NORD University / BUSINESS SCHOOL

Master of Science in Global Management

Title of the Thesis:

The role of EVs' Push and Pull policy instruments in phasing out the market from ICEVs and achieving a widespread adoption of EVs: The Norwegian Context.

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Abstract:

Climate change subjects and crises have been tackled and addressed by many current scientific research, most of which show that the human activity is the main driver of the global warming which affects directly or indirectly the human living and endangers its existence and the existence of many other species that are considered paramount to preserve the survival and the balance of the human life. Wherefore many governments from around the globe have committed to work unanimously to reduce the causes of the global warming and the climate change under the Paris Climate Agreement and the Kyoto Protocol, and so many other agreements.

According to the IEA (International Energy Agency, 2017), the transport sector represents at least a quarter of global energy related GHG emissions, and therefore in response to the Paris agreement (2016) objectives, there have been initiatives to limit the global temperature at 1,5 °C above pre-industrial levels and decrease it from 2°C above pre-industrial levels. Nevertheless, the transport sector as one of the major causes of the increase of the global temperature, it is demanded to show a notifiable decrease in the GHG and the CO_2 emissions at least before 2025. However, it is seen that electrification could be a palliative solution to the transport's high GHG emissions.

Policymakers from around the globe committed to introduce EVs to decarbonize the transport sector and to mitigate the environmental challenges and the increase of the emissions emanating from the use of fossil fuel vehicles, and to set policies and incentives that would promote the adoption of the EVs as a sustainable alternative to the conventional cars, and thus reduce the personal mobility emissions and decrease the energy dependency on natural resources. In order to phase-in the EVs purchase and adoption within the market in addition to achieving an exponential growth in Electric vehicle sales, the government has made initiatives to lower the costs, to reduce the tax, to provide suitable infrastructure, to improve the technology, and so forth. According to the International Energy Agency, about 10% of sold passenger vehicles globally in 2022 were all-electric, what is considered to represent more than 10 times of all-electric sold passenger vehicles within the last five years.

However, the present thesis comes to study the role of the Push "Discouragement" and Pull "encouragement" policy measures and initiatives in phasing-in EVs adoption to decarbonize the road transport from the personal mobility's emissions. Findings show that participants accord more public support to Pull policies than Push policies, even though, both of them had a positive effect on the switching behavior towards EVs adoption. On the other hand, the

Mooring factor of the PPM theory related to the EVs policy incentives played both a positive role in the consumers switching behavior by targeting to introduce only new EVs by 2025 to the Norwegian market and had also a negative effect on the switching behavior by constraining and blocking the switching behavior of many car owners towards EVs adoption. As the changing policy campaigns and discounts are being removed by the government with the rapid pace of EVs adoption, yet some consumers still prefer to keep their conventional vehicles instead, since there will be no more benefits for EVs owners as it used to be before. The government therefore should consider the effect of this particular policy initiative in blocking the switching behavior towards the personal sustainable mobility and tackle it since there still are many individuals owning ICEVs in Norway, and their decision regarding that could constrain the regional, county, and national targets to phase-out the roads completely from ICEVs.

Key words: EVs, Push & Pull Policy measures, GHG and CO_2 emissions, Effectiveness, EVs owners and users, Consumers switching behavior, Push, Pull, mooring theory.

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List of Acronyms:

Acronym	Signification	Acronym	Signification
EVs	Electric Vehicles	**CO_2**	Carbon Dioxide
BEVs	Battery Electric Vehicles	**CO_2-eq**	Carbon Dioxide - equivalent
E-REVs	Extended Range Electric Vehicles	**CH_4**	Methane
HEVs	Hybrid Electric Vehicles	**HFCs**	Hydrofluorocarbons
PHEVs	Plug-in Hybrid Electric Vehicles	**LPG**	Liquefied Petroleum Gas
ICEVs	Internal Combustion Engines Vehicles	**PFCs**	Perfluorocarbons
CBM	Circular Business Model	**Nox**	Nitrogen Oxides
EGD	European Green Deal	**HC & WC**	Home Charging & Work Charging
ESR	Effort Sharing Regulation	**IN**	Innovation Norway
ETS	Emissions Trading System	**KP**	Kyoto Protocol
EU	Europe	**Mt**	Million tons
EU- EEA	Europe- The European Economic Area	**NICCDIES**	National Integrated Climate Change Database Information and Exchange System
GHG	Greenhouse Gas	**NOK**	Norwegian Kroner
Gt	Billion Tons	**Norwegian NTP**	Norwegian National Transport Plan
GW	Global Warming	**OECD**	Organization for Economic Co-operation and Development

PT	Public Transport	**OFV**	Opplysningsrådet for veitrafikken/ The Road Traffic Information Council
RCN	Research Council of Norway	**PA**	Paris Agreement
R&D	Research & Development	**PPM**	Push, Pull, Mooring
SIVA	Industrial Development Corporation of Norway	**SPP:**	Sustainability-Push-Pull Model
TCO	Total Cost of Ownership	**VAT**	Value Added Taxes
ZEV	Zero Emission Vehicles		

1.0 Introduction:

1.1 Background: the need for phasing-in electromobility, the case of Norway:

Following the excessive use of fossil fuels, and the growing dependency of the transportation sector on fossil energy, there has been a significant increase in various GHG emissions like "(CO_2), (CH_4), (N_2O), but mostly in (CO_2)" that have a lot of negative effects on global temperature raising many climate change issues (NICCDIES). However, the fossil-fueled vehicles sharply contribute to the deterioration of the air quality, the increase in the global temperature and climate change that in their turn, impact the economy, the human health & migration, the agriculture, the sea levels, and the life of all the species negatively (Black et al., 2011; Erickson and Jennings, 2017; Incropera, 2015; Sachs, 2015).

However, despite the Norwegian government's investments in advanced fuels-alternatives in the transport sector since 1990s, the **Norwegian GHG emissions from road transport** *(Road Transport emissions are accounted with non-ETS emissions)* **reached high levels of CO_2 emissions accounted to 14 million tons CO_2-eq in 2022**, which constitutes about 29% of the total emitted emissions in Norway that were fixed at **48.9 Mt CO_2-eq** and were the largest source of the whole emitted CO_2 emissions in Norway that year (Norskindustri, 2023), whilst the Norwegian road transport's subsector emissions that emanate originally from **road traffic** reached **8.7 Mt CO_2-eq** in the same year, which constitutes 62% of the Norwegian road transport emissions and 18% of the total Norwegian emissions in 2022 (Statistisk Sentralbyrå, 2023).

In addition, the latter emissions are remarkably lower compared to the Norwegian road transport's GHG emissions emanated during the previous years "e.g. compared to 2001 to 2019" (Statistics Norway)…Norway as a geographically and strategically important area with high natural resources potentials, and hence has crucial economic drivers depending on several

sectors such as: “maritime, minerals, petroleum, agriculture, etc.”, Norway perceives these road transport’s high emissions as a threat that is able to perish the Norwegian potentials and activities mentioned above and the northern life if they keep increasing by time.

1.2 Intention and context: International, National, and Local solutions:

Based on the facts advanced in the last paragraphs, it has been seen urgent to the Norwegian government to treat the problems mentioned above to be able to protect the Norwegian life, resources, activities and arctic life by:

1. Investing in advanced fuels alternatives “electromobility in this case”;
2. Setting international, national, and local goals, policies, ambitions and plans that aim to cut the Road Transport emissions;
3. Introducing a combination of Push and Pull policy interventions and initiatives that support the transition from fossil-fueled personal mobility to a sustainable personal mobility “EVs”.

All the mentioned strategies are set with the objective of attracting as much public support to the introduced policies in order to achieve a widespread EVs adoption in the Norwegian market beside phasing it out from the conventional vehicles, and hence lower the road transport’s emissions, and protect the global environment, which will be further detailed in the following parts and paragraphs.

1.2.1 Investing in advanced fuels-alternative for the personal mobility “Norwegian case”:

Introducing electromobility as an alternative to the fossil fuels vehicles is the most crucial initiative to cutting the emissions from road transport, and to decarbonize the transportation sector, and particularly the personal mobility. Norway as the pioneer of the EVs market worldwide has set many policy instruments and incentives to phase-in the EVs uptake and to achieve the transition from fossil-fueled vehicles to electric powered vehicles that have less environmental harm on the nature, holding a goal to introduce only net-zero vehicles from 2025 and on (Black et al., 2011; Erickson and Jennings, 2017; Incropera, 2015; Sachs, 2015).

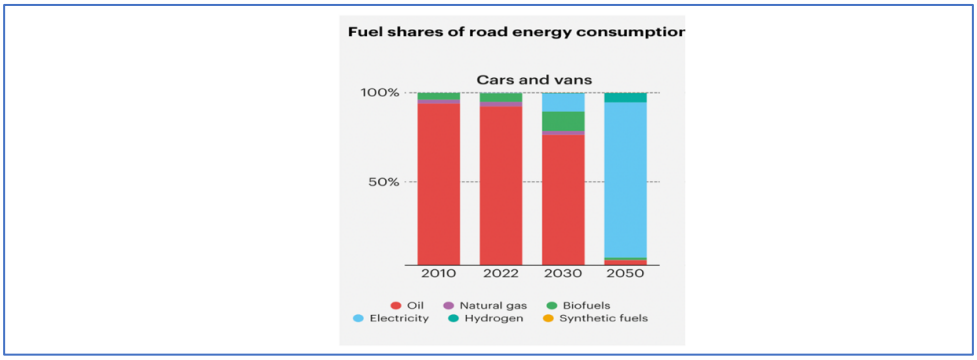

Figure 1: Fuel shares of road energy consumption.
Source: IEA2023.org

Nevertheless, the Norwegian government has set initiatives to achieve zero emission targets in the transport sector, the objective is to introduce incentives to accelerate the in-phasing of only zero-emission passenger cars in the market starting from 2025, and to continue collaborating with technology funding agencies to develop more technological solutions and support their introduction to the market, making the charging infrastructure more accessible and easier for use, prepare suitable parking areas, and adequate charging stations in buildings and parking spaces for EVs (Meld. St. 13, NMCE Norway, 2020–2021).

However, it is crucial to mention that the decarbonization of road transport necessitates a big emphasis on scaling-up the investments in electrification and biofuels and other green fuel alternatives, as fortunately Norway intends to achieve a 92% decline in road transport emissions from now to 2050, to get fixed at 7% of the Norwegian emissions (0.7 Mt CO_2-eq), through increasing the Norwegian investments in Electricity and Biofuels (Norskindustri, 2023). However, the forecast shows that the Norwegian government plans to make the use of electricity more dominant in 2050 in all vehicle categories in contrast with the previous years where the use of oil was notoriously dominant, as the figure shows its high market share "Oil" in 2010 that will keep decreasing slightly to 2022, and will lessen significantly in 2030, and sharply by 2050, leaving the market space to more green fuel alternatives (IEA, 2023).

On the other hand, the era of Hydrogen as a green fuel alternative will mark its first 1% market share in 2030, it will rise slightly to 2% in 2035, and will sharply increase to 16% market share in 2050, according to the forecasts in the table below. The table describes the rates of sales share of "electric cars", the alternative fuels shares that would be present in the market that could increase or decrease throughout 2022 to 2050, as well as the forecast on how many fueling infrastructure of EVs in millions, and for hydrogen in thousands would be available on the Norwegian roads. It can be observed that the biofuel share would increase slightly from 2022 up to 2035, and then will remarkably decrease by 2050, whereas the use of Hydrogen will increase to a slight extent, but electric energy will be the most dominant over 2035 to 2050 with a big market share. We can also see that the fueling infrastructure of EVs and Hydrogen vehicles will eventually grow and increase over time to align the availability of the fuel alternatives in the market (IEA, 2023).

Milestones	2022	2030	2035	2050
Sales share of plug-in hybrid, battery and fuel cell electric vehicles	**13%**	**70%**	**98%**	**100%**
Two/three-wheelers	16%	78%	100%	100%
Cars and vans	13%	67%	100%	100%
Buses	4%	56%	90%	100%
Heavy trucks	1%	37%	65%	100%
Alternative fuel shares	**5%**	**20%**	**36%**	**93%**
Biofuels	5%	11%	12%	3%
Electricity	0%	8%	22%	74%
Hydrogen	0%	1%	2%	16%
Fuelling infrastructure				
Electric vehicle public charging points (million)	3	17	18	31
Hydrogen refuelling stations (thousand)	1	12	15	46

Figure 2: Fuel shares of road energy consumption 2.
Source: IEA2023.org

The main goal is projected on finding efficient ways to guarantee and provide a good transport system, and cleaner ways of mobility to the public and the communities, with the aim of protecting the environment, the natural resources, and all the ecosystem, as the Norwegian government considers also as one of the strongest policy instruments to reaching that given goal and for halving the transport sector's emissions is to promote natural ways of mobility along with the sustainable personal mobility, such as: walking, cycling, and using zero-emission or biogas public transport along municipal, county and national roads, for which the Norwegian government intends to consecrate approximately NOK 80 billion to develop (Meld. St. 13, NMCE Norway, 2020–2021). (Javid, et al., 2014 & 2017) also came to confirm the previous statement and categorized the strategies aiming to lower the emissions emanating from the transport sector and especially from the personal mobility under 3 crucial headings: "the development of sustainable and green fuel alternatives to the fossil fuel energy; the minimization of the vehicle energy consumption by opting for other clean modes of mobility, such as: (W&C; the use of PT; sharing the same car with other people driving to the same destination and so forth); and the reduction of the personal car use and thus cut the emissions that stem from each passenger's driven kilometers.

1.2.2 Setting international, national, and local goals, policies, ambitions and plans that aim to cut the Road Transport emissions "The case of Norway":

Following all the climate issues and the global challenges faced by the world due to the high emissions caused by many sectors and by the massive use of fossil-fueled vehicles, Norway, Europe and many other countries from around the globe committed unanimously on international levels, national levels, and local levels to define certain policies, goals, and

specific targets to cut the emissions emanating from the transport sector under different agreements. In this part are presented the most important Norwegian international, national, and local agreements/ policies and goals aiming to cut the road transport's emissions:

As part of the Paris Agreement and the European Green Deal, Europe and Norway got committed to become the first climate-neutral continent by 2050, and hence to cut their GHG emissions up to 55% by 2030 compared to 1990, all through strengthening the trading arrangements related to road transport and by increasing the target for reductions in the Norwegian non ETS-emissions that are also responsible on the regularization of the emissions emanating from ***the transport sector and the personal mobility*** (Meld. St. 13, NMCE Norway, 2020–2021). However, the country has a triple agreement with EU consisting firstly of EU-ETS that covers nearly half of the Norwegian emissions from different sectors like: "Petroleum extraction; manufacturing and mining; other emissions from transportation; energy supply; and so forth". Secondly, Norway's commitment to reduce domestic emissions from the non-ETS sectors annually towards 2030.

