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Norway's EV incentives: a success story?

Evaluating the effectiveness of *Norway*'s incentive mix for EV uptake and transition

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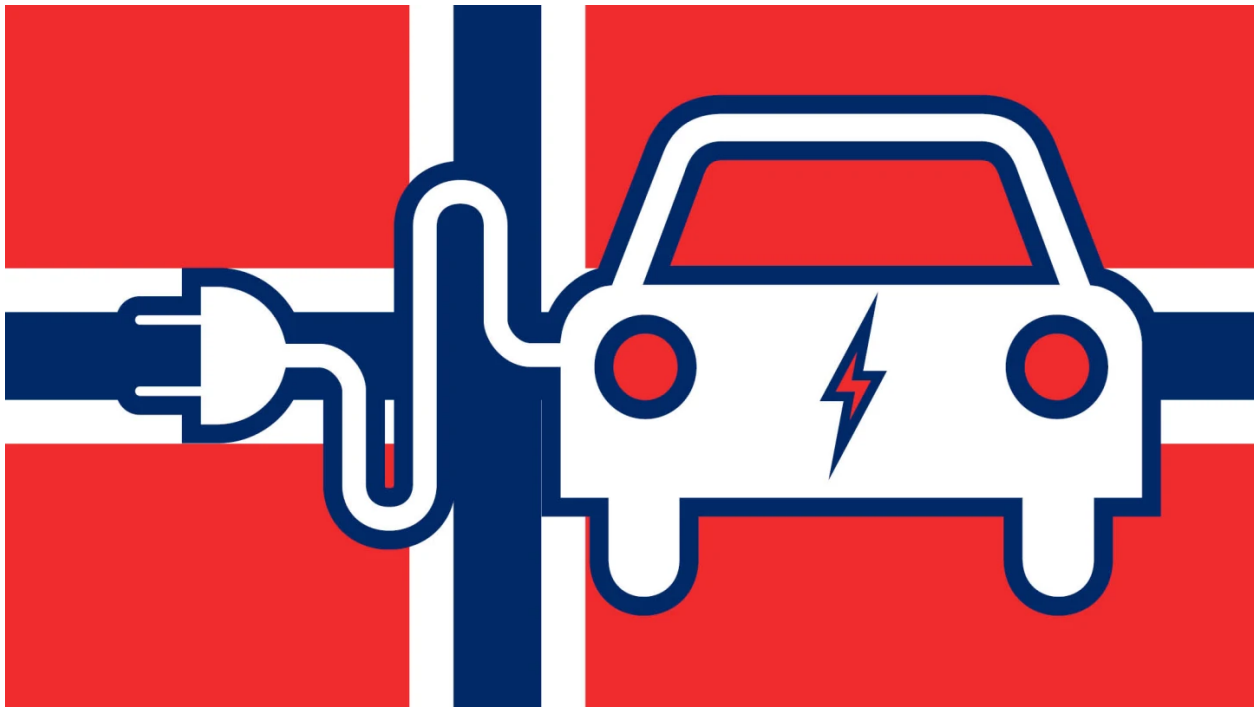

Figure 1. Taken from Milne (2017).

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Abstract

Introduction: Electric vehicles (EVs) are increasingly promoted for sustainable personal mobility, due to potential environmental benefits. To accelerate their uptake, governments around the world have introduced financial and non-financial EV incentives, Norway taking the lead. Considering this frontrunner position, Norway can offer lessons to other countries. Existing literature insufficiently explores the process of uptake and an incentive mix's broader implications, both positive and negative. To fill this gap, the following research question is addressed: *How effective is Norway's incentive mix for EV uptake and transition, and what are the implications for EV transitions in other countries?*

Theory: This research builds on transitions theory, specifically the multi-level perspective, pinpointing the limited knowledge of how a niche scales up to the mainstream. It focuses on incentives enabling uptake, the research adopting a novel, holistic categorisation of incentives: financial, infrastructure, and normative. By applying and adapting the extended policy mix concept, an incentive mix effectiveness assessment framework is constructed with indicators, evaluating an incentive mix based on four characteristics' presence: Consistency, Coherence, Credibility, and Comprehensiveness (4 Cs).

Methods: This research employs an embedded, single-case study design, examining Norway's incentive mix through the lens of different stakeholder groups. To apply the assessment framework and gather qualitative primary data, 25 semi-structured interviews were conducted with varying actors, identified through stakeholder mapping. Interview questions were formulated using framework indicators and during data analysis, thematic coding systematically categorised findings according to the 4 Cs.

Results: Norway employs financial, infrastructure and normative EV incentives – economic ones being most influential for uptake. Arguments for and against the 4 Cs' presence are made. Strong incentive mix effectiveness is exemplified by rapid EV growth, widespread support, and political consensus. However, weak effectiveness is manifested through emerging problems being insufficiently tackled, certain political parties' resistance, and suggested improvements. Various lessons from Norway are identified, including the necessity for widespread charging infrastructure.

Discussion/Conclusion: While Norway's EV uptake has induced local environmental benefits and stimulated market development, this research demonstrates the incentive mix's costly nature, both in monetary terms and negative implications, limiting its effectiveness. By adopting a pioneering EV role globally, Norway undoubtedly ran the risk of encountering mistakes. Although problems should not be disregarded, Norway's experiences lay the foundations for effective incentive mixes elsewhere. The research illustrates the need to recognise that EVs are only a small part of road transport's sustainability transition, a shift from private to public transport being crucial.

Key words: electric vehicles, uptake, transition, incentives, policy mix, effectiveness, Norway

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1.0 Introduction

The urgency of global warming has called for action across all sectors to reduce human contribution to climate change. The transport sector in particular is responsible for 23 percent of total energy-related greenhouse gas (GHG) emissions, through its fossil fuel reliance, 93 percent of it being dependent on oil (Sims et al., 2014; Taljegard, 2017). More specifically, three quarters of these emissions stem from road transport and hence, vehicle usage (Ma et al., 2012). Therefore, the industry, and road transport particularly, play a critical role in combating climate change and ensuring that global warming is limited to well below 2 degrees Celsius above pre-industrial temperature levels (Sims et al., 2014; UNFCCC, 2015). Across the world, demand for mobility is increasing rapidly and vehicle numbers are projected to more than double by 2050, the majority of this growth occurring in developing countries (Meyer et al., 2007). Without measures in place to enhance sustainability, transport emissions will rise by more than 80 percent by 2050 (Ma et al., 2012). To avoid this scenario and meet energy demand, the sector requires urgent decarbonisation through smart mobility solutions (Santos, 2017; Ma et al., 2012).

The electrification of the transport sector using renewables represents an arguably effective strategy to reduce carbon-intensive fuel use and cut GHG emissions (Shi et al., 2019). Alongside avoided journeys where possible, modal shifts to lower-carbon alternatives such as public transport, improvements in vehicle and energy performance, and infrastructure investments, this solution offers high global warming mitigation potential (Sims et al., 2014, p.603). Within road transport specifically, electric vehicles (EVs) have been increasingly promoted as a long-term solution for sustainable personal mobility (Ma et al., 2012). Compared to conventional internal combustion engine vehicles (ICEs) which employ a fossil fuel-powered engine, plug-in EVs draw all or part of their motor power from the electric grid through on-board batteries (Ma et al., 2012). These batteries are charged using household electricity or public charging points and, ideally, can be powered completely renewably (Mousazadeh et al., 2009). As a result, EVs have attracted attention due to their ability to reduce road transport emissions and improve air quality (Shi et al., 2019).

Despite potential sustainability benefits of EVs, adopting them as the road transport mainstream has proven difficult in practice (Hall et al., 2017). As transitions theory demonstrates, such sustainability transitions are complex, long-term phenomena, requiring deep structural changes in existing sectors and collaboration among numerous actors (Van den Bosch & Rotmans, 2008; Geels, 2011). More specifically, decarbonising the transport industry has been hindered due to the absence of a global legally binding deal and the high relative cost of clean energy technologies (Santos, 2017). The latter is particularly relevant with EVs, hindering successful widespread market penetration (Greene et al., 2014). Experience shows that as the scale of a niche technology rises, their costs reduce due to learning effects and economies of scale (Stern et al., 2006). Therefore, purchasing and operating costs of EVs can fall immensely if the right support is in place for scale-up (Santos, 2017). Santos (2017) argues that “until the cost of alternative vehicle systems falls enough to be attractive, taxes and subsidies are needed” and thus, highlights the importance of national and local government involvement. Alongside economic barriers, EV adoption also experiences organisational, technical and educational obstacles (O’Neill et al.,

2010). Thus, to overcome setbacks and accelerate EV uptake and transition, a wide range of government incentives are necessary to support the technology – both financial and non-financial (Greene et al., 2014; Coffman et al., 2017).

Over the last decades, EV incentives have been introduced around the world, particularly in China, Europe, Japan and the US (Hall et al., 2017). Norway has taken the lead through its diverse and strong incentives for promoting purchase and ownership, making EVs more convenient, appealing and cost-efficient in daily use (Bjerkan et al., 2016). The country's generous incentives and heavy taxes on diesel and gasoline cars have resulted in a lower total cost of ownership for EVs compared to ICEs (Skjølsvold & Ryghaug, 2020; Steinbacher, 2018). The government's approach has created an alleged 'EV revolution', 54.3 percent of 2020 passenger vehicle sales accounting for plug-in battery EVs (Norsk Elbilforening, 2021a). Norway is considered a global forerunner in electromobility, its EVs being predominantly powered by renewables – the country sourcing 93.4 percent of electricity from hydropower (Bjerkan et al., 2016; Statistisk Sentralbyra, 2020). Since the late 1980s, EV incentives have included: registration tax exemptions, free parking, toll road fee exemptions, VAT exemptions, bus lane use, ferry rate deductions, free charging, and investments in charging infrastructure (Steinbacher, 2018; Mersky et al., 2016). Through its financial and non-financial incentives, the Norwegian government has made a non-binding decision to end the sale of fossil fuel passenger road vehicles by 2025 (Steinbacher, 2018, p.1). All new sales are to be zero-emission vehicles (ZEVs), illustrating that increased uptake and a subsequent EV transition are scheduled to occur.

Considering Norway's frontrunner position with EVs due to its unique incentives and the growing interest in EV uptake globally, Norway can evidently offer lessons to other countries. Despite a national 2025 goal and various instruments in place, barriers to uptake persist and EV incentives have vast implications, both strengths and adverse effects; thus, a successful and complete EV transition is not guaranteed in Norway. Due to the complexity of uptake and the broad applicability of Norway's experiences, it is therefore important to question the effectiveness of the EV incentive mix and examine its strengths and weaknesses for uptake and transition. Thus, this study addresses the following research question and sub-questions:

How effective is Norway's incentive mix for EV uptake and transition, and what are the implications for EV transitions in other countries?

a) *What types of EV incentives (financial, infrastructure, normative) are present in Norway?*
b) *What are the strengths and weaknesses of Norway's EV incentive mix?*
c) *What lessons does Norway's EV incentive mix offer to other countries?*

Existing literature has primarily focused on the effect of incentives on the price of EVs compared to ICEs and on the quantity of EVs adopted, Norway's case being praised as a global EV success story through its rapid market growth (Haugneland et al., 2016; Hannisdahl et al., 2013; Lorentzen et al., 2017; Levay et al., 2017). However, beyond adoption rates, more research is necessary to evaluate the practical and broader implications of incentives, both strengths and shortcomings. This will enable lessons from this pioneering case to be extracted and the adequacy of Norway's incentive mix for EV uptake and transition to be scrutinised. Moreover, research has

predominantly investigated individual incentive types, while exploration of the wider notion of incentives has been lacking – a comprehensive analysis that examines the combined effects of multiple incentive types for EV transition: financial (reduced costs of EVs), infrastructure (EV infrastructure benefits) and normative (desirable societal outcomes from EVs). This holistic approach enables the topic to be addressed in a more complete way and the importance of different incentive types for EV uptake to be directly compared. Furthermore, the process of uptake is currently insufficiently explored in transitions theory, understanding of how an innovation scales up to the mainstream and the processes that enable it to do so being limited (e.g. Ehnert et al., 2018; Naber et al., 2017). Thus, by investigating the use of incentives to accelerate EV uptake and analysing its implications, this research strives to fill this knowledge gap. Overall, the study contributes to science and society as it critically reflects on the completeness of Norway's EV incentive mix and pinpoints areas of improvement, to enhance the success and minimise arising issues of EV uptake, in Norway and beyond. If the practical implications of Norway's EV incentives are not understood, these issues and the theoretical gap in understanding of uptake will persist. To generate these contributions and obtain an overarching picture of the topic, interviews were conducted with a range of stakeholder groups to encompass the varying actors that are impacted by Norway's EV incentives and embody differing perspectives.

The structure of this thesis is as follows: theoretical framework, methodology, background chapter, results, discussion, conclusion and appendix.

2.0 Theoretical Framework

To evaluate the effectiveness of Norway's incentives for EV transition and determine the implications for other countries, this section establishes relevant theory, taking a focus on uptake within transitions and more specifically, how EV uptake is enabled through incentives. It covers: socio-technical transitions, barriers to uptake, incentives for uptake and an incentive mix effectiveness assessment framework.

2.1 Socio-Technical Transitions

Geels (2011) argues that environmental issues can only be tackled through socio-technical transitions – "deep structural changes in transport, energy, agri-food and other systems" (p.24). Thus, to achieve a sustainability transition, fundamental change in the transport sector is necessary. Such systemic changes completely reconfigure sectors, including their technology, markets, policy, infrastructure, consumer practices, scientific knowledge and cultural meaning (Elzen et al., 2004). Moreover, the transformations are initiated by various actors, namely: policymakers, firms and industries, civil society, consumers, researchers and engineers (Geels, 2011; Jolly, 2010). Sustainability transitions are therefore complex phenomena, conducted by numerous actors and comprising of long-term processes (Van den Bosch & Rotmans, 2008; Geels, 2011).

A prominent visualisation and understanding of the multi-dimensionality of socio-technical transitions and the structural change that they entail, is the multi-level perspective (MLP) (Geels, 2011; Naber et al., 2017; Van den Bosch & Rotmans, 2008). It defines transitions as non-linear, dynamic processes, resulting from the interaction of three conceptual levels: niches, socio-technical regime, and socio-technical landscape (see *Figure 2*) (Naber et al., 2017). Niches represent the lowest, least stable level, where actors generate novelties and potential seeds for systemic change, which oppose the present locked-in regime; EVs are an example (Lawhon & Murphy, 2012; Geels, 2011). The socio-technical regime forms the structure of the existing system, its rooted form ensuring stability (Figenbaum, 2017). The locked-in nature results from an established set of rules, including: lifestyles and user practices, cognitive routines and shared beliefs, legally binding contracts and institutional regulations (Geels, 2011; Naber et al., 2017). Lastly, the socio-technical landscape is the external environment and broader context in which niches and regime interact (Rip & Kemp, 1998). As the technical and material backdrop sustaining society, it incorporates: political ideologies, societal values, macro-economic trends and demographical patterns (Geels, 2011). Dynamic interaction between the three levels can induce socio-technical transitions and thus, a change from one regime to another (Geels, 2011; Kivimaa, 2014). This occurs by (1) niche innovations picking up momentum, (2) landscape alterations exerting pressure on the regime, (3) regime destabilisation forming 'windows of opportunity' for niches (Figenbaum, 2017). The process of moving a niche technology to the mainstream, the regime, is often referred to as 'uptake' and is thus crucial to achieving a transition (Suleiman, 2021; Augenstein et al., 2020).

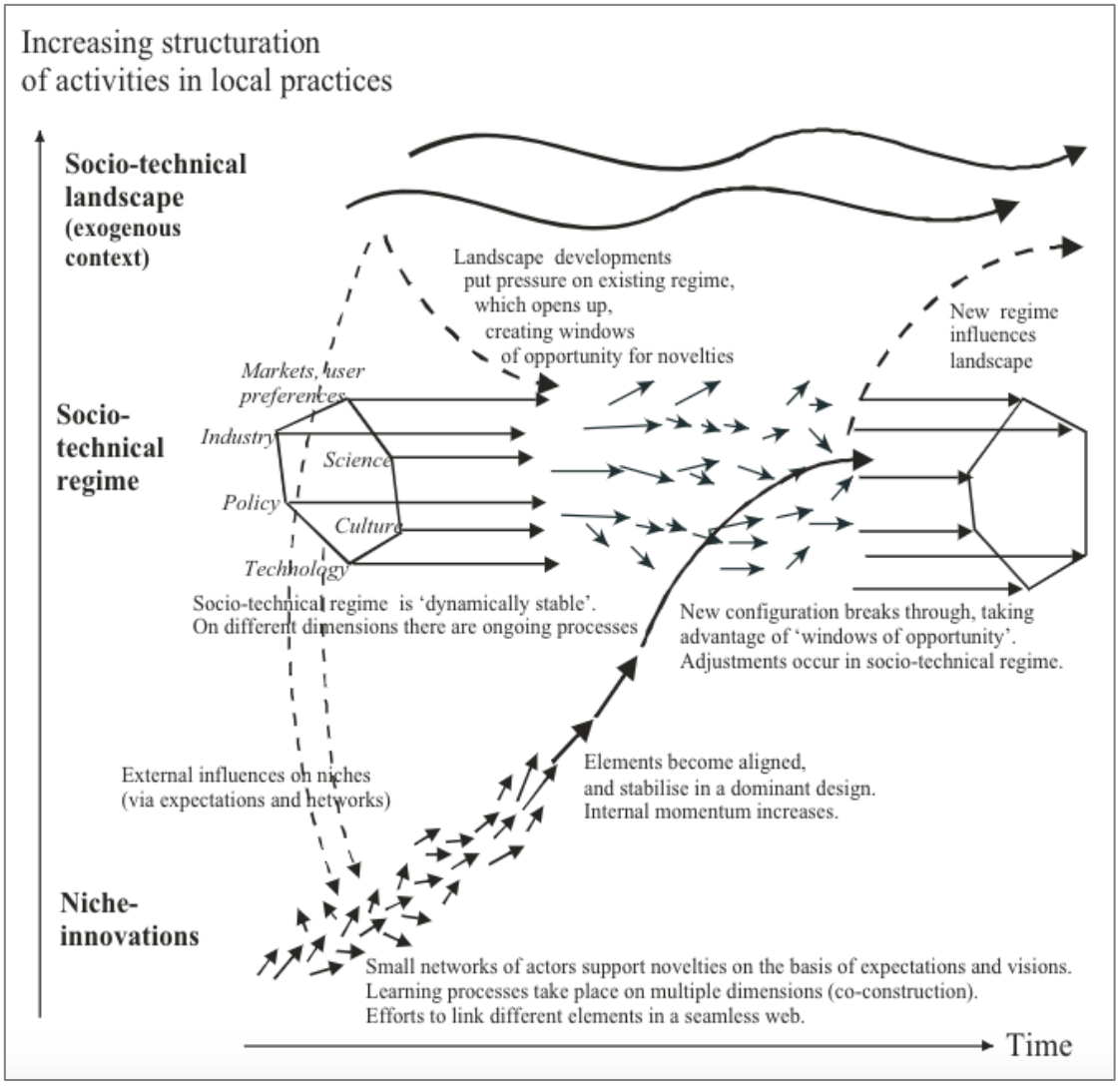

Figure 2. Visualisation of the MLP on transitions (taken from Geels, 2011, p.28).

2.1.1 Uptake

While theories of sustainability transitions, such as the MLP, offer a framework to conceptualise the overarching mechanism of a socio-technical transition, the specific process of uptake is insufficiently explored and theorised, limiting our knowledge of it (Augenstein et al., 2020; Kivimaa, 2014). A gap in literature exists on how an innovation scales up to the mainstream and the processes that enable it to do so (Ehnert et al., 2018; Naber et al., 2017; Jolly, 2010; Van den Bosch & Rotmans, 2008; Seyfang & Longhurst, 2016). According to Augenstein et al. (2020), uptake "remains a fuzzy concept", due to the varying usage and understanding of it by researchers across different academic fields. Diverse terminology is used across literature to describe uptake, from upscaling, to adoption, to diffusion (e.g. Van den Bosch & Rotmans, 2008; Meelen et al., 2019; Seyfang & Longhurst, 2016). Various frameworks have also been created to model the mechanisms behind uptake, such as: the three processes 'deepening, broadening and scaling up' by Van den Bosch & Rotmans (2008); the four processes 'growing, replication, accumulation and transformation' from Naber et al. (2017); and the five processes 'upscaling, replicating,

partnering, instrumentalising, and embedding' formulated by Ehnert et al (2018). However, the range of approaches and lack of dialogue between researchers across disciplines have hindered deeper understanding of the process (Augenstein et al., 2020). Suleiman (2021) explains that "to date, no single applicable, comprehensive and systematic analytical framework has been identified that outlines the most formative aspects for analysing and understanding socio-technical system transition processes". Furthermore, frameworks such as the MLP present an oversimplification of the processes of change and by offering an prevailing successive, mechanistic interpretation of transitions, arguably impede understanding of the complexity behind the uptake process (Genus & Coles, 2008; Augenstein et al., 2020). By exploring the uptake of EVs in Norway, this research seeks to fill this gap in knowledge.

2.2 Barriers to uptake

Further countering the linear approach to transitions, it is important to identify the barriers to uptake that exist and highlight the fact that uptake and transition are not guaranteed processes. As described by Figenbaum (2017), existing technology, development and introductory costs of new technologies collectively result in lock-in effects and represent barriers that limit a niche innovation's adoption. Concerning EVs specifically, literature discusses various barriers that hinder its natural widespread uptake, categorised into four types: financial, organisational, technical, and educational (Li et al., 2018; O'Neill et al., 2019). Firstly, financial barriers refer to the higher upfront purchasing cost of EVs over ICE vehicles (Broadbent et al., 2019; Foley et al., 2020). However, with EV prices declining as market penetration rises, this bottleneck is diminishing (Engel et al., 2018). Secondly, organisational barriers in terms of infrastructure and planning impede EV uptake, including a lack of: comprehensive recharge network, sufficient charging infrastructure and access to efficient stations (O'Neill et al., 2019; Broadbent et al., 2019; Li et al., 2018; Engel et al., 2018). The 'chicken-and-egg problem' persists, whereby customers are averse to choosing EVs if infrastructure is inadequate and providers are hesitant to invest in charging facilities if market uptake has not been established (O'Neill et al., 2019; Foley et al., 2020). As a result, 'range anxiety' has emerged (Broadbent et al., 2019; Rietmann & Lieven, 2019). Thirdly, technical barriers include limited driving range and vehicle options, along with poor battery performance and efficiency (Holtsmark & Skonhoft, 2014; Aasness & Odeck, 2015; Morgan, 2020). However, with more than 350 EV models being released by 2025 and technical improvements, these obstacles will likely diminish (Engel et al., 2018). Fourthly, authors discuss educational barriers to EV uptake – a lack of information about EV ownership and operation, including awareness about potential fuel and maintenance cost savings (Broadbent et al., 2019; Levay et al., 2017). Education, through experiential learning and information provision, is arguably important to demystify EVs and create a social norm around their use, as the 'conventional' vehicle of the future (O'Neill et al., 2019). For these reasons, niches such as EVs may experience setbacks and insufficient momentum, or tensions in existing regimes could hinder the materialisation of 'windows of opportunity' for scale up to the mainstream (Geels, 2012).

