2019). '*Nigeria set for electric cars.*' 1-25.

Eccarius, T., & Lu, C.-C. (2019). Powered two-wheelers for sustainable mobility: A review of consumer adoption of electric motorcycles. *International Journal of Sustainable Transportation,* 1–17. doi:10.1080/15568318.2018.1540735

Emirates Authority for Standardization and Metrology (n.d.).

Enel Foundation (2018). *Accelerating electric vehicle adoption in the Middle East.* Retrieved from https://www.enelfoundation.org/news/a/2018/11/accelerating-electric-vehicle- adoption-in-the-middle-8east.

Figenbaum, E., Kolbenstvedt, M., 2015a. Pathways to electromobility – perspectives based on Norwegian experiences. TØI, *Report 1420/2015*.

Figenbaum, E., Kolbenstvedt, M., 2015b. Competitive electric town transport. Main results from COMPETT – an Electromobility+ project. *TØI report 1422/2015*.

Figenbaum, E. (2017). Perspectives on Norway's supercharged electric vehicle policy. *Environmental Innovation and Societal Transitions,* 25, 14–34. doi:10.1016/j.eist.2016.11.002

Gaventa, J. (2021). *Africa's bumpy road to an EV future.* Retrieved from https://energymonitor.ai/sector/transport/africas-bumpy-road-to-an-electric-vehicle- future.

Gulf News (2019). Charge EV for free until December 31, 2021. *Gulf News*. Retrieved from https://gulfnews.com/uae/transport/in-dubai-charge-ev-for-free-until- december-31- 2021-1.1574511667172.

Hawkins, A.J. (2020). *The electric car industry now has its own lobbying group.* Retrieved from https://www.theverge.com/2020/11/17/21571747/zero-emissions-transportation- association-tesla-uber-rivian-lobby.

Hundeyin, D. (2020). *What is the difference between the UAE and Nigeria? Everything.* Retrieved from https://businessday.ng/columnist/article/what-is-the-difference- between-the-uae-and-nigeria-everything/.

Iruoma, K. (2021). *Are electric cars a threat to Nigeria's economy?* Retrieved from https://african.business/2021/02/energy-resources/are-electric-cars-a-threat-to- nigerias-economy/.

Jacobs, F. (2020). *Even oil-rich Middle East is switching to EVs.* https://www.globalfleet.com/en/smart-mobility/africa-middle-east/features/even-oil- rich-middle-east-switching evs?a=FJA05&t%5B0%5D=Electrification&t%5B1%5D=UAE&t%5B2%5D =Saudi %20Arabia&curl=1.

Kestera, J., Noela, L., Zarazua de Rubensa, G., &Sovacoola, B. (2018). Policy mechanisms to accelerate electric vehicle adoption: A qualitative review from the Nordic region. *Renewable and Sustainable Energy Reviews*, 719–731.

Kumar, R. R., & Alok, K. (2020). Adoption of electric vehicle: A literature review and prospects for sustainability. *Journal of Cleaner Production*, *253*, 119911.

Khurana, A., Kumar, R., & Sidhpuria, M. (2020). A study on the adoption of electric vehicles in India: The mediating role of attitude. *Sage* , 23-34.

Kotilainen, K. A., Aalto, P., Valta, J., Rautiainen, A., et al. (2019). From path dependence to policy mixes for Nordic electric mobility: Lessons for accelerating future transport transitions. *Policy Sciences* , 573-600.

Li, W., Long, R., Chen, H. et al (2019). Effect of policy incentives on the uptake of electric vehicles in China. *Sustainability* .

Li, W., Long, R., Chen, H. et al. (2020). Public preference for electric vehicle incentive policies in China: A conjoint analysis. *International Journal of Environmental Research and Public Health* .