Furthermore, Norway is required by its agreement with EU to reduce emissions by 40% from the non-ETS emissions in 2030 compared to the 2005 levels, but holds an ambition to reduce it by 45% to 50% instead, up to 2030-2033 according to the (National Transport action Plan 2022-2033), in addition to aiming to halve the Norwegian transport sector's emissions by 50% between 2005 and 2033, as the transport sector is responsible of around 60% of non-ETS emissions in Norway (Meld. St. 13, NMCE Norway, 2020–2021). The Norwegian government plans also to gradually raise the taxes on the GHG emissions from the non-ETS sectors with an average of NOK 1400 from the 2021st tax rate, which will roughly reach NOK 2000 and get fixed at **NOK 2020 per ton CO_2-eq in 2030** (Meld. St. 13, NMCE Norway, 2020–2021), noting that the carbon tax of the non-ETS emissions was fixed at **NOK 952 per ton CO_2-eq in 2023** (Trading Economics, 2023). Moreover, Norway intends to decrease the offshore emissions coming from Oil and Natural gas by 50% in 2030 compared to 2005, in addition to setting different specific targets in different municipalities (e.g., Oslo is to cut emissions by 95% up to 2030 compared with 2009 levels), nonetheless, adjusting the policy instruments between 2021-2030 would make those targets easy to reach (Nordic Economic Policy Review 2023).

In order to provide the reader with a clear overview about the Norwegian International and National policies' agreements & goals, I saw that is important to present them under their

chronological order along with their type of policy classifications, that are described in the table below:

Year	Key Milstone	Type
1989	The first country to have a stabilized goal over CO_2 worldwide (Hovden and Lindseth, 2004)	Emissions Target
1991	Introduction of a CO_2 taxation in Norway	National Policy measure
1994	The first nation worldwide to set a target aiming to stabilize the GHGs emissions in Norway	Emissions Target
1996-1997	Exemption from road tolls and reducing road taxes	National Policy measure
1999	Norway claims its target and commitment to reduce Nitrous Oxide emissions under the Götenburg Protocol	Emissions Target
2002	Norway claims its commitment to keep its emissions no more higher than 1% between 2008-2012 compared to 1990, under the Kyoto Protocol	Emissions Target
2004	Norway suggests that every sector should be environmentally responsible and regulated by certain policies	Emissions Target
2006	Norwegian Climate Policy sets three targets: Lessen emissions by 30% by 2020; Carbon Neutral by 2050; Broaden its target to reduce emissions by 9% between 2008-2012 compared to 1990 levels under the Kyoto Protocol	Emissions Target
2009	Norwegian NTP endorses to ecompass the environmental targets into the plan	Emissions Target
2011	Entrance of the "Zero Growth" target into the plan of urban areas action plan	National Policy measure
2014	Norway sets an objective to reduce their emissions by 40% to 2030	Emissions Target
2016	Norway integrates the Paris agreement, and commits to further reduce their emissions	Emissions Target
2017	Norwegian Climate Change Act is endorced. Norway introduced new changes into the NTP (National Transport	National Policy measure

	Plan) and gave more details about lowering emissions in urban areas	
2020	Norway raises its targets to further reduce emissions that were adopted under the Paris agreement and the Climate Change Act	National Policy Target at a Municipal Level

Table 1: Norwegian different Policy agreements and targets' development over time.

1.2.3 Introducing a combination of policy interventions and initiatives that promote EVs adoption and the green transition from fossil-fueled to electric vehicles (The focus of this thesis):

In order to phase out the country of any internal combustion engine vehicles vending by 2025 and on, the earliest of any country, Norway started implementing tremendous categories of BEV-friendly policies and incentives since the 1990s, starting with the exemption from purchase and import related taxes (Figenbaum, 2017), and the introduction of the best financial incentives for EVs by exempting the EVs owners from many taxes, and other fees making this innovation the most cost-effective choice within the market (wri.org), such as : the exemption from road tolls, municipal free parking, exemption from registration tax, and so forth. Many of these policies and incentives have been gradually broadened and continuously revised and rectified over years according to the market changes that has been witnessing a spectacular growth over the last years (P.B. Wangsness et al., 2020).

Thus so far, each municipality has the right to revise some of the incentives set by the government, such as the access to bus lanes that could have been adapted by local authorities since 2017 (Norsk Elbilforening, 2020), the government has revised cutting the company's EV taxation many times after endorsing it in 2000, the local authorities began charging road users with ferry fees, municipal parking fees, road tolls, etc. Nevertheless, the local authorities can't charge EVs users with over 50% of what the ICEVs owners usually pay for road tolls and other services. However, from now on the Norwegian strategy is to go net-zero as much as they can and strengthen the green tax system that requires the most polluter to be the most charged for their emissions and to pay more than the other less polluters do. It is the so called "The polluter pays principle", it is a system suggesting that if hydrogen cars are less pollutant than electric cars, and both are less pollutant than conventional cars, then the hydrogen car's owners will pay less taxes than the electric vehicles owners must, and both will pay less taxes than what the conventional car's owners should (Norsk Elbilforening, 2020).

Nevertheless, it is important to highlight that all the mentioned EVs policy incentives are classified and categorized under two types of factors that promote the sustainable personal mobility. The first are the Pull factors indicated in the following table that usually aim to attract people with different privileges to switch from the traditional personal mobility to the sustainable personal mobility like: "exemptions, discounts, access to bus lanes, etc.", and the Push factors that aim to restrict the benefits of the fossil-fueled passenger cars, and make the car drivers perceive them as inconvenient, and hence switch to the EVs, such as: "imposing CO_2 taxes, paying full road tolls, full ferry fees, etc.", making it appear unfavorable to pay different services and fees that EVs drivers are exempted from. The main goal of introducing a combination of Push and Pull policy incentives is to be able to convince and persuade different types of car drivers with the suitable ways that are able to attract them according to their perspectives and opinions (Wicki, Brückmann, and Bernauer, 2022).

PS: The opposite of the incentives that are considered as privileges to the EVs drivers are the inconveniences to the traditional car's drivers (e.g., EVs drivers are exempted from road tolls is a Pull measure to the EVs owners. The opposite is that the traditional car drivers will pay full road tolls, which makes it a Push measure to the conventional car's owners).

The table below provides the reader with the chronological order of the most important introduced EVs incentives in Norway:

Category	Year/ Period	Incentives
Purchase Tax	1990-2022	Exemption from purchase and import taxes.
	2023	Imposing purchase taxes according to the car's weight for all new EVs, starting from 2023.
VAT on Purchase	2001-2022	Exemption from VAT on purchase with a percentage of 25%.
	2023	Implementing 25% VAT on the purchase from 2023, starting from NOK 500,000 and over.
VAT on Leasing	2015-	Exemption on leasing VAT with a percentage of 25%.
Company Car Tax	2000-2008	Reduction of company car tax with 25% for EVs.
	2009-2017	Reduction of company car tax with 50% for EVs.
	2018-2021	Reduction of company car tax with 40% for EVs.
	from 2022	Reduction of company car tax with 20% for EVs.
Annual road tax	1996-2021	Exemption from annual Road tax.
	2021	Reduction of Road tax.
	2022	Full Road tax.

Toll Roads	1997-2017	Exemption from road tolls.
	2018-2022	Maximum 50% on toll roads for EVs.
	2023	70% on toll roads.
Ferries Fares	2009-2017	Exemption from any charge on ferries.
	2018	Maximum 50% on ferry fares for Evs.
Municipal Parking	1999-2017	Free municipal parking for Evs.
Access to bus lanes	2005/2016-Now	Access only to EVs that carry 1 or more people.
Zero emission sales	From 2017	Action plan to make all passenger vehicles "electric or hydrogen" zero emission from 2025.
Charging right	2017-2021	Establishment of electric charging stations in appartment buildings.
Public Procurement	From 2022	Cars will become ZEV from 2022.
	From 2025	Buses need to be ZEV from 2025.

Table 2: The Norwegian EV incentives according to (Fridstrøm, 2021).
Source: Figenbaum et al., 2015; Norsk Elbilforening, 2020.

As we already mentioned, the implementation of electromobility is a successful key factor for the green transition and the decarbonization of the transport sector, and hence for the reduction of the GHG emissions, the global warming and so the climate change issues. The EVs Push and Pull policy instruments and incentives are a central component of driving the ongoing growth and development of the sustainable personal mobility, in addition to the in-phasing of the net zero transition during the last 30 years-period. Many scholars explain the increasing growth of the EVs market share by the strong incentives and discounts that aim to respond to the national transportation plan of Norway, in addition to the huge amount of investments that the government has made to facilitate EVs' adoption, such as: the availability of infrastructure, the possibility of having electric chargers in houses and/or buildings, in addition to the availability of a decent electricity system, of which 98% of its production comes from renewables in Norway like hydropower (Skjølsvold et al. 2013; Statistics Norway, 2019). Therefore, this is also considered as a successful competitive factor that distinguishes Norway over many other countries for having an abundant and cheap electric energy that would ease the electricity supply for EVs, and thus the EVs uptake.

Furthermore, the Norwegian GHG emissions have been slightly decreasing year over year, where the total GHG emissions were accounted to 55.0 Mt CO_2-eq in 2000, to reach 48.9 Mt

CO_2-eq in 2022, and **46.6 Mt CO_2-eq in 2023** ***"Next update: 5 November 2024 on ssb.no"*** (Statistisk Sentralbyrå, 2024). Moreover, Norway with around 5.4 to 5.5 million inhabitants between 2021 and 2024 (macrotrends.net), it is considered one of the top 5 countries recording the highest growing share of Battery Electric Vehicles sales, with a percentage of 82.4% market share of all electric vehicles in 2023, of which 104,590 units are BEVs, and 10,169 are plug-in hybrids according to statistics from the Norwegian Road Federation (wri.org., electrive.com, and Statista.com), and had the largest EVs market share in 2022, Iceland came at the second place with a percentage of (41%), Sweden was registered to be the third with (32%), the Netherlands with (24%), and China with a percentage of (22%) (wri.org). However, it is concluded that those achievements related to **the diminution of the Norwegian GHG emissions especially in road transport,** besides the increase of the EVs market share are explained by the increase of electrification use especially for passenger vehicles and the **introduction of the EVs-friendly policy instruments and incentive**s dedicated to phase-in the EVs uptake in Norway. This is also confirmed by (Zhang, Yu, and Zou 2011), that stressed in their study that the EVs policy incentives have a constructive outcome regarding EVs adoption.

1.3 The objective of the thesis:

The present thesis presents the Norwegian government efforts in reducing the transportation sector's emissions through the introduction of a combination of Push and Pull policy instruments and initiatives to promote the adoption of the most sustainable available personal mobility "EVs" within the market, and hence preserve the environment from the harm generated through the traditional personal mobility. The MSc of Global Management aims to find solutions to the global problems and challenges regionally and nationally (Nord University, n.d.), as the intention of this research study is to better understand the effect of the Norwegian EVs Push and Pull policy initiatives in switching the consumers behavior from ICEVs to electromobility, and hence towards the green transition, particularly in the transport sector and the personal mobility. This thesis could also contribute to the overall knowledge of the Norwegian national solutions to decarbonize the personal mobility with gaining public support, be it smart city development, smart mobility plan, the contribution of the smart people to develop the smart mobility in the smart city, and national and international sustainable development.

1.4 The Problem statement and the Research questions of the thesis:

The problem statement of this thesis is as follows:

Do the EVs Push and Pull policy initiatives have a positive effect on switching the consumers' behavior from ICEVs adoption towards EVs adoption?

The Research questions of this thesis were formulated to further investigate in the research problem in more details:

- Are the EVs Push and Pull policy initiatives effective in switching the consumers' behavior from ICEVs to EVs adoption?
- What type of policy initiatives have a greater effect in switching the consumers' behavior towards EVs adoption "Push, Pull or Mooring"?
- What type of EVs policy initiatives enjoy and attract more public support in regards of the EVs consumers?

2.0 Literature Review:

In this part, we will highlight the most important key concepts and the key findings of the existing research literature in the EVs push and pull policy initiatives based on different sources that are examined in order to understand the topic thoroughly. We will start by defining the different EVs available in the market, defining the consumers switching behavior according to the literature, and present the Push and Pull Policy incentives in the following sections.

2.1 Types and Definitions of EVs:

Electric Vehicles are produced to be entirely powered by electric energy, their first appearance in the global market was over 100 years ago, which means that they are old inventions that couldn't get enough popularity because of several factors such as: "the availability of cheap fossil fuels, weak electric infrastructure and network, beside the poor investments in electric battery technologies" (Matulka, 2014; Niestadt and Bjørnåvold, 2019). However, the EVs began gaining popularity until the recent decades because of the concerns about the global warming that led the countries to start worrying and taking initiatives to tackle: "the environmental issues, the energy challenges, investments in electric mobility by implementing EVs incentives, investments in battery technologies, electric infrastructure, promotion of cleaner habits of mobility within the communities, as well as supporting the consumer behavior" that would phase in and contribute to the transition towards the green and the sustainable mobility (Baur and Todorova, 2018; Gönül et al., 2021; IEA, 2016, 2018, 2020; Mock and Yang, 2014). The main focus of this study is about BEV, as the interviewed sample was mainly constituted of BEV's owners and users.

BEV: Battery Electric Vehicles

In contrast to the internal combustion engines vehicles, the battery electric vehicles (BEVs) run entirely on electric energy powered through one or more battery power where the energy is stored, without any internal combustion engine, they are usually powered by lithium- Ion (li-ion). The battery gets charged not only from electric grid but also by its braking system "when the car is in decelerate mode". It has the possibility to be charged using Level 1 or Level 2 at home or in buildings, and with Level 3 in the designed commercial charging stations. Their storage capacity is way better than the hybrid's one, therefore the battery can keep the charge and use it much longer than other hybrids, it is also distinguished over hybrid vehicles since the storage capacity allows it to run longer distances with one single charge, unlike the hybrid ones that need to get more charge to run the same distance the BEV does with only one plug. When talking about the architecture BEVs remain less complex than other EVs "PHEVs, HEVs, etc." (Dorlecontrols, 2024).

NB: The focus of the present thesis is on BEVs owners, the participants were 38 individuals owning BEVs, and only 2 owning PHEVs, I therefore defined the BEVs more than the other types of EVs.