2.3 Incentives for uptake

To overcome barriers and setbacks, existing literature introduces the idea of accelerating transitions and strategies to facilitate and enhance uptake of a niche innovation (Ehnert et al., 2018). To accelerate transformative change and uptake, Von Wirth et al. (2019) discuss the importance of purposive experimentation, Kivimaa et al. (2019) emphasise the role of intermediaries, and Roberts et al. (2018) describe the significance of government policies to induce positive feedbacks. The latter is further echoed by other scholars, explaining that niche innovations require initial protection in the form of technological policies to encourage adoption and successfully compete in incumbent socio-technical regimes (Smith & Raven, 2012; Lindberg et al., 2019; Liao et al., 2017). The use of policies to stimulate uptake is the focus of this research and more specifically, the implementation of incentives to break down the barriers to EV adoption.

Incentives are employed by governments, at international, national and local levels. In general terms, incentives represent external motivators used to promote a particular behaviour change (Pavetti & Stanley, 2016, p.8). They are a "means of urging people to do more of a good thing and less of a bad thing" (Dekker et al., 2020), leading to potential improved outcomes. Literature suggests that incentives breakdown the barriers that refrain people from progressing in a desired activity or task, particularly when benefits are not immediately apparent (Pavetti & Stanley, 2016, p.5). Academics commonly sub-divide incentives into financial and non-financial ones (Coffman et al., 2017; Peterson & Luthans, 2006; Sicsic et al., 2016; Dambisya, 2007; Hardman, 2019). A financial incentive uses money as a motivator to encourage specific behaviours or actions and induce a desired change, such as subsidies and tax benefits on EV purchase and use (Peterson & Luthans, 2006; Langbroek et al., 2016). On the other hand, non-financial incentives do not use monetary rewards to engage individuals but rather encourage behaviour change for reasons beyond money (Pavetti & Stanley, 2016, p.20). Based on literature, in the case of EVs, these non-financial incentives can be further divided into infrastructure incentives, including access to high occupancy vehicle (HOV) lanes, preferred parking, charging infrastructure accessibility, as well as normative incentives, such as environmental benefits (e.g. GHG reductions, air quality improvements) and health benefits from reduced exposure to air pollution (e.g. premature deaths avoided, decrease in cardiovascular harm) (Coffman et al., 2017; Liao et al., 2017; Zhang et al., 2018; Liang et al., 2019; Malmgren, 2016; Santos & Davies, 2020). Thus, this research takes a unique, more holistic approach to the topic and categorises incentives for EV uptake into three types: financial, infrastructure and normative (see *Table 1* below).

Table 1 – EV incentive categorisation

Incentive Type	Description	Examples
Financial	Reduced costs (purchase and ownership) associated with EVs	Registration, road, company car, VAT, re-registration tax reductions; reduced charges on toll roads, ferries and parking; free charging opportunities; grants for charging infrastructure
Infrastructure	Infrastructure benefits of EVs	Access to high occupancy vehicle lanes, preferred parking, increased charging infrastructure accessibility
Normative	Desirable societal outcomes of EVs	Environmental benefits (GHG reductions, air quality improvements); health benefits (from reduced exposure to air pollution)

2.3.1 Incentive mix

Due to the complex and multi-faceted nature of sustainability transitions, as well as the varying motivations of individuals to adopt a niche innovation, no single strategy is able to tackle the entire issue at hand (Geels, 2004; Kern et al., 2017). Existing literature emphasises the need for multiple incentives in order to drive niches (by ensuring their competitiveness amongst incumbents), destabilise established systems and expedite a transition to a lower carbon economy (Markard et al., 2020; Scordato et al., 2018; Broadbent et al., 2019). As demonstrated by Scordato et al. (2018), Sweden's pulp and paper industry illustrates the necessity of several destabilising incentives to accelerate the sector's transition process. Thus, similar to policy mix theory which originated from the need to move beyond single policy instruments and adopt a combination of them, it is argued that numerous incentives are necessary to be implemented over time, including for EVs (Rogge & Reichardt, 2016; Edmondson et al., 2019; Broadbent et al., 2018).

Concerning EV incentives in particular, existing literature has predominantly focused on the effect of incentives on the price of EVs compared to ICEs and on the quantity of EVs adopted (Levay et al., 2017). Widespread research has assessed the perceived or actual impact of different incentive types on EV uptake, to determine which has the biggest positive effect on EV adoption rates (e.g. Matthews et al., 2017; Zhang et al., 2016; Liao et al., 2017). Literature has identified the particular importance of monetary measures to enhance EV uptake, such as purchase and VAT reductions (Rietmann & Lieven, 2019; Jenn et al., 2018; Santos & Davies, 2020; Abotalebi et al., 2019; Li et al., 2019; Broadbent et al., 2019; Sierzchula et al., 2014; Bjerkan et al., 2016). The significance of charging infrastructure availability and density is also highlighted, specifically fast charging (Coffman et al., 2017; Zhang et al., 2016; Broadbent et al., 2018; Broadbent et al., 2021; Santos & Davies, 2020; Mersky et al., 2016). Environmental incentives on the other hand are deemed less influential on EV adoption (Broadbent et al., 2019). However, literature is currently lacking on the wider impact of EV incentives, beyond adoption rates, incorporating both their strengths and potential adverse effects. As a result of EV incentives: Aasness and Odeck (2015) exemplify issues of revenue loss and congestion on transit lanes, Holtsmark and Skonhoft (2014) highlight possible increased private car use over public transport and cycling, Camara et al., (2021) identify high implicit costs relative to the emission savings at the household level, Morgan (2020) describes 'techno-political lock-in or path-dependence' on private transport, and

De Haan et al. (2007) indicate a growing total car fleet, households being encouraged to own more cars. Thus far, the exploration of such consequences has been limited and therefore, this research contributes by building on these authors' findings and enhancing understanding of the broader impact and effectiveness of Norway's range of EV incentives for uptake and transition.

2.4 Incentive mix effectiveness assessment framework

To increase understanding of uptake and assess EV incentives' wider effectiveness, this research compares a combination of incentives to a policy mix – a concept that acknowledges the interactions and interdependencies between different policies and the necessity for complementary policies to be implemented because collectively, they influence the extent to which policy goals are achieved (Cunningham et al., 2013; Flanagan et al., 2011). Due to the compatibility of these concepts, this study identifies a set of incentives as an 'incentive mix' and considers policy mix theory appropriate and relevant to employ (Edmondson et al., 2019). In particular, the extended policy mix concept of Rogge and Reichardt (2016) is applied to the case, its four characteristics to describe the nature and performance of a policy mix forming the structure of the analysis: Consistency of elements, Coherence of processes, Credibility, and Comprehensiveness (4 Cs). Firstly, consistency of elements refers to how well aligned the policy mix elements are, to achieve policy objectives. Secondly, coherence of processes captures how collaborative and systematic the process of policy making and implementation is, to achieve policy objectives. Thirdly, credibility refers to how believable and reliable the policy mix is, in its elements and processes. Lastly, comprehensiveness pertains to how complete the policy mix elements are, and how thorough decision-making processes are. As demonstrated in literature, these characteristics can be used as concrete assessment criteria to evaluate a policy mix, including its effectiveness (Rogge & Schleich, 2018; Li et al., 2020). Thus, the 4 Cs represent a suitable approach to assess the effectiveness of an incentive mix for EV uptake and transition and, as explained in Section 2.4.1, are adapted to form this research's assessment framework, applied to Norway's case.

2.4.1 Operationalisation

In order to link findings with the incentive mix effectiveness assessment framework, identify which of the characteristics are present in an incentive mix and determine its effectiveness for EV uptake and transition, it is necessary to operationalise the characteristics of Rogge and Reichardt (2016). *Table 2* visualises this operationalisation, outlining the four characteristics, their sub-characteristics, and how they are translated in this specific research on Norway's EV incentive mix. Primarily, the characteristic descriptions and sub-characteristic classifications were adapted from Rogge and Reichardt (2016) and Rogge and Schleich (2018) respectively, adjusting them to suit the incentive mix terminology. Moreover, the theory's translation into this particular case was formulated using inspiration from previous research that practically applied the 4 Cs as assessment criteria – Rogge and Schleich (2018) and Li et al. (2020). Since this study adopts an abductive research design (see Section 3.1), before data collection, the operationalisation and formulation of indicators was expanded to the furthest extent using these existing papers.

However, based on the findings, reflections on the framework's applicability occurred and improvements were implemented to the 'Translation into Research' indicators.

To elaborate on these reflections, after examining the primary data collected, the original framework accommodated well for this case and proved to be robust, offering a suitable structure to assess the effectiveness of Norway's EV incentive mix. While the original indicators identified per characteristic were generally appropriate, based on the findings, slight amendments were made to the framework to enhance its wider applicability. Firstly, due to an observed overlap between several indicators, two were removed: 'national and local governments are pulling in the same direction' which overlapped with the 'incentive mix credibility at the sub-national level' analysis of local government support, and 'responsibilities of the different EV stakeholders are clearly defined' that was addressed in the descriptions of EV stakeholders' roles in the incentive formulation process of informational coherence. Secondly, due to a widespread emphasis placed on rural-urban differences in EV incentives and support by interviewees, two additional indicators were added to the framework under 'incentive mix credibility at the sub-national level', namely: 'strong support in urban areas' and 'strong support in rural areas'. Thirdly, to clarify the translation of comprehensiveness into research and enhance understanding of it, its indicator was reworded to: 'the incentive mix is complete to effectively achieve an EV transition in Norway; adjustments or improvements are not necessary'. Thus, the initial effectiveness assessment framework broadly remained the same and through small improvements, was enriched and made more concise.

Hence, *Table 2* illustrates the revised operationalisation of the effectiveness assessment framework based on the research findings and indicates the adjustments that have been made from the initial operationalisation (refer to 'Legend' for clarification).

Table 2 – Framework operationalisation. Descriptions adapted from Rogge and Reichardt (2016), sub-characteristics taken from Rogge and Schleich (2018), and translation into research adapted from Rogge and Schleich (2018), Li et al. (2020), and own findings.

Legend	
Red	Indicator added/revised
~~Strikethrough~~	Indicator removed

Characteristic	Description	Sub-characteristic	Translation into Research
Consistency	It refers to the incentive mix and how well aligned its elements are, to achieve incentive objectives. It can range from having contradictions [weak consistency] to synergies [strong consistency].	1st level: consistency of the EV strategy	The EV transition plan in Norway is a good match with other targets of the Norwegian government.
		2nd level: consistency of the instrument mix	The existing incentive types reinforce each other in their positive effect on supporting an EV transition.
		3rd level: consistency of the instrument mix with the EV strategy	The EV transition in Norway can be achieved with the help of existing incentives and measures.
Coherence	It captures how collaborative and systematic the process of incentive making and implementation is, to achieve incentive objectives. It can range from [weak coherence] to [strong coherence].	Informational coherence	There is a continuous exchange of information between policymakers and EV stakeholder groups.
			Policymakers are well informed about developments in the EV branch.
			Emerging problems are spotted early on by policymakers.
			Policymakers strive to remove problems of EV incentives; incentive mix is continuously adjusted based on obstacles.
			The search for solutions to problems takes place in a constructive exchange between policymakers and key stakeholders in the Norwegian EV industry.
		Procedural coherence	The EV incentives are implemented in a transparent procedure.
			~~The responsibilities of the different EV stakeholders are clearly~~

			~~defined.~~
			~~National and local governments are pulling in the same direction.~~
Credibility	It refers to how believable and reliable the incentive mix is, in its elements and processes. It can range from [weak credibility] to [strong credibility].	Incentive mix credibility at the national level	A broad consensus across all political parties on EV transition and EV incentives.
			A clear political vision
			Strong support for EV incentives and transition from the Norwegian government
		Incentive mix credibility at the sub-national level	Strong support from state governments
			Strong support from municipalities
			Strong support in urban areas
			Strong support in rural areas
Comprehensi-veness	It refers to how comprehensive and complete incentive mix elements are, and how thorough decision-making processes are. It can range from [weak comprehensiveness] to [strong comprehensiveness].	n/a	~~Important incentives are not missing to effectively achieve an EV transition in Norway.~~ The incentive mix is complete to effectively achieve an EV transition in Norway; adjustments or improvements are not necessary.

3.0 Methodology

To answer the research question, Norway's EV incentive mix is evaluated using an effectiveness assessment framework (see Section 2.4) to determine its effectiveness for EV uptake and transition. This section describes the methodology employed in this research, including: research design, stakeholder mapping, data collection, data analysis, ethics, and validity and reliability.

3.1 Research Design

To effectively investigate the research question, a qualitative research approach forms the basis of this study – a methodology that describes and explains human experiences, social contexts, behaviours and interactions (Fossey et al., 2002). Data analysed in this approach stems from in-depth, open-ended interviews, fieldwork observations, and written documents (Patton, 2005). More specifically, this qualitative study adopts an abductive research strategy – a mix of deductive and inductive approaches (Dubois & Gadde, 2002). The research occurs "from rule to result to case" (Van Hoek et al., 2005); the process starts with understanding theory, then observations and findings are gathered in the field, and lastly, these are brought back to theory, compared and linked to generate results (Ong, 2012). Thus, in this research, existing theory was first applied to construct the theoretical framework and after relevant findings were gathered from the case, the initial framework was assessed and updated to produce an improved version.

Moreover, this research employs Yin's embedded, single-case study design (Yin, 2017). A case study is an empirical inquiry of a phenomenon in its real-life context, which enables in-depth exploration and understanding (Saladin et al., 2018; Mattison et al., 2020). More specifically, this design analyses the overall picture of a case by exploring two or more individual embedded units of analysis (Rowley, 2002; Mattison et al., 2020). Numerous sub-units are identified within the case and context, such as roles or locations, and the results from each are later merged to generate a holistic perspective on the topic (Rowley, 2002). Considering the research question, the context is Norway and the case is the effectiveness of the incentive mix for EV uptake and transition. Since Norway's EV incentive mix is examined as a whole through the lens of different stakeholder groups, multiple units of analysis are present, each representing a stakeholder group (see *Figure 3*). Through these embedded units and by specifically investigating Norway rather than multiple countries, this design allowed for rich and extensive insights to be gathered on the context and a deeper understanding of the issue to be gained (Gustafsson, 2017; Yin, 2017).

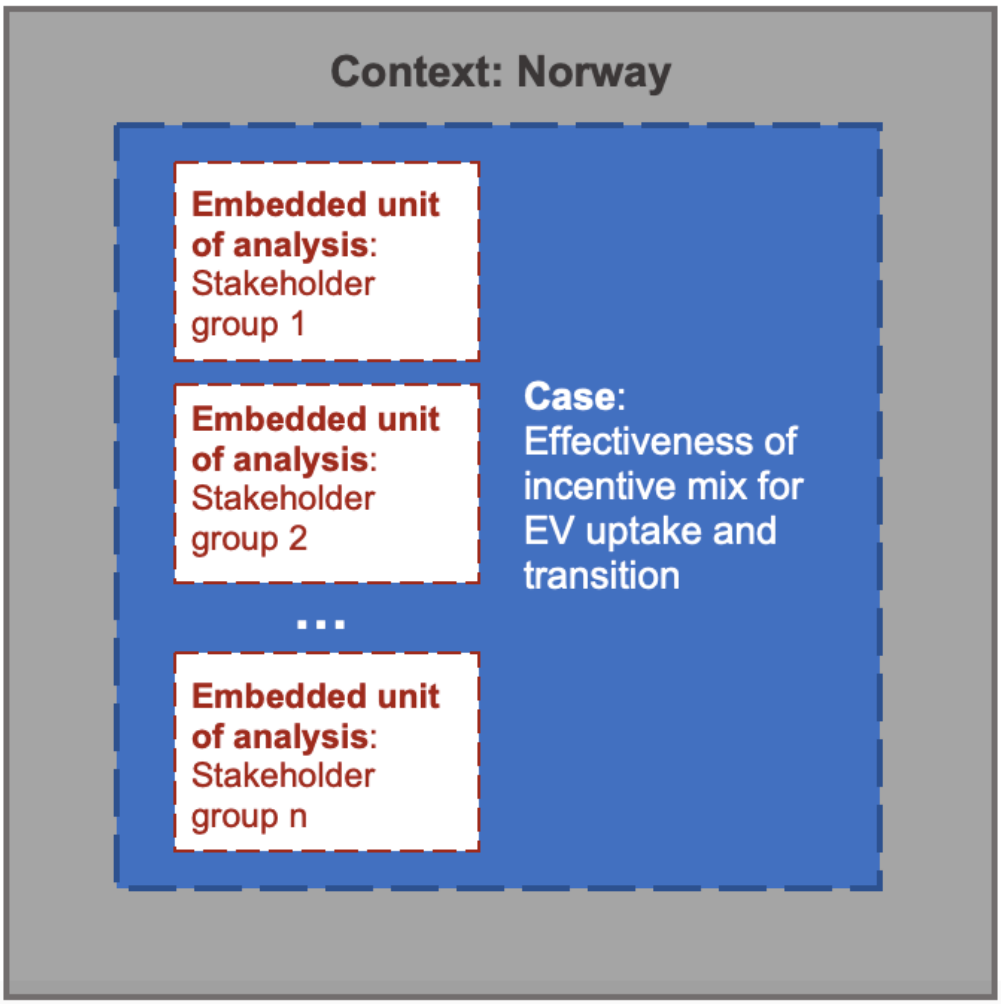

Figure 3. Embedded, single-case study design of this research (adapted from Yin, 2017).

3.2 Stakeholder Mapping

In order to get an overview of the relevant stakeholders for this research and thus, identify the embedded units of analysis, stakeholder mapping was carried out. In doing so, 17 actors of influence to this study were identified and displayed in a visual form (see *Figure 4* for the overview and *Table 3* for a breakdown of stakeholder roles). This process highlighted the varying perspectives present in the research and the range of stakeholders that should ideally be incorporated in primary data collection, to achieve a complete overview of the topic. Thus, this stakeholder map guided the search for interviewees and data sources[1], ensuring that both supportive and critical perspectives on Norway's EV incentives were targeted and incorporated in the analysis.

[1] Some stakeholders were identified over the course of the interviews e.g. DFØ, NAF.

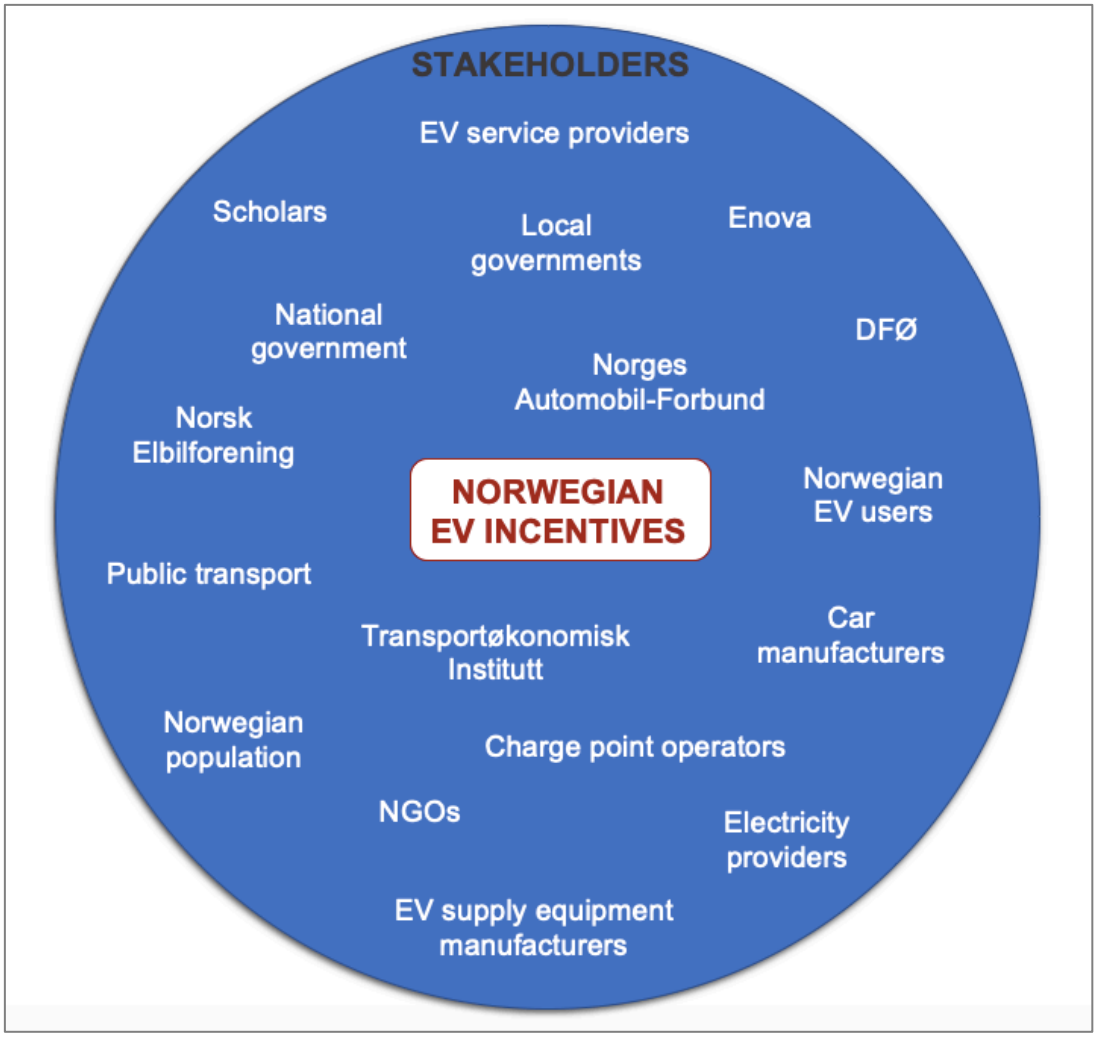

Figure 4. Stakeholder Map: a visualisation of the stakeholders related to Norway's EV incentives.

Table 3 – Breakdown of stakeholders and their role in Norway's EV uptake and transition.

Stakeholder	Role	Source
National government	Norway's national government and policymakers are responsible for selection and introduction of a range of EV incentives to promote adoption, such as tax reductions on purchase and use.	Norsk Elbilforening, 2021d.
Local governments	Norway's local governments, municipalities and counties, can adjust the level of incentives for bus lane access and parking since 2017, ferries since 2018, and toll roads since 2019, up to 50 percent of the ICE price.	Norsk Elbilforening, 2021d.
Norsk Elbilforening	The Norwegian EV Association. A non-profit organisation which represents the interests of over 85,000 EV owners and carries out year-round testing and gathers feedback from its members. The association cooperates with national and local governments, charging operators and vehicle manufacturers to improve the user experience.	Norsk Elbilforening, 2021b; Norsk Elbilforening, 2021c; Holteng & te Riele, 2019.
Norges Automobil-Forbund (NAF)	The Norwegian Automobile Federation. A non-profit organisation that represents 500,000 car owners in Norway, including both ICE and EV owners. The association collaborates with other stakeholder groups to enhance the user experience of car users in Norway. Thus, Norsk Elbilforening and Norges Automobil-Forbund are competitor organisations.	NAF, 2021.
Norwegian EV users	EV owners in Norway and their opinion on Norway's incentive mix, based on experiences.	n/a
Car manufacturers	Car manufacturers that sell EVs in Norway, represented by the Automobile Importers' Association of Norway (Bilimportørenes Landsforening, BIL).	BIL, 2021.
Scholars	Academics who have carried out research on Norway's EV incentive mix and have insights to share.	n/a
Transportøkonomisk Institutt (TØI)	The Institute of Transport Economics, a national institution for transport research and development. The institute carries out applied research on topics related to transport, including road, rail, sea and air, and practically applies its findings by advising authorities, transport sector and the public. This includes research on EVs and Norway's incentive mix. The majority of its research is commissioned by central government bodies and local authorities, while some by the private sector.	TØI, 2021.
NGOs	Non-profit organisations in Norway who are involved with the topic of EVs and their associated incentives, either in a supportive or critical way.	n/a

Enova	A state enterprise owned by the Norwegian Ministry of Climate and Environment, which provides financial support to businesses investing in environmentally-friendly innovation and technology development, to enable them to become financially viable. This includes EV fast-charging infrastructure projects. Each year, the enterprise handles NOK 2.6 billion of funding.	Enova, 2021; Energy Facts Norway, 2021.
DFØ	The Norwegian Agency for Public and Financial Management. The expert body for financial management in Norway's government institutions which is also responsible for ensuring that the government reaches its goals through good governance, organisation, management and decision-making support. The agency encourages and monitors green public procurement, including building data on the progress and impacts of EV incentives.	DFØ, 2021; Government.no, 2021;
Norwegian population	The general Norwegian population and their opinion on Norway's EV incentive mix.	n/a
Public transport	Public transport companies in Norway and their experience on how the EV incentive mix has impacted public transport.	n/a
Electric vehicle supply equipment (EVSE) manufacturers	Producers of the EV charging equipment which safely transfers energy between the electric utility power and the EV, including: charging cords, charging stands, attachment plugs, vehicle connectors, and protection.	Energy Star, 2013.
Charge point operators (CPOs)	Organisations that install and manage EV charging stations using hardware from EVSE suppliers and optimise EV charging operations from one or more manufacturers. They are service providers, ensuring charging network infrastructure and the connection between chargers.	AMPECO, 2021.
Electric vehicle service providers (EVSPs)	Network providers that ensure connectivity of charging stations to a cloud-based serve and managing backend software, database and communications.	AMPECO, 2021.
Electricity providers	Companies supplying and distributing the electricity to enable charging for EVs at stations.	n/a

3.3 Data Collection

This research involved both primary and secondary data collection.