Mahoney, J. (2000). Strategies of causal inference in small-n analysis. *Sociological Methods & Research*, 28(4), 387–424. doi:10.1177/0049124100028004001

Mahroogi, F. O., & Narayan, S. (2019). A recent review of hybrid automotive systems in Gulf Corporation Council region. *IME, Part D: Journal of Automobile Engineering*, 3579-3587. https://doi.org/10.1177/0954407019836055

Melton, N., Axsen, J., & Moawad, B. (2020). Which plug-in electric vehicle policies are best? A multi-criteria evaluation framework applied to Canada . *Energy Research and Social Science* , 1-5.

Nigeria Energy (2021). *Electric car prices go down as experts task Nigeria on EV policy*. Retrieved from https://www.nigeria-energy.com/en/media/news/electric-car-prices- go-down-as-expert-tasks-nigeria-on-ev-policy.html.

Nigerian Investment Promotion Commission (2017). *Electric cars to be introduced into Nigerian market by 2018.* Retrieved from https://www.nipc.gov.ng/2017/08/25/electric-cars-introduced-nigerian-market-2018/.

Nigerian National Petroleum Corporation (NNPC) (2021). *Oil production.* https://www.nnpcgroup.com/NNPC-Business/Upstream-Ventures/Pages/Oil-Production.aspx.

Onyilo, I. A., Arsat, M., Latif, A.A., & Akor, T.S. (2020). Green automobile technology competencies in Nigeria and the fourth industrial revolution. *Journal of critical reviews* , 865-869.

Papyrakis (2017). *Natural resources: A blessing or a curse.* file:///Users/newtechpc6/Downloads/REPUB_88682_OA%20(2).pdf

Plotz, P., Funke, S.A., & Jochem, P. (2018). The impact of daily and annual driving on fuel economy and CO2 emissions of plug-in hybrid electric vehicles. *Transport Res Part A*, 331–340.

Pulse. Nigeria (2019). *UNN unveils Nigeria ' s first electric car*, 1-15.

Rajper, S. Z., & Albrecht, J. (2020). Prospects of electric vehicles in the developing countries: A literature review. *Sustainability*, 12(5), 1906. doi:10.3390/su12051906.

Rietmann, N., & Lieven, T. (2019). How policy measures succeeded to promote electric mobility–Worldwide review and outlook. *Journal of cleaner production*, *206*, 66-75.

Ross, M. L. (2015). What have we learned about the resource curse? *Annu. Rev. Polit. Sci.*, 18, pp. 239-259.

Rowlatt, J. (2021, June 1). Why electric cars will take over sooner than you think. *BBC News.* Retrieved from https://www.bbc.com/news/business-57253947.

Sierzchula, W., Bakker, S., Maat, K., & Van Wee, B. (2014). The influence of financial incentives and other socio-economic factors on electric vehicle adoption. *Energy Policy*, *68*, 183-194.

Smith, P.L. & Little, D.R. (2018). Small is beautiful: In defense of the small-*N* design. *Psychon Bull Rev* 25**,** 2083–2101. https://doi.org/10.3758/s13423-018-1451-8**}**.

Styczynski, A. B., & Hughes, L. (2019). Public policy strategies for next- generation vehicle technologies: An overview of leading markets. *Environmental Innovation and Societal Transitions*, *31*, 262-272.

Thomas, D. R. (2006). A general inductive approach for analyzing qualitative evaluation data. *American Journal of Evaluation*, 27(2), 237–246. https://doi.org/10.1177/1098214005283748

TNAP (2019). *Slovak company plans to assemble electric cars in 2019*.

Twin, A. & Li, T. (2021). *World's top 10 oil exporters.* Retrieved from https://www.investopedia.com/articles/company-insights/082316/worlds-top-10-oil- exporters.asp.

Unger, B. & Cronin, B. (2020). *Electric vehicles show potential in the UAE.* Retrieved from https://www.eqmagpro.com/electric-vehicles-show-potential-in-the- uae/.