The table below defines the characteristics of the available EVs within the market beside mentioning the battery size and the electric range of each one of them:

<table>
<tr><th colspan="2">Type of Vehicle</th><th>Battery Size</th><th>Electric Range (km)</th></tr>
<tr><td colspan="4">Electric Vehicles</td></tr>
<tr><td colspan="4">Common Characteristics between many EVs</td></tr>
<tr><td colspan="4">Low specify energy of battery; No tailpipe emissions;
Travels <250km / charge; Long charging time (0.5 to 8 hrs.);
Battery takes large space; Batteries are very heavy;
Lower maintenance cost; High up-front costs;
Can recover braking energy; Running cost: low;
Motor efficiency: 80%; Needs only one gear; Quiet operation (less noise);
Lacks charging infrastructure; Produces maximum torque
Uses electricity from many sources.</td></tr>
<tr><td>BEVs</td><td>Battery Electric Vehicles</td><td>Large</td><td>120-140</td></tr>
<tr><td colspan="4">Characteristics</td></tr>
<tr><td colspan="4">Vehicles are:
Fully powered electric grid; No Internal Combustion Engine "ICE";</td></tr>
</table>

Powered by 1 or more electric motors; No exhaust pipe; No fuel tank; No Oil or fluids changing; A large battery back; Get charged by an external outlet; Can be charged at home or in commercial designed charging stations.			
E-REVs	Extended Range Electric Vehicles	Medium-Large	120-140
Characteristics			
Vehicles are: Similar to BEVs, except that they have an extra traditional engine working as an extra energy supplier supporting the vehicle if ever the battery runs out of electricity.			
PHEVs	Plug-in Hybrid Electric Vehicles	Medium-Small	8-65
Characteristics			
Vehicles are: Half powered with a traditional fuel ICE, and half powered by an electric battery that can be charged with an external plug; The electric battery is smaller than the one used for BEVs; It uses the electric battery for the short distances; It uses the traditional fuel ICE for long distances; The car can run on electric battery for about 20-30 miles before resorting to gas; The electric battery can be charged at home and in commercial charging stations.			
HEVs	Hybrid Electric Vehicles	Small	0
Characteristics			
Vehicles are : Powered by an ICE beside 1 or more electric motors; The electric motors use the energy stored in the electric batteries; Uses regenerative braking and ICE to charge; Could be **Mild or Micro-hybrids**, where the vehicle cannot use only electricity to start or power the car; They can be **full hybrids:** the electric batteries are usually large with more powerful electric motors but can only run at low speed and for short distances, they are also more costly than mild-hybrids.			
ICEVs	Internal Combustion Vehicles	Very Small	0
Characteristics			
Vehicles are :			

Powered by ICE with the support of an igniter battery functioning as a powertrain; High specific energy fuel; Fuel weight is low; Energy efficiency: 30%; Fuel tank takes relatively little space; Braking energy is not recovered; Higher maintenance cost; Uses only hydrocarbons; Noisy operation; Short refilling time (<5 min.); Ample refilling infrastructure; Need to pick up speed to deliver maximum torque; Travels >600km / fill.

Table 3: EVs types and characteristics.
Source: Rezvani et al., 2015, Helveston et al. 2015, Tate et al., 2008.

2.2 The socio-demographic and EVs owners and users' characteristics:

I see that is important to approach the socio-demographic information about the EVs owners in order to track the individuals that are more likely to switch their behavior from purchasing conventional vehicles towards the adopting of EVs.

Research on EVs adoption have witnessed an incredible increase in the late decades, (Rezvani et al., 2015), has reviewed 16 studies about the BEVs and the PHEVs adoption in 2011-2014, where (Hjorthol, 2013) has also provided a relevant review about them in 2013. It is common knowledge that it is crucial to ***include the social and individual factors*** that are supposed to increase the likelihood of the EVs adoption. According to (Sierzchula et al., 2014), there are three types of factors that can influence the EVs adoption, which are: **the consumer characteristics** and intentions, the technological and innovation factors, and the context factors that represent the availability of the adequate infrastructure, the fuel prices, the electricity costs, and most importantly the policy advantages regarding the EVs adoption.

Usually, the technological factors revolve around design (Burgess et al., 2013), practicality/reliability (Schuitema et al., 2013), noise (Skippon and Garwood, 2011), emissions (Krupa et al., 2014; Jensen et al., 2013; Dütschke, et al., 2014), and battery specifications (Carley et al., 2013; Graham- Rowe et al., 2012). Whereas the consumer characteristics revolve around different factors, such as: social norms (Caperello et al., 2013; Moons and Pelsmacker, 2012), lifestyle orientations (Axsen et al., 2012; Lane and Potter, 2007), socio- economic characteristics (Zhang et al., 2011), and environmental beliefs (Carley et al., 2013; Egbue and Long, 2012; Krupa et al., 2014).

There is a limited number of studies that track and identify the people who are more likely to adopt EVs. (Plötz et al., 2014) advanced that ***men are more interested in buying EVs than women***, majority are ***of a young age or are middle-aged*** (Hidrue et al., 2011; Plötz et al., 2014),

most of them are educated (Hidrue et al., 2011), ***most are financially well-off people*** (Curtin et al., 2009; Ozaki and Sevastyanova, 2011), and also households owning a lot of cars, many people ***prefer to drive an EV inside the city, and usual vehicle for long-time journeys*** (Gärling and Thøgersen, 2001; Graham- Rowe et al., 2012).

However, many of the studies mentioned above have more focus on the EVs buyers and users and just a little extent on the actual owners and users. Nevertheless, there is a limited number of qualitative studies carried out on BEVs users with in-depth interviews in many European countries, such as France (Pierre et al., 2011), Germany (Cocron et al., 2011) and the UK (Graham-Rowe et al., 2012), that inquire into the experiences encountered by the users with their vehicles, and how they describe their practicality in accommodating their daily needs, as well as their perspectives about e-mobility.

A very early study about mobility habits carried out ***among the first Norwegian EV owners and users*** concluded that the ***usual owners of EVs in Norway are men***, of an average ***age between 30 to 60 years old***, with a ***very decent education and revenue***, living in ***swarm households***, and owning a multitude of cars, they also live mostly ***in urban areas***, and own a PHEV type of electric cars (Econ Analyse, 2006). (Ozaki and Sevastynova, 2011) also advanced that usually people living inside major cities like London for instance, tend to own only 1 EV, unlike buyers from the countryside who have more likelihood to own a second car. Several aspects weren't covered by the early studies on the EVs users, such as the differences between the owners and users of the different EVs brands, what type of communication was used between buyers and sellers for all type of information diffusion at different stages, also the transport mode the users/ owners might have had chosen if they didn't have an EV, or if ever the incentives weren't the same, or maybe if they have changed. In addition, there was also no study covering the travel habits characteristics of the early EVs owners and users, such as: (purpose, km length, modes, and so forth) before and after purchasing an EV, it is also crucial to ask about the reason after choosing the X type of EVs, as well as the type of brand (Figenbaum et al., 2014).

2.3 The consumers switching behaviors:

According to the literature, the customer switching behavior is when an individual leaves the product of origin in favor of the new product, or as defined by (Kaeveney, 1995), the consumer switching behavior is the behavior and choice of the customer to change his original product supplier with another product/ service provider. It is a complex phenomenon that can happen due to the product's intense competition and the daily technological developments and

availability within the market, but it can also happen due to the negative characteristics of the original product (Padma, et al. 2018). (Fared, et al., 2014) stressed that understanding the consumer switching behavior is not an easy task, since it encompasses different and several variables and switching factors that interact with each other's to influence the consumer's decision and behavior to switch. However, the consumer's behavior is always linked to the consumers' needs that can also be influenced by "social norms, psychological factors, cultural factors, etc.". Other factors are also linked to the consumers switching behavior, such as: "benefits, costs, ethical issues, competition, product performance, etc." (Keaveney, 1995).
In our case, the factors influencing and initiating the consumers switching behavior are initially the Push and Pull policy initiatives, in addition to the Mooring factor that I will further detail in the following section and under the theoretical framework part.

2.4 Push and Pull factors in the EVs Policy Interventions:

Studying the EVs Push and Pull policy incentives, and their effect to attract the public support to phase-in the EVs adoption, and to phase-out the market from the traditional vehicles is the central focus of the present thesis, therefore I saw that it is important to define them based on previous research studies and literature, which will be presented in the following paragraphs.

In order to incentivize the shift of the citizens behavioral habits towards the adoption of the sustainable personal mobility, the government targets two types of initiatives, the supply-side that focuses on supporting the car industry in R&D, and by many initiatives, restrictions and regulations alleviating the EVs vending more than the conventional ones, and the demand-side that focuses on initiatives, restrictions and regulations promoting EVs purchase and ownership in regards of the consumers (Wicki, Brückmann, and Bernauer, 2022). (Steg and Vlek, 1997) advanced that ***there are two types of policy measures from a demand-side perspective*** that the government can promote to reach their targets, which are ***"the Push measures and the Pull measures"*** that are our main focus in this thesis.

2.4.1 Push Policy Measures:

According to (Brückmann and Bernauer, 2020; Huber and Wicki, 2021; Wicki et al., 2019) Push measures are the policy interventions that impose fees, taxes and other restraints on certain undesirable behaviors, (which is the conventional car purchase and driving in this case), (Lilliestam et al., 2021) showed that the government proceeds to doing this mainly by strengthening the carbon pricing system, using the ETS "emissions trading system" and the carbon taxes.

(Venturini et al., 2019) stressed that the inconveniences answering the push measures taken by the government consist for instance of : the increase of the CO_2 tax, the boost of the EU fleet emission targets (Fekete et al., 2021), and many others measures like: increasing the conventional car's purchase taxes and prices, the increase of the Gasoline and Diesel prices and taxes, restricting the import and the sale of diverse conventional car ranges, limiting the fueling infrastructure accessibility, imposing higher annual road taxes, imposing high road tolls, making restrictions on the conventional vehicle's access to the city center and the parking areas inside the city, paying full ferry fees, and so forth (Hoerler et al., 2023).

(Tilov and Weber, 2021), also come to confirm that raising the Gasoline and Diesel prices and taxes could play a successful role in reducing the conventional car's traveling frequency and mileage, and hence changes the consumers traveling's habit and behavior, in addition to the stepwise increase of the CO_2 tax that is considered to be a successful policy measure to stimulate the behavior change towards electromobility if amalgamated with the adequate pull policy interventions according to several prior research studies (Eriksson et al., 2008, Thaller et al., 2021, Wicki et al., 2020). However, there is a strong correlation between the taxation on "diesel & gasoline" and the one imposed on CO_2, we can consider them as a single tax since the kilos of CO_2 generated by the means of transport are the direct result of the liters of fuel consumed by them. In the Norwegian context, the taxation on litercan is considered as a direct tax on CO_2 regardless how many components are included in the tax, hence only one sub-component accounts as CO_2.

Moreover, the GHG and the CO_2 taxes offer a crucial incentive that enables the reduction of the emissions through investing in R&D, which is a long-term investment. (Fischer and Newell, 2008) stressed also about the importance of including the costs of R&D knowledge and new technologies experimentation beside the learning by doing in the CO_2 taxation. This could be also an incentive aiming to decarbonize the personal mobility through immediate action, for the consumers since the purchase and the use of the conventional vehicles would be very costly. Nonetheless, raising carbon taxes makes it more expensive to release GHG emissions, therefore it is a way to achieve efficiency and promote cleaner ways of mobility such as: walking, cycling, puddling, etc., (depending on the residency area of each region and person) and encourage the green shift from fuels automotive to EVs, Hydrogen vehicles, and so forth (Meld. St. 13, NMCE Norway, 2020–2021).

The government's purpose is not to raise the overall tax rate, but instead to make more pressure on the economic operators and their consumers to hasten the green shift and thus, lower the

emissions. By way of illustration, the Norwegian government reduced road use duty in the 2020-2021 budgets to compensate the augmentation in the carbon tax rate and hence minimize the negative economic impacts of tax charges on ordinary people who own or use "Petrol and Diesel" vehicles (Meld. St. 13, NMCE Norway, 2020–2021). However, the purpose of imposing taxes on road use duty is more to set a cost on social effects/ impacts of road use (i.e., congestion, noise, accidents, etc.). Nonetheless, the Norwegian government still didn't confirm if they will keep opting for this compensation mechanism, since it is projected that it could decrease the overall estimated reduction of about 3-million-ton CO_2-eq in greenhouse gas emissions up to 2030 to a lower level than if no compensation mechanism was adopted (Meld. St. 13, NMCE Norway, 2020–2021). Moreover, the revenues the state will generate through imposing the taxes on non-ETS sectors will help reducing the taxes of many other sectors to maintain the balance, primarily for the groups that are more affected by tax rises, as mentioned earlier.

Furthermore, the technological aspect should be mainly evolved in developing and commercializing the EVs, but the carbon pricing system does not mostly focus on accelerating any technological development (Lilliestam et al., 2021), despite the Norwegian government's efforts in supporting EVs technologies mainly by including the R&D costs in the CO_2 taxes as a push measure, however this demands extra efforts than imposing the CO_2 tax in order to attract consumers that express more interest in EVs technologies (Meld. St. 13, NMCE Norway, 2020–2021).

Here we conclude that the push measures do not focus only on car drivers and seek only to change the consumer's behavior towards electromobility, but also seek to strengthen and harden the non-EVs adoption to the vehicles selling companies by setting initiatives that ban the conventional cars vending in Norway by 2025, and by imposing high company fossil fuel car taxes, etc., which is included in the supply-side policy interventions which would directly affect the choice of the consumers, since the availability of certain types of vehicles in the market will always attract many individuals to use or own them (Wicki, Brückmann, and Bernauer, 2022; Hoerler et al., 2023). Hence, Push measures are trying to make the adoption of non-EVs unattractive and inconvenient to the consumer and the seller by restricting their existence and availability within the market and by many other initiatives.

However, despite the possibility of being more effective in spurring the EVs uptake, many scholars suggest that push measures are less opportune to receive public support than pull measures (Brückmann and Bernauer, 2020; Huber and Wicki, 2021; Wicki et al., 2019). Restrictions, taxes and Push policies usually involve many potential problems and could face

a huge opposition especially from consumers with right-winged principles, in addition to the people registering high yearly mileages or those owning larger vehicles (Harring et al., 2017, Stradling et al., 2000, Wicki et al., 2019). The effectiveness of this type of policies is also related to the commitment of car owners to the global issues, as for instance, from a region to another, or from a municipality to its neighbor, there is one or many groups that are more committed or ambitious about climate targets than the others, then the rate of the shift from fossil-fueled vehicles to EVs will vary unevenly, and moreover, the scope of the varying gasoline taxes would be limited as this could engender tankering and tax competition (Mandell and Proost, 2016). As an alleviating solution, there should be a strong sensibilization from the government about the importance of the Push Policies in phasing-out the market from fossil-fueled vehicles, and hence lower the GHG emissions that endanger the life of all the species, in order to attract as much public support to them, and thereafter there will be also a sensibilization from the car drivers themselves to each other's to phase-in electromobility in order to protect their environment. As it is very mandatory to attract public support in order to accelerate the pace of EVs adoption, and to reach the government's targets in cutting the road transport's emissions, particularly the personal mobility.

2.4.2 Pull Policy Measures:

According to (Shanyong Wang, Jing Wang, Feng Yang, 2020), the pull measures are classified under two types of factors, ***the soft environmental pull factor***, and ***the hard environmental pull factor.*** The soft environmental pull factor consists of the policy campaigns and discounts offered by the government to attract the individuals to adopt EVs and to choose the green transportation, they are the non-material tools like policy, initiative, ideology, culture, etc. They have as a purpose to encourage the individuals to adopt a certain product by offering many economic and financial attractiveness, like the exemption from ferry fees, from road tolls, from many taxes, and so forth, guaranteeing a product causing less pollution and emissions, with technological benefits and many other characteristics (Beltramello, 2012; Wang, et al., 2019; Wang, et al., 2020). Whereas the hard environmental pull factor is the contraire, it is the material factor where the government mobilizes the adequate resources to build infrastructure, phasing in the sustainable transportation projects, including the Public Transportation, such as: Metrobuss in Trondheim, Bybanen to Fyllingsdalen in Bergen and other projects in the case of Norway (IEA, 2023), which creates a motivation in regards of the individuals to shift their behavior towards the sustainable mobility sometimes only to benefit from the given treats (Yu, et al., 2015; Li, 2016; Jia 2018; Wang, et al., 2020).