3.3.1 Primary Data Collection

To encompass the study's systemic and embedded nature, extensive qualitative primary data collection was carried out. More specifically, using the 'stakeholder map' as guidance and a contact within the car manufacturers stakeholder group as a starting point, interviews were held

with relevant stakeholders, from one to the next, to gather holistic insights. To access the interviewees necessary for the study, snowball sampling was employed. This entailed existing interviewees providing referrals to more interviewees until all the required data had been obtained (Biernacki & Waldorf, 1981). Considering the research's broad nature and the difficulties in accessing certain stakeholders, particularly from abroad and through online mediums, this non-probability sampling technique enabled relevant participants to be continuously identified and accessed. However, by employing snowball sampling, the research ran the risk of selection bias and potential danger that the sample did not encompass enough diversity in perspectives, distorting the findings to enhance either support or criticism and misrepresenting the view of stakeholder groups involved. To diminish this risk, where a referral or lead to a particular stakeholder group was not provided by interviewees, individuals from such stakeholder groups were contacted separately. Although not always successful, these efforts enabled further stakeholder groups to be integrated on top of those accessed through snowball sampling and thus, resulted in a broader range being interviewed. To encompass opposing views and guide the process of contacting individuals, a prior expectation was made that certain groups would be more supportive of the incentive mix, such as user associations and car manufacturers, while others more critical, including academic, NGOs or public transport. In doing so, it was strived to diminish the danger of selection bias and incorporate varying perspectives on the topic.

Overall, a total of 25 online interviews were conducted, ranging from 1 to 1.5 hours in duration, incorporating 12 of the 17 stakeholders initially identified during stakeholder mapping. *Figure 5* below depicts the specific actors that were accessed in the study's primary data collection (circled). Furthermore, *Table 4* provides an overview of the broader groupings of stakeholders interviewed, outlining the number of interviews conducted for each and how the interviewees are identified in the research. Hence, the 8 stakeholder groups interviewed are: user associations, car manufacturers, local governments, scholars, NGOs, national public sector representatives, EV users, and public transport. To enable triangulation of findings within stakeholder groups and enhance the findings' trustworthiness, it was strived to have at least two interviewees per group. Since some stakeholders were not accessible in the end, potentially limiting findings in this regard, it was attempted to capture their perspectives by means of other interviewees. For instance, the view of the national government and policymakers was embodied through insights from national public sector representatives in Enova and DFØ, as well as local governments. Moreover, the perspectives of EVSE manufacturers, CPOs, EVSPs, and electricity providers, all stakeholders linked to EV charging provision, were compensated for by ensuring that EV infrastructure was thoroughly addressed during the interviews. Interviews were carried out until a sufficient proportion of relevant stakeholders were accessed or encompassed and until data saturation was reached – after which further interviews supported existing findings and did not provide completely new insights. Thus, a range of stakeholder groups with varying interests and perspectives on the topic were incorporated in primary data collection, enabling concrete findings to be gathered and merged to evaluate the effectiveness of Norway's EV incentive mix.

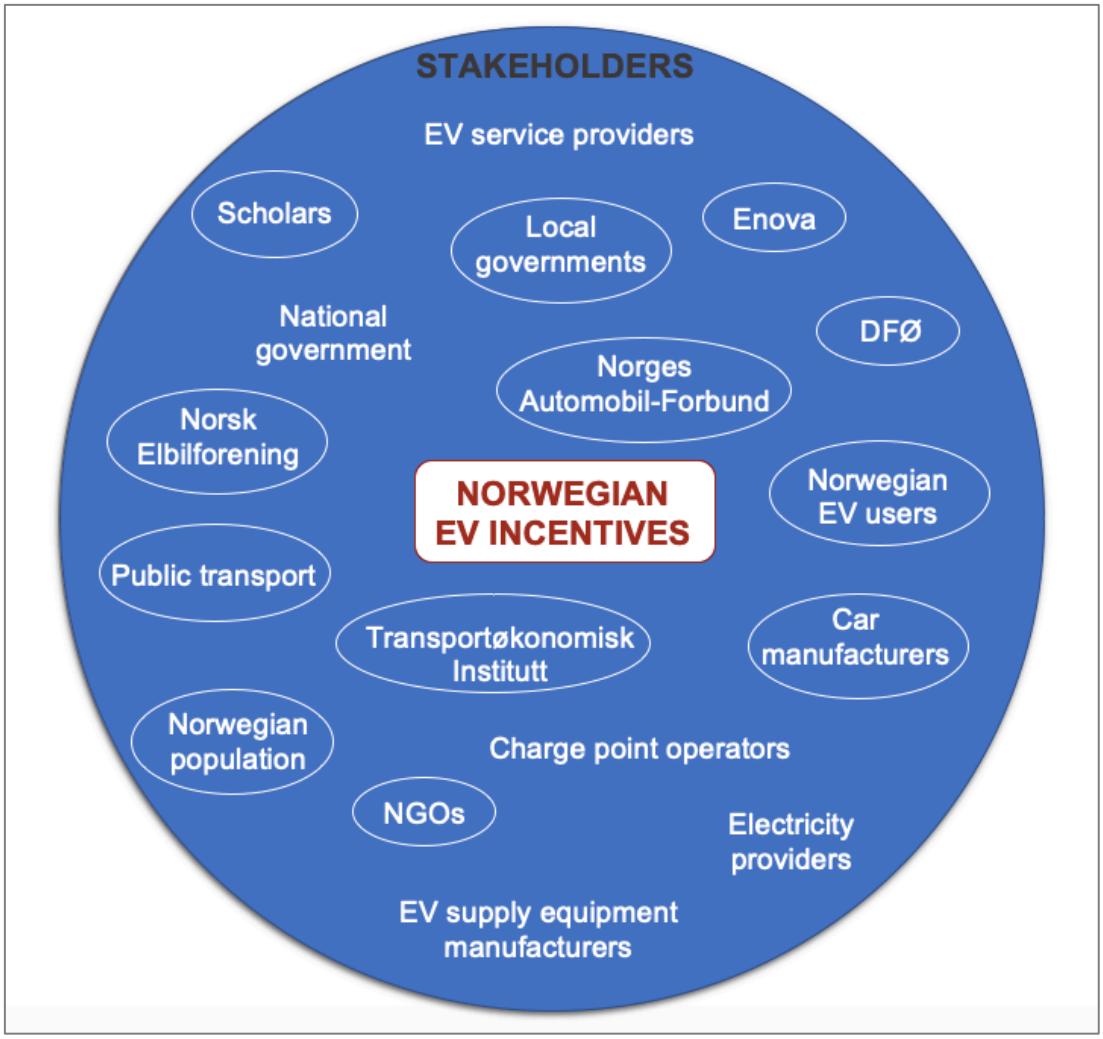

Figure 5. Visualisation of the stakeholders interviewed in this research (circled), from the broader stakeholder map.

Table 4 – Overview of stakeholder groups interviewed, the number of representatives per group and their identification in the research.

Stakeholder Group	Number of Representatives	Identification
User Association	2	User association 1
		User association 2
Car Manufacturer	2	Car Manufacturer 1
		Car Manufacturer 2
Local Government	6	Local government 1
		Local government 2
		Local government 3
		Local government 4
		Local government 5
		Local government 6
Scholar	4	Scholar 1
		Scholar 2
		Scholar 3
		Scholar 4
NGO	4	NGO 1
		NGO 2
		NGO 3
		NGO 4
Public Sector (National)	3	Public sector 1
		Public sector 2
		Public sector 3
EV User	3	EV user 1
		EV user 2
		EV user 3
Public Transport	1	Public transport 1

For this analysis, interviews were carried out in a semi-structured manner. To ensure coherence and manage discussion, an interview guide was created for every interview. Each one stemmed from the general interview guide (see Appendix 9.1), with slight variations and additions to make the questions more distinct to the stakeholder representative being interviewed. The guides consisted of predominantly open-ended questions, based on the operationalisation of the effectiveness assessment framework's four characteristics (Section 2.4.1); *Table 5* below displays the respective interview topics and questions formulated for the effectiveness characteristic and sub-characteristic (refer to Appendix 9.1 for the exact questions). The questions were carefully selected to exclude leading questions and ones which could make participants feel judged. The interviews included an introductory question and follow-up questions to get interviewees to elaborate on answers. Based on recipient answers, they also contained questions additional to the guide; in doing so, interviews were flexible and in-depth, allowing data to be collected in a socially interactive manner.

Table 5 – Interview questions formulated using the operationalisation (Section 2.4.1)

Characteristic	Sub-characteristic	Interview Topic	Interview Question
Consistency	1st level: consistency of the EV strategy	Alignment of incentives with other targets and policies	5
	2nd level: consistency of the instrument mix	Types of EV incentives	2
		Degree of success of current incentive mix	8
	3rd level: consistency of the instrument mix with the EV strategy	Completeness of EV incentive mix	9a
Coherence	Informational coherence	Role in incentive formulation	1b
		Actors involved in incentive formulation	4
		Degree of success of current incentive mix.	8
	Procedural coherence	Actors involved in incentive formulation	4
		Alignment of national and local governments	6
Credibility	Incentive mix credibility at the national level	Vision for EVs	3
	Incentive mix credibility at the sub-national level	Alignment of national and local governments	6
		Urban-rural incentive differences	7
Comprehensi-veness	n/a	Completeness of EV incentive mix	9
		Degree of success of current incentive mix	8

3.3.2 Secondary Data Collection

Academic literature provided theoretical insights on transition studies, specifically the multi-level perspective, and relevant contextual background information on current research in the field of EV uptake, in Norway and abroad. Moreover, it exemplified the existing scholarly work on incentives to enhance uptake and enabled the effectiveness assessment framework to be applied and adapted to this research. Organisational websites further contributed to the literature review and enabled the contact network for primary data collection to be built up, in the form of stakeholder mapping. Overall, secondary data served as a way to obtain an understanding of the relevant theory and existing literature on the topic, pinpoint the scientific and practical relevance of the research, and enable the primary data findings' contributions to be determined.

3.4 Data Analysis

During data analysis, the collected data was examined and applied to the effectiveness assessment framework (Section 2.4), to evaluate Norway's incentives for EV uptake and

transition. To analyse the primary data, thematic coding was employed through several steps. Firstly, the interviews were individually transcribed from the recordings. Once all interviews were conducted, the transcriptions were then read through carefully, to become acquainted with the narrative behind the data set and reduce the risk of ideas being lost. Following this, to become familiar with the data and have an overview of different interviewees' arguments, short summaries were also written for each interview transcription. Next, to organise the large quantity of data and extract relevant findings from the transcriptions in a systematic manner, the primary data was sorted and categorised into the four incentive mix effectiveness characteristics: consistency, coherence, credibility, and comprehensiveness. For further precision, using relevant interview question responses, tables were then made per indicator of the characteristics[2] from *Table 2* (see Appendix 9.4 for a sample). In doing so, the interview transcriptions were carefully and individually examined, appropriate points and quotations added to the relevant tables under the different effectiveness characteristics and sub-characteristics. Once organised in such tables, the points made by different interviewees could be compared and contrasted and overarching arguments, for and against the effectiveness of Norway's EV incentive mix, were constructed and formulated. Thus, this approach enabled the results to be synthesised and the presence of the 4 Cs to be analysed in the case. Lastly, the primary data findings were collectively used to reflect on the original incentive mix effectiveness assessment framework and make adjustments to the initial indicators.

Regarding secondary data, the information gathered collectively shaped the contextual background, theoretical framework and methodology of this research, providing a foundation for the primary data findings to be assessed on. Once gathered, the results of primary data collection could be directly linked back to the secondary data, to discuss how they either confirm, differ or contribute to existing literature.

3.5 Ethics

To ethically conduct this qualitative research, various measures were taken throughout data collection and analysis (Mason, 2002; Sanjari et al., 2014; Allmark et al., 2009). Primarily, each interviewee received a project information sheet in advance, containing a research summary to ensure awareness of how the qualitative data would be used (see Appendix 9.2). Prior to the interview, any questions or clarifications were addressed in a complete way. Next, informed consent was obtained from all interviewees, to certify that they were fully informed about the study and willing to participate (Mason, 2002; Sanjari et al., 2014). It was formally acquired through an interview participation consent form, completed and signed by each participant before the interview (see Appendix 9.3). This form confirmed that interviewees: were satisfied with the information received about the study, were given the opportunity to ask questions and think carefully about participating, agreed to the interview recording and data being used for scientific purposes, and had the right to withdraw consent at any point and see the final report. Furthermore, confidentiality and privacy were maximised throughout the research by preventing the disclosure

[2] A separate table ('Other') was made for findings that did not correspond with a specific indicator, enabling new indicators to be identified for the effectiveness assessment framework i.e. rural and urban support.

of individual responses alongside their identities, unless agreed upon otherwise. The data was handled carefully, it being anonymised from the transcriptions onwards and stored securely to avoid interviewee identification risks; an overview of the anonymous interviewee identification is shown in *Table 4*. It was also ensured that the software used to record the interviews met GDPR standards and thus, respected interviewees' data privacy.

3.6 Validity & Reliability

To assure integrity of the research, validity and reliability issues were identified and managed throughout the process (Bashir et al., 2008). Regarding validity, construct validity and thus, the appropriateness of the operationalisation to measure the research's theoretical construct, was enhanced by formulating indicators using insights from existing research that assessed the effectiveness characteristics: consistency, coherence, credibility and comprehensiveness (Yin, 2017). When devising the interview guide, these indicators were directly translated into interview questions to ensure sufficient data collection to measure the theory (*Table 5*). To further strengthen construct validity, based on the findings, the operationalisation of the research was reflected on and adjusted to improve the indicators' suitability to assess the theoretical concepts. Next, internal validity was enhanced by using direct, detailed quotations from recorded interviews when describing causal relations found, increasing accuracy of findings and reducing bias of interpretation (McMillan & Schumacher, 2010). To eliminate potential language barriers during interviews and misinterpretation of results, an interviewee's line of reasoning was verified where necessary to ensure the argumentation was correctly understood. Opposing arguments made by different interviewees were also considered and documented in the findings; thus, differing perspectives and explanations were acknowledged when establishing the research results and conclusions. In addition, by applying the findings from Norway, a global EV frontrunner, to the broader underlying theory of transition studies and uptake, this research goes beyond the specific case of Norway and produces generalisable results (Yin, 2017). While the research findings are based on primary data collection and thus a risk of bias must be accounted for, they illustrate potential future trajectories of other countries that can serve as lessons for them, enhancing the study's external validity.

Furthermore, this research strived for reliability by providing in-depth and transparent methodological documentation during data collection and analysis (Bashir et al., 2008). All procedures are explicitly stated in this methodology to ensure reproducibility. More specifically, precise details are provided on the specific indicators used to operationalise the effectiveness assessment framework characteristics and evaluate Norway's EV incentive mix. A case study database was made to compile and organise all relevant data sources used during the research, particularly interview transcriptions, and offer additional evidentiary backing (Yin, 2017).

4.0 Background

This section offers relevant background information, namely: types of plug-in EVs, plug-in EV charging, introduction to Norway, Norway's 'National Transportation Plan', and the history and types of EV incentives in Norway.

4.1 Types of plug-in EVs

EVs obtain all or part of their power from electricity supplied by the electric grid, stored in on-board batteries (Energy.Gov, 2020). More specifically, plug-in EVs embody two types of vehicles: Battery Electric Vehicles (BEVs) and Plug-In Hybrid Electric Vehicles (PHEVs) (O'Neill et al., 2019; Hardman, 2019). As shown in *Figure 6*, while BEVs are powered exclusively by an electric drive train and produce zero tailpipe emissions, PHEVs are either powered by a rechargeable battery using electricity or an ICE, deriving power through petroleum-based or alternative fuel (O'Neill et al., 2019; Broadbent et al., 2019; Energy.Gov, 2020). Therefore, BEVs arguably represent a more decisive shift towards the decarbonisation of private transportation, exemplifying the importance of distinguishing between them when considering EV adoption in a context and its potential to curb GHG emissions (O'Neill et al., 2019). For this reason, EV incentives may vary slightly between BEVs and PHEVs; this is the case in Norway and this research therefore focusses primarily on BEV incentives.

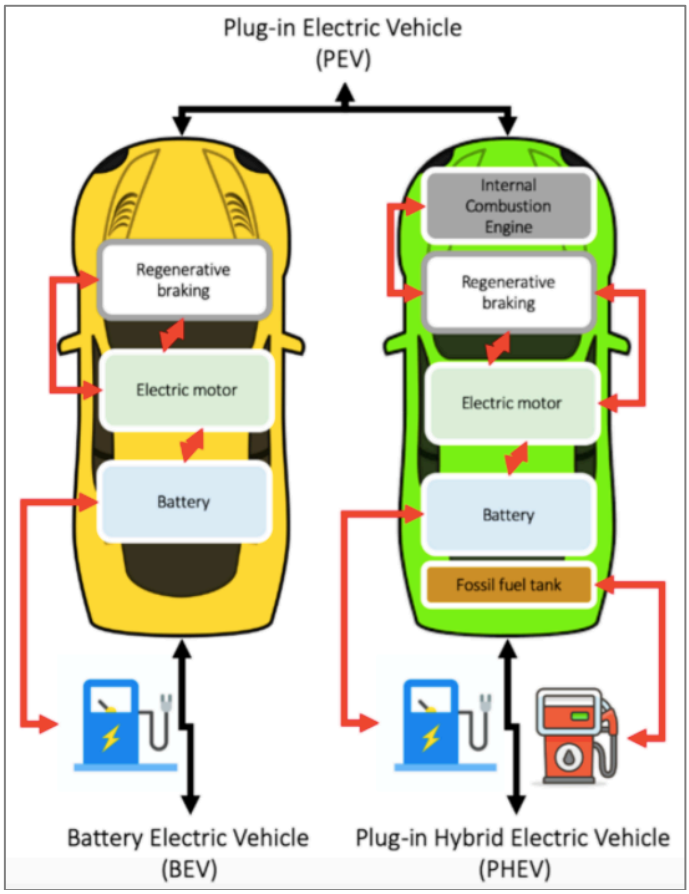

Figure 6. Types of EVs (taken from Foley et al., 2020)

4.2 Plug-in EV charging

Table 6 below provides an overview of the relevant terminology related to plug-in EV charging, including: types of electricity, types of charging, levels of EV charging, and types of plugs.

Table 6 – Overview of plug-in EV charging terminology

Category	Term	Description	Source
Types of electricity	Alternating current (AC)	Flow of electric charge which periodically changes direction. The power from the grid is AC, since it is easier to increase and decrease AC voltages than DC voltages.	Lumen (2021); NewMotion (2021).
	Direct current (DC)	Flow of electric charge in only one direction. Electronic devices with a battery power source use DC power. Therefore, AC power from the grid needs to be converted to DC to be used by the device, via a converter. In EVs, a converter is found inside the car.	Lumen (2021); NewMotion (2021).
Types of charging	AC charging	Most common charging for plug-in EVs, where power gets converted inside the vehicle, using the onboard converter, to then charge the battery. The charging speed depends on the charging point's output power and convertor's capabilities to convert power to DC. This method is appropriate for slower charging, such as in homes, and has lower production, installation and operation costs, making charging cheaper.	NewMotion (2021).
	DC charging	Fast charging which converts power from AC to DC in the charging station, before it enters the EV. Thus, DC power is directly delivered to the car battery, avoiding the vehicle's converter. Due to its increased speed, this charging predominantly occurs along highways. The method necessitates a lot of power from the grid, resulting in higher production, installation and operation costs, and more expensive charging.	NewMotion (2021).
Levels of EV charging (charging speed)	Level 1	Slowest charging equipment, plugged directly into a 120 Volt AC outlet and supplying between 1.3 to 2.4 kW power output. It provides between 3-5 miles of EV range per hour. This AC charging is mostly found in residential settings and used for overnight charging.	Freewire (2020); Villarreal (2020).
	Level 2	Chargers that operate at 208 to 240 Volt and generate between 3 to 19 kW of AC power. They provide 18 to 28 miles of EV range per hour. This AC charging is faster than Level 1 and the most popular option for homes, work spaces and public areas, fully charging an EV in up to 8 hours.	Freewire (2020); Villarreal (2020).

	Level 3	DC fast chargers that operate at 480 Volt, generating a maximum output of 350 kW. They fully charge an EV battery in 60 to 90 minutes. This DC charging is designed for commercial use, along highways.	Freewire (2020); Villarreal (2020).
Types of charging plug (see *Figure 7* below)	Type 1	Standard AC plug in America and Asia. It is a single-phase plug, enabling up to 7.4 kW power output.	Wallbox Chargers (2021).
	Type 2	Standard AC plug in Europe. It is a triple-phase plug, having more wires to let through power than Type 1. It enables faster charging, up to 22 kW power output in homes and 43 kW at public charging stations.	Wallbox Chargers (2021).
	Combined Charging System (CCS)	Enhanced version of the Type 2 plug. With two extra power contacts, the CCS plug enables fast charging, up to 350 kW. Thus, the plug supports both AC and DC charging.	Wallbox Chargers (2021); Mobility House (2021).
	CHAdeMO	DC plug that enables fast charging, up to 100 kW.	Wallbox Chargers, 2021.

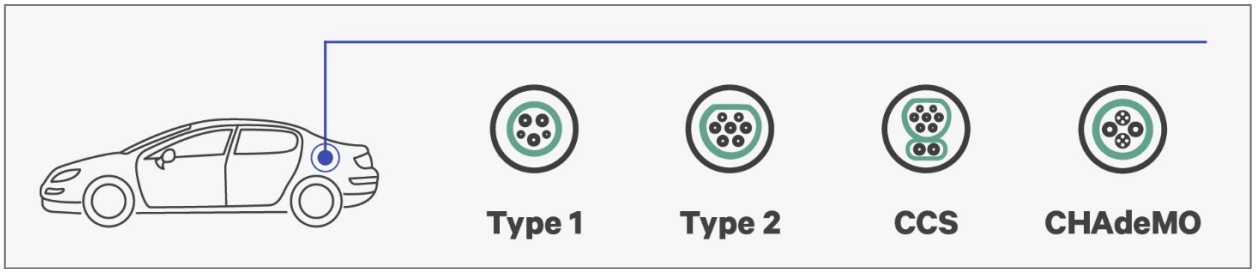

Figure 7. Types of EV charging plugs (taken from Wallbox Chargers, 2021).