US Department of Energy (2019). *How do all-electric cars work?* Retrieved from: https://afdc.energy.gov/vehicles/how-do-all-electric-cars-work

Venables, A. J. (2016). Using natural resources for development: Why has it proven so difficult? *J. Econ. Perspect*, 30 (1), pp. 161-184, 10.1257/jep.30.1.161

Weiss, M., Zerfass, A., & Helmers, E. (2019). Fully electric and plug-in hybrid cars - An analysis of learning rates, user costs, and costs for mitigating CO_2 and air pollutant emissions. *Journal of cleaner production*, *212*, 1478–1489. https://doi.org/10.1016/j.jclepro.2018.12.019.

Wesseling, J. H. (2016). Explaining variance in national electric vehicle policies. *Environmental Innovation and Societal Transitions*, *21*, 28-38.

Wilken, D., Oswald, M., Draheim, P., Pade, C., Brand, U., & Vogt, T. (2020). Multidimensional assessment of passenger cars: Comparison of electric vehicles with internal combustion engine vehicles, *Procedia CIRP*, Volume 90, 291-296, https://doi.org/10.1016/j.procir.2020.01.101.

Wu, Y., & Zhang, L. (2017). Can the development of electric vehicles reduce the emission of air pollutants and greenhouse gases in developing countries? *Transportation Research Part D: Transport and Environment*, 51, 129– 145. doi:10.1016/j.trd.2016.12.007

Yang, C.-J. (2010). Launching strategy for electric vehicles: Lessons from China and Taiwan. *Technological Forecasting and Social Change, 77(5), 831–834.* doi:10.1016/j.techfore.2010.01.010

Yeh, S. (2007). An empirical analysis on the adoption of alternative fuel vehicles: The case of natural gas vehicles. *Energy Policy 35*, 5865–5875.

Zhou, G., Ou, X., & Zhang, X. (2013). Development of electric vehicles use in China: A study from the perspective of life-cycle energy consumption and greenhouse gas emissions. *Energy Policy*, 59, 875–884. doi:10.1016/j.enpol.2013.04.05

Zimm, C. (2021). Improving the understanding of electric vehicle technology and policy diffusion across countries. *Transport Policy*, 54-66.

Appendices

Appendix A

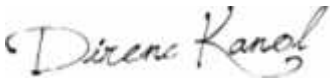
BİLİMSEL ARAŞTIRMALAR ETİK KURULU

28.12.2021

Dear Yedidia Owusu Achiaw

Your project “Explaining the Adoption of EV Policies in Oil-Rich Countries.” has been evaluated. Since only secondary data will be used the project it does not need to go through the ethics committee. You can start your research on the condition that you will use only secondary data.

Assoc. Prof. Dr. Direnç Kanol
Rapporteur of the Scientific Research Ethics Committee



Note: If you need to provide an official letter to an institution with the signature of the Head of NEU Scientific Research Ethics Committee, please apply to the secretariat of the ethics committee by showing this document.

Appendix B

Thesis

by Yedidia Owusu Achiaw

Submission date: 11-Feb-2022 03:31PM (UTC+0200)
Submission ID: 1760020397
File name: Yedidia_Owusu_Achiaw_Thesis_Final_1.doc (273K)
Word count: 14071
Character count: 78105

Thesis

ORIGINALITY REPORT

9%	8%	2%	3%
SIMILARITY INDEX	INTERNET SOURCES	PUBLICATIONS	STUDENT PAPERS

PRIMARY SOURCES

1	www.researchgate.net Internet Source	3%
2	Submitted to University of Duhok Student Paper	1%
3	Submitted to Yakın Doğu Üniversitesi Student Paper	1%
4	docs.neu.edu.tr Internet Source	<1%
5	link.springer.com Internet Source	<1%
6	journals.sagepub.com Internet Source	<1%
7	neu.edu.tr Internet Source	<1%
8	othes.univie.ac.at Internet Source	<1%
9	eprints.utm.my Internet Source	<1%