(Wicki, Brückmann, and Bernauer, 2022) argued that the pull measures of the policy interventions are implemented as an answer to the barriers and obstacles hindering the EVs uptake and as a tool that alleviates them, to improve and promote the vehicles alternatives to the conventional cars, and that consists of several factors: “Economic, technological, environmental and so forth”, namely: the EVs high purchase prices, the limited vehicles ranges, the limited charging infrastructure, the high purchase and import taxes, and many other inconveniences that can affect the consumer’s adoption decision. In other words, the Pull measures are seeking to make the BEVs adoption very attractive to the individuals in a way to provide them with a cost-effective and an environment-friendly product with enhanced technology options and characteristics. (Hsu, 2014; Chiu, et al., 2011) stressed that Pull measures are introduced to the individuals to attract them to choose and accept a certain choice or a new alternative.

Different researchers advance that Pull policy interventions may have more effect on EVs adoption’s rate by providing many discounts, and a cost-effective product, and hence could get more public support and be more effective and attractive than push measures that necessitate that the consumers owning non-EVs should pay higher prices, taxes, and fees (Brückmann and Bernauer, 2020; Hardman, 2019; Rietmann and Lieven, 2019; Wicki et al., 2019). (Keizer et al., 2019, Steg, 2003) advance that the people who are not 100% attracted or interested in conventional cars can be easily pulled and affected by pull measures, since it doesn't require any sacrifices from them.

(Austmann and Vigne, 2021; Berkeley et al., 2018; Brückmann et al., 2021; Carley et al., 2019; Rezvani et al., 2015) stress that many recent studies have proven that the high cost of EVs ownership and purchase is one of the major obstacles hindering the EVs uptake, this could be a decisive factor that would affect the consumer's behavior negatively, and thus could lower the EVs adoption rate, therefore the existing Pull policy measure offering the consumers a financial support (subsidies) that reduces the EVs registration and purchase prices and taxes is judged to be mandatory and sufficient in phasing-in EVs adoption (Brückmann and Bernauer, 2020; Coffman et al., 2017; Egbue and Long, 2012). Another study has shown that the BEVs purchase price subsidy has more influence on the BEVs adoption’s intention than the BEVs overall subsidy (Wicki, Brückmann, and Bernauer, 2022).

However, there is a lack of awareness of the fossil fuel vehicles owners about the Total Cost of Ownership (TCO), since there are extra costs that come in addition to the purchase and the ownership price, such as: “insurances, taxes, maintenance, road tolls, ferry fares, and so forth” that the BEVs owners could be exempted from or benefit from specific discounts lowering their

extra costs and thus, would lead them to have more savings compared to the conventional car's owners, and this is still not regarded by the general public (Lane and Potter, 2007; Andor et al., 2020; elementenergy, 2021; Gössling et al., 2022). It is commonly shown by many prior studies that the consumers awareness about the BEVs cost privileges and their TCO compared to the prices and TCO of the conventional cars would lead to a higher uptake of the BEVs within the market, hence (Hoerler et al., 2023) considers that spreading awareness about these two elements is one of the most important Pull measures.

Furthermore, (Brückmann and Bernauer, 2020) advanced that the combination of different Pull policy interventions such as: the combination between implementing more charging infrastructure and providing more parking space privileges, providing tax rebates, and exemptions from many fees usually benefit from a high public support and are very successful at increasing the EVs adoption's rate, and thus changing the individual's attitudes towards more sustainable personal mobility habits.

(Coffman et al., 2017) come also to confirm that policies phasing in public charging infrastructure tend to get more public support and thus accelerate the EVs uptake within the market. The fast charging stations and the availability of their infrastructure inside and outside the city is also an important factor that shapes the consumer's attitude towards electromobility, this includes the possibility of installing home charging and work charging (HC & WC) in houses and buildings to provide the consumers with limitless and convenient charging opportunities, and thus affect positively their attitudes towards EVs adoption (Hackbarth and Madlener, 2016; Coffman et al., 2017; Liao et al., 2017; Ščasný et al., 2018; Nazari et al., 2019; Higueras-Castillo et al., 2020; Kim et al., 2020; Danielis et al., 2020).

Furthermore, (Haustein and Jensen, 2018) talked about the "Better Home & Charge and Work & Charge solutions" that suggest providing the consumers with fast charging solutions that would make it easier to them to travel long distance trips, as many BEVs owners worry about the battery capacity to afford long road trips, and therefore being able to charge the vehicle at home or/ and at work would make it easy to them to travel a good distance with a fully charged battery, this factor could be also a decisive Pull measure to drive the EVs uptake.

Furthermore, (Hoerler, Stoiber, and Del Duce, 2023) stress in their study that fostering home and work charging opportunity to be an important Pull measure that can change not only the conventional car owners attitude towards BEVs adoption, but is also capable to convince the owners of the mid-sized and the large-sized EVs to switch to a small BEV that is usually characterized by many societal advantages, such as being distinguished by lower operational

costs, by providing a solution to the people with lower abilities to access to the mainstream private transport that (Ulrich, 2005) names it by *"the extension of the human range of mobility"*, by causing less pollution than the conventional vehicles in regards of the urban air quality "e.g. NOx emissions", and the global warming "e.g. CO_2 emissions" (Berkeley, Bailey, Jones, and Jarvis, 2017), in addition to causing less noise and zero gas emissions, which are considered as highly recommended and crucial Pull measures to take into consideration especially in the megacities where the space is very scarce, the number of cars and the congestion are very high, with limited parking areas and charging infrastructure (Hoerler, Stoiber, and Del Duce, 2023). (Patt et al., 2019) also confirms that people parking their cars in shared garages or in the streets are more likely to adopt EVs and demand a foster HC & WC, and the people who could easily get access to HC & WC and private charging also express more willingness to adopt EVs, which makes it a crucial Pull measure as well.

3.0 Theoretical Framework:

The present chapter aims to explain the theoretical foundation of this thesis. The adopted theoretical framework that I saw it can explain thoroughly the concepts and analyze the findings of this thesis is the "PPM" Push-Pull-Mooring model, for its alignment and possibility to explain the influence and effectiveness of the Push and Pull policy incentives in promoting EVs adoption. In this chapter, we will start with an explanation of the origin and the meaning of the PPM theory, and then we will align it to our context, as I went through the secondary literature, and the previous research studies made about the PPM theory and its relationship with Push and Pull policy incentives in achieving a widespread adoption of this technology, as many of similar studies already adopted this theoretical framework that has been seen cohesive with their findings.

3.1 Push-Pull-Mooring:

Human migration is the first research background for which the Push-Pull-Mooring theory was developed (PPM) (Moon, 1995; Lee et al., 2001), it categorizes Human Migration into Push, Pull, and Mooring factors, explaining why certain people choose to relocate/ migrate from a certain terrestrial region to another land (Bansal et al., 2005). It examines the different intentions of the migrants, that might be explained by the push aspects that illustrate the unfavorable circumstances that push the individuals to think about leaving the point of origin or the current residential place, and/ or by the pull aspects that are the compelling factors that attract the individuals to migrate to the destination point, or in other words, Push factors are the repelling factors that describe more the reduced attractiveness of the individual's current

place of habitation that initiate an intention or a behavior of taking a migration decision and migrating, whilst the Pull factors illustrate more the perceived benefits and attractiveness of the destination place. And the mooring factors are the ones that interact with the push and the pull factors and complement them in a way to whether present facilitators or impediments for the switching intention/ behavior, and therefore could inhibit or ease the migration behavior (Moon 1995).

According to many scholars, the PPM model could be also utilized to explain not only the human migration in a geographical context, but also the migration of the human intention, willingness, and behavior, translated to the factors that push or pull the individuals towards shifting their intention, their willingness and behavior in terms of goods, services, philosophical thinking and so forth "for instance, switching from a certain product, brand, services, taste, thinking, perception, etc., towards another" (Jung et al., 2017). Hence, the PPM has been used as a theoretical framework to explain the consumer's shifting intentions and/ or behaviors (Li and Ku, 2018), which is the case of the present thesis, since we are studying the EVs Push and Pull policies that drive the car owner's behavior from purchasing and driving conventional vehicles to purchasing or driving electric vehicles.

Furthermore, many scholars suggest that the PPM theoretical model emphasizes that each study can define its own specific attributes according to the object of the research under the Push-Pull-Mooring factors, and this is what differentiate the given model from other theories that need to specify the link between fixed variables. (Bansal et al., 2005) also consider that the PPM model is assembling many variables under their effect categories, and therefore doesn't suggest any fixed variables within the theoretical framework. However, this model is able to analyze both the positive and the negative factors of the studied variables of the subject that aim to influence the switching willingness and behavior of the consumers. Furthermore, the PPM theoretical framework incorporates several shifting predictors, which is a positive thing that enables the researchers to categorize, organize and arrange different variables and conclusions, and hence explain more thoroughly the switching intentions and behaviors. Moreover, this model has been validated not only in the EVs switching intention and behavior from conventional vehicles to EVs, but also in different research contexts such as: product application (Nugroho and Wang, 2023), online grocery shopping (Singh and Rosengren, 2020), organic food (Ghufran, et al. 2022), consumption mode (Fang and Li, 2022), etc.

3.1.1 Push Factors in switching from conventional vehicles to EVs:

According to the protection motivation theory, when a risk is detected, a protective action performance follows the threat appraisal of that danger (Rogers, 2003). In that case, when the environmental threats of using and commuting with the traditional private cars are detected, the government introduces the adequate protective measures to tackle them, which are the Push Policy measures that aim to phase out the roads from the given product causing that harm, therefore, Push factors refer to the pressure, the financial barriers, the negative inconveniences and unfavorable policy incentives that the government levies on the conventional cars' owners and drivers, in order to push them towards abandoning their traditional cars and purchasing electric vehicles instead. (Brückmann and Bernauer, 2020; Huber and Wicki, 2021; Wicki et al., 2019) also confirm that and consider that the Push measures are distinguished by initiatives restricting the benefits of the traditional fossil fuel vehicles and car use, beside promoting the use of Public Transport and the personal electromobility. (Hsu, 2014; Chiu, et al., 2011) advanced that the push measures are made to convince and persuade the individuals to abandon their current choice and to switch their interest towards another. The Push measures usually come as an answer to the negative attributes of a certain product (which are the negative attributes of the fossil fuels vehicles), and the main objective of these measures is to phase out the market from the conventional cars and drive the individuals away from commuting by the traditional private vehicles. (Wang, et al., 2020) explain that commuting by private cars has many negative effects that are considered to be situational and psychological, and the perceived inconvenience come to illustrate the negative characteristics of this phenomenon from a situational and a psychological outlook (Collins, & Chambers, 2005).

The theory of the perceived inconveniences drives the consumers towards evaluating the perceived benefits and drawbacks of a certain behavior or a certain product, in this case the consumers must evaluate the perceived benefits of owning an EV and drawbacks of owning a conventional car (Wang, et al., 2020). The role of the Push Policy initiatives is to minimize the financial advantages, and the perceived benefits of the traditional vehicles and augment the economic barriers and the perceived inconveniences related to them on the other hand, by making them more financially unappealing, with higher upfront costs, and higher tax credits, higher Diesel and Gasoline prices, and higher services fees, like road tolls, and more restrictions, such as: restrictions on parking places, restrictions on access to the city center, less fueling infrastructure, and so forth. Therefore, the Push Policy incentives can increase the consumer's switching behavior from the adoption of the traditional vehicles to the adoption of

EVs through promoting different inconveniences and financial barriers of the conventional car's adoption that I will present in the paragraphs below.

1. Augmenting financial barriers: In product decision making, scholars consider that the products' prices are an indispensable financial factor that influences the consumer's willingness to trade cost with benefit, and the perception of the consumers to the price, whether it is appealing or inconvenient is important in the consumer's switching behavior from a product/ service to another (Jung, Han, and Oh, 2017). This positive or negative perception of the product's price plays a big role in leading the consumers to leave the original product that is financially unappealing to switch to the new alternative with more economical benefits, with the belief that the original product's price is unfair and inconvenient (Keaveney, 1995; Singh and Rosengren, 2020).

According to literature, the financial barriers related to the Push policy measures are the Push incentives that affect the conventional cars consumers economically by imposing on them high CO_2 tax, high purchase and registration tax, high upfront costs, high Diesel and Gasoline prices and taxes, imposing full road tolls, full ferry fees, high annual road taxes, payable parking places, and so forth (Brückmann and Bernauer, 2020; Huber and Wicki, 2021; Wicki et al., 2019). The consumers therefore will find themselves in front of high expenses, and hence will perceive the financial inconveniences of the conventional car's ownership, and thus will switch their behavior from purchasing an ICEV to the purchase of an EV, which is more financially appealing. Moreover, (Hoerler et al., 2023) considers that raising the consumer's awareness about the TCO of the conventional vehicles is a crucial push incentive, since there are many extra costs that come in addition to the TCO to make the conventional cars' adoption more financially unappealing and almost unaffordable to the consumers, and the role of the consumer's awareness about the high TCO and the extra additional costs will make them realize how financially inconvenient to own a traditional vehicle, and thus will lead them to switch to EVs adoption instead.

2. The perceived inconveniences: (Wang, et al., 2019; Chen, & Tsai, 2017) argued that the perceived inconvenience of using conventional cars is interpreted by the extent to which the individuals perceive an inconvenience finding available parking areas inside the city, finding available charging infrastructure, finding decent gas fueling stations inside and outside the city, etc., the push measures come to promote these inconveniences to impede the consumer's choice, to push them to abandon their current product and shift their choice towards a sustainable transportation's mode. We can also define these inconveniences to be the

restrictions on public utilities and services related to the Push policy initiatives, that are illustrated as we said in the restrictions on access to the city center, minimization of the availability of the fueling infrastructure of the Diesel and Gasoline vehicles, limiting the parking spaces of the conventional cars, or availability of the emission-free-zones inside the city, and so forth. This type of restrictions can push the individuals to consider buying EVs instead of the traditional vehicles, since they will perceive many inconveniences related to the use of the ICEVs, that will limit and restrict their movements and travelling habits and opportunities especially inside the city. Moreover, we can all agree that the scarcity of the fueling infrastructure will lead to the abandonment of the traditional vehicles now or later (Wang, et al., 2019; Chen, & Tsai, 2017).

3.1.2 Pull Factors in EVs adoption:

The Pull factors of the EVs policy incentives refer to the financial attractiveness and the perceived conveniences associated with the EVs adoption, and therefore constitute a crucial factor in shaping the consumers attitudes towards electromobility (Adu-Gyamfi et al., 2022). (Biresselioglu, Kaplan, and Yilmaz, 2018) also stressed that the governments have introduced series of financial benefits such as free road use, tax & price reductions and exemptions to minimize the economic burden to EVs adoption and make it more affordable and attracting to own EVs rather than conventional cars. Not only that, but the governments promulgated many different convenience benefits and measures such as: “the expansion of the number and availability of the charging infrastructure, the availability of parking places inside the city, the access to bus lanes, etc., to further influence the consumers’ switching behavior towards EVs, and thus attract more public support, and phase out the market from the traditional vehicles. We hereby conclude that the financial attractiveness, and the perceived conveniences are important Pull factors to achieve a widespread adoption of electromobility (Haustein, Jensen, and Cherchi, 2021; (Hu et al., 2023). However, I will detail more these two variables in the following paragraphs.