4.3 Introduction to Norway

This sub-section provides relevant background information on Norway, including: geography, population, political structure, and economy.

4.3.1 Geography

Norway is located in northern Europe, on the western part of the Scandinavian peninsula, and one-third of the country is situated within the Arctic Circle (see *Figure 8*) (Sandvik, 2021; Life in Norway, 2021). Its landscape is dominated by high plateaus and rugged mountains, two-thirds of the country being mountainous, and by a long coastline deeply indented due to glacial fjords, with approximately 50,000 islands along it (CIA 2021; Sandvik, 2021; BBC, 2018). Resulting from this unique terrain, most major towns are either located along the coastline or by fjords (Life in Norway, 2021). While coastal Norway's climate is mild and wet, the inland regions are cooler and drier, and experience longer winters, especially the Arctic north (Life in Norway, 2021). Due to

elevations, lakes at high altitudes and abundant precipitation from westerly winds, Norway has immense hydroelectric potential (Sandvik, 2021). For this reason, hydropower stations currently meet the majority of Norwegians' electrical consumption needs, accounting for 93.4 percent (Encyclopedia, 2018; CIA, 2021; Statistisk Sentralbyra, 2020).

Figure 8. Map of Norway (taken from World Atlas, 2021).

4.3.2 Population

Norway has a population of approximately 5.4 million, the majority of Norwegians residing in the southern parts of the country due to the milder climate and better connectivity to mainland Europe (CIA, 2021; Encyclopedia, 2018). While population clusters are found along the coastline, Norway's interior remains sparsely settled due to the extreme climate and difficult terrain, especially the north (CIA, 2021; Sandvik, 2021). Norway's population is concentrated in cities, 83.3 percent of the total population residing in urban areas (CIA, 2021). More than half of the population lives in Østlandet, the south-eastern region which is where the capital of Oslo is located (Sandvik, 2021). After Oslo, the two largest towns are Bergen and Trondheim respectively – both coastal settlements (Encyclopedia, 2018).

4.3.3 Political structure

Norway, officially known as the Kingdom of Norway, is a democratic constitutional monarchy which distributes state power between the Parliament, the Cabinet and the Supreme Court (CIA, 2021; Sandvik, 2021). The national government's executive branch (the Cabinet) consists of state ministers and the Prime Minister and is appointed by the monarch, with approval of the Parliament (Sandvik, 2021). The legislative branch comprises of the Parliament and holds 169 seats, members of which are elected by proportional representation vote every four years (Encyclopedia, 2018; CIA, 2021; Sandvik, 2021). Furthermore, Norway has a multiparty system, its political parties consisting of: Centre Party, Christian Democratic Party, Conservative Party, Green Party, Labour Party, Liberal Party, Progress Party, Red Party, Socialist Left Party, and the People's Action Against Toll Fees (CIA, 2021; Encyclopedia, 2018; Stein et al., 2020). Norway's current Prime Minister is Erna Solberg, the head of the Conservative Party, who is leading a minority government between the Conservative, Liberal and Christian Democratic Parties – a centre-right coalition government (Life in Norway, 2021). The next national elections will occur this year, on 13 September, 2021 (CIA, 2021).

Alongside the central government, Norway's local government is divided into 356 municipalities ('kommuner') which are grouped into 11 counties ('fylker') (KPN, 2021); *Figure 9* below illustrates this county division. Councils govern the municipalities and counties, popularly elected every four years, two years after the parliamentary elections (Sandvik, 2021; Encyclopedia, 2018).

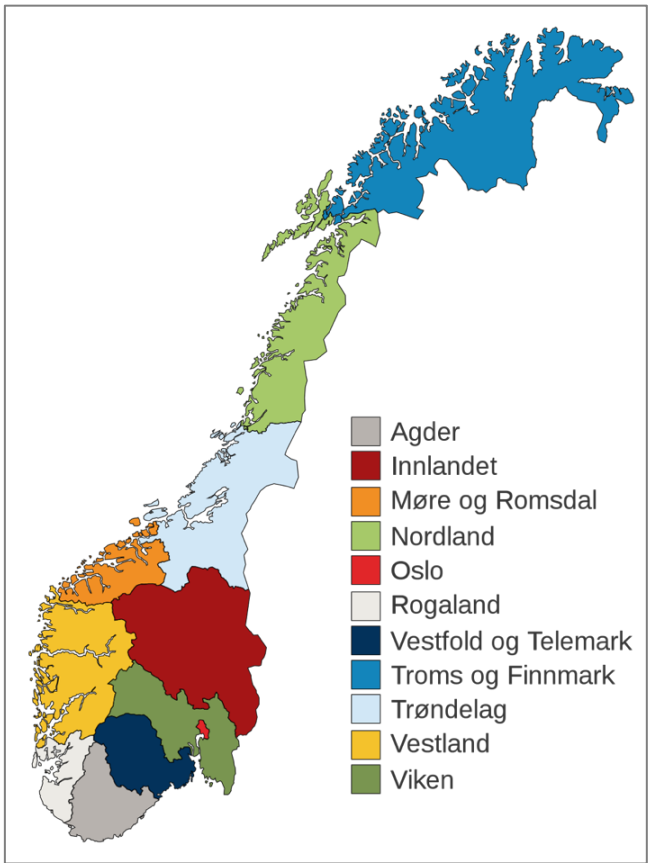

Figure 9. Overview of the counties in Norway (taken from Norges fylker, 2020).

4.3.4 Economy

While not a member of the EU, Norway is part of the European Economic Area (EEA) and thus, participates in the EU's single market and contributes to the EU budget (CIA, 2021; Encyclopedia, 2018). The country is rich in natural resources and energy sources, the economy depending on them, including: oil and natural gas, fish, hydraulic energy, forests and minerals (Nordea, 2021; Forbes, 2018). Since the 1970s, the Norwegian economy has relied heavily on petroleum and gas revenues, Norway becoming one of the world's largest exporters (Sandvik, 2021; Life in Norway, 2021). Considering the eventual decline of oil and gas and to spare revenues for future generations, the Norwegian government saves state earnings from the petroleum sector in the world's largest sovereign wealth fund, valued at USD 1.29 trillion in 2020 (Forbes, 2018; Nordea, 2021; Sandvik, 2021). Moreover, other important industries include: agriculture, seafood, hydropower, shipping, and tourism (Forbes, 2018; Life in Norway, 2021).

4.4 Norway's National Transportation Plan (NTP)

In 2017, the Norwegian government passed the NTP for 2018 to 2029 – a politically agreed roadmap and guiding policy for emission reductions in the transport sector (Kristensen et al., 2018; Holteng & te Riele, 2019). This climate strategy plans to cut transport CO2 emissions by 50 percent in 2030, and meet the Paris Agreement obligations (Kristensen et al., 2018; Figenbaum, 2018). For road transport particularly, the NTP announced that, after 2025, all new passenger cars and light vans should be zero-emission vehicles (Holteng & te Riele, 2019). To specify, zero-emission vehicles refer to BEVs or hydrogen emission vehicles, which obtain electricity through a battery and produce it using hydrogen-powered fuel cells; thus, PHEVs are not encompassed (Norsk Elbilforening, 2021d; Robledo et al., 2018). With 54.3 percent of 2020 car sales being BEVs, Norway's EV uptake is growing and, although debated, may reach the non-binding 2025 goal (Norsk Elbilforening, 2021a). Norway's EV incentives represent a core strategy for increasing EV uptake and achieving NTP goals (Kristensen et al., 2018).

4.5 History of EV Incentives in Norway

Norway's emergence as an important EV market globally stems from a strong set of incentives for BEV purchase and ownership, pursued over the past 40 years (Figenbaum & Kolbeinstvedt, 2013; Ingeborgrud & Rydhaug, 2019). Norwegian EV incentive development can be distinguished into two phases (Ingeborgrud & Rydhaug, 2019; Skjølsvold & Ryghaug, 2020). In the first phase (1990-2009), a broad set of incentives were implemented but, rather than pursuing mass-market adoption, the focus was to spark a new industry – the production and export of Norwegian EVs, namely: the 'Th!nk' and 'Buddy' (Ingeborgrud & Rydhaug, 2019; Car manufacturer 1). It was a technology niche creation period, where EV market demand was limited (Skjølsvold & Ryghaug, 2020; Ingeborgrud & Rydhaug, 2019). The second phase (2009-present) has concentrated more on using incentives to create an EV market and mainstream them for environmental purposes, rather than promoting industry development – Norway's EV models having gone bankrupt (Skjølsvold & Ryghaug, 2020; Ingeborgrud & Rydhaug, 2019; Local government 5). *Table 7* below provides a historical overview of EV incentives implemented in Norway.

Table 7 – Overview of BEV incentives implemented in Norway

Year Introduced	Incentive	Description	Current status	Source
1990 (temporary); 1996 (permanent)	Exemption from registration tax	BEVs exempted from registration or import tax (up to EUR 10,000 saved).	Still in place.	Steinbacher et al. (2018); Fridstrøm (2021).
1996	Road tax exemption	BEVs do not pay annual circulation (ownership) tax.	Still in place.	Fridstrøm (2021); Norsk Elbilforening (2021d).
1997	Exemption from road tolls	BEVs exempted from road tolls, saving several thousand Euros annually.	Partial or full exemption. From 2019, local authorities can introduce rates up to 50% of ICEV rate (50% rule).	Figenbaum (2018); Norsk Elbilforening (2021d).
1999	Introduction of special EV license plates	EVs obtain special license plates with the prefix 'EL' or 'EK' (since 2015), making EV incentive implementation easier (EVs are clearly distinguishable).	Still in place.	Steinbacher et al. (2018); Ingeborgrud & Rydhaug (2019)
1999	Free public parking (with potential free charging)	High annual savings for EV drivers. Free municipal parking is often bundled with free charging (not regulated by national law however).	Free or partial fee. From 2018, local authorities can introduce rates up to 50% of ICEV rate (50% rule).	Steinbacher et al. (2018); Figenbaum (2018); Norsk Elbilforening, (2021d).
2000	Reduced tax on EV company cars	BEVs used as company cars pay 50% less car tax.	Since 2018, company car tax reduction was reduced to 40%.	Steinbacher et al. (2018)
2001	Exemption from VAT on purchase	BEVs exempted from 25% value-added-tax on purchase.	Still in place.	Steinbacher et al. (2018)
2003 (Oslo); 2005 (nationwide)	Access to bus lanes	BEVs have access to bus lanes in Norwegian towns and cities, creating significant time savings.	Since 2017, local authorities can limit the access to only EVs that carry one or more passengers,	Steinbacher et al. (2018); Norsk Elbilforening (2021d).

			or remove the incentive due to congestion or bus delays.	
2008	Introduction of local support schemes for installing charging systems in housing associations/ cooperatives.	Introduced by Oslo municipality and adopted by municipalities around Norway, grants provided to cover part of the cost of charging system purchase and installation. Up to 20% of investments in Oslo, Skedsmo and Trondheim; up to 50% in Asker and NOK 50,000 in Baerum.	Still in place.	Holteng & te Riele (2019); EAFO (2020); Wallbox (2019; 2020); Kristensen et al. (2018).
2009	Exemption from ferry fares	BEVs exempted from paying ferry charges.	Partial or full exemption. From 2018, local authorities can introduce rates up to 50% of ICEV rate (50% rule).	Steinbacher et al. (2018)
2009	National EV infrastructure programme (EUR 7 million)	Resulted in 1900 normal charging points by 2011 and further developed into a goal of 25 000 public charging points by 2020.	In 2020, there were 11,450 standard charging points and 3778 fast chargers (CHAdeMO and CCS).	Kristensen et al. (2018); Figenbaum (2018); Wagner (2020).
2015	Exemption from VAT on leasing	BEVs exempted from 25% value-added-tax on leasing.	Still in place.	Steinbacher et al. (2018)
2015	National fast charging infrastructure programme	ENOVA programme to finance at least two multi-standard fast charging stations every 50km on all main roads in Norway (8000km road network).	By 2017, 230 fast charging stations on all main roads in Norway have successfully been established.	Norsk Elbilforening (2021d); Wilt (2020)
2018	Exemption from re-registration tax	BEVs exempted from reregistration tax on second-hand sales of passenger cars.	Still in place.	Wilt (2020); Figenbaum (2018)
2018	Fiscal compensation for scrapping ICEV	Monetary compensation for scrapping an ICEV and converting to a BEV.	Still in place.	Norsk Elbilforening (2021d).

4.6 Types of EV incentives in Norway

Based on interviewee insights and employing this research's EV incentive categorisation from *Table 1*, *Table 8* below provides an overview of the incentives present in Norway, as described during primary data collection. Considering this, the three incentive categories are relevant in the case of Norway's EV incentives: financial, infrastructure, and normative.

Table 8 – Overview of EV incentives identified in Norway.

Financial	**Infrastructure**	**Normative**
Tax exemptions on purchase: 25% VAT, registration tax, purchase tax (*Scholar 1; User association 1; Local government 1; Local government 2; Scholar 3; Scholar 4; Public sector 1)*	Access to bus lanes *(User association 1; Scholar 2; Scholar 4; Local government 4; Public sector 1; Public sector 3)*	Environmental motive, including GHG reductions *(User association 1; Car manufacturer 1; Scholar 2; Scholar 4; Local government 2; Local government 5; EV user 2; EV user 3)*
Cheaper to use: toll road reductions, cheap parking and charging, road tax exemption, reduced ferry and tunnel fares, easier and cheaper to repair, energy-efficient motor, cheap electricity *(Scholar 1; Scholar 2; Scholar 4; User association 1; EV user 1; EV user 2; Public sector 3; Local government 3; Local government 4)*	Support for building charging stations *(Scholar 1; Local government 1; Local government 2; Local government 6)*	Social factor, including the need to defend one's car purchase to others (*Car manufacturer 1)* and the idea of driving an ICE not feeling morally right *(EV user 1)*
High tax on fossil fuels *(Scholar 1)*	Legal obligation to have a charging station in housing associations *(EV user 1; Local government 4; Local government 5)*	Health benefits from air pollution improvements *(NGO 2)*
	Greater access to parking *(Public sector 2)*	

5.0 Results

Based on the primary data collected through interviews across stakeholder groups, this section outlines the research findings. Firstly, the findings per characteristic of the incentive mix effectiveness assessment framework are presented, namely: Consistency, Coherence, Credibility and Comprehensiveness (see *Table 2*). This enables the extent to which the characteristics are present in Norway's incentive mix to be identified and its effectiveness to be determined. Secondly, lessons from Norway are provided, as described by the interviewees.

5.1 Consistency

Consistency refers to how well the incentive mix's elements are aligned, to achieve incentive objectives (Rogge & Reichardt, 2016). It comprises of 3 levels: consistency of the EV strategy, consistency of the instrument mix, and consistency of the instrument mix with the EV strategy (Rogge & Schleich, 2018). Thus, the presence of consistency in Norway's incentive mix is determined based on an analysis of these levels.

5.1.1 1st Level: Consistency of the EV Strategy

Regarding consistency of the EV strategy, the compatibility of the EV transition plan with other targets of the Norwegian government, on the one hand, it is argued that the EV goal is a good match within the wider national plans. Firstly, broadly speaking, the EV transition goal is seen to fit within Norway's GHG emission reduction goal across sectors (Public sector 2). Through initiatives in different sectors, including EV incentives, Norway has adopted specific reduction targets in accordance with EU goals, and is *"on track with the rest of the EU or the medium*" (Local government 2). Secondly, the EV incentives are considered to be well-aligned with other transportation policies in Norway, being part of a wider plan to electrify the sector, including: vans, trucks, buses and ferries (User association 1). Collectively, these efforts are working towards a 50 percent reduction in transportation emissions by 2030, the EVs even supporting broader electrification through battery industry developments (User association 1). As pointed out by a local government representative (4), *"there is a general tendency to electrify everything"*; Norway's EV transition plan arguably fitting in. Thirdly, comparable to EV incentives, the Norwegian government has offered incentives for emission reductions in other areas too, including strong incentives for changing home heating from wooden to more climate-friendly sources (Local government 3). Therefore, incentive provision is not an isolated case for EVs, but consistent with the Norwegian government's wider strategies.

On the other hand, interviewees have argued that the EV transition plan lacks compatibility with other governmental targets in numerous ways. Primarily, the plan is said to conflict with Norway's 2012 'zero-growth agreements' in specific large urban areas, where all growth in personal transport is to be matched by public transport, cycling and walking, rather than passenger vehicles (Public transport 1; User association 2; Tønnesen et al., 2019). Due to the generous EV incentives, it is cheaper for Norwegians to drive and this is arguably promoting car ownership and private transport (NGO 1), *"encouraging people, households, to have more cars – two cars, three*

cars" (Scholar 1). In doing so, the country's car fleet is growing, creating tension with the 'zero-growth agreements' that aim to limit private car use in cities (User association 2). "*We are encouraging them to drive more, which in my view is a great conflict with a policy where we want households to use bikes and to use public transport to avoid traffic congestion and noise and so forth*" (Scholar 1). Some urban areas, such as Oslo's neighbouring communities, have not been able to reach this 'zero-growth' goal due to rising car ownership and, although there is uncertainty whether EV incentives are the main cause, they are considered a significant factor (NGO 1). While the national strategy is to electrify the car fleet using EV incentives, city governments have been seen to reduce parking spaces over time – actions that seemingly oppose each other and exemplify inconsistency between the EV transition plan and other governmental targets (Scholar 4).

Moreover, the EV transition plan is arguably inconsistent with governmental actions in the wider transport sector and across industries. To achieve emission reductions, the Norwegian government is said to be focussing too much on the private car, rather than tackling the country's largest GHG emission sources and achieving greater improvements (Car manufacturer 1; EV user 1; NGO 3; NGO 4). Proportionately, the private car represents only a small part of CO2 emissions, so "*switching your petrol car with an electric car is just a small thing*" (Local government 6); it is not the most effective approach to cut GHG emissions (EV user 2). Rather than placing EVs so high on the agenda, politicians should arguably shift efforts to more polluting areas to achieve a bigger impact, such as the transport sector's commercial and freight vehicles, and "*making drastic changes in the oil industry*" (NGO 4; EV user 3; Local government 5; Car manufacturer 1; EV user 1). "*It's very easy to attack and just have a focus on the car; but, for the coming years, if we're moving Norway to a more sustainable future, the whole transport sector and the whole power electricity sector also needs to be part of that picture*" (Car manufacturer 1); more balanced efforts across transport modes is arguably crucial to reach emission reduction goals (Local government 5). The EV plan is viewed as a "*spin-off from the real solutions that we have in Norway. We have a lot of fossil fuels that we make in Norway, the oil and the gas. And, as I see it, EVs is one of the largest things that our government does to get along with the Paris agreement, without doing the biggest changes. And using that as PR for other countries, that we did this very expensive climate solution*" (NGO 3). Thus, the Norwegian ambitious EV plan arguably does not correspond with wider governmental actions.

Furthermore, it is argued that the Norwegian government's targets across sectors lack alignment and one consistent direction. According to an NGO representative (2), *"We are moving in all directions at the same time. […] It's all over the place. There's no coherent direction for Norway in any way and the EV policies are part of that."* According to this perspective, Norway is highly concerned about nature and achieving emission reductions, however, is simultaneously building new superhighways and airports and is dependent on its large oil industry; while the government is encouraging EV uptake, it is not investing in electricity-powered railroads (NGO 2). Similarly, Norway is said to be "*trying to make everything more green but that word is thrown around a lot*" (EV user 1). These conflicting climate-related strategies, including the EV transition plan, arguably highlight a misalignment across government plans.

Overall, while consistency of the EV strategy is exemplified through the EV plan corresponding with the national GHG reduction goal, wider electrification of transport, and other sectors' emission reduction incentives, it is questioned due to its conflict with urban 'zero-growth agreements', limited emission reduction efforts outside of private cars, and lack of alignment across sectors.

5.1.2 2nd Level: Consistency of the Instrument Mix

Consistency of the instrument mix signifies that existing incentive types reinforce each other in their positive effect on supporting an EV transition, hence in conjunction contributing to a growth in EV uptake. Overall, the Norwegian government employs a range of incentives to encourage the population, including financial, infrastructure and normative ones (see *Table 8*). Based on interviewees' incentive descriptions, the immense rise in EVs over time and the fact that, in 2020, the BEV market share surpassed 50 percent of all new car sales, it can be argued that Norway's incentives collectively support an EV transition (Scholar 4; User association 2). For this reason, it can be firmly argued that consistency of the instrument mix is present in Norway's case.

However, while collectively contributing to a rise in EV uptake, it is important to highlight that the positive effect on Norway's EV transition is arguably greater from certain incentives than others. Interviewees predominantly argue that financial incentives and tax exemptions offered in Norway represent the main motive to purchase an EV, the country traditionally having high vehicle purchase taxes (Scholar 1; NGO 1; NGO 3; Local government 4; Public sector 2). As a result of the purchase tax and 25 percent VAT exemptions, policymakers *"make an electric vehicle on par with an ICE when it comes to equalising the price"* (User association 1). The fee reductions on toll roads, ferries and parking further contribute to this, as well as the reduced costs associated with EV repairs, since the motor is simpler than an ICE (EV user 1; Local government 2; Local government 4). Thus, Norway's incentives make EVs *"cheaper to acquire and cheaper to use"* (Scholar 4). While environmental and social factors may be considered, such as wanting to drive as often as one would like *"without feeling guilty for burning oil"* (EV user 2), according to a car manufacturer representative (1), *"when you look into people's proud wallet, you know, that's the factor that decides"* – highlighting the relative importance of financial advantages. A local government representative (3) explains that, while the environmental incentive was stronger in the earlier days *"when the EVs were ugly and small and funny looking […] today, it's mainly an economic decision"*. Another local government representative (5) describes a conducted survey which asked EV users whether they would be willing to pay more for driving their EV; the results showed that only 17% responded *"yes, I would do it anyway because I want to save the world or the planet or contribute"*, exemplifying financial incentives' significance.

Thus, while collectively achieving a positive effect on Norway's EV transition and having 2nd level consistency, Norway's incentive types contribute to EV uptake to varying degrees – financial ones having the largest impact.

5.1.3 3rd Level: Consistency of the Instrument Mix with the EV Strategy

Consistency of the instrument mix with the EV strategy refers to whether a complete EV transition can be achieved using existing incentives. To specify further, in this case, a complete EV transition signifies that EVs constitute 100 percent of passenger road vehicle sales, the car fleet consisting solely of EVs. The feasibility of a complete EV transition is debated across the interviews. On one hand, a local government representative (4) believes that EVs have *"grown to such a big amount now that, I think it's unstoppable"*. Considering the country's growth in EVs so far, it is argued that they have taken off and their market share will continue to increase towards a full transition (Local government 4). An EV user (1) further adds that *"the goals of the policies are pretty much, if not, on their way to being reached"*, emphasising the existing incentives' success towards achieving a complete EV transition.