1.Financial attractiveness “Soft environmental Pull factor”: According to (Adu-Gyamfi et al., 2022) one of the crucial determinants of the consumer’s switching behavior to EVs adoption that also attract as much public support are the benefits that the government promotes as Pull measures of the EVs. The perceived financial attractiveness in this case are the benefits that the government provides the EVs users and owners with, in order to attract them and influence their behavior towards EVs adoption, these measures can attract the conventional car owners, the individuals that are in phase of taking a purchase decision and can also influence

and attract more public support from the EVs owners themselves to keep adopting the same technology.

(Kim et al. 2018; Brückmann, Willibald, and Blanco, 2021) categorized the financial attractiveness or the economic subsidies as the ***Soft environmental Pull factors*** that are the non-material tools that consist of the policy campaigns and discounts offered by the government like the «exemption from ferry fees, electricity prices discounts, exemptions and/or reductions on different road services, from road tolls, and so forth», guaranteeing a product causing less pollution and emissions, with technological benefits and many other characteristics (Kim et al. 2018; Brückmann, Willibald, and Blanco, 2021), therefore, they have as a purpose to encourage the individuals to adopt a certain product by offering many economic and financial benefits (Beltramello, 2012; Wang, et al., 2019; Wang, et al., 2020).

As we already mentioned, the implementation of this set of subsidies and policy incentives directly makes the EVs' Total Cost of Ownership (TCO) cheaper and more affordable compared to the conventional car's (TCO), since there are also many costs that come extra to that given cost for the ICEVs, like "road tolls, CO_2 tax, purchase and registration tax, full ferry fees, etc.", that the EVs owners are exonerated from, which can attract more public support to the EVs, and influence the switching behaviors from the traditional cars to EVs positively (Lane and Potter, 2007; Andor et al., 2020; elementenergy, 2021; Gössling et al., 2022). Moreover, (Jung, Han, and Oh, 2017; Li, 2018) indicated that the financial/ economic benefits of the EVs have a direct effect on the consumers' switching behavior and are positively associated with the increase of the abandonment of the conventional cars in favor to the EVs adoption. (Steg, et al., 2006; Rhodes, et al., 2017) also argue that the pull policy measures like offering purchase discounts and subsidies to adopt low-emitting technologies enjoy more public support than many other policy measures and have a positive effect on the switching behavior of the car owners.

2. The Perceived conveniences "Hard environmental Pull factor": As the opposite of the perceived inconveniences of the Push policy measures, where the government tries to restrict the availability and access of the conventional cars to the Public utilities and services like the unavailability of the gas fueling stations, restrictions to access to the city center, and bus lanes like EVs, restrictions on parking places and so forth, the perceived conveniences of the EVs adoption are the ***Hard Environmental Pull Factors*** that are the material factors through which the government mobilizes the necessary resources, policies and tools to provide the EVs owners and users with unpaid emission-free parking zones, the freedom to access to the city

center, the availability of the charging infrastructure, including inside buildings, houses, working areas, etc., the access to bus lanes, and so forth, which result in strong public support and initiate a positive attitude towards shifting behavior to the EVs adoption (Yu, et al., 2015; Li, 2016; Jia 2018; Wang, et al., 2020).

Moreover, in a similar study in Shanghai and China, the government implemented different convenience measures in favor of the EVs drivers and owners, which is "the cancelation of the annual inspection's queues, priority lanes for licensing, the possibility to access to fast-transit lanes, the access to high-occupancy (HOV) lanes, in addition to the exemption from the traffic and purchase restrictions (Hardman, 2019; Wang, Cao, and Zhang, 2021). However, some of these measures are strange to the Norwegian policy incentives, but still they are regarded as perceived conveniences to the consumers that can attract their public support to the given policies and influence their switching behavior positively towards EVs adoption (Zhuge et al. 2020; Xiong and Qin 2022; Xian et al. 2022). Furthermore, (Coffman et al., 2017) come also to confirm that the hard environmental pull factors related to the perceived conveniences of the EVs by the consumers, "like the availability of the fast-charging stations, home charging, work charging, etc.", tend to enjoy more public than other policy incentives and therefore affect the consumer's attitudes positively towards EVs adoption.

3.1.3 Mooring factors in EVs adoption:

The Mooring factor was originally used in the human migration literature in order to explain on the one hand the reason behind some people would choose to stay in their current position or place of residence regardless the negative inconveniences they could face by staying there, and despite all the economic, safety, social…etc. temptations and advantages that they could benefit from in the destination place. On the other hand, the mooring factor could also represent the elements that would support the push and pull factors in a way to further promote the act of migration to the point of destination.

In our case, we would say that the mooring factor in EVs adoption are the factors/ policies that interact with the push and pull policy incentives in a way to whether prevent and constrain or to support and expedite the switching behavior to EVs adoption. In this study, I will represent two variables that would explain the mooring factor in EVs adoption. The first variable is ***Inertia associated with a perceived risk*** that will **inhibit** the migration behavior towards EVs regardless the negative inconveniences that the individuals would face by choosing not to shift to EVs, or by rethinking not to keep using an EV. The second variable is also a ***perceived risk*** that will **support** the behavioral shift towards EVs.

1. Inertia and the associated perceived risk with a negative effect on EVs adoption:

The first variable is **Inertia,** according to (Beltramello, 2012; Han, et al., 2011; Lai, et al., 2011; Worthy et al., 2013) Inertia is perceived by many scholars as the opposition and resistance to change habits, perceptions and norms, or the sluggishness to consider and initiate the act of change. It is one of the psychological inhibitors of the consumer's shifting behaviors, and the mooring factor that could constrain the consumer's decision and act to EVs and the green transportation's adoption. (Worthy et al., 2013) considers that Inertia influences the individuals' decisions and behaviors psychologically in a way to make them repeat and re-choose the same previous choices also in terms of products and services "the conventional cars". It is the maintenance of the status quo, the opposition to change, and has a negative effect on the new choice (Lai, et al., 2011). According to (Wang, Wang, and Yang, 2020) Inertia could be described as *"a subconscious emotional process"* that affects the consumers' intention and behavior negatively towards the adoption of EVs and the green transportation. It can represent the emotional barrier that would affect directly the consumers behaviors and choice to keep adopting the original product which is the conventional vehicles and impede their decision and behavior to purchase the new technology which is the EVs.

In the present thesis, the resistance against the new choice or product could manifest also in the form of the fear of the perceived risk and uncertainties associated with the new choice represented as: Inertia that incarnates the **Fear** of the perceived risk which is the **EVs' uncertain changing policies and campaigns**. As the perceived risk is related at first hand with the uncertainty of the outcome and consequences of a decision or a behavior (Munoz-Leiva, Climent-Climent, and Liébana-Cabanillas, 2017). The perceived risk in the present study refers to the potential risk and uncertainty about the future changing EVs policy incentives with the ongoing widespread of EVs within the market, as the Norwegian government started limiting the financial benefits and EVs campaigns with the growing pace of EVs adoption, which could lead the individuals to perceive the EVs as not financially appealing as how they were before, and therefore would affect the switching behavior towards EVs negatively. (Wang, Cao, and Zhang, 2021) confirm that and advanced that in the early stage of development of EVs, all the governments including the Norwegian one used to offer generous subsidies and financial exemptions and campaigns, and started reducing them gradually as the pace of EVs adoption increased within the market, these latter factors increased the economic costs and left up the financial barriers of EVs adoption, which led the individuals to perceive potential financial

risks associated with EVs, and therefore applies a negative effect on the switching behavior as a mooring factor.

2. The perceived risk as a mooring factor with a positive effect on EVs adoption:

The second perceived risk is the Norwegian government's target to introduce only all zero emissions' new passenger cars "electric, hydrogen" by the next year, which is 2025. This policy target is to make all individuals re-think about their purchase decision and develop many uncertainties that with the scarcity of the traditional vehicles within the market and the widespread adoption of EVs, and the national plan to phase-out the market from conventional cars, the ownership of ICEVs would be very difficult and expensive, as the fueling stations will become lacking with the future increase in availability and ownership of EVs and scarcity of ICEVs, the Diesel and Gasoline prices could become more unaffordable, the road services and fees, as well as the maintenance costs could become more costly, and so forth. (Zhang et al., 2022) advanced that individuals or consumers with high-risk perceptions could influence their behaviors and intentions to adopt a new choice to avoid the losses, the consequences of the uncertainties and the perceived risks, thus the consumers tend to initiate a negative attitude towards the product that constitutes a source of risk and initiate a positive one in regard of the new choice with less perceived risks. Therefore, the perceived risk in this case is presented as a mooring factor interacting with the Push and Pull factors in a positive way to support the switching attitude towards EVs. I didn't find much literature about the effect of this particular policy target on EVs adoption and the switching behavior of car owners from conventional cars, but we will further investigate about it and discuss it in the findings section.

4.0 Methodology:

This chapter aims to present the methodology applied to answer the problem statement and the research questions of the present thesis, as well as how the data was collected. I will start with the philosophy and approach applied for this thesis, secondly the research design, followed by the definition of the qualitative research method that was chosen to analyze the data of the present thesis, the definition of the interview guide applied, a presentation of the field of experimentation and investigation, the conduct of interviews, the data collection, and finally the credibility and internal validity of the data and findings. The collecting tools of the data, and so the analysis and their interpretation are critical components of the empirical research, therefore the selection of the adequate methodology is crucial in order to get relevant research findings and contribute to the chosen research field with applicable data and outcomes.

4.1 Philosophy and approach: Post-Positivism:

The research philosophy is crucial to be determined in a study for its goal to guide the research design, the collection of data, and to determine the outcome of the research (Saunders et al., 2019). The research philosophy chosen for the present thesis is "Post-Positivist approach" that believes that this world is governed and managed by certain laws and theories that the human can test to agree and confirm them or disagree and contradict them using scientific methods. Post-Positivism usually emphasizes how the theory can be important at shaping and guiding the research, at testing it (Annells, 1997). (Letourneau & Allen, 2006) also stresses that this philosophy approach consists in starting the research with pre-determined literature and theory that the researcher can base his data collection upon and revise that given theory by testing it on the real world, and then supports it or rejects it through his findings' section. Moreover, Post-positivism makes the researcher believe that the reality could be objective only with the consideration of subjectivity while shaping the research processes and analyzing the perceptions and behaviors of the people/ variables, phenomena, etc., which means that it rejects the idea of complete objectivity and promotes the principle of multiple perspectives (Testbook Edu Solutions, 2024). In addition, the context factor is very important in the post-positivism approach to shape the research findings and considers that generalization could be limited to similar factors and contexts. Furthermore, by adopting a post-positivist approach it would be possible to the researcher to acknowledge the limitations and complexities of the social science research and phenomena and considers them as context-dependent with the influence and involvement of many different factors, and multiple reality layers. Post-positivism also promotes flexibility in the choice of theories based on research questions, as well as the choice of methods (Habib, 2021).

However, the reason why I employed post-positivism approach for my research study is because I started with digging into the literature and chose the theoretical framework that I will base my research analysis upon, and then formulated the research questions to test my employed theory. As the post-positivist approach allows the researcher to employ the qualitative and quantitative methods, and my research is basically qualitative deductive that defines the theory before data collection and analysis, I saw that is the suitable approach to adopt, in addition to its subjectivity and flexibility to the multitude of the studied variables and perceptions, since I will explore about the different experiences and perceptions of many EVs users on the governmental policy incentives.

4.2 Research design: Case study:

The research design of this thesis was established to answer the research questions of the problem, and to determine the methodology of data collection and analysis.

The present research investigates about the influence of EVs policy instruments in achieving a widespread adoption of EVs, in the Norwegian case. The period of gathering the secondary data was achieved between Fall 2023 and Spring 2024, whereas the data collection and the data analysis was achieved in Spring 2024. With the growing pace of EVs adoption and the EVs changing policies according to the expansion of the market and many different effect circumstances, and therefore the contribution of the present thesis and findings would be limited geographically and for a specific timelapse, except if future researchers would like to use it as previous research studies made in the field X in the period Y or following a chronological order for the same type of studies. Henceforth, I will treat this research as a case of study. The purpose is to provide the reader with rich understanding of the effectiveness of the Norwegian EVs policy instruments in achieving an EVs widespread adoption along municipal, county and national Norwegian roads to decarbonize the transport sector and cut their emissions that complicate the global management issues. However, the case study research design could be employed in order to test a theory and see its application on the real world (Anastas Jeane, et al., 1999).

Moreover, this research was carried out following the steps below:

- The subject of this research was chosen according to my personal and professional orientations. The growing interest on my part and on the part of our generation for electric mobility and sustainable innovation of the personal mobility, beside the ambition of achieving net-zero in the transport sector and in many other sectors that are triggering the achievement of the global management goals.
- I defined the problem statement by going through many case studies in the field, making a preliminary survey beside having brief discussions with some people owning BEVs.
- The next step was to dig into the literature and prior studies in the field of research on the role of EVs policy instruments and incentives in EVs adoption, and similar studies and observe how much they are convergent or divergent with the outcome of the previous step.
- After getting enough knowledge about the research topic and defined the problem statement, I went again through the literature to seek for the adequate theory that could

help me base my research upon, and then formulated the research questions that will test the chosen theory and confirm it or contradict it in the analysis section.

- The choice of the field was well defined according to my target interviewees, i.e., the people who have adopted/ purchased BEVs/PHEVs and who have experienced them.
- The next step was to collect data through a semi-structured interview guide.
- The analysis of the data and their interpretation based on literature and the chosen theoretical framework led us to make a conclusion about the outcomes of the study and confirm some of the theoretical variables and disapprove others.

4.3 Qualitative Research with a Deductive approach:

According to different researchers, qualitative research is not characterized by the data, since they can also be quantified, rather by its method of analysis which is not mathematical (Strauss and Corbin, 1990). According to (Deslauriers, 1991), even if many or all authors do not agree on the definition of the qualitative research, the majority of them ascribe similar characteristics to it (Bogdan & Biklen, 1982; Denzin, 1978; Taylor & Bogdan, 1984; Van Maanen, 1983). However, the qualitative method is here to analyze the data that is difficult to be quantified by providing a structured analysis beside being inspired by the pre-existing literature and experiences from the life and the common sense that it tries to systematize (Douglas, 1976; Denzin, 1977, p.31).

The choice of our methodology was based on the nature of our problem statement and research questions, which led us towards the choice of a qualitative analysis method. According to (Miles and Huberman, 1991), qualitative approaches have been described as being able to provide rich and solidly grounded explanations and descriptions of processes anchored in a local context. Furthermore, a theoretical model can be validated by qualitative data (deductive qualitative) or determined from observations aggregated from statistical processing (inductive quantitative).

The qualitative deductive approach was adopted for this study. This approach is considered to be a top-down method with preset codes or priori variables, where the researcher begins with pre-determined and existing data and theory from the literature, and then tests it and align it with the outcome of his research through observations and so many other tools. According to (Andrea J. Bingham, 2022) the qualitative deductive approach could help the researcher to:

1. Organize the data into attribute codes (Miles et al., 2020) that would sort the data into categories such as: “data type, e.g., interviews”, “time, e.g., Spring 2021”, “participant, e.g., age/gender/ profession, etc.”, “location, e.g., Bodø, Norway”, and so forth.
2. Classify the data into categories to maintain alinement with the established research questions: the deductive approach can help the researcher maintain the focus on the purpose of the research and the research questions, by sorting them out using key words in order to highlight the broad elements of the research, and then sort the data with the same categories to come up only with focused relevant findings and outcomes.
3. Sort the data based on the components of the theoretical framework, and then analyze the findings and answer the research questions based on those pre-determined theory-based components and categories.

(Creswell, 2005) advanced that the qualitative research method is characterized by broader interpretations since the researcher examines the phenomenon through different experiences and perceptions of different individuals from different backgrounds…in their natural context and align them with the different previous literature outcomes based on experiences of other people from similar or different time lapses, locations, contexts and backgrounds. Moreover, the qualitative deductive approach is considered to be more structured and systematic since the researcher has the possibility to start with a clear plan for the research study and uses a research theory and design that have been already approved. It helps the researcher to collect and analyze the data in a more objective and consistent way unlike the inductive approach that is categorized with unclear research questions and unexpected research results and outcomes (Questionpro.com). This approach works best if the researcher has clear questions and a pre-determined theory that he will try to test, and whether prove or disapprove through his research analysis.

Furthermore, (Onwuegbuzie & Leech, 2005, p. 270) stress about the importance of the relationship between the interviewer and his interviewee in the qualitative research, since the researcher has many contextual observational events to focus on while interviewing his participants. This method allows the interviewer to change and adapt his questions according to his interaction with the second part and to the answers he gets. More specifically, it allows the researcher to observe and interpret many factors that is not possible to measure them through tests and surveys, such as: “the body language, the facial expressions, the hesitations and the firmness, etc.” of the participant about the subjects, and to adapt to them in a way to ask for more details, to extend the questions or to change their orientation to analyze the facts

from a broader viewpoint. (Hillocks, 2006) stressed that it is even possible to obtain specific details that cannot be obtained in earlier research phases through the qualitative research method.

On the other hand, it allows the participant to ask and adapt his answers if he ever couldn't understand the meaning of the questions, or even to talk about the experiences and viewpoints of other people he knows driving the same experience in a different way on the same subject, and so forth. Thus, the researcher has the possibility to make his interpretations through his own observational lens that makes him explain the different realities generated through the similarities or the differences of the meanings and perceptions of each individual, therefore the outcome of the research becomes influenced to a big extent by the researcher's values (Onwuegbuzie & Leech, 2005, p. 271).

4.4 The interview guide:

In order to answer our research problem, it is necessary to build a research tool that allows the collection of data. The interviews that I conducted with my target people are semi-structured interviews characterized by an open start on the questions of external effects followed by specific questions on the contribution. For the structured portion of the interview, I asked all representatives the exact same questions using the interview guide, and kept asking the same questions or modelling them, extending them or asking for more details, and even modifying the order of the questions all depending on my interaction with each particular individual for the semi-structured part of my interview.

According to the literature, the semi-structured interviews, or often called qualitative interviews, are based on interview guides characterized by their generalities and their questions which are quite generally reformulated, which means that a part of them could be predetermined, and the other part could not be planned, or could have been adapted or extended following the paths of the answers. This type of interviews is distinguished by enabling the researcher to supervise more interviews and try to push the interlocutor to give more details during the interaction beside exploring specific themes; the questions asked in this type of interviews are mostly open-ended (Barrett, 2018).

Moreover, the semi-structured interview has many characteristics of which are "the ability to put more to less numerous questions; the pre-specified themes; the flexibility of the questions; the freedom of the interviewer; the ability to add or to further extend unplanned topics; the flexibility and fluidity on the one hand to reorganize the topics and questions and to acquire

more detailed information on the other one. Furthermore, the interview guide constitutes the inventory of planned and unplanned themes and factual data which, at one point or another during the exchange, will be the subject of intervention by the interviewer if the respondent does not address them spontaneously (Galletta, 2013).

4.4.1 Development of the guide:

Organizing the research interview guide is an important step that must be approached with caution. For indeed, a well-structured and well-presented guide can considerably improve the return quality.

However, the interview guide used for this thesis was constructed through digging into several research studies identified from the study of the literature, from a preliminary survey, the observation of the phenomena from their natural setting, through the prior discussions with EVs owners, and most importantly based on the research questions that aim to bring an answer to the thesis problem. The choice of certain questions was adapted to the theoretical approaches explaining Push and Pull factors in the adoption of the sustainable personal mobility and the green transport facilities. The interviews were conducted on the basis of the different themes of the interview guide, which were deemed relevant based on the literature review carried out and which allowed us to highlight the main variables that influence the EVs adopters.

The interview is made up of 15 questions, the majority of which are open questions that give the interviewees the opportunity to express themselves freely. I have developed this guide in order to respond to our problem and achieve our research objectives; To do this, the research object was openly indicated to the interviewee to provide him with significant freedom of speech by asking him to answer the questions, then I started with general introductory questions on EVs incentives and policy instruments, in order to observe the factors influencing the EVs adoption's decision to our interviewees.

4.4.2 Pre-test:

For the present survey, a pre-test phase allowed us to make the necessary modifications and validate the items to be retained, with separate samples.

As such, we ensured the reliability of the semi-structured interviews, through the verification of two essential elements; on the one hand that the source subjects had the information we wanted to collect, and on the other hand that the wording of the questions was clear and unequivocal. In this sense, these pre-tests made it possible to make modifications which were

taken into account in the final version of the interview guide. Validity, in general, has no empirical basis and is mainly based on judgments. This test made it possible to provide some elements of information on the general context of the research in theory and in the field. All the same, this exercise will prevent us from being too 'abstract' and 'literary' (Drucker-Godard, Ehlinger, Sylvie, Grennier, & Corinne, 2007).

4.5 Field of experimentation:

In this part, it is a question of presenting the environment in which the survey was carried out, the sample that was constituted, and the collection techniques of the data.

4.5.1 The field of investigation:

It is important to choose the adequate target group to provide the thesis problem with the adequate answers, I chose my target group from my personal and professional contacts. This choice is obviously explained by reasons of convenience in terms of ease of access to the subjects and the target concerned by the survey. The population targeted by my survey is made up of people who have experienced EVs and especially BEVs through owning and purchasing them. My target people were 40 interviewees from different parts of Norway "Bodø, Oslo, Mo i Rana, etc." and constituted mostly of:

- My friends owning BEVs/PHEVs; Some of mutual acquaintances of my friends owning the same innovation that they have put me in contact with;
- My ex-work colleagues from my ex-internship that own BEVs; Some of the colleagues who worked in the same co-working space from other companies owning BEVs;
- Some of my professors owning BEVs/PHEVs; Some of my friend's work-colleagues owning the same innovation that have put me in
  contact with as well.

4.5.2 Conduct of interviews:

Indeed, in the semi-structured interview, the most used in management, the order of discussion is not imposed. The interviewer relies on the sequence of ideas specific to the respondent to evoke one theme before or after another. This flexibility of the semi-structured interview allows, through the relative freedom left to the respondent to better understand their logic while, at the same time, the formalization of the guide promotes strategies of comparative and cumulative analysis between the respondents and lends itself better to certain constraints in the field such as the low availability of respondents (Creswell et al. 2007). Our survey took place

between February and April 2024. It should be noted that I opted for a methodological approach based on semi-directive individual interviews. These allow the discussion to be semi-structured, the questions to be explored in more depth, and to gather as much information as possible.

The way I have established contact with my target group was through:

- Calling my close friends and taking an appointment with them;
- My friends have called their acquaintances and gave them my phone number, then we have had meetings through Microsoft Teams;
- Sending an e-mail to my ex-work colleagues to take an appointment with them and have had a meeting through Microsoft Teams; I followed the same procedure with their friends and colleagues after taking their e-mails and contacting them with a prior notice;
- The same procedure was followed with the rest of the target individuals.

The meetings took place via internet through video calls using Microsoft Teams since the interviewees were in different locations and Norwegian cities, which makes it more suitable to conduct online interviews with them (Easterby-Smith et.al, 2021, p. 198), expect for the meetings made with my close friends that took place face-to-face. The interview's duration varies, most often between 45 minutes to 1 hour, for my survey most of the interviews took place during the respondents' working time, they were all transcribed manually, expect for the interviews carried out face-to-face that were registered through voice-memo, and then registered by notes on the laptop. All the answers were gathered in one document to facilitate their analysis afterwards.

The study was carried out through a period of eight months, collecting theoretical knowledge from several scientific sources and ensuring the reformulation of the collected data. The interviews were conducted over a period of 2 months as already mentioned, but I met some difficulties concerning the appointments, since some of my target group used to promise to contact me after a couple of days, but I had to contact them over again to ensure the progress of the meetings, then I was able to catch-up at the end.

4.6 Data Collection:

Our data collection was classified under two categories: Primary data collection, and Secondary data collection in order to analyze our problem from a broader outlook. At the beginning, I started collecting the secondary data and going through it, as (Johannessen et al., 2011) stressed

about it to be the available data gathered and published by organizations, governments, scientific journals, company reports, data banks, scientific articles and other data sources that could provide the future researchers with the necessary information they can base their research upon in different topics and research fields.

Moreover, (Easterby-Smith et al., 2012) advanced that the secondary data has many important characteristics, such as: being time saving for providing a lot of relevant information that the researcher could spend a lot of time gathering them instead of just having them available to analyze and use them for the research. Furthermore, the secondary data is judged to provide a good quality of information and findings, since the authors are trustworthy organizations providing information backed-up with credible evidence respecting the norms of research, credibility and bias, in addition to conducting the research in reliable circumstances beside mobilizing all the necessary resources to come-up with good quality of information.

Moreover, it provides the historical information about the phenomenon and the research field that the investigator would like to explore about, which allows him to follow up with the historical sequences of the phenomenon and have an in-depth understanding of the subjects to come up with relevant new findings and analysis. As I already mentioned, I firstly went through the secondary data like the scientific research cases in the same field I wanted to explore, the data published by the government that represent the Norwegian EVs policy instruments and incentives, the Norwegian national transport plan reviews, the Norwegian Road Traffic Information Council and many other databases for the present case of study, in order to identify my thesis problem and look for the tools that would make me further explore about it.

The second part was focusing on the primary data that I developed myself, (Johannessen et al., 2011) advanced that this type of data is developed by the researcher or a group of researchers in a field of study. It is the raw data collected following the research objectives and the questions of the work, in this thesis the primary data was collected through observation, document analysis, a preliminary survey, the elaboration of a qualitative semi-structured interview guide that enabled me to collect and analyze the phenomenon in the field. Moreover, the collection of the data through the semi-structured interview that was elaborated on Google Forms was conducted online via Microsoft Teams, and some of the interviews were conducted face-to-face and registered in the form of voice memo, and then analyzed relatively with the chosen theoretical framework to explain the research phenomenon. The sample of the present research was constituted of 40 interviewees in Norway, all of them were from similar to different backgrounds, owning BEVs, and little of them owning PHEVs, and that was the main

criterion to be eligible to answer the Interview guide. All the participants were invited to have a meeting in order to provide answers to the interview guide. It is impossible to interview people through the whole country, but I tried to diversify the participants criteria to come up with more qualitative and relevant findings.

Many questions in the interview could seem irrelevant for the study and the research problem, such as the age, the income, the educational background of the participants, but I thought it would be interested to explore about the socio-demographic situation of our interviewees, and that may provide a better understanding of their choice of adopting EVs, and also could somehow support further research studies in the field.

4.7 Credibility/ Internal Validity:

The qualitative research method is not much known by validity and reliability methods like the quantitative research. However, (Devers, 1999) published about different strategies to check the validity of the qualitative research such as: the Triangulation; the Search for Disconfirming Evidence; and the Subject review. The subject review is the method adopted for this thesis where the researcher shares the findings and their interpretations with the interviewees to make sure that the interpretations align with the meanings of the participants in order to confirm the credibility of the results. I did this step with many interviewees but not with all of them in order to make sure that the orientation of the results is lining up with what the interviewees advanced during our meetings.

5.0 Findings, Analysis and Discussion:

The purpose of this chapter is to highlight the outcome of the research directly taken from the field of investigation, and more precisely to highlight the results relating to our research problem. In this part, I will deduce what role the Push and the Pull factors of the EVs policy interventions play in incentivizing or triggering the EVs uptake and switching behavior among each category of the individuals who took part of the interviews, in addition to highlight if these given policies are truly effective in attracting public support in promoting the personal sustainable mobility in regards of the consumers. This analysis aims to exploit the data collected in order to conclude the main findings answering our research questions and confirm or oppose to the chosen theoretical framework that I based my research upon that will explain the research phenomenon of the present thesis.

5.1 The socio-demographic characteristics of the consumers mostly affected by the EVs incentives in switching their behavior towards electromobility:

The first element to ***discuss is the socio-demographic data*** about the interviewees to study which category of individuals is highly affected by the EVs policy interventions and incentives to switch from ICEVs to EVs. The findings of the research show that 77,5% of the sample were male, and only 22,5% were female, of which the majority are between 31 to 40 years old holding a percentage of 62,5% of all the sample, the second age group was holding 20% of the total sample and represented the people aged between 41 and 50 years old, then the individuals aged between 18 and 30 years old represented a percentage of 10% of EVs holders, and last 7,5% of the sample were people aged over 50 years old. All the interviewees were highly educated and 62,5% of them were holding a master's or over a master's degree, 27,5% were holding a bachelor's degree and only 4 were graduate of the vocational high school. Most of them were having high annual income between NOK 600.000 to 900.000, living with their spouse and small family, and owning only 1 EV per household. Moreover, 90% of the sample advanced that they are living and working inside an urban area, and 10% mentioned that they are commuting between a rural and an urban area to work.

However, the findings of the present thesis come also to confirm earlier studies about EVs owners and users characteristics and advance that most of the Norwegian EVs owners are men, of an average age between 31 and 40 years old, holding high university degrees and having a decent range of incomes, most of them live with their small families, and hold 1 BEV per household, since they mostly live in urban areas and have other transport facilities they are able to use than the personal car, and they also prefer driving the BEV inside the city, and a traditional vehicle to travel long-distance trips (Ozaki and Sevastynova, 2011).

5.2 Answering the research questions:

This chapter aims to answer the research questions outlined in the subsection 1.4 of the introduction part through the presentation of the research findings collected from the participants through the interview guide.

1. **Are the EVs Push and Pull policy initiatives effective in switching the consumers' behavior from ICEVs to EVs adoption?**

During the data gathering and the interviews, it was evident that the Push, Pull, Mooring factors of the policy incentives are indispensable in shaping the consumers behavior towards electromobility and the sustainable personal mobility, regardless the support or the opposition of the participants in regards of certain particular policy incentives. All the informants stressed that the EVs incentives had a big role in shaping their decision and behavior to switch, and to regard the adoption of the sustainable personal mobility as indispensable in nowadays society

with the aim of preserving the nature, the ecosystem, and the world from the global management issues caused by the emissions emanating from the conventional vehicles.