However, despite strong incentives, numerous interviewees argue that a full EV transition cannot be achieved in Norway for varying reasons. Firstly, a public sector representative (1) states that EVs are simply not feasible across the whole country: *"we do accept that it won't work everywhere".* Northern Norway in particular, such as Finnmark, experiences more difficulties in adopting EVs and the technology's capability as an ICE alternative is questioned (Public sector 1). Secondly, a complete EV transition is considered unrealistic due to the significant rural resistance to EVs (EV user 1). In contrast to the predominant urban acceptance, an arguably substantial part of Norway's rural inhabitants *"don't see an EV as an option at all"* (EV user 1). Since this represents a large part of the population, a complete market share of EVs is considered unattainable (EV user 1). Thirdly, a user association representative (2) contends that the present charging infrastructure shortage across Norway and the issues associated with chargers during use, is preventing a full EV transition; "*the number of chargers […] is far too low, then you have the user experience which is awful, at least for new cars*". EV drivers are said to experience many queues at charging stations, even on a regular Thursday or Friday (User association 2). Without complete and functioning charging systems in place, Norway's full EV transition plan is arguably unachievable. Fourthly, parking is recognised as a significant obstacle to a complete EV transition (Scholar 4). For those who do not have parking access near their home or apartment, "*owning an EV becomes very unpractical*" (Scholar 4). Typical overnight charging at home is not possible and regular visits to charging stations are thus required, which collectively becomes time-consuming – "*so impractical… only environmentalists do that*" (Scholar 4). This problem of individual parking arguably means that EVs cannot reach beyond 80 or 90 percent of the car fleet, hindering a full EV transition (Scholar 4). Lastly, in order to achieve the EV transition plan in its entirety, an NGO representative (1) believes that it will *"demand some more measures, either economic or more regulatory".* Since the 2025 decision to end the sale of fossil fuel passenger road vehicles is legally non-binding, *"it will have no consequences for anyone if we don't reach it. There are no penalties or anything attached to it. And it's not a law, it's just a political vision"* (Scholar 4). This arguably prevents the realisation of a complete transition; in order to reach 100 percent EV market share, a regulatory, binding ban on new fossil cars or increased economic incentives are arguably necessary (NGO 1).

Therefore, 3rd level consistency is illustrated by 'unstoppable' EV growth and success, however hindered due to EVs not being feasible everywhere, rural resistance, charging infrastructure

shortage, inadequate charging experience, lacking individual parking and charging, and insufficient regulatory or economic measures.

5.2 Coherence

Coherence represents how collaborative and systematic the incentive-making and implementation processes are, to achieve incentive objectives (Rogge & Reichardt, 2016). To assess whether coherence is present in Norway's EV incentive mix, its two sub-characteristics are examined: informational and procedural coherence (Rogge & Schleich, 2018).

5.2.1 Informational Coherence

As identified in *Table 2*, informational coherence occurs when: there is continuous exchange of information between policymakers and EV stakeholder groups, policymakers are well-informed about developments in the EV branch, emerging problems are spotted early on by policymakers, policymakers strive to remove problems of EV incentives by incentive mix adjustments, and the search for solutions to problems takes place in a constructive exchange between policymakers and key EV stakeholders. This analysis is structured based on these factors.

5.2.1.1 Continuous exchange of information between policymakers and EV stakeholder groups

Continuous exchange of information between policymakers and EV stakeholder groups in Norway occurs when discussion is inclusive of all stakeholders, stakeholders communicate directly with national policymakers, and collaboration in formulating incentives occurs. Primarily, various interviewees suggest that such informational exchange takes place in Norway, enforcing informational coherence. Broadly speaking, an NGO representative (1) expresses that EV incentive formulation and the interaction between stakeholders and national government occurs in numerous spaces; *"there are […] multiple platforms where that interaction takes place"*, exemplifying an impression of stakeholder inclusivity related to decision-making. Based on the interviews, a range of stakeholder groups express information exchange with the national government. Firstly, Norway's user associations arguably take an influential role with policymakers in EV incentive decision-making, including the Norwegian Electric Vehicle Association and the Norwegian Automobile Federation (NAF). As consumer organisations for EV owners, and more broadly car owners in the case of NAF, they *"have frequent meetings with governments and politicians"* (User association 2) and directly collaborate with national policymakers on the incentives, giving their input and suggestions on how politicians should argue during government meetings (Car manufacturer 2; User association 1; User association 2). According to a user association representative (1), the formulation of EV incentives is *"a lot tied up to the yearly budget negotiations so, it's mainly a discussion in the parliament"*. Thus, as lobby organisations for EV users, they maintain continuous close contact with political parties, both majority and opposition parties, and particularly prior to budget negotiations, to have an influence on potential changes to EV incentives (User association 1; User association 2). User associations also work on proposals to the parliament, encouraging improvements in the EV user experience;

thus, this direct communication and exchange with policymakers enables the associations to have a 'strong voice' in incentive decision-making (User association 2; EV user 1) .

Secondly, although some lobby directly to politicians, the majority of car manufacturers in Norway are represented by the Norwegian Car Importers Association (BIL) in EV incentive discussions (Car manufacturer 1; Car manufacturer 2). Rather than directly approaching the national government, manufacturers share all relevant information and opinions with the association, who then lobby on behalf of them to the government and parliament on budgets and climate plans (Car manufacturer 1; Car manufacturer 2). Instead of car manufacturers individually attempting to exchange their perspective with politicians, BIL aims to be aligned and have *"one voice on behalf of the whole industry"* (Car manufacturer 1). Through frequent meetings with policymakers, BIL personally exchanges information and thus, incorporates the car manufacturers' perspective in EV incentive mix decisions (User association 2; Car manufacturer 1). The Norwegian Motor Trade Association (Norges Bilbransjeforbund, NBF), consisting of car dealers and services, also lobbies together with BIL to influence the incentives (Car manufacturer 2; User association 2). Meetings with the national government are easily arranged and there is *"good access I think in Norway to the policymakers"* (Car manufacturer 2), exemplifying informational coherence.

Thirdly, certain scholars and specifically the Norwegian Institute of Transport Economics (TØI) are said to collaborate with Norwegian policymakers on the EV incentives. Generally-speaking, academics are incorporated in discussions *"when they have these expert advice for the government"* (User association 1), being invited by the government to share their insights. The TØI in particular is *"actively engaged in the EV policies and giving advice to government and government agencies"* (User association 1). With research being mostly commissioned by the national government, either ministries or the public roads or railway administrations, the core purpose behind the institution is *"to provide information for policy-making"* (Scholar 4). The TØI's existing research has been used *"as a basis for forecasts and policy analysis"* (Scholar 4) of EV incentives, and its researchers are regularly invited to give presentations to the parliament and ministries. Thus, specific scholars and particularly those at the TØI experience collaborative informational exchange with policymakers.

Fourthly, according to different interviewees, local governments, including municipalities and state governments, have a voice in EV incentive discussions and give their input to policymakers. It is *"the national government that should decide in the end but based on local suggestions"* (Local government 3). Local governments are invited to *"formal hearing rounds, so if it's a new law from the central government […] we can express our concerns or opinions on that"* (Local government 5). Thus, when EV incentive changes are being discussed, municipalities and counties have the possibility to share their thoughts (Local government 6). According to the experiences of a local government representative (1), *"we are able to give […] our opinion about the incentives"* and *"we have also had a very close and good cooperation with the government […] they are paying attention to us, regarding our success and how we evolve in this. And we can impact the incentives in that way […] It's very much a two-way collaboration"*. The opportunity for direct contact between local governments and policymakers exemplifies informational exchange during EV incentive formulation.

Fifthly, NGOs are arguably directly involved with policymakers and influence Norway's incentive mix decisions (Car manufacturer 1). An NGO representative (1) describes, *"we're in constant dialogue with national authorities, with local authorities, as to what kind of policies make sense"*, demonstrating the possibility to provide input. Another NGO representative (4) outlines how they directly lobby national policymakers on the EV incentives and political processes, such as state budgets, the national transportation plan and the climate plan; comparable to local governments, they attend *"a lot of hearings on political questions or environmental questions, which […] they want our comments on"*. Thus, a direct informational exchange between policymakers and NGOs occurs on EV incentives.

Sixthly, interviewees argue that the Norwegian state-owned company Enova takes on a collaborative role with policymakers on incentive decisions. Aside from offering financial support to charging infrastructure projects that are not commercially viable, Enova has established a publicly-accessible database 'Nobil' which maps out the EV chargers that exist across Norway; this data is shared with policymakers and offers a basis for assessing the country's progress on EV charging infrastructure (Local government 2; Car manufacturer 2; Public sector 3). Additionally, when the national government implements new regulations, Enova is also asked to share their opinion through governmental hearings (Public sector 3). Considering this, collaboration between policymakers and Enova occurs, contributing to informational coherence.

Lastly, it is argued that the Norwegian Agency for Public and Financial Management (DFØ) represents another stakeholder group that directly cooperates with EV incentive policymakers. As an agency encouraging and monitoring green public procurement, DFØ builds up statistics and knowledge about how the EV market is practically developing, regarding EV uptake around Norway, and observes EV incentives' impacts (Public sector 1; Public sector 2). This information is shared with relevant national ministries *"as a basis for policymaking and for following up on our policy"* (Public sector 1), in an efficient manner. Hence, the DFØ shares data on Norway's EV incentive progress, directly cooperating with the national government.

On the other hand, interviewees at the same time also describe indirect communication or lacking informational exchange with Norwegian policymakers. Generally-speaking, several interviewees highlight that a forum is missing for discussion between EV stakeholders and the national government (Car manufacturer 1; Local government 2; User association 1). A car manufacturer representative (1) shares *"we have a lot of different organisations, who are listening very much to their own voice […] we do not have the one forum where we all come together to have reasonable discussions – that is missing here in Norway"*. As mentioned previously, EV incentive decision-making occurs in the parliament during yearly budget negotiations and thus, direct contributions from EV stakeholder groups to these discussion are arguably lacking (User association 1). Thus, an inclusive platform for discussion between stakeholder groups and policymakers is emphasised as a way to improve the incentive mix's informational coherence (Local government 2). More specifically, particular stakeholder groups are said to experience a lack of informational exchange with policymakers. Firstly, scholars do not necessarily experience direct communication with policymakers on the EV incentives. While one scholar (1) shares that they have not collaborated

yet with the national government, others (2; 4) express how conferences, such as a mobility conference in Oslo, may attract politicians and represent potential spaces for scholars to present findings to policymakers, albeit in an indirect manner. According to another scholar (3), after writing a report on the EV incentives, the national government allegedly *"paid attention to these arguments"*, however an engaging exchange of information in the decision-making process arguably does not occur.

Secondly, although it is described earlier that local governments can input EV incentive discussions through political hearings, some local government representatives (2; 3; 4) conversely express a lack of inclusion and collaboration in the formulation process. It is argued that EV incentives are decided nationally and local governments are required to implement them – *"that's nationally determined, so we just handle the consequences […] I have this distance to it because we just deal with the problems, not the incentives"* (Local government 3). Similarly, another local government representative (4) states *"those are national incentives so we cannot do much about them; we don't decide them and we just have to follow them"*, illustrating low local government involvement in incentive formulation. This sentiment is echoed when a further local government representative (2) describes *"if the government and the parliament say, 'okay, this is what we have to do', then also we have to do so […] we have to see how we cope with that"*. According to interviewees, local governments now have some more decision-making power since they can adjust EV toll road, bridge, ferry, tunnel or parking fees, up to 50 percent of the equivalent ICE price (50% rule), however the EV incentives are still ultimately national (Local government 2; Local government 4). Based on these descriptions, it can be argued that information exchange between national and local governments is lacking in EV incentive decision-making.

Lastly, a public transport representative (1) describes being only indirectly involved in incentive discussions with policymakers; while not a firm member in negotiations, they may get invited to political meetings in order to *"give some information and analysis on the whole transport system. So, we are kind of invited in but indirectly in the negotiations"*. Thus, direct and continuous information exchange between policymakers and public transport actors does not occur in this case.

Hence, informational coherence is manifested through multiple platforms for interaction between EV stakeholders and policymakers, along with direct communication between policymakers and: user associations, BIL, TØI, local governments, NGOs, Enova, and DFØ. Conversely, others argue that an inclusive forum for discussion is missing, and policymakers lack direct collaboration with: scholars, local governments, and public transport representatives.

5.2.1.2 Policymakers are well informed about developments in the EV branch

As outlined in Section 3.3.1, certain stakeholder groups were not accessible for interviews, including the national government. Despite efforts to capture their perspective through other interviewees, access to EV incentive policymakers is crucial for evaluating this indicator; thus, its presence in the case of Norway's EV incentive mix could not be determined.

5.2.1.3 Emerging problems are spotted and addressed

As Norway is considered to be the global frontrunner in EVs, *"testing out so many different variables because [it is] approximately five years ahead of the rest of the world"* (Car manufacturer 2), it is arguably expected that the country would face problems as a result of its EV incentives. Informational coherence however emphasises the importance of policymakers spotting these emerging problems, striving to remove them by adjusting the incentive mix and searching for solutions in a constructive exchange with key stakeholders (*Table 2*). Primarily, interviewees describe various problems as having been spotted and addressed in Norway. First off, due to EV access on HOV lanes, certain lanes across Norway and particularly those in bigger cities like Oslo and Bergen began to experience congestion (EV user 1; Scholar 4) – *"as the number of electric vehicles increase, they fill up the lane, so the bus is delayed because of all the electric vehicles"* (Local government 4). A local government representative (3) adds that *"it's all okay when you have just 1 car, 2 cars, 10 cars, 10,000 cars, 100,000 cars, but then it's starting to get the problem because there's too many EVs"*. According to a public transport representative (1), the resulting extended travel time for buses sparked debate and *"got into the front page on the newspapers"*. Due to this, transit lanes across Norway have been individually examined and in ones where congestion from EVs became a problem, the incentive has been rethought and local authorities can now reduce it (Local government 3; Local government 4; Scholar 2). Through a compromise between the EV association and road authorities, specific bus lanes now only permit EVs with at least one passenger alongside the driver during rush hours, to reduce the EV numbers and promote car sharing (Local government 5; Scholar 3; EV user 1; EV user 2; Car manufacturer 2; Public transport 1). According to a user association representative (1), this incentive adjustment reduces traffic by approximately 40 percent, since people would otherwise predominantly drive alone. Although creative measures to by-pass this requirement have been witnessed, such as using inflatable dolls, interviewees generally argue that bus lane congestion has been tackled where present (Local government 5; Car manufacturer 2; EV user 1; Scholar 3; Public transport 1) – *"it seems that they, you know, they found solutions"* (EV user 2), exemplifying informational coherence.

Furthermore, another emerging problem due to Norway's EV incentives is the loss of local revenue. EV incentives related to vehicle use are implemented locally and not compensated by the national government; thus, in consequence of increasing numbers of EVs receiving fee exemptions for toll roads, bridges, ferries, tunnels and parking, significant income losses have been experienced (Local government 1; Car manufacturer 1; Local government 3; Local government 6). It is further added that due to EV discounts, several local ferry companies have ended up closing or going bankrupt (Car manufacturer 1; Scholar 2); the "*ferry companies have to carry this burden, which is a problem"* (Scholar 1). Since such revenues generally fund transportation projects locally, the reduction has meant that some local governments have struggled to allocate money for existing plans, such as road maintenance and construction, tunnels, and ferry routes (Local government 3; Public sector 3; Scholar 4). To tackle this, local authorities have been granted the possibility to introduce fees for EVs (50 percent rule), resulting in slight variations in prices between different areas (Car manufacturer 1; Public sector 3; Local government 3; Local government 5; Local government 6; NGO 3). Hence, it is argued that the emerging problem of local revenue loss was identified and a potential solution implemented.

Moreover, an issue stemming from Norway's initial free parking and charging incentive for EVs, particularly affecting cities, was the fact that *"the streets were filled up with electric vehicles; it's so attractive and people bought their second car an electric car, so they could drive that to work, park it for free in the street outside"* (Local government 4). According to a local government representative (5), EV users began to occupy parking spaces with chargers for the entire day – referred to as 'charging station hogging'. To combat EVs filling parking spots, the 50 percent rule granted local governments with the possibility to impose fees on EV parking and charging (Local government 4; Local government 5). This adjustment arguably effectively tackled this issue, one case explaining that *"the average use dropped from close to 100 percent of all 24 hours to let's say 30 percent […] that's quite a perfect utility of a charger"* (Local government 5).

In addition, as previously mentioned, lack of charging infrastructure in Norway is a further problem that has emerged, particularly in sparsely populated areas where commercial profitability of chargers is lacking. There are 'big holes' in charging infrastructure, particularly outside of central and south-eastern parts (EV user 2; Local government 2). The chicken-and-egg problem is said to exist, *"it won't be profitable to invest in charging stations until there are enough clients; and there won't be enough clients until there are enough charging stations"* (Scholar 4). EV users experience long queues at charging stations, *"especially going up to the hills, to the ski resorts, on Fridays – it's hell"* (Car manufacturer 2). An NGO representative (2) describes how during the summer vacation in Norway last year, when many drove north or south, that *"you have to wait three hours to charge your car for half an hour"*. Such time delays are arguably *"not an option for a lot of people"* (Car manufacturer 2), discouraging a switch to EV since ICE fuelling remains more time-efficient (Scholar 3). The national government arguably lacks a charging plan and has shared inaccurate statistics on the actual availability of chargers around Norway (User association 2). As a result, the scope of EVs is restricted, potentially creating range anxiety; rather than a viable ICE replacement, EVs are arguably a commuter car (Public sector 3). Although still a problem, Norway's lack of charging infrastructure is being addressed in numerous ways. Firstly, according to a user association representative (2), a 'breakthrough' occurred this year in April, when the parliament unanimously voted on a proposal stating that *"the government has to improve their work on getting a better infrastructure for the EVs"*. Secondly, Enova's financial support for fast charger projects that otherwise lack profitability stimulates the country's charging network, increasing EV reach and making them a more feasible ICE alternative (Car manufacturer 2; Public sector 3). Through the 'Nobil' database, *"people have an overview of where the chargers are"* (Public sector 3), addressing EV user range anxiety concerns. Thirdly, to tackle insufficient charging, a local government representative (5) shares that the Norwegian government has adopted a national policy to connect 'European route E6', a road that spans the country from south to north, with fast chargers at every 50 kilometres, *"even up in the mountains"*. In doing so, Norway is becoming increasingly connected, gradually diminishing the infrastructure challenge. Fourthly, policymakers have implemented specific charging infrastructure requirements to tackle charger deficiency (Local government 4). Lastly, a local government representative (5) describes innovative charging strategies that are currently explored as potential solutions, including wireless charging and moveable quick chargers. Considering these efforts, it can be argued that Norway's charging infrastructure gaps are gradually being filled.

Based on the interviews, a further challenge that Norway's EV users face is related to the lack of plug and payment standardisation at charging stations, complicating the user experience. Plug variation between EV models limits accessibility to certain charging stations and a broad range of phone applications for payment exist across different chargers (EV user 3; Car manufacturer 2) – there is a *"different [payment] solution for everything"* (EV user 3). It is argued that Enova is addressing these issues through the criteria it has set for charging projects to receive financial support (Public sector 3). To enhance the user experience, all plug types are to be available, along with two fast charging plugs and a backup one with a lower voltage; in addition, the payment method should be accessible to all (Public sector 3). A local government representative (5) also describes their efforts to tackle standardisation issues, insisting that public charging stations use type 2 plugs for slow charging (accessible to all EV types), have both CHAdeMO and CCS connectors for fast charging, and employ Open Charge Point Protocol (OCPP) to ensure interoperability between EV chargers and the charger management software. Thus, standardisation issues at charging stations are arguably being addressed, contributing to informational coherence.

On the contrary, interviewees also express a lack of response from policymakers to emerging EV incentive problems, exemplifying weak informational coherence. Broadly speaking, some argue that it takes time before EV incentives are adjusted when issues occur (Public transport 1) – *"it's a big ship, like that in the Suez canal, so it takes some time to make changes"* (Public sector 2). A public transport representative (1) describes that *"where everybody sees that it is a problem, they have changed things"*, such as bus lane congestion, but arguably not all emerging problems are being addressed by policymakers. An NGO representative (4) adds that problems are more effectively addressed on the local rather than national level – *"it's easier to talk about the noise and pollution and that there are too many cars in the local areas, than if a minister shall talk for the whole country"*. For these reasons, Norway's EV incentive mix may lack informational coherence, emerging problems not being addressed constructively by policymakers.

More specifically, interviewees identify numerous problems that, from their perspective, have been insufficiently engaged with or recognised by policymakers. Firstly, due to Norway's incentive mix, various interviewees express how an EV is often purchased as an additional *"commuter car"* (Public sector 3), rather than an ICE replacement (Local government 5; Local government 6; Public sector 1; EV user 1; EV user 3) – *"the car that one of the parents uses to fetch kids and go to the local store, not the car you use when you go on a family vacation or take a long trip"* (Car manufacturer 2). The EV incentives are considered too attractive, contributing to the increase of 50,000 cars per year (Public sector 1; Scholar 3; User association 2; NGO 4) – *"after EVs have come to market, Norway has only increased in car usage and how many cars we have"* (NGO 3). The car fleet is arguably a *"lagging system […] it's not a one-to-one exchange, 1 EV car in, 1 diesel car out – that's not how it works"* (User association 2). The EV incentives are said to encourage driving habits *"since you feel you're doing something that is okay for the environment, you don't do any emissions"* (Local government 6), away from more environmentally-friendly modes of transportation, such as public transport and cycling (Scholar 1). Particularly in cities, too much emphasis is placed on promoting EVs, when urban areas are proportionately the most connected, public transport-wise (NGO 4) – *"it's a paradox that we have most electric cars around*

the city centres" (Public transport 1). A public transport representative (1) adds how *"in some areas, it's cheaper than public transport"*. This greater dependency on and shift to private transport is considered *"dangerous"* (NGO 4) and *"in the way for a good public transportation"* (Local government 3). The EV incentives *"decrease the possible rise of collective transport or public transport"* (Public transport 1). It is argued that policymakers *"forget very much that the goal is not to increase the number of EVs"* (Scholar 1) and that these issues have thus far not been addressed (Public transport 1). A scholar (1) explains, *"they really don't want to hear about my thoughts"* (Scholar 1), indicating weak informational coherence related to these problems. According to interviewees, policymakers should shift their focus to reducing total car numbers in Norway, EVs being replacements for ICEs rather than extra vehicles, and striking a better balance with other transport modes, prioritising public over private transport (Local government 4; Local government 5; NGO 1; NGO 4).

Secondly, as pointed out by the majority of interviewees, a significant debate on the fairness of Norway's EV incentive mix has emerged over time, the argument being that the incentives are *"only going to the rich people because only the rich can afford to buy new cars"* (User association 1). As both simple electric cars like Nissan Leaf and expensive Tesla cars can access EV incentives, the following question has surfaced: *"is it fair that no matter how luxurious your electric car is, you get this [25% VAT] reduction?"* (Local government 4). According to an EV user (2), there is *"resentment against the rich elites in Oslo getting their Tesla's for free, more or less".* This created *"a lot of uproar about the subsidies"* (Scholar 3) and the perception that *"you shouldn't sponsor the rich people buying really, really, really nice EVs"* (Car manufacturer 2). A public sector representative (3) describes, *"it's affluent people that dominate the EV market"*. Thus, the rich are seen to be benefiting most from Norway's EV investments even though they could afford a car otherwise too, while the less affluent, those who cannot afford a car and rely on public transportation or cycling, are not and do not see improvements (Local government 1; Local government 3; Local government 5; NGO 3; User association 1; User association 2; Public sector 1; EV user 1). Based on the interviews, reactions to this equity debate vary significantly. On one side, some disagree and believe that: the rich buying EVs enabled the technology to develop and become cheaper in the long-term (Scholar 3; User association 1), they would otherwise simply buy polluting ICEs (Car manufacturer 2; NGO 3), and that the rich *"voluntarily accept taking the better part of the depreciation costs and allowing the less wealthy people to get the same car but a little older"* (Scholar 4), through the second-hand market. Conversely, those interviewees agreeing with this perspective argue that big, luxurious EVs are not necessary and should not be encouraged and that policymakers should address this, through for instance a price cap on EVs that can receive tax exemptions (NGO 2; NGO 4; Local government 2; Local government 4; Local government 6). According to an EV user (1), this issue has *"not been talked about that much in the public"*, implying that efforts to find solutions to the opposing opinions are lacking.