All the participants stressed that they were whether pulled or pushed, or even affected by the mentioned mooring factors in switching their decision and behavior from choosing and purchasing ICEVs to purchasing EVs, regardless of how they perceive these policies, in other words, regardless of whether they support the policies or not "e.g., Few people that were pushed rather than pulled by the policy initiatives don't support the Push policy measures because they see themselves left with no choice, and that the government obliges them to choose their preferred choice instead", but even though, still the Push policy initiatives had a positive effect in switching their behavior towards electromobility regardless of how they feel towards them. Based on our findings, we conclude that the Push, Pull, Mooring factors of the Norwegian policy initiatives are effective and have a big role in shaping the consumers behavior towards electromobility, and offering this diversity of factors, makes it more flexible with the different individuals, since some interact more with Push factors, whilst others respond to the Pull ones, and some interact with the Mooring factors, all in a way to switch their behavior towards EVs adoption.

2. **What type of policy initiatives have a greater effect in switching the consumers' behavior towards EVs adoption?**

Here, I am going to present the most influencing policy incentives by order that had a positive effect in switching the participant's behavior towards EVs adoption.

2.1 <u>Pull Factors:</u>

The majority stressed that they were pulled by the purchase subsidies more than any other measure "that is classified under the financial attractiveness", this explains the importance of reducing the EVs purchase price and introducing the exemption from purchase taxes and registration taxes in attracting more people to adopt EVs. The individuals explained their attractiveness to this special measure by describing it as cost-effective and money saving, they also stressed that if the EVs could have been very expensive to adopt, then their willingness to adopt a BEV would have become very low regardless their strong interest in the sustainable benefits that this technology offers.

Secondly, the availability of the charging infrastructure "that is classified under the perceived benefits" comes as the second measure boosting the EVs adoption, as many people expressed the importance of the availability of the charging infrastructure in EVs adoption, some participants consider it as a decisive factor to adopt an EV, since the battery needs enough

electric energy supply to run with, especially for mid to long-distances, that's why the participants advanced that they wouldn't have risked with abandoning their traditional vehicles and adopting an EV if the charging stations were still unavailable or inconvenient to reach.

The third most influencing Pull measure according to our participants is the exemption from toll roads "that is classified under the financial attractiveness", most of the individuals who were strongly interested in the exemption from toll roads were people that mostly commute between urban and rural areas, commute between the different districts "bydel" for work, etc.

2.2 Push Factors:

The most important Push policy measure according to our participants is paying the CO_2 tax "classified under the financial barriers", as all of them indicated that one of the most influencing measures that pushed them towards selling their conventional cars and adopting BEVs is the CO_2 tax. (Venturini, et al., 2019) stressed that the push measures such as: the increase of CO_2 tax is proven to be very successful despite the opposition of the public to most of the push measures.

The second important Push policy measure according to our participants is the High price of Diesel and Gasoline "classified under the financial barriers", the individuals stressed that the price of the fuels automotive are getting higher year by year, and that this was making them spend large amounts of money to fuel their cars, and it is obviously exorbitant especially if the price will keep getting higher in the future, henceforth, the EVs seemed to be more cost-effective than the conventional vehicles. Here we conclude that increasing the fuel prices is a crucial policy measure that discourage the conventional cars adoption and shapes the individuals' attitudes towards switching to electromobility.

The third indicated important Push measure was the restrictions and the scarcity of the gas fueling stations "classified under perceived inconveniences", most of the people that were pushed by this specific measure were people with high traveling and commuting frequency and find this measure to be inconvenient for them, thus adopting a BEV was the best choice to avoid struggling to find gas fueling stations whenever they need them. This explains the importance of this measure in convincing people to switch from a conventional car to an electric one, especially for those who commute every day for work purposes, for leisure-purposes, and so forth.

2.3 Mooring factors:

The first important Mooring factor according to our participants was the effect of the Norwegian policy target to introduce only all new ZEV to the market by 2025 "classified under

the perceived risks", that had a positive effect on the participants' switching behavior towards EVs adoption. After the introduction of this policy target by the Norwegian government, some of the participants developed uncertainties and started perceiving high risks related to the adoption of ICEVs, since according to them, there will be more financial barriers related to ICEVs like "higher Diesel and Gasoline prices, higher CO_2 tax, higher road tolls, etc.", and more perceived inconveniences, like "lack of fueling stations, no access to the city center, etc." for the conventional vehicles.

The second important Mooring factor based on our research is the fear of the changing policy incentives "classified under Inertia with a perceived risk" that we consider that it had a negative effect on the switching behavior towards EVs, the participants that were influenced by this particular policy initiative were holding a fear against the uncertain policy campaigns that the government started eliminating and reducing by the rapid pace of EVs adoption. The participants began perceiving that the EVs wouldn't be as cost-effective as how they were before and could probably align with the TCO of the conventional cars, therefore there was a hesitation in regards of EVs policies, and this policy blocked their intention and willingness to switch.

Summary:

According to our findings, the most influencing policy measures that had a greater effect in switching our informants' behavior from ICEVs to EVs are **the Pull policies** and especially the financial attractiveness related to the purchase subsidies, and secondly the availability of the charging infrastructure, and to some "Home charging" was a decisive factor in adopting an EV. The same thing for the Pull policies that also had a positive effect on the consumers switching behavior, but less than the Pull policies, the financial barriers related to the CO_2 tax, and the high Diesel and Gasoline prices were the most influencing and decisive push factors to our participants. Whereas only few participants were affected positively by the Mooring factor, that is the introduction of only new ZEV vehicles by 2025, and less individuals were influenced negatively by the Mooring factor that is the changing EVs policy campaigns that cancel many advantages that were offered to EVs owners.

3. **What type of EVs policy initiatives enjoy and attract more public support in regards of the EVs consumers?**

Results indicate that the Pull policy measures enjoy more public support than the Push policy measures, and both have more public support than the Mooring factor measures. The Pull factor and the purchase subsidies enjoy more public support in the consumers switching behavior

towards EVs adoption more than any other policies, then comes the abundant availability of the charging infrastructure, and HC & WC became also indispensable in nowadays consumers intention to switch. The informants link their support more to the attracting Pull policies rather than the Push policies, and only very few informants perceive that they rather support the Push policies, since it is the only way to convince certain individuals to switch from ICEVs in favor of EVs. The literature also comes to confirm this finding, as (Steg, et al., 2006; Rhodes, et al., 2017) argue that the pull policy measures like offering purchase discounts and subsidies to adopt low-emitting technologies enjoy more public support than many other policy measures like the ones imposing taxes to discourage the conventional vehicles' purchase. (Bjerkan, et al., 2016) stressed that the reduction in the up-front price of the EVs is the most powerful and decisive incentive to boost the EVs uptake. (Cherry, et al., 2012) describes the policy measures like the purchase subsidies by being voluntariness, in a sense that they engender low perceived revenues to incentivize the desired behaviors, but on the other hand they have a high percentage of benefits and are financially covered by citizens and taxpayers. The Push policy measures enjoy less public support than Pull policies, since restrictions, taxes policies usually involve many potential problems and could face a huge opposition especially from consumers with right-winged principles, in addition to the people registering high yearly mileages or those owning larger vehicles (Harring et al., 2017, Stradling et al., 2000, Wicki et al., 2019). The Mooring policy measures enjoy less support, since they are introduced by the government as policy targets, and not direct policy initiatives, which makes them less perceived by the consumers, but even though, their purpose is to back the Push and Pull policies in a way to support the switching behavior towards EVs adoption.

5.3. Testing the theoretical framework and the related literature with the research findings:

The aim of this chapter is to test the chosen theoretical framework and the related literature with the research findings of the present thesis, this will allow us to whether approve or disapprove them. The Push-Pull-Mooring theory is made to explain the human migration, but scholars and many researchers apply that given theory to the migration of the consumers intention and behaviors from a product/ service to another (Li and Ku, 2018). However, we are going to test that theory on our case that is the EVs Push and Pull policy incentives in achieving a widespread adoption of EVs and influencing the car owner's behavior from the adoption of conventional cars to the purchase of EVs. I will structure the present chapter under the three

variables of the chosen theoretical framework: “Push factor; Pull factor; and Mooring factor in EVs adoption”.

5.3.1. The Push Factor in switching from conventional vehicles to EVs:

Based on the Push factor of the PPM theory, this study examines the role and effect of the EVs push factor in switching the consumer’s behavior from traditional vehicles to EVs by minimizing the perceived benefits and the economic advantages of the ICEVs, and by augmenting the financial advantages and the perceived benefits of the second alternative that the government wants the consumers to switch to on the other hand that is “EVs”.

1. **Augmenting the financial barriers:**

The first component of the Push policy factor is the augmentation of the financial barriers that would lead the consumers to think about the economic drawbacks of owning and using ICEVs, that could manifest as: high upfront costs, high purchase costs, high road tolls, expensive Diesel and Gasoline prices and taxes, and so forth.

Participant 7: *“Well, the need of a vehicle in my daily life is indispensable since I have three kids, I need to drop each one of them in his school, my wife to work, and then head to my workplace, I also need to take them with me in my way back, do the grocery shopping, and then my wife takes the car and drops each one of the kids in his activity center, and take them back, you see that is impossible for us not to use the car, and the ICEV is basically a bad choice and financially inconvenient with the extra road fees, the high Diesel and Gasoline prices, there is also the CO_2 tax that makes it very expensive to us, therefore the EV is the best choice to us, we may make savings by owning it…”.*

The findings show that almost all the individuals perceive that the economic factor related to the prices, fees, and taxes is important in shifting their behavior from ICEVs to EVs, in addition to having a consciousness about the TCO of the conventional vehicles that come extra to the higher services and fees related to road use, fueling need, taxes, etc., whereas the high CO_2 tax was the most relevant push policy that created a positive effect on the individual’s willingness and switching behavior towards the adoption of EVs instead of keeping their conventional vehicles. Our participants confirm that they started perceiving that ICEVs are economically very unappealing and financially inconvenient regardless the advantages this type of vehicles could offer to their consumers and led them to switch to an EV instead. (Keaveney, 1995; Singh and Rosengren, 2020) stressed that economic barriers and financial consciousness about a product could lead the consumers to leave a product in favor of another, and here we confirm

the effectiveness of the Push factor of the PPM theory that initiate the individuals to leave the starting point in favor of the new place, which is leaving ICEVs in favor of EVs.

2. **The perceived inconveniences:**

The second component of the Push Policy factor is the perceived inconveniences related to the restrictions on the availability of the fueling infrastructure, parking areas inside the city center, making restrictions on the conventional vehicle's access to the city center, etc. According to our findings, these inconveniences play a big role in shaping the consumers behavior in shifting from conventional vehicles to EVs. These Push policy measures are seen by our participants to have a positive effect in phasing-out the market from ICEVs, and replacing it with green transportation "EVs", as the car owners perceive that the scarcity of the fueling gas stations, beside the restrictions or ban on the access to the city center, in addition to the lack of the parking spaces especially inside the city would result in many drawbacks and would limit their traveling habits and movements inside the city. The participants' perception about the inconveniences is related to many factors, such as the traveling needs and habits of each participant.

Participant 6: *"I live in a rural region and I must commute daily to my work which is located in the city center, and I found that is impossible to keep owning an ICEV because of my daily need to travel with my car inside the city, so basically the scarcity of the fueling stations and the parking areas, in addition to the restrictions that are imposed on the conventional cars to have access to the city played a big role in making me switch to an EV…."*.

Some of the participants expressed that they don't support this type of restrictions and inconveniences, and they prefer the pulling factors more, and perceive them as attractiveness factors, whilst the Push policies are promoting an offensive way of influencing the car drivers' behaviors. Yet, according to the PPM theory, the Push factors get manifested as the negative effects that Push the people away from the starting point, and direct them towards the destination point, and in our case, the Push factor get manifested as the unfavorable policy measures that the government presses the car drivers with in order to push them to abandon their ICEVs and direct them towards EVs instead (Brückmann and Bernauer, 2020; Huber and Wicki, 2021; Wicki et al., 2019). Yet regardless the perception of the participants that Push policy measures constitute a negative pressure on car drivers, but they still believe that they have a great effect in achieving a widespread adoption of EVs and limiting the adoption of ICEVs that are basically harmful to the human and environment, especially among people who

are careless about their environment and the global issues, and this comes also to confirm the effectiveness of the Push factor in shaping the consumers behavior to migrate from the original product towards the new one, according to the PPM theory and the literature.

5.3.2. The Pull Factor in EVs adoption:

Based on the Pull factor of the PPM theory, this study examines the role and effect of the EVs pull factor in shaping the consumer's behavior towards EVs adoption by augmenting the financial attractiveness and the perceived benefits of electromobility. In the PPM theory, the Pull factor constitutes the attractiveness variables that initiate the individual's behavior towards choosing the new destination/ destination point instead of the point of origin. In our case, the Pull factor constitutes the attractiveness variables "financial attractiveness, and the perceived benefits" of the EVs, that could influence the consumer's behavior towards the adoption of the new choice which is electromobility.

1. **Financial attractiveness "Soft environmental Pull factor":**

The government introduced policies to limit and reduce the economic burdens of EVs adoption on the one hand, and offer many discounts and exemptions to make the EVs adoption financially appealing on the other hand, in order to attract as much car owners and users towards electromobility, that are classified as the financial attractiveness or economic discounts and campaigns, and as the "Soft environmental Pull factor", or the non-material tools by (Kim et al. 2018; Brückmann, Willibald, and Blanco, 2021).

Participant 10: *"The economic factor was the first attracting characteristic towards EVs to me and my wife, for us that we use our vehicle a lot, and that it is indispensable in our daily traveling habits, we perceived that benefiting from the purchase discount, the discount on road use, ferry fees, no CO_2 tax, and no higher Diesel and Gasoline prices would help us save economically since the EV's TCO would be cheaper than the conventional vehicle's one, but I would say that the purchase subsidy was the most relevant and decisive pull factor to us followed by the discount on road tolls, since we travel a lot back and forth the city center".*

Our findings show that the financial benefits especially the EV's purchase subsidy have a positive effect in shaping the consumer's behavior towards the adoption of EVs and have also a great effect in influencing their switching behavior from conventional cars to electromobility. As all the EVs owners stressed about the importance of the financial discounts and campaigns in shaping their behavior towards EVs adoption, and to some the financial attractiveness was the decisive factor to influence them to purchase EVs, and regard that the EV's TCO is cheaper, which would let them make some savings compared to the ICEVs.

In the PPM theory, the Pull factor constitutes the variables that attract the people to the destination point, or to the new choice, and according to the literature, the financial/ economic benefits of the EVs have a direct effect on the consumers' switching behavior and are positively associated with the increase of the abandonment of the conventional cars in favor to the EVs adoption (Jung, Han, and Oh, 2017; Li, 2018), and our findings confirm both the Pull factor of the PPM theory, and the Pull factor of EVs adoption "financial attractiveness", that the economic benefits have a great influence in the adoption and the switching behavior towards EVs adoption.

2. The Perceived benefits/ conveniences "Hard environmental Pull factor":

The second component of the Pull factor in our thesis is the perceived benefits of the EVs that constitute the "Hard environment Pull factor" that is related to the material tools that constitute the benefits that the EVs owners' and users will benefit from such as: "the availability of fueling infrastructure, the access to bus lanes, the availability of free-emissions parking zones inside the city, etc.

Informant 11: *"At the beginning, I was attracted by the pull policy incentives of EVs, but I was still worried about the availability of the charging infrastructure since I commute a lot with my car for work purposes, and then the government was expanding and implementing more charging stations inside and outside the city, but the most relevant Pull factor to me was the possibility to install home charging, since I can leave my car charge during the night, so it will be ready for use in the morning, and thus I wouldn't spend time in the charging stations while I have to work, I can say that it was a decisive pull policy to me that made it more attractive to adopt an EV instead of keeping a conventional one.*

The informants were very satisfied of the perceived benefits offered by the government to them in order to attract them towards EVs and consider that they have a great positive effect in shaping their behavior towards the adoption of electromobility instead of ICEVs. Both the PPM theory and the literature related to the Hard environmental Pull factors support the fact that the Pull factor has a positive effect on initiating the migration to the new place, and destination point, which is the adoption of the new technology in our case "EVs" (Yu, et al., 2015; Li, 2016; Jia 2018; Wang, et al., 2020). Our findings confirm that as almost all the participant advanced that this type of Pull policy incentives had a positive effect in shaping their attitudes towards EVs adoption.

5.3.3. Mooring factors in EVs adoption:

Based on the PPM theory, this study examines the effect of the EVs mooring factor in inhibiting

or supporting the Push and/ or the Pull factors by whether blocking the migration decision and behavior towards EVs adoption or by supporting it. In our case we will present the first Mooring factor *"Inertia and the associated perceived risk" that has a negative effect on EVs adoption, and "the perceived risk as a mooring factor" that has a positive effect on EVs adoption.*

1. **Inertia and the associated perceived risk with a negative effect on EVs adoption:**

The first mooring factor that we chose to investigate about is Inertia with a perceived risk that could constrain the migration decision/ behavior from the starting point to the destination point, which is the blockage of the switching behavior from conventional vehicle's adoption to the EVs' adoption. In our case, Inertia represents the psychological/ emotional barrier "Fear" associated with the perceived risk "the EVs changing policies and campaigns" that could constrain the act of change negatively and would lead the consumers towards keeping their product of origin, which is conventional vehicles.

Informant 12: *"I personally have an EV since a long time ago, but my son was thinking about having an EV as well, but still, he couldn't take a decision about it. He was afraid of all the extra costs that came in addition to the previous policy campaigns, like we used to benefit from free road tolls, but now the government has set a fee on it, there was also free municipal parking for EVs, now we started paying them, there was free access to the city center, but now they started making more restrictions on the access to the city center not only on conventional cars, but also on EVs, etc., etc., etc. So, my son was afraid of switching to an EV, and not benefiting of any benefits, he also thinks that the government will make an end to all the previous benefits and reductions they offered to EVs owners before, that's why he kept his conventional vehicle".* Our findings show that some of the acquaintances and/ or family members of our participants were affected negatively with Inertia with the perceived risk of the governmental changing policies and started perceiving potential financial and hard environmental barriers related to EVs adoption which led them to keep their product of origin instead of adopting a new one.

According to the PPM theory, the mooring factor could constrain the migration behavior, and promotes staying in the place of origin. According to literature, Inertia has also a negative effect on the switching behavior since it represents the psychological and emotional barrier and the opposition to change (Beltramello, 2012; Han, et al., 2011; Lai, et al., 2011; Worthy et al., 2013). Moreover, the mooring factor that could be represented as Inertia and the associated perceived risk can drastically decrease the positive influence of the Push and Pull factors on the consumers' switching behavior (Hu, Wang, Zhou, Gao, and Zhu, 2023). This aligns with

our findings that show that many car owners and users hold the status quo because of the effect of Inertia associated with a perceived risk, which constitutes a negative effect on the switching behavior towards EVs adoption and leads the consumers to keep owning a conventional car, that is of course a negative choice to adopt since the government intends to cut the personal mobility emissions that cause harm to the environment. We therefore confirm both the literature and the Mooring factor of the PPM theory that Mooring representing "Inertia with a perceived risk" has a negative effect on the consumers' switching behavior towards EVs.

2. **The perceived risk as a mooring factor with a positive effect on EVs adoption:**

The second mooring factor that I chose to investigate about is the perceived risk that has a positive effect on EVs adoption that is "the Norwegian government's target to introduce only all new electric passenger cars to the market by 2025", and the role of that policy in shaping a positive attitude towards EVs adoption.

Informant 3: *"In my situation, I was actually attracted by the financial campaigns and discounts that the government offers to EVs users, but I didn't make a decision until that the government advanced its target to make all the new sold vehicles zero emissions by 2025, that means that owning a conventional vehicle is no longer a choice, it is somehow a must to have only EVs, because with this rapid pace of EVs introduction, there will be of course a lack in the fueling gas stations, no more parking areas for ICEVs inside the city, no access to the city center, and of course higher fueling prices. So, all types of barriers would be applied, which will leave no space to think about ICEVs, therefore I saw that electromobility is the future of the Norwegian passenger cars, then I took the decision to purchase a BEV that I actually find myself satisfied about".*

Some of the participants that were affected by the mooring factor of the given perceived risk "No more new ICEVs within the market" conclude that this particular policy had a positive effect on their attitudes towards EVs adoption, since they perceive that this policy initiated in them a high-risk perception, that after introducing only all new EVs to the market, the financial barriers, and all types of restrictions will be imposed on conventional cars that started being a source of risk, therefore it would be smart to adopt EVs instead to avoid the losses that could happen in the future by owning ICEVs. According to the mooring factor of the PPM theory, the mooring factor interacts between the Push and the Pull factors in a way to oppose to them and constrain the migration to the destination point, or to support them by initiating a positive attitude towards the migration to the point of destination, which is our case now. According to the literature, the individuals with high uncertainty and risk perception intend to leave the point

of origin that constitutes a source of risks in favor of the destination point which constitutes a source of comfort (Zhang et al., 2022). Our findings confirm both the Mooring factor that interacts with Push and Pull factors in a way to support the migration to the destination point, therefor it has a positive effect on the switching behavior towards EVs adoption, and the literature that shows that the perceived risk has a positive effect on leaving the point of origin that is conventional cars and heading to the point of destination that is the EVs adoption.

5.4 Summary of the theoretical framework's testing:

This discussion focuses on how the chosen theory was aligning to the outcome of my research study. The study is about the role that the EVs Push and Pull, and Mooring policy measures play in shaping the consumer's behavior and/ or switching behavior from ICEVs' adoption to EVs' adoption in the Norwegian context. The chapter highlights the importance of all the policy measures in shaping a positive behavior towards the adoption of EVs.

The theoretical framework entails that the **Push factor** represents the negative factors and attributes of the original point that have a positive effect in convincing people to leave it, which is leaving the original product "ICEVs" in favor of the destination point which is "EVs". According to our research, the Push policy measures "Financial barriers; Perceived inconveniences" had a positive effect on the consumers switching behavior to leave ICEVs and adopt EVs by imposing high prices and taxes on purchase, registration, road use services and so forth, in addition to restricting their access to the city, the lack of fueling stations, etc.

The **Pull factor** of the PPM theory represents the attractiveness variables that pull the individuals to choose the point of destination and perceive it as beneficial and attractive. Our findings confirm that the Pull policy measures "Financial attractiveness; Perceived benefits" have a positive effect in influencing the consumers' switching behavior towards EVs by offering many price and tax rebates and campaigns, in addition to the availability of abundant charging stations, parking areas, etc.

The **Mooring factor** of the PPM theory represents the factors that interact with the Push and Pull factors, and whether support or constrain the migration behavior. In the present study, the Mooring factor got manifested as "Inertia with a perceived risk; Perceived risks", the first variable is mooring policy measure that constrained the migration behavior from ICEVs to EVs by upgrading the fees and taxes that the EVs users used to benefit from, and the second mooring policy measure had a positive effect in switching the consumers behavior to adopt EVs instead of the product of origin "ICEVs" by targeting to introduce only all new EVs to the Norwegian market since 2025.

Our study shows that our findings confirm and align with the chosen theoretical framework and admits that the Push-Pull factors have a positive effect on the consumers switching behavior from ICEVs to EVs, and the Mooring factor could inhibit and/ or support the switching behavior towards EVs adoption. Therefore, I conclude that the PPM theory is valid to use for the research studies about the consumers switching behavior from conventional cars to EVs/ sustainable transportation, or from product/ service to another.

6.0 Conclusion:

The objective of the concluding chapter is to summarize the outcome of the present thesis, and present the theoretical and the practical implications, and so the limitation of the research study.

6.1 Theoretical implications:

The first important theoretical implication of the PPM theory is its design to explain the Push-Pull-Mooring factors in switching the consumers behavior from a product/ service to another. As this theory was validated by many scholars in several consumers switching intention studies, the present thesis extends its validity and application to confirm the positive effect of the Push-Pull-Mooring factors in shaping the consumers switching behavior towards electromobility, and the sustainable personal mobility. Henceforth, I conclude that the PPM theory is valid to test both studies on the EVs policy incentives, and the consumers switching behavior. Moreover, the application of this theory on my research study would provide the literature with important insights on the negative and positive factors of the consumers switching behavior towards electromobility, as the previous studies had rather more focus only on unclassified factors. Moreover, there is also another important factor covered by this theory that is Inertia, and further EVs switching policies research should cover its effect that is the psychological and emotional factor in switching the consumers behavior towards EVs, that would broaden the effect of different variables on EVs adoption. However, further research studies can employ the PPM theory to cover more EVs switching variables as: the effect of "environmental consciousness, social influence, etc.", on the switching behavior towards EVs, as I perceived these variables as important, but I was limited by the time.

6.2 Practical implications:

The present study has rich implications to offer to the Norwegian policymakers. First, the Pull policies have more influence on the consumers switching behavior towards EVs and enjoy more public support than any other policy factors that are respectively "the financial attractiveness, and the perceived benefits". The government should keep boosting rich policy campaigns and financial rebates, and even event's discounts "like free road tolls in the New

year holidays", in order to attract as much car owners as possible. It would be also attractive to offer different Pull benefits in the future like: "more emissions-free zones parking's inside the city, dedicated bus lanes, no queues on yearly inspections, more HC & WC". Moreover, with the rapid pace of EVs adoption and the cancelation of many previous benefits and subsidies, it would be relevant to make a regional analysis to the daily mobility needs & habits, and to the most used and common transportation modes in the given district, region, or municipality that is so mandatory to map and implement the most influencing policy measures and incentives that could effectively push or pull the population living in that area to initiate the desired behavior in regards of electromobility, and avoid spending resources on incentives with limited significance to a given region or to a certain population, "e.g., regions with high ferry commuting habits, the district can offer discounts on ferry fees more than road tolls, or in low-income regions, keeping the purchase subsidies is relevant as a starting financial benefit, or trading-in the fossil-fuels vehicles with EVs with a low price, and even specify certain regions and areas as road toll free zones for EVs users. Many of these measures can further expand EVs adoption among all the Norwegian counties, regions, and cities.

For the Push factors, the present research shows that the most effective Push policies are "the financial barriers, and secondly the perceived inconveniences", the government should sensibilize and knowledge the individuals about ICEVs' TCO, and the additional costs that come on top of it to make these vehicles economically unappealing and unaffordable. Moreover, the government should drive low-carbon marketing campaigns to show the different benefits of EVs, and inconveniences of ICEVs, like "ICEVs are more expensive to fuel, and driven km by EVs are way less expensive; the benefits of keeping only ZEV inside the city, and banning the ICEVs from entering to the city center, emissions-free parking, etc.", all these techniques will make the government succeed in switching the behaviors towards EVs.

Third, given the positive effect that perceived risk as a Mooring factor plays in shaping the consumers behavior towards EVs, the government has introduced a successful policy target to introduce only new ZEV by 2025 to the market, the government and industries should also invest in better EVs battery technologies, and introduce this type of policies to phase-in the market with completely environment friendly EVs, or hydrogen vehicles, and so forth. The other Mooring factor which Inertia with a perceived risk, that is the fear of the changing policy discounts and exemptions, the government should consider that the positive effect of the Push and Pull policy could be limited and constrained by the negative effect of Inertia from people with high risk perception, these people develop negative scenarios about the new choice, and

therefore that given policy could completely block their switching behavior, and the gradual decrease of the policy discounts with the presence of a decent amount of ICEVs within the market is a negative choice, this step could be taken after the complete phase-out of ICEVs.

6.3 Summary and limitations:

The goal of the present thesis was to understand how the consumers perceive the EVs push and pull, Mooring policy measures that promote the purchase and adoption of the electromobility. The EVs as the most sustainable personal mobility that is available in the market are promoted by the government with the purpose of achieving sustainability goals beside cutting the emissions that emanate from the transportation sector. Phasing-in electromobility is part of the smart mobility plan of the smart city management, and this thesis explores how the Norwegian EVs Push, Pull, Mooring policies affect the consumers "smart people" switching behavior towards abandoning ICEVs and adopting EVs instead. Based on our chosen theoretical framework "PPM", this study shows that the Pull policy measures "Financial attractiveness, Perceived benefits", and the Push policy measures "Financial barriers, Perceived inconveniences" have a positive effect on the consumers switching behavior from ICEVs to EVs adoption. Whereas the Mooring policy measure "Perceived risk" have are positively related to the switching process, whilst the Mooring policy measure "Inertia with a perceived risk" is negatively associated with leaving the point of origin "ICEVs" and migrating to the point of destination "EVs".

This study complements the previous research studies in EVs switching behavior that examined the effectiveness of other PPM variables on the consumer switching behavior towards EVs, such as "social influence, price consciousness, environmental threats awareness, perceived value, etc." Alongside, this is seen to be also one of our research study limitations, since the comprehension of the consumer's switching behavior is a complex process encompassing different variables and factors as the ones I just mentioned above, and therefore there is a research gap in the variables that could explain this phenomenon. Moreover, Inertia and the related emotional and psychological barriers should be more regarded by the government since they are obviously linked negatively to EVs adoption. Furthermore, this study covers limited regions of Norway, and few participants from these different regions, which entails that the findings could not be 100% generalized on all the Norwegian territory, since the EVs policies could be different according to different local authorities, and the same applies for the travel habits that differ in local contexts, and therefore the effect of the EVs policies could differ and also not be generalized on all the NO cities and municipalities, etc.

6.4 Future research studies:

As we already mentioned, the findings of this research cannot be generalized over all the regions of Norway, and so the effect of the studied variables, therefore a regional analysis of the travel habits and the individuals' environmental conditions, in addition to the EVs market development in each region is mandatory to study by the government, in order to implement new variables that would be more adequate to each living area. Studying Inertia and the psychological factors related to EVs adoption could also be important to cover in the future studies, which will help the government to act accordingly, and avoid wasting time and resources on invalid policy instruments.

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