Thirdly, numerous interviewees convey that the negative environmental and social implications associated with Norway's EVs and their uptake are insufficiently considered. While some efforts have been made regarding battery recycling and enhancing vehicle modularity (Car manufacturer 1; Car manufacturer 2), it is argued that environmental and social consequences of EVs have not been addressed enough by policymakers. According to an NGO representative (4), *"when we are*

telling the ministers or politicians about these things, they say 'our goal is to get the cars with zero pollution'; and then they forget all the other things". A local government representative (4) adds, *"politicians sometimes forget that an electric car is still a car; it's still a private car"*, indicating a lack of emphasis on combatting challenges associated with them. Various problems with EVs are raised during the interviews. For instance, an interviewee outlines how vehicles release microplastics from their tyres when driving and due to the greater weight of EVs from their batteries, microplastic pollution is higher with EVs than ICEs (Scholar 1). As with other private vehicles, EVs contribute to road wear and use of asphalt, as well as use valuable space and cause more congestion and traffic safety issues (Public transport 1; Local government 2; Local government 5; Local government 6; Scholar 4). While more silent than ICEs at low speeds, upwards from 50 kilometres per hour, noise levels between EVs and ICEs do not differ, *"because most of the noise is from the wheels"* (Local government 4). EV uptake also contributes to more road and infrastructure construction and hence, cutting down of nature (NGO 3; Local government 2). According to an NGO representative (4), EVs have contributed to *"more greenwashing of big highway projects"*. It is also crucial to consider an EV's cradle-to-grave, its complete lifecycle and question: *"how sustainable is the solution?"* (EV user 3). According to interviewees, EV production generates more emissions than ICE production; only after approximately 30,000 kilometres do EVs become the more environmentally-friendly option (Scholar 1; Local government 4). Alongside environmental implications, ethical and humanitarian issues such as child labour are associated with battery production; cobalt is an important battery component and its vast mining in the Democratic Republic of the Congo entails widespread controversies (Local government 6; NGO 4). Batteries' end-of-life represents another environmental concern of EVs, a low proportion of them currently being recycled (Scholar 4; Local government 6; NGO 4). Overall, according to a scholar (1), *"this policy is quite effective in reducing Norwegian greenhouse gas emissions, while we don't think very much about the possibility that this might cause increased emissions abroad"*. Thus, it is arguably crucial for policymakers to thoroughly address these emerging environmental and societal implications of EVs.

Fourthly, despite several implemented strategies, various interviewees argue that the problem of insufficient charging infrastructure, both charging stations and the electricity system, is not addressed enough – *"it picks up, but it picks up too slowly; everything happens too slowly"* (Scholar 3). Norway's electricity transfer system is still lacking and thus, the ability to supply enough electricity to the necessary charging stations (User association 1; NGO 2). Beyond EVs, Norway is a country based on electricity; *"Oslo is heated by electricity and everything is electric and we're lacking infrastructure for it… it's fascinating*" (NGO 2). Despite this electricity dependence, Norway's *"backbone infrastructure for electricity is not strong enough"* (NGO 2) – an issue that has arguably been known for a long time, when electric trains were introduced. According to an NGO representative (2), *"infrastructure is key; it's absolutely key and this is something that we have talked about since day one"*, indicating a delay in identifying the problem. An EV user (2) explains, *"it is not my impression that that has been a priority up to now"*. While the government has relied on the market to solve infrastructure shortages, a local government representative (5) argues *"you could leave everything to the market, but to be honest, it would be too little too late"*, exemplifying policymakers' lacking efforts to tackle the problem. According to interviewees, it is crucial that policymakers invest in and upgrade EV infrastructure, to address

insufficient chargers, potential electricity grid imbalances, and persistent troubles with range anxiety, EV users fearing that they will not reach their destination (NGO 3; NGO 4; Local government 6; Public transport 1; Public sector 2; Car manufacturer 2; Scholar 3).

Fifthly, cities increasingly experience a lack of private parking spaces and individual chargers; since the primary place to charge an EV is at home, due to cheaper electricity and convenience, this discourages EV ownership as it becomes unpractical (Local government 4; Scholar 4). According to a local government representative (5), 30 percent of people living in Norwegian cities do not have access to a private parking spot. A user association representative (2) adds, "*1 out of 4 cannot charge at home, so there has to be a solution for them if you're going to have everybody on electric cars"*. Despite certain local governments testing out public charging projects to combat this, for instance at schools in the afternoons and weekends, it is argued that this issue has been insufficiently addressed (Local government 3; User association 2). There is *"a gap between how many that can charge at home and how many is going to have an EV; and you have to fix that"* (User association 2).

Sixthly, despite existing efforts to tackle standardisation issues at charging stations, interviewees express the problem's persistence across Norway and need for it to be addressed more effectively (EV user 3; NGO 2). According to an EV user (1), *"there's no standardisation, that's for sure"*. Due to plug and payment variations, it is *"complicated to navigate through the charging stations for EV users"* (Car manufacturer 2) and results in a *"user experience which is awful"* (User association 2). There are *"about 150 apps it seems, to be able to meet the one at the next station"* (Local government 3) – something that is considered to be problematic for EV users of older generations (EV user 1). Thus, charging standardisation issues are arguably insufficiently addressed, it still being *"so many years [away] from how you experience a gas station"* (User association 2).

Seventhly, although local revenue losses from incentives have been somewhat addressed by allowing local authorities to charge EVs using the 50 percent rule, interviewees argue that revenues are still less than originally calculated and the issue is not fully solved (Local government 2; Local government 4; Public sector 1) – *"the government's income is getting problematic"* (Car manufacturer 2). A scholar (4) states, *"when the total revenue plummets because too many people drive electric cars, this becomes a problem […] I don't think that has been solved yet",* exemplifying insufficient efforts in tackling the issue. Public transport in particular is financed through the Norwegian road toll scheme and car taxation and thus, EV incentives decreasing their income means less potential public transport investments (NGO 1; Scholar 3; EV user 3; Local government 2) – a development that has created *"waves of controversy"* (NGO 1). As pointed out by a local government representative (4), *"if the income goes down because of the EVs, who's gonna sponsor the bus?".* In Oslo's case, where 90 percent of toll road income is channeled into public transport and cycling, revenue losses arguably directly affect progress in these transport modes and currently, the city has difficulties financing a new metro tunnel (NGO 3; NGO 4; Local government 5; User association 2; Public transport 1; Scholar 4). An NGO representative (4) adds, *"you get less money when the EVs are increasing and if you still have to give them 50% reduction in the taxes, you will maybe have some problems with getting the money for these*

projects". According to interviewees, this dilemma is encountered across Norway and yet to be solved, implying weak informational coherence (Scholar 4; Local government 4).

Eighthly, a significant problem that has recently emerged due to Norway's EV incentives is the fact that *"a lot of relatively new cars have been scrapped because it's not economically viable to fix them"* (NGO 2). While EVs are exempt from taxes such as VAT, reparations and purchases of EV parts are not tax-free – *"they are so much more expensive than the car itself"* (NGO 2). As a result, *"electric cars are not as often as fossil fuel cars repaired; they are just thrown away because it's more cheap to buy a new car"* (Local government 4). Interviewees argue that the idea that EVs in a good state are being scrapped rather than repaired is immensely problematic, contradicting the environmental motive to adopt an EV (Local government 4; Car manufacturer 2; NGO 3). Thus, to achieve greater informational coherence, it is arguably necessary for Norway's policymakers to address this issue and promote greater circularity (NGO 4).

Ninthly, a lively debate has developed in Norway over the last *years "with regards to how fast should you phase out those user advantages, with EVs being so numerous now"* (NGO 1). Based on the interviews, opinions differ significantly on how incentive phasing out should occur, with varying suggestions being made by different political parties and stakeholder groups. According to a car manufacturer representative (1), Norway's policymakers *"are somewhat reluctant to take on the discussion on how we will proceed […] we need to decide is the tax on buying or using, and that's a discussion that has not been up on the table very much yet"*, exemplifying lacking efforts to address this topic. A local government representative (4) shares that the EV incentive mix *"is very expensive for the Norwegian state" and "negative consequences are growing now"*, indicating a need for adjustments to be made in order to combat the associated problems. It is argued that policymakers *"have really not yet touched upon how we will live also with these incentives in the coming years"* (Car manufacturer 1) and, in order to stimulate informational coherence, this phase out discussion is crucial.

Thus, while informational coherence is exemplified through emerging problems being spotted and addressed, including EV congestion on bus lanes, local revenue losses, hogging of parking spaces and chargers, and lacking charging infrastructure and standardisation, other interviewees argue that policymakers delay addressing issues and insufficiently consider them, opposing coherence. The latter refers to: increased car usage over public transport, rich disproportionately reaping EV benefits, negative EV environmental and social implications, lack of charging infrastructure and standardisation, lack of private parking and chargers in cities, revenue losses, scrapping of new EVs, and phase out disputes. Therefore, a disagreement among interviewees exists on the tackling of local revenue losses and charging infrastructure and standardisation, the problems demonstrating both strong and weak informational coherence.

5.2.2 Procedural Coherence

Based on the theoretical framework, procedural coherence occurs when EV incentives are implemented in a transparent procedure.

5.2.2.1 EV incentives are implemented in a transparent procedure

A transparent procedure concerning EV incentive implementation is understood as incentives being openly and clearly communicated to the Norwegian public, knowledge about them being widespread. On one hand, Norway's EV incentives are considered to be transparently implemented, enhancing procedural coherence, since they are known to many Norwegians (Local government 4; EV user 3; User association 2). According to an EV user (3), the EV incentives are "*discussed by everyone […] you just know it […] it's just common knowledge"*. With increasing EV numbers being visible on Norway's streets, the incentives are considered to be *"something that everyone knows"* (Local government 4). A user association representative (2) adds that *"I think nobody is unaware of that, the benefits because either you take an advantage of the benefits or you hate it; so, everybody has an opinion about it"*, emphasising broad awareness of the incentives across the population and thus, transparency.

Moreover, numerous interviewees point out that EV incentives are a commonly discussed topic across various types of media platforms in Norway, illustrating the transparent nature of their implementation and widespread knowledge about them. Aside from national information sources, the EV incentives, changes to them and problems surrounding them are discussed in newspapers, on TV programmes, and on Facebook and other social media (Public transport 1; Local government 2; Local government 3; EV user 1; EV user 2; EV user 3; NGO 4) – *"it's in the media all the time and it has been for several years"* (Local government 4). According to an EV user (1), most Norwegians read the same newspapers and therefore, knowledge about EV incentives reaches a broad audience. The topic is also regularly discussed on the radio, journalists inviting scholars to discuss their research findings on EV incentives (Scholar 2; EV user 2). Furthermore, the incentives are physically displayed on signs when passing through toll booths, highlighting lower fees for EVs, and car advertisements, explaining the possibilities for financial support when purchasing an EV (Local government 2; EV user 1). Overall, due to the broad media coverage, information about Norway's EV incentives is believed to be easily and transparently accessible (Local government 4). A user association representative (2) emphasises this further by stating that, *"if you want to start a new internet paper, you should start it on EVs because it's really like a clickbait for everyone […] the EV stuff is kind of like raw meat lying; it's very popular and it creates clicks and it creates lots of debates"*. According to a scholar (1), the topic has even reached international media. For these reasons, Norway's EV incentive mix is transparently implemented, contributing to its procedural coherence.

On the other hand, despite this predominant perception, a local government representative (2) counters this idea when they express hesitation about whether information on the EV incentives does in fact have such a wide reach. According to them, *"my impression is that some people don't know that they can also get subsidies or financial support […] the government reach out to the people but it has a little bit to do with what do they read? What is their way of living?"* (Local government 2). A potential lack of knowledge exists with people who are less educated or have more traditional views on cars (Local government 2). Thus, EV incentive awareness arguably varies, opposing the idea that they are transparently implemented.

Overall, procedural coherence is exemplified by the widespread belief that the EV incentives are 'common knowledge' and the fact that they are discussed across a range of media platforms in Norway, however a potential lack of awareness among less educated or people with traditional views on cars challenges the sub-characteristic's presence.

5.3 Credibility

Credibility pertains to how believable and reliable the incentive mix is, in its elements and processes (Rogge & Reichardt, 2016). The two sub-characteristics explored to distinguish its presence in Norway's case are: national and sub-national level (Rogge and Schleich, 2018).

5.3.1 Incentive Mix Credibility at the National Level

As outlined in *Table 2*, EV incentive mix credibility on the national scale exists when there is: broad consensus across all political parties on the EV transition, a clear political vision, and strong support from the national government for the incentives and transition. On one hand, the Norwegian incentive mix is considered to be credible since numerous interviewees describe an alignment between varying, opposing political parties on it and the transition; there is broad political agreement on the topic (EV user 1; Local government 2; Scholar 1). According to a car manufacturer representative (2), the EV incentive mix is a *"fusion between the green parties, who wanted to make EVs cheap, and the progress party, who wanted to make cars cheap"*. The incentives represent an alliance between varying political parties – *"you have really very, very different groups that are enthusiastic about this policy […] there's really great agreement"* (Scholar 1). A user association representative (2) adds that, regardless of the election outcome in autumn, the EV plan will remain the same because *"the two largest parties in each block, they agree upon this question. So, the conservatives and the labour party have the same, more or less, the same model"*. These parties arguably have corresponding programmes concerning EVs (User association 2); *"all parties, both the blocks, had the same kind of goal"* (Public sector 3). There is *"broad support from all political parties […] meaning that there is typically little opposition towards the EV policies"* (User association 1). To provide an example, when the Norwegian government discussed the new climate plan or when the parliament recently voted on the proposal to improve charging infrastructure, decisions were unanimous (Public sector 1; User association 2); due to political consensus, *"there's a lot of discussions about a lot of things but one of the things which wasn't discussed was electric vehicles"* (Public sector 1). Despite a theoretical division between left, right or central parties, the EV incentives are said to symbolise a middle ground (Local government 6); the parties have been *"pulling in the same direction"* (Public sector 3). Political stability has arguably resulted from this (Public sector 3; NGO 4); the EV incentives are unique in that they have *"been lasting for so many years and through changing governments"* (Car manufacturer 2). These remarks emphasise widespread political consensus on EVs and hence, national incentive mix credibility.

In addition, EV incentive mix support is arguably far-reaching due to its politically popular nature (Local government 4; NGO 3; NGO 4). According to a local government representative (4), the EV transition is politically appealing since the majority of voters drive cars and thus, politicians

strive to be favoured among drivers; for this reason, *"you use billions of NOK to invest in big motorways, but you can't afford to use thousands for bike lanes"*. Similarly, *"we should prioritise that [EVs] instead of railway"* (NGO 3). The EV plan is easy to gather support for (NGO 4); *"in a way, this is a politician's dream because they can do […] something that is popular and at the same time, it makes sense environmentally. Because a lot of other things that you have to do to save the environment are unpopular things"* (Local government 4). For this same reason, consensus also currently exists among politicians about postponing the EV incentive phase out, to avoid declining political support (Local government 4). It is argued that, as EV users increase, so does the difficulty of removing the incentives (Local government 4); *"it will be hard to find the politician who will be recognised as the person who killed incentives"* (Car manufacturer 1). Therefore, the politically popular nature of Norway's EV incentives on a national level arguably illustrates their broad support and credibility.

Furthermore, nationally, it is argued that there is widespread political support for Norway's emission reduction targets and EVs are considered crucial to reach these targets (Scholar 3). The EV transition plan is part of the country's emission reduction plan, in accordance with the EU goals, and therefore, it has gained national governmental support (Local government 2). Concerning the incentives, there is *"not so much debate because everyone has started to understand that, in order to reach this target, you have to have a very tough EV policy"* (Scholar 3). Thus, the incentive mix arguably has national credibility.

On the contrary, interviewees also express areas where Norway's incentive mix potentially lacks national support and credibility. Primarily, although support across political parties is previously discussed, interviewees also pinpoint certain political parties that do in fact oppose the EV incentives. The Norwegian 'Senterpartiet' (Centre Party) is arguably an example – an "*agrarian populist party which is […] very sort of pro-diesel and SUV"* (EV user 2). According to a local government representative (2), the party claims that *"it's better with diesel and all those poor people in the countryside"*. It is considered a rural party which is negative of the EV advantages, arguing that EVs are not a viable alternative there due to their range (EV user 2; Public sector 3). Also, according to a user association representative (2), while the larger parties, the conservative and labour ones, agree on the EV plan, the smaller parties lack consensus. Contrary to earlier arguments, an NGO representative (3) adds that the EV incentives are supported by the Progress Party, but *"Høyre [the Conservative Party] is mixed about it"*. Additionally, several interviewees describe how, over the last years, a political party called 'Folkeaksjonen nei til mer bompenger (FNB)', an anti-toll road party, has emerged and increasingly gained popularity across the larger cities (NGO 1; NGO 4; EV user 1). As their main agenda is against road tolls generally, it has *"had a sort of chilling effect on the use of road tolls as an [EV] incentive"* (NGO 1). Consequently, the party is seen to be at least partially against the EV incentives. Lastly, a scholar (4) identifies an inconsistency between the EV plan and views of the green and left parties, who *"stick with the old paradigm that cars are bad from the environmental and climate point of view"*. Hence, based on these comments, EV support is dependent on the governmental party and not simply a given.

Furthermore, national credibility is arguably lacking due to a misalignment between different parties on the phasing out process of the incentives (User association 1). While the existence of

EV incentives is less debated, the discussion is primarily related to the speed of the transition and thus, how and when EVs should be taxed (Public sector 1; Car manufacturer 2). Interviewees from varying stakeholder groups describe the debate currently occurring between political parties, suggesting that a clear political vision and plan for the EV incentives and transition is missing; *"it's going to be interesting to see how politicians are gonna navigate between these conflicting targets, conflicting goals"* (Scholar 4). As stated by a public sector representative (2), *"the politicians [are] giving different signals"*. According to a car manufacturer representative (1), parties have been making various suggestions for changing the EV incentives; *"we have now seen some drafts from different political parties".* The Labour Party, for example, has proposed VAT introduction for EVs above the purchase price of 600,000 NOK, to restrict financial benefits when buying luxury EVs such as Tesla's and Porsche's (Scholar 4; EV user 2; User association 1; Car manufacturer 1). In addition, suggestions to raise ICE taxes have been made, however such proposals are met with opposition, particularly from the Centre Party which defends ICE use (Scholar 3). Lastly, *"most of the greenest parties are talking about banning other vehicles [ICEs]"* (Car manufacturer 2) – a proposition that, like previously, does not correspond with all political parties' viewpoints. Thus, it can be argued that a clear vision and plan for the EV incentives, across Norway's political parties, is lacking, limiting national level credibility.

Overall, while signals of strong national support for the EV incentives and transition are recognised, being politically popular and a way to reach the country's emission reduction targets, this broad consensus and national credibility is countered by resistance from particular political parties and disagreement on the incentives' phasing out.

5.3.2 Incentive Mix Credibility at the Sub-National Level

Based on the theoretical framework, incentive mix credibility at the sub-national level exists when there is strong support for the incentives from state governments (counties) and municipalities, and in urban and rural areas. To examine the presence of sub-national credibility, the analysis is divided into these indicators.

5.3.2.1 Strong support from state governments and municipalities

On one side, EV support from state governments and municipalities is expressed during various interviews, implying sub-national incentive mix credibility. Firstly, local governmental alignment with the national government on the EV incentives is highlighted, a local government representative (5) stating that, *"they [national government] made sure that EVs were cheap to buy. We made sure that they were cheap to use; so, we are kind of pulling in the same direction"*. More specifically, the present national government in Norway is arguably particularly aligned with the country's larger municipalities (Scholar 3). Generally, local governments predominantly support the incentives and, although there are differences between the political parties on the national and local level, large discrepancies are hard to find (Scholar 1; Local government 4; User association 1; NGO 2; Public sector 2); *"the reason is it has broad support from all political parties"* (User association 1), on both levels. Another local government representative (3) emphasises this: *"just to assure you about that, it is local support for special incentives for EVs; it's not some kind of local-national fights on this issue, it's consensus"*. An additional representative from a local

government (1) describes their experience with the national government concerning EVs as a 'two-way collaboration' – *"I have nothing negative to say about the government in this regard"*, emphasising alignment. It is further added that, especially in cities where there is a bigger focus on cars than public transport, local governments are supportive of EV incentives (Local government 3). Overall, widespread support is arguably present, both counties and municipalities collaborating amongst themselves to share their experiences with EV uptake, discuss common problems and opportunities, and learn from one another to avoid encountering the same mistakes (Local government 1; Local government 2; Local government 3; Local government 4; Local government 5; Local government 6; Public sector 2). As a result, differences in local EV market share across the country are decreasing (Public transport 1; Local government 5; Local government 6).

Secondly, it is argued that local support for the EV incentives increased when the national government granted local authorities with the 50 percent rule on EV pricing (User association 1). Prior to this, national state regulation determined that EVs should be fully exempted from such fees and local governments could not alter this, resulting in local income loss issues (Car manufacturer 1; User association 1). According to a user association representative (1), *"when they opened up that you could have up to 50 percent, you gave the local authorities a lot more flexibility"* and decision-making power, enhancing local governmental support for the incentive mix and sub-national level credibility.

Thirdly, local government support for the EV incentives is exemplified by the particularly high EV uptake across municipalities and counties in central and southern Norway. According to a local government representative (2), areas south of Trondheim experience widespread support and high EV adoption. Numerous interviewees state that the densely populated nature of these regions is the core reason behind this large EV uptake, as it ensures commercial viability of EV fast chargers and thus, good charging infrastructure to be widely accessible (Public sector 3; NGO 3; EV user 2; Local government 2; Local government 3; Local government 4). In southern Norway, *"you have many commercial parties wanting to invest […] so it's working"* (Public sector 3). According to an EV user (2), *"there is always a gas station where you can stop and charge for half an hour"*, illustrating the ease of the user experience. Alongside this, further reasons for local governmental EV support there include: appropriate geography for EVs, Norway's larger cities such as Oslo which have *"more momentum and […] are more progressive in their thoughts"* (Local government 2), and more issues with air pollution, encouraging EV adoption to tackle them (Local government 4).

Conversely, interviewees also bring to light various ways that Norwegian state governments and municipalities may be lacking support for EVs and associated incentives. Primarily, opposition exists due to the revenue losses experienced by local governments, as mentioned earlier. The negative impact on financing has induced disapproval of the incentives, local governments eager *"to also put the bill on the persons driving EVs"* (Local government 3). Two local government representatives (3; 6) describe political opposition to EVs in their respective areas, some politicians being sceptical due to worries about the capacity of power and electricity systems to support this electrification, while others have 'rural thinking' and traditional perspectives on cars,

EVs not being seen as a viable ICE alternative. Thus, while EV support is arguably widespread locally, it is crucial to recognise that EV resistance also exists, influencing sub-national incentive mix credibility.

Moreover, generally-speaking, there is seen to be lacking efforts related to EVs by certain local governments across Norway. Differences in EV support are experienced, a local government representative (1) highlighting that numerous municipalities *"could have done a lot more when it comes to electrifying their cars"*. A public sector representative (2) explains that a lack of political willingness, personal interests and good stewardship is hindering a growth in EV support in specific local governments. To further elaborate, *"the explanation we have is people. That usually one person is very enthusiastic and wants to do something new and is willing to take the brunt of that to really get it moving"* (Public sector 1). Hence, EV efforts and support are arguably missing from particular sub-national governments.

In addition, a potential clash exists between local and national governments in support for EVs, with certain local governments, such as Oslo and Bergen, striving for more aggressive emission reduction goals than the national targets and prioritising public transport, cycling and walking over EVs (NGO 1; Local government 5; Scholar 3). A local government representative (5) explains *"public transportation for us is key […] we prefer of course that people are taking public transportation when they are commuting in and out to their office in the morning […] we don't want them to use the private car"*. According to a public sector representative (1), in terms of achieving environmental improvements*, "the local authorities are tending to lead the way, especially the big local authorities"*. At present, significant political discussion is taking place on local governments' ability to enact zero-emission zones, banning ICE vehicles from driving there, or car-free areas altogether (Local government 3; NGO 1; Scholar 3; Car manufacturer 2). The latter represents a potential conflict between national versus local EV support; *"the main disalignment, so to say, has been on the balance between how much more aggressive should cities like Oslo be allowed to move […] a sort of struggle between how much control should be where"* (NGO 1). While EV-friendly in terms of building public chargers for instance, Oslo's local governmental policy has been to increasingly reduce parking spaces, new housing having a maximum of 0.3 or 0.4 parking spaces per apartment (EV user 1; EV user 3; User association 2; Scholar 2; Scholar 4). This arguably clashes with EV support by *"making it more difficult to electrify the fleet"* (Scholar 4). An NGO representative (3) adds that national and local governments are *"less aligned than ever right now"*; for the first time, local governments are opposing new road construction, including Bergen, Trondheim and Oslo – views that potentially counter national EV plans and incentive mix credibility.

Furthermore, contrary to central and southern Norway, EV support and uptake in northern parts of the country are considered to be lagging behind – *"there's still a lot of things that have to be done"* (Local government 2). According to a local government representative (4), *"there are very few people on vast areas of land; and it's colder. And congestion, air pollution, it's not as big issue there"*, resulting in lower EV support from local communities there. EV barriers are greater in the north, upwards from Trondheim (Public sector 3; Local government 3; Car manufacturer 1); *"we have long winters, we have steep mountains and people are a little bit sceptic using these cars*

because the batteries don't hold too long" (Local government 2). Thus, due to difficult terrain, extreme weather, low population density, the north experiences relatively high costs of public charging infrastructure since investments are not necessarily repaid and subsequently, the areas lack EV charging facilities (EV user 2; EV user 3; Local government 2; Local government 6; NGO 3). *"In order to have profitability as a charging operator, you need a volume, right? You just need that there are a certain density of electrical cars […] so, it's hard to get profitability in the charging infrastructure"* (Public sector 3). When discussing the north's conditions, a public sector representative (1) even states *"we do accept that it won't work everywhere"*, exemplifying the high barriers to EV support and sub-national credibility.

Hence, while local governments display alignment on the EV incentives, show support due to local decision-making power, and experience high uptake in central and southern areas, credibility and EV support is restricted due to local revenue losses, lack of stewardship, prioritisation of public transport, and low uptake in northern areas.

5.3.2.2 Strong support in urban areas

Based on the interviews, Norway's urban areas are considered to be supportive of EVs for various reasons. Primarily, urban areas arguably access a wide range of incentives; compared to rural areas, *"the people living in more cities, they were more in position of using the incentives"* (Local government 1). EV incentives have the tendency to be stronger in cities, encouraging EV driving there (Scholar 2; Scholar 3; Scholar 4; Public sector 1; NGO 4). Since most Norwegian cities have a toll ring around them to reduce traffic and finance infrastructure development, EV support is high as users can gain significant economic advantages from toll road deductions (User association 1; Scholar 2; Scholar 3; Scholar 4; NGO 1; NGO 4; Public sector 1). Urban EV drivers also have access to designated bus lanes and benefit from reduced parking fees (User association 1; Scholar 2; Scholar 3; Scholar 4; Public sector 1; NGO 4). A local government representative (2) argues that more effort is put into encouraging Norwegians to buy EVs in urban over rural areas. For this reason, EV support and uptake has been high in urban Norway, contributing to sub-national incentive mix credibility (NGO 1; Car manufacturer 2; User association 1).

In addition, according to several interviewees, EVs are met with strong urban support due to the convenience in using them there. First off, it is argued that distances tend to be shorter, diminishing issues associated with EV range (Public sector 1; Local government 6); *"most daily trips in the cities are short so an electric vehicle is well-suited for the purpose"* (Scholar 4). Secondly, urban areas' densely populated nature results in greater access to public EV charging infrastructure due to higher profitability, ensuring comfort with EV use (Local government 2; Local government 6). Thirdly, according to a public sector representative (1), a small EV is suitable for Norwegian urban driving conditions, where snowy or unpaved roads are not an issue. Hence, EVs are considered compatible with urban areas, strengthening their support and sub-national EV incentive mix credibility.

Furthermore, urban settings experience EV incentive mix support due to a greater urgency to tackle air pollution issues there (Local government 3; Local government 4). Considering higher

population densities and congestion, *"EVs are important in cities because of the local climate"* (Local government 3) and thus, due to alleged progressive views and willingness to adopt a new technology, are largely supported (Local government 2).

On the other side, interviewees also express ways in which EV support is lacking in urban areas, undermining sub-national incentive mix credibility. For instance, numerous remarks are made about urban contexts lacking access to parking spaces and thus, individual or private charging opportunities – complicating EV ownership and weakening support (Car manufacturer 1). According to a user association representative (1), *"the main bulk of your charging will be done at home and it's also the most convenient form of charging […] so, the real problem is actually areas where you don't have access to your own parking space and this is a bigger problem in cities"*. Charging an EV solely through public chargers is considered inconvenient and discourages EV support in urban areas (Scholar 3; Scholar 4). There are structural challenges associated with parking due to spatial restrictions; therefore, as the EV share increases, *"how do you solve that you have enough public charging in cities?"* (NGO 1). Concerning EV ownership, an NGO representative (1) states that, over time, *"the difficulties will be perhaps more concentrated in cities"*, reducing support for EVs and their incentives in Norway's urban settings.

Moreover, as mentioned previously, certain local governments, particularly ones with larger cities, are shifting away from private vehicles altogether, including EVs, and alternatively promoting public transport, cycling and walking (Scholar 3; EV user 3). With Oslo striving to be 'car-free' and removing parking spots, *"it's getting more and more difficult to actually own a car if you don't have private parking"* (Car manufacturer 1). Thus, it can be argued that Norway's urban shift away from private transport clashes with the EV incentive mix, undermining support and sub-national credibility.

Therefore, while urban areas have greater access to incentives, EVs are convenient to use and urgency exists to combat air pollution, private parking and charging constraints and the notion of 'car-free' cities counter sub-national credibility there.

5.3.2.3 Strong support in rural areas

On the one hand, despite a current lower market share than in urban areas, rural support for EVs and their incentives is arguably present in numerous ways (Car manufacturer 1; Public sector 2). Firstly, EV uptake and support has increased rurally since battery capacities have improved (Scholar 1; Public sector 3). After longer-range EVs emerged in 2016 and particularly after the Tesla Model 3 was introduced in 2019, it is said that *"the market share for electric vehicles is actually growing faster in rural areas than in urban areas"* (User association 1). EV technology improvements and expanding model availability has made EVs *"a more realistic alternative for more people"* (Public sector 3), particularly for rural Norwegians. As a result, the *"popular idea that EVs are designed for urban areas and they don't fit in the countryside"* (User association 1) is declining. Thus, rural EV support is growing, contributing to sub-national incentive mix credibility.

Secondly, rural support for and adoption of EVs has increased due to widespread access to parking and private charging facilities, space being less of a challenge than in urban areas (Scholar 4). Contrary to urban parking issues, in rural Norway, "*most people are living in detached houses, with their own parking and an easy access to charging, even if it's just a plug on the wall"* (Local government 5). According to a user association representative (1), *"the backbone for charging infrastructure is your own parking place, if you have one"*; therefore, the widespread rural access to both parking and charging enables convenient EV ownership and support (NGO 1; Scholar 3; Car manufacturer 1). Subsequently, it is argued that *"you will see higher uptakes in the countryside because they already have the infrastructure for charging"* (User association 1). Support and, hence, credibility is considered to exist in rural Norway.

Thirdly, contrary to previously mentioned, certain rural areas with access to ferries, bridges and toll roads have also benefitted significantly from the EV incentives and fee reductions (User association 1; Scholar 4). High EV uptake exists in these areas and thus, benefitting from EV incentives is arguably not limited to Norway's urban population (User association). EV incentive mix support from various rural areas therefore exists.

On the other hand, as previously explained, rural opposition to EVs and incentives is also experienced, conflicting with sub-national incentive mix support and credibility. Primarily, resistance to EVs in rural areas is still widespread; *"resentment exists and the sort of idea that you cannot use an electric car in rural Norway"* (EV user 2). It is argued that EVs are commonly seen as a city person's car (EV user 1; NGO 2) – *"when you live on the countryside, EVs is not an option really"* (NGO 3). Rural areas experience tougher driving conditions and therefore, are deemed unfit for EVs (Public sector 1). More specifically, Norway's rurally-supported Centre Party advocates for traditional ICEs and criticises EVs on various features – ideas that may circulate in rural areas, reducing EV support (Public sector 3; Local government 3).

In addition, although EV battery technology has progressed over time, EV range arguably continues to hinder rural EV support (User association 1; Public sector 1; NGO 1; Local government 1; Local government 2). Due to potentially longer commutes of rural Norwegians, EVs are considered unsuitable, impractical and challenging in rural areas and thus, their sub-national credibility reduced (Scholar 4; Public transport 1; Local government 3; Local government 6). It should be noted however that various interviewees counter this notion and consider the EV range that is presently available to be sufficient for rural inhabitants (EV user 2; Local government 5). According to an NGO representative (2), *"80 or 90 percent of all driving in Norway is less than 100 kilometres; so, you don't need to have the possibility to go, you know, 380 kilometres each time"*. A user association representative (2) adds, *"how often [do] you drive 300 kilometres in one go? You don't."* In terms of range, rural EV requirements are thus not seen to be so different from urban areas (Local government 2).

Moreover, rural EV support is restricted due to most inhabitants only benefitting from a limited number of EV incentives, compared to urban settings (Local government 1). According to numerous interviewees, rural EV users are predominantly unable to reap the benefits of toll road and parking incentives, as well as POV lane access (NGO 1; NGO 2; NGO 4; User association

1; Public sector 1; Scholar 2; Scholar 3). According to a car manufacturer representative (2), fewer taxation policies exist in rural areas and thus, less opportunities for tax incentives. For this reason, rural EV support and sub-national incentive mix credibility are restricted.

Furthermore, although progress is occurring, various interviewees assert that rural EV support is limited due to lacking public charging infrastructure (NGO 4; Local government 2). A local government representative (3) describes charging difficulties and the vulnerability associated with rural EV users: *"especially in Troms and Finnmark, where you have these enormous distances between people and cities or urban structures".* Apart from charging stations along main roads, rural Norway lacks appropriate EV charging infrastructure, decreasing the convenience of EV use and its support (NGO 2; NGO 3; Public transport 1) – *"it's not really practical"* (NGO 2).

Lastly, two local government representatives (3; 4) express that rural Norway generally experiences fewer issues with local air pollution and hence, a lower urgency to stimulate EV uptake and support. Particularly in the rural north, areas are sparsely populated and vehicle congestion is not a significant issue (Local government 4). Therefore, EV transition may not be considered necessary, reducing sub-national EV incentive mix credibility.

Thus, while uptake is increasing in rural areas and spatial conditions are suitable for EVs, EV incentive support and credibility is lacking due to traditional attitudes to cars, alleged longer distances, insufficient public chargers, and lower necessity to tackle air pollution issues.

5.4 Comprehensiveness

Comprehensiveness refers to how complete incentive mix elements are, and how thorough decision-making processes are (Rogge & Reichardt, 2016). The extent to which comprehensiveness is present in Norway's EV incentive mix is dependent on whether elements are missing or improvements are recommended to achieve an effective EV transition in the country. To clarify further, an 'effective' EV transition signifies a full transition, whereby problems are minimised.

On one side, Norway's EV incentive mix is considered complete to reach an effective EV transition, a local government representative (1) asserting that they have "*been the right incentives. I don't see any better ways of doing it for the municipality actually*". By having incentives on one end and additional regulations on maximum ICE pollution levels (CO2 grams per kilometre), they argue that the incentive mix does not require additions or alterations (Local government 1). Furthermore, a public sector representative (3) adds that present EV incentives are sufficient – *"I don't think we need any more incentives in Norway"*. As was the case in Germany with solar panels, where incentives managed to raise the volume, improve the technology and significantly reduce their price, it is suggested that the same will occur with EVs in Norway through the current incentive mix (Public sector 3). Over time, the government incentives have successfully boosted battery capacity and stimulated new EV models and car manufacturers, the idea being that *"the market should take over soon"* (Public sector 3). Thus,

Norway's incentive mix is considered comprehensive and capable of achieving an effective EV transition, the incentives not being necessary any more in due time.

On the other side, interviewees exceedingly argue that Norway's EV incentive mix lacks completeness and requires a range of changes or improvements. Primarily, a core improvement suggested by various stakeholder groups, is the need for more governmental support to build charging infrastructure in Norway. So far, infrastructure support has arguably been insufficient, *"when you look at how much money that the Norwegian government has spent on infrastructure [..], it's really, really small compared to the direct and indirect support to the individual car"* (User association 1). Since an indirect network externality exists between EVs and charging, *"in order to get higher diffusion of EVs, you have to have a network"* (Scholar 3). Thus, it is considered crucial that the Norwegian government supports charging infrastructure more as a whole (User association 1; User association 2). Contrary to the government's alleged argument that 'the market will solve this', fast chargers are arguably not always commercially viable (User association 1); *"the market is developing after the queues and we need the system to be there in front of the queues – so that people don't get too many arguments to not buy an EV"* (Car manufacturer 2). Therefore, to strengthen EV incentive completeness, the government is encouraged to step in and support a well-established network, as Tesla has done (NGO 2; Car manufacturer 2). To avoid bureaucracy and delays, a scholar (3) suggests a general subsidy for anyone wanting to build a fast charging station. The *"key for the future [of EV uptake], is to have a well-working charging infrastructure. And what we see today is that, there's a huge cost of not running it"* (Car manufacturer 1).

In addition to expanding charging infrastructure support, it is argued that the EV incentives should place a greater emphasis on standardising the EV charging experience. At present, plug variations between EV models restrict charging station access and the numerous phone applications for payment complicate charging and navigation between stations (EV user 3; Car manufacturer 2). Thus, standardising the charging experience is recommended to enhance incentive mix completeness.

Furthermore, among interviewees, a widespread recommendation for Norway's incentives is to reduce them and begin taxing EVs, to achieve an effective transition. The incentive mix is considered too costly and unaffordable for the government, especially as EV numbers grows further (EV user 2; Local government 4); according to a scholar (4), they are *"overcomplete"*. It is argued that EVs, and more broadly speaking driving, are currently too cheap and that incentives are too high, increasing the total car traffic (Local government 2; Scholar 1; Scholar 2; NGO 4). Thus, EV incentives should be lowered, whilst still keeping EVs cheaper than ICEs, and a change in the Norwegian car tax system considered (Local government 2; Local government 6; NGO 1; Car manufacturer 1). According to a car manufacturer representative (1), *"we need to decide is the tax on buying or using"* EVs, as both are not feasible. Various stakeholder representatives argue that the incentives should remain on an EV's purchase but gradually removed from use over the next years (Scholar 2; Scholar 4; Local government 3; NGO 4; Public transport 1) – *"tax the use of a car, not the car itself"* (EV user 2). According to a local government representative (3), parking and road toll fees *"have other purposes"* and EVs being exempt from them through

use incentives leads to local revenue losses and potential challenges. Thus, firstly, EV parking incentives should arguably be removed, particularly in city centres where car use is to be discouraged – EVs should pay the same fees as ICEs because they take up the same in space (Public transport 1; NGO 4). A scholar (2) criticises the EV parking incentives, asking: *"why are you trying to get more cars into the city centre when you prefer to have walking and cycling as the main mode?"* Secondly, road tolls for EVs should arguably be increased (EV user 2; Scholar 1; Scholar 2; NGO 4). A public transport representative (1) contends that the 50 percent rule with EV road tolls is insufficient, "*especially when it comes to these tax subsidies when going to the city centres, it can't be just the half; you have to turn it up"*. Thirdly, according to an NGO representative (4), EV bus lane access should be broadly restricted, due to congestion issues. Fourthly, two scholars (1; 4) express the need for EV road use to be taxed, based on the distance that is driven; this is to cover the external costs of driving, including: congestion, road wear, accidents, local pollution and GHG emissions. Contrary to ICEs where fossil fuels can easily be taxed when fuelling the vehicle, it is challenging to tax EV electricity consumption since, when charged at home, the overall electricity use is likely to also contribute to other amenities, aside from the vehicle (Scholar 1). Thus, taxing EV driving through electricity taxes becomes difficult (Scholar 1). To overcome this issue and tax driving, implementing a GPS system in EVs is suggested, through which the kilometres driven are measured and a road price equal to the vehicle's external costs is determined (Scholar 1; Scholar 4). Overall, to tackle associated problems and achieve greater EV incentive mix comprehensiveness, a reduction in the incentives, particularly those related to use, is encouraged.

Moreover, to reach an effective EV transition, numerous interviewees suggest that ICEs and their fuel, either diesel or petrol, should be taxed to a higher degree (Scholar 3; Local government 2; NGO 4). The focus should be on making ICE purchase and use more expensive, rather than having low taxes on EVs (Local government 2; NGO 4). In this way, since the incentives are considered a heavy financial burden on the Norwegian government and due to EV's environmental issues, "*from the production of batteries, to not climate-related things, to noise, and local pollution, microplastic*" (NGO 4), incentives can be reduced while still achieving the EV transition goal (NGO 4). According to a local government representative (2), it is crucial to "*stop making these electric cars so cheap, you should make them more expensive but you should make the other cars even more expensive […] so people choose for electric cars*". It is thus important to continuously ensure that EVs are the more economically viable option compared to ICEs (Local government 2).

In addition, Norway's current EV incentives largely extend to both BEVs and PHEVs; PHEVs receive comparable taxing and pricing incentives, including being exempted from purchase tax and paying low VAT (User association 1; Local government 2). Based on these similar incentives, they are seen to be a 'competitor' to BEVs in the country (User association 1; Car manufacturer 1). As outlined by a user association representative (1), *"the incentives for plug-in hybrids is almost as good as [battery] electric vehicles and I think this is totally unnecessary to subsidise plug-in hybrids that much; especially when we know the level of emissions that is in their type approval"*. Over the last years, the PHEV market share has been growing rapidly across Norway and since their emission levels during use significantly deviate from the levels suggested by

manufacturers during vehicle emission tests, *"from forty to ninety percent more in real life"* (User association 1), it is suggested that the EV incentives for PHEVs should be reduced (Local government 2). Environmentally-speaking, to achieve an effective EV transition where BEVs are prioritised, incentives for PHEVs and BEVs should be differentiated – *"we have to remove unnecessary low taxation for cars, "so called" lower emission vehicles"* (User association 1).

Furthermore, several interviewees suggest that Norway's current EV incentives lack complementary regulatory measures to reach an effective, complete transition (NGO 1; Scholar 3; Local government 2; NGO 3). A local government representative (2) argues that *"you have to use both carrot and the whip"*, the 'carrot' being the incentives while the 'whip' being regulation. Therefore, it is suggested that more direct regulatory measures alongside the incentives are implemented, such as a binding ban on buying new ICEs and zero-emission zones, whereby people are 'forced' to pick EVs (Scholar 3; NGO 1; NGO 3). It would arguably be *"the easiest way to reach this [transition] goal"* (NGO 1); and at present, is considered missing from the EV incentive mix.

Moreover, to enhance completeness, Norway's incentives should arguably be adjusted to differentiate between rural and urban areas (Public transport 1; NGO 4). Currently, the Norwegian government *"use[s] too much energy on promoting EVs in the cities"* (NGO 4); when driving into cities, EVs benefit from transit lane access, and lower parking and toll fees (NGO 4). A reduction of urban EV incentives is recommended, along with a greater emphasis on EVs in rural areas, *"where public transport has lower chances to be a good solution"* (NGO 4; Public transport 1). According to a public transport representative (1), the government's 50 percent rule is not sufficient; when driving into city centres, EVs should pay closer to the full price to encourage public over private transport use.

Additionally, Norway's incentive mix does not distinguish between EV size and energy-efficiency; the tax system is the same for all EVs, in contrast to the differentiation based on fuel efficiency with ICEs (NGO 4). The same tax exemptions are offered to large, heavy EVs, despite having a more significant environmental impact, regarding: battery production, plastic pollution, electricity consumption and space (NGO 4; Local government 6). The lack of distinction between EV types arguably stimulates the purchase of larger EVs over small, energy-efficient ones, *"because when a large car is quite cheap, then you buy a large car which is not environmentally friendly at all, in any way"* (Local government 6). For this reason and to achieve an environmentally-sound EV transition, it is suggested that the government introduces greater differentiation on taxes and advantages – *"you should pay more for electric vehicles which have a higher climate impact […] it's better for the environment to have taxes on the footprint of the cars"* (NGO 4). Consequently, this change could stimulate the production of more carbon-efficient EVs (NGO 4).

A further improvement identified to boost completeness of Norway's incentives, is the extension of tax exemptions to the service and repair of EVs and purchase of vehicle parts (NGO 2). According to a car manufacturer representative (1), the EV VAT exemption has created 'strange bi-effects', where *"if you would purchase your winter tires along with your car, there's no VAT on that; but, if you purchase them individually later on, that's full VAT"*. Since EV parts are not tax-

free after purchase, the service or repair is proportionately more expensive than the EV itself (NGO 2). As explained earlier, this has caused relatively new EVs to be scrapped (NGO 2). The idea that new EVs are being purchased instead of repairing older EVs is environmentally-detrimental and a challenge that is should be addressed, by enhancing alignment in EV tax exemptions.

Moreover, in response to discussions on EV incentives disproportionately benefitting the rich, getting 'sponsored' to buy luxurious cars, interviewees suggest ways to tackle this issue and enhance incentive mix completeness (Local government 6). Since the rich *"would anyhow buy these cars, so they don't need the subsidy to buy them. But poor families are dependent on the subsidy to buy an electric car"* (Scholar 3), the EV incentives should arguably be reduced for the rich. This could be achieved by: adjusting income tax to achieve a more equitable balance, tagging incentive levels to household income, putting a ceiling on the price of an EV that can receive tax exemptions, or taxing a vehicle's power or battery size (EV user 1; Scholar 3; EV user 2; Local government 6). The *"public acceptance of not giving too much to the rich"* (EV user 2) is widely debated and although opinions on it vary, numerous interviewees express the need for this controversy to be addressed, to improve Norway's EV incentive mix and achieve an effective transition.

In addition, the car manufacturer representatives (1; 2) specifically recommend that EV incentives and the discussion around phasing them out becomes more predictable. In terms of reducing the incentives, *"we are still just postponing and postponing and postponing"* (Car manufacturer 1). The government initially decided that the incentives would exist until the first 50,000 EVs are registered and since then, every autumn, they have been prolonged (Car manufacturer 1). This yearly uncertainty has arguably made it hard for car importers and customers. Without knowledge on how the incentives will evolve in the coming years, a car manufacturer representative (1) explains: *"it's hard being a salesman today, giving the right advice because you really don't know, and if you give the wrong advice, of course, the customer will blame that on you and not the government for giving the wrong information"*. Even though incentive reductions are not desired by car manufacturers, predictability in EV incentives is said to be crucial; instead of a fast policy change, it is a *"situation where we can plan and deal with"* (Car manufacturer 2) and customers have more security in their EV purchase and are more encouraged to choose one over an ICE. In doing so, the EV incentive mix would arguably be improved and an effective EV transition possible.

Furthermore, to enhance comprehensiveness, numerous interviewees suggest that the EV incentives should be better merged with public transport and other transport modes. A more holistic approach should be taken which considers transport types other than EVs, bridging the gap between private and public transport and optimising the wider transport system (Local government 2; Local government 3; Local government 5; Car manufacturer 1). According to a local government representative (4), *"an electric vehicle is better than a fossil fuel car, but it's still a car. And you must not make them so attractive that people start to drive electric cars instead of a going by bus or walking or using the bicycle. […] You want people to change from fossil fuel to electric fuel, but you don't want more people to drive cars; you want less people to drive cars. […]*

We must make it attractive to change to electric cars but not too attractive". Due to issues of space, noise, traffic safety, congestion, pollution and infrastructure development damaging nature, the amount of private vehicle use should be reduced (NGO 4; Local government 2; Local government 3; Local government 4). Therefore, another local government representative (5) emphasises the need to establish and encourage efficient alternatives for private transport, including: public transport, car sharing, cycling, shared electric bikes, and park-and-ride solutions linked with public transport. Ideally, smart solutions should be implemented, where smaller EVs are used to reach crossroads with larger public transport (NGO 2; NGO 3; Local government 5). Public transport is considered *"the best solution for people to travel"* (NGO 3); however, at present, due to poor connections, a car is necessary to travel in Norway (EV user 3; NGO 3). It is therefore recommended that an emphasis is placed on improving the public transport network, and specifically the country's train system (Local government 5; NGO 3). In the long-term, railroad construction is arguably more efficient in terms of energy and costs, resulting in less nature being cut down, compared to road construction; *"if we're building new infrastructure, it should be railroad"* (NGO 3). Overall, the EV incentives should be altered to improve the balance with other transport modes, ensuring that public transport is encouraged over EVs, while still pushing out ICEs (Local government 4; NGO 2).

Lastly, to achieve an effective EV transition, a user association representative (1) recommends that EV taxation incentives, specifically the VAT exemption, should be extended beyond private individuals to companies. At present, company-owned EVs do not benefit from the full VAT exemption as privately-owned vehicles do (Public sector 1). The alleged outcome is that the 2020 EV share for private-owned cars was significantly higher, at 72 percent, than that for company-owned cars, at 36 percent (User association 1). By enabling companies to access this exemption, the overall share of EVs could increase significantly; *"it's 72 versus 36; so, 72 showing how much it could be if the tax rules were similar for personal privately-owned cars and company-owned cars"* (User association 1).

Overall, while comprehensiveness is considered present on the one hand, Norway's incentive mix being complete, a variety of improvements are conversely suggested, implying weak comprehensiveness.

5.5 Overview of Characteristic Results

Considering these results, *Table 9* below provides an overview of the findings per characteristic of the effectiveness assessment framework, identifying the arguments found that support a strong or weak presence of the characteristic. On the one hand, the incentive mix has been effective for EV uptake and transition by: aligning with wider transport electrification and broader cross-sectoral GHG reduction plans, stimulating rapid growth in EV adoption, enabling collaboration between EV stakeholders and policymakers during their formulation, spotting and addressing numerous emerging issues, being discussed across numerous platforms, achieving consensus across differing political parties, and experiencing support at national and sub-national levels. However, Norway's incentive mix lacks effectiveness in the sense that: it focusses excessively on the private car rather than tackling the most polluting industries' emissions, it does not overcome

certain barriers to uptake, one forum for discussion between all EV stakeholders and policymakers is missing, emerging problems are insufficiently tackled or addressed, communication of incentives does not extend to the whole population, resistance from certain political parties exists, sub-national opposition is experienced, and numerous improvements are suggested. Thus, based on the primary data gathered, for each characteristic, interviewees make a case for and against its presence in Norway's EV incentive mix, exemplifying the complexity behind the analysis and determining the overall effectiveness of the incentive mix.

Table 9 – Overview of the results per characteristic of the effectiveness assessment framework.

Characteristic	Sub-characteristic	Translation into Research	Strong presence	Weak presence
Consistency	1st level: consistency of the EV strategy	The EV transition plan in Norway is a good match with other targets of the Norwegian government.	Corresponds with broader GHG reduction goal across sectors	Conflict with urban 'zero-growth agreements'
			Alignment with wider electrification plan	Emission reduction efforts lacking in broader transport sector/other industries
			Cross-sectoral incentives for emission reductions	One consistent direction lacking across sectors
	2nd level: consistency of the instrument mix	The existing incentive types reinforce each other in their positive effect on supporting an EV transition.	Incentive types collectively encourage EV uptake (largest effect from financial ones)	n/a
	3rd level: consistency of the instrument mix with the EV strategy	The EV transition in Norway can be achieved with the help of existing incentives and measures.	EV growth is "unstoppable"	EVs are not feasible everywhere
			Transition en route to being achieved	Rural resistance to EVs
				Shortage of charging infrastructure; inadequate charging experience
				Lack of individual access to parking/charging
				Lack of regulatory or economic measures
Coherence	Informational coherence	Continuous exchange of information between policymakers and EV stakeholder groups	Multiple platforms for interaction between EV stakeholders and national government	Forum missing for discussion between EV stakeholders and policymakers
			Policymakers directly collaborate with: user associations, BIL, TØI, local governments, NGOs, Enova, DFØ	Policymakers lack direct collaboration with: scholars, local governments, public transport representatives
		Emerging problems are spotted and addressed	EV congestion on transit lanes → at least one passenger during rush hours	Delays in policymakers addressing problems
			Loss of local revenue → fee up to 50% of ICE price	EV as extra car, increased car usage, shift from public to private transport

Coherence			EVs hogging parking spaces and chargers → introduce fees	EV incentives disproportionately benefitting the rich over the poor
			Lack of charging infrastructure → unanimous parliamentary vote, Enova support and database, national policy on route E6, charging infrastructure criteria, innovative charging strategies	Negative environmental and social implications of EVs: microplastic pollution, road wear/asphalt use, use of space, noise, road construction cutting down nature, production emissions, ethical issues with cobalt mining, battery waste
			Lack of charging standardisation → implement charger criteria for plugs and payment	Charging infrastructure (stations and electricity system) not addressed enough
				Cities lack of private parking/chargers
				Standardisation issues insufficiently addressed
				Revenue losses yet to be solved
				Relatively new EVs being scrapped
				Phase out discussion not addressed
	Procedural coherence	The EV incentives are implemented in a transparent procedure.	Common knowledge to Norwegian population	Potential lack of awareness among less educated or people with traditional views on cars
			Discussed across range of media platforms: newspapers, TV programmes, social media, radio, toll booth signs, car advertisements	
Credibility	Incentive mix credibility at the national level	Broad consensus across all political parties on incentives and transition; clear political vision; strong support for EV incentives and transition from the Norwegian government	Broad political agreement and support	Resistance by certain political parties
			Politically popular (politically damaging to phase out)	Political disagreement on phasing out; unclear vision
			Way to reach Norway's emission reduction targets	
	Incentive mix credibility at	Strong support from state	National and local government alignment	Local revenue losses causing opposition

Credibility	the sub-national level	governments and municipalities	Local decision-making power and support due to 50% pricing rule	Effort and stewardship lacking in certain municipalities
			High uptake in central and southern areas	Local prioritisation of public transport, cycling and walking clashing with incentives
				Low uptake in northern areas
		Strong support in urban areas	Access to more incentives	Access to private parking and charging lacking
			Convenience (shorter distances, more charging infrastructure, suitable for driving conditions)	Clash with cities striving to be 'car-free'
			Urgency to tackle air pollution	
		Strong support in rural areas	Rural EV uptake growing faster than urban areas	Rural resistance due to traditional thinking about cars
			Access to private parking and charging	Less convenient (longer distances)
			Particularly high support in areas with ferries/bridges	Fewer incentives to benefit from
				Lack of public charging stations
				Lower urgency to tackle air pollution
Comprehens-iveness	n/a	The incentive mix is complete to effectively achieve an EV transition; adjustments or improvements are not necessary.	Right combination of incentives and regulation	More governmental support to build EV infrastructure
			Current incentives boosting battery capacity and new EV model development	More charging standardisation
				Reduce EV incentives, particularly use ones
				Tax ICEs and their fuel more
				Reduce EV incentives for PHEVs
				More regulatory measures
				Reduce EV incentives in urban areas
				Reduce EV incentives for large, heavy EVs
				Extend EV tax exemption to service/repair
				Reduce EV incentives for the rich
				Greater predictability with EV incentives
				Merge EV incentives better with other modes of transport
				Extend EV tax exemption to company-owned EVs

5.6 Lessons from Norway

Based on interviewee insights, Norway's incentive mix and experience with EV uptake can provide a range of lessons for other countries. Primarily, Norway arguably exemplifies the viability of the EV technology for the long-term and the rest of the world (User association 1), showing that *"it's actually possible for people to drive around in EVs, even in a very cold country; it's possible to make this change"* (Scholar 3). The feasibility of a full EV transition is illustrated, Norway proving that EVs can be a better alternative to ICEs, even in a mountainous context with extreme winters (User association 1; NGO 4; Scholar 3). According to interviewees, the country has taken on a driving role for EVs and is a *"small laboratory"* (Public sector 3) for the rest of the world. It has *"created a lighthouse project to show people what's possible"* (Car manufacturer 1), gaining extensive experience that can be shared with other countries. Norway arguably demonstrates the possibility of changing people's behaviour towards greener alternatives, its EV market share growth showing the speed at which this transition can occur (Local government 1; Car manufacturer 2; Public sector 2). Over time, Norway's EV focus has boosted technology development, building up battery capacity and reducing the price, as well as stimulating electrification of the wider transport sector – the progress achieved therefore directly benefits EV transitions elsewhere (Car manufacturer 1; NGO 3; EV user 1).

Moreover, based on Norway's increasing EV numbers, interviewees emphasise the effectiveness of incentives to motivate EV adoption and, in particular, economic incentives to boost technological change (Local government 1; EV user 2; EV user 3; Academic 2; NGO 2; Car manufacturer 1). As described by an NGO representative (1), *"incentives work; people are rather responsive when you make an economic case, that is very clear"*. It is argued that people are generally more motivated by economic than normative reasons (Local government 4) – *"the consumer, they often take the economic rational choice, so it should never be too expensive to go green"* (Local government 5). Thus, based on Norway's experience, a package of incentives encourages EV uptake (Local government 5) – the use of 'carrot' over 'stick' works (Car manufacturer 2).

Furthermore, it is argued that Norway's EV experience illuminates the important role of governments in promoting EVs – *"they have a big role and they have a responsibility to do something"* (Local government 1). It is considered crucial for the government to offer incentives when EV uptake is first starting up – a combination of both national and locally-driven incentives (Local government 4; NGO 1); *"if you leave it to the market forces, then the pace would be low and slow"* (Local government 1). Over time and as EVs' commercial viability grows, the incentives should then be reduced to allow the market to take over (Local government 4). To reach this point, however, the government's involvement is arguably crucial.

In addition, stemming from the widespread concern among interviewees about Norway's lack of EV infrastructure, the necessity for widespread charging infrastructure investment alongside EV rollout is emphasised (Public sector 2; Car manufacturer 2; Local government 5). A comprehensive, country-wide public charging infrastructure network is crucial to stimulate EV

uptake by making ownership convenient and diminishing issues such as range anxiety (Public sector 3; NGO 2; Local government 2). Emphasis should arguably be placed on connecting less commercially viable areas, to avoid differences in EV uptake across regions, as is the case in Norway (Local government 3; User association 2). According to an NGO representative (3), *"if you can't charge your car and charge your car fast, no one is gonna buy an EV"*, exemplifying the indispensable nature of infrastructure to achieve an EV transition.

Next, based on Norway's experiences, interviewees highlight the importance of consistency and long-term predictability of an incentive mix. According to a local government representative (5), *"the policy has been firm and stable […] the politicians have not changed the rules every second year because that predictability is extremely important for the consumers […] to really trust that if they buy an EV today, it will be a good idea let's say in 3 years"*. This stability has arguably diminished fear about incentives being abruptly removed and in doing so, encouraged EV adoption (NGO 1) – *"if you are consistent in doing so, you can reach a target"* (Local government 2). To avoid the seeming political difficulties that Norwegian politicians now face with phasing out EV incentives, it is suggested that, in advance, countries draft a step-by-step plan for the incentives and clearly communicate this to the public in order to meet their expectations (Public transport 1; Car manufacturer 1). A population should *"see that this won't last forever"* (Public transport 1) and be aware that the EV incentives will be reduced over time. In doing so, rather *than "putting more and more wood on a fire to keep it alive"* (Car manufacturer 1), this clear path will enable politicians to avoid troubles with reducing incentives later on.

Furthermore, certain interviewees argue that Norway's EV incentive mix can be replicated in other countries, by adopting *"a clever design of your tax"* (User association 1). Through heavy taxes on diesel and gasoline cars, Norway is arguably "*bringing money into the public treasury rather than tapping it"* (Scholar 4), which is subsequently used to finance the EV incentives (User association 1). Thus, it is argued that, even countries with public finance restraints can employ such incentives – *"you don't have to be a rich country to impose such taxes and it can really accelerate the path to full electrification, without actually hurting revenues – as long as you arrange it in a clever way"* (User association 1). Norway's approach to EV incentives is therefore considered to be broadly applicable.

Moreover, considering the problems and adverse effects that Norway has encountered through its incentive mix, interviewees encourage other countries to learn from Norway's experiences to avoid making the same mistakes (NGO 4). Despite their local pollution benefits, it is also recommended that EVs' negative impacts are sufficiently considered (Public sector 1). Overall, the potential problems to be aware of include: revenue losses, lack of private parking and charging, shift from public transport to EVs, increased car use and congestion, noise, battery waste, the rich disproportionately benefitting, social and environmental consequences of EV production, and charging standardisation issues (Scholar 2; Public transport 1; User association 2; EV user 1; EV user 2; EV user 3; NGO 1; NGO 2; NGO 3; Car manufacturer 1; Public sector 3; Local government 6). It is important for other countries to keep such consequences in mind and be aware of the incentive adjustments that need to be made along the way, when problems arise (Scholar 4; Public sector 2). The bigger picture behind EVs and their incentives should be

recognised, a car manufacturer representative (1) encouraging other countries *"to learn from what we have been doing wrong"*. When deciding on an incentive mix, the individual impacts of Norway's EV incentives should be examined; based on these, along with driver user patterns per context, the most decisive and necessary incentives can effectively be determined, without offering too many (EV user 1; Scholar 2; Public sector 3; Local government 6).

Additionally, interviewees encourage other countries to ensure that they strike an appropriate balance between EVs and other transport modes, such as public transport, cycling and walking. Rather than concentrating on EVs, it is considered imperative to look at mobility more broadly (Public sector 2); *"you can both increase public transport and decrease driving and increase EV uptake"* (NGO 1). This balance should be maintained, by focusing on public transport and where private transport is necessary, ensuring that EVs are incentivised over ICEs (Public transport 1; NGO 1; Local government 3; Local government 4; Local government 5). A local government representative (4) adds that the average Norwegian car is parked for 95 percent of its lifetime, encouraging car sharing as another alternative. Thus, other countries should view transport holistically and recognise that EVs are still private cars, which should not be made too attractive.

Lastly, Norway arguably experiences a range of conditions that collectively support an EV transition there – an absence of which may present a challenge for other countries embracing EV uptake. According to interviewees, Norway's incentive mix may be difficult to export since Norway traditionally has high taxes or fees on buying and using cars, and a range of them, making it easy to establish incentives in the first place (NGO 4; User association 2; Local government 5). Norwegians are said to be accustomed to paying heavy prices on cars, meaning that fee reductions greatly stimulate EV adoption (Local government 3; Scholar 4). As described by a public sector representative (2), *"we have taxes we can take off"*. By contrast, most European countries are said to only possess VAT on cars, reducing the scope for incentivising EVs and possibly necessitating other strategies (Car manufacturer 2; EV user 2) – *"you can't take away a cost that isn't there"* (Car manufacturer 2). Next, contrary to other countries, Norway produces a large amount of electricity which is consumed at a low price, facilitating the car fleet's electrification (Public sector 1; Car manufacturer 1; Local government 5). Since Norway's houses predominantly have electric heating, a scholar (4) adds that the electricity grid in the country is already strong enough to accommodate for charger installations in homes – something that could pose a challenge elsewhere. Culturally, Norwegians are arguably also adaptive to innovation, reducing potential educational barriers to EV uptake (Local government 5). Norway's strong governance and political stability is further seen to simplify incentive implementation (Public sector 1; Scholar 4). Contrary to earlier, others argue that EV incentives are expensive and while Norway is a rich country, with a healthy economy and the financial means to fund incentives and surrounding infrastructure (NGO 3), "no other country can" (Car manufacturer 1). Next, due to the vast amount of uninhabited land in Norway, as well as the population predominantly living in semi-detached housing, it is considered relatively easy for new public chargers to be built along highways and individuals to have their own parking place and private charger (Scholar 4). Thus, EV ownership is arguably more convenient in Norway than in other contexts. Considering these conditions in Norway, other countries may experience more obstacles to achieving widespread EV uptake and should be aware of them when implementing their own EV incentive mix.

Overall, due to Norway's leading role in EVs, a range of lessons can be taken from Norway, both successes and mistakes, for other countries pursuing EV incentives and transition.

6.0 Discussion

Considering these results, this section relates the findings to underlying theory and existing literature to examine the research's academic relevance and importance, discusses the implications beyond Norway, and critically reflects on the research approach. The structure is as follows: contribution to theory, implications beyond Norway, and reflections on research approach.

6.1 Contribution to Theory

Considering the findings, this research makes scientific and theoretical contributions to the understanding of the MLP in transitions theory, specifically the process of uptake and how it can be induced through an incentive mix. Broadly speaking, the case of Norway exemplifies the complexity behind sustainability transitions, the extensive structural changes that they require, as well as the necessity for collaboration among a broad range of stakeholders, as identified in the stakeholder mapping (*Figure 4*). As explained in the theoretical framework, uptake lacks elaboration in the MLP, how a niche innovation scales up and the processes that enable this. By exploring EV uptake in Norway and highlighting the positive and negative implications of uptake, this research contributes to filling this gap; it counters the predominant simplified, predictable interpretation of transitions recognised by Augenstein et al. (2020) and exemplifies the complex, non-linear nature of it. The case shows that a range of issues can arise from the rearrangement of a socio-technical regime away from ICE path dependency and, as demonstrated in the primary data, confirms that O'Neill et al.'s (2010) barriers to uptake exist, including financial, organisational, technical and educational. These issues and barriers impede the process of uptake and highlight that a new stable and functioning regime is not guaranteed. The findings signify that uptake should not be expected and Norway's EV transition is not assured, particularly when instruments are not in place to induce it.

To overcome such setbacks, Norway's EV incentive mix represents an example of a strategy to accelerate transformative change and transition and facilitate the process of niche uptake, reflected by the resulting rapid growth in EV adoption there (Ehnert et al., 2018). This research thus confirms the importance of governmental involvement for uptake to induce positive feedbacks, as described by Roberts et al. (2018). By implementing a broad range of incentives to provide protection until EVs can successfully compete with the incumbent ICE regime, Norway further validates existing research's emphasis on the necessity for a combination of incentive types to drive niches and destabilise established systems (e.g. Smith & Raven, 2012; Markard et al., 2020). The study's categorisation of incentives into financial, infrastructure and normative is unique in that it adopts a more holistic, encompassing approach than present literature. Rather than focussing on one EV incentive type, it offers a more complete picture and analysis of the EV incentives that exist and how they compare in their effect on uptake rate. The case of Norway highlights the specific importance of financial and infrastructure incentives over normative ones – consisted with the majority of existing papers (e.g. Rietmann & Lieven, 2019; Coffman et al., 2017; Broadbent et al., 2019).

Beyond the influence of incentives on adoption rates, this research considers the wider implications of an EV incentive mix and examines both the strengths and potential adverse effects of it – the latter being something that, at present, is insufficiently explored in literature. While the discussion of such adverse effects is limited in academia, several problems of uptake identified in the case of Norway's incentive mix confirm existing literature on the topic. Firstly, the challenge of revenue losses due to EV incentives is echoed by Aasness and Odeck (2015) when they explain how Oslo's toll revenues, largely used for investments and maintenance of public transport, have decreased due to EV uptake growth and thereby cut public transport funding. Secondly, the problems of HOV lane congestion due to EV access and the subsequent delay in travel time for public transport users are also identified by Holtsmark and Skonhoft (2014), and Aasness and Odeck (2015). Thirdly, the idea that EV incentives promote greater car use and a shift from public to private transport, creating a larger car fleet and an imbalance in transport modes, confirms findings of De Haan et al. (2007) and Holtsmark and Skonhoft (2014). Travel patterns that harm the environment are arguably promoted and high-income families are incentivised to buy an EV as an additional car (Holtsmark & Skonhoft, 2020). An increased dependence on private transportation is also discussed by Morgan (2020), the EV incentive mix and transition establishing a country's commitment to invest in road infrastructure and facilitating a 'techno-political lock-in or path-dependence' on road and vehicle use, rather than lower-emission alternatives. Lastly, the environmental and social consequences identified in this research, due to Norway's EV incentive mix and the technology's uptake, confirm findings of existing literature. According to Holtsmark and Skonhoft (2014), by increasing car usage, the incentives create considerable social costs, such as increases in health-damaging pollutants, noise, accidents, maintenance and management investments. Literature further encourages the lifecycle of EVs to be examined to identify the true external benefit of the technology: the resources used during battery and car production, and its source of electricity (Holtsmark & Skonhoft, 2014; Aasness & Odeck, 2015; Morgan, 2020). According to Morgan (2020), EVs cannot be seen as zero-emission due to their resource-intensive production, including lithium, cobalt and nickel; for this reason, EV uptake will continue to increase transport emissions due to the vehicles' embodied carbon emissions, which are only paid off over time. Newman et al. (2014) and Camara et al. (2021) question the relative emission savings from incentive investments and whether the automobile industry is part of the problem or the solution of transport emissions; to what extent do EVs contribute to a future of sustainable mobility? Thus, this research confirms and strengthens the significance of numerous problems of EV incentives and uptake identified in literature.

While various connections can be made to existing literature on uptake and the implications of EV incentives, this study directly contributes to academia by uncovering new, unexplored findings. This research on Norway's EV incentive mix brings to light an equity discussion – the belief that EV incentives disproportionately benefit the rich, by promoting private over public transport. There is a perception that while the rich are able to access the EV incentives even if they could afford a car otherwise too, those who cannot afford a car and rely on public transportation or cycling do not benefit or experience improvements from the EV incentive mix. In addition, the findings illuminate the importance of good stewardship and the human element to enhance incentive mix effectiveness. Even though a location's circumstances may be considered ideal for EVs, in order

to induce uptake and generate support for EVs, human dedication and willingness are crucial. Lastly, the research findings exemplify differences in access to EV incentives in urban versus rural settings and numerous interviewees challenge this idea. EV incentives have the tendency to be stronger in cities, urban EV users having the possibility to benefit from incentives such as bus lane access and parking fee reductions, while those accessible in rural areas are limited. As a result, EV uptake is higher in urban than rural areas – something that is seen to be flawed since urban areas tend to have a higher degree of transport infrastructure (e.g. buses, trains, metro, biking paths) and more sustainable mobility options. This idea links to Newman et al.'s (2014) critique on the prevailing assumption being that an urban environment is most suitable for EVs and contributes by demonstrating how differences in EV incentives support this assumption. The promotion of vehicle use for environmental purposes, in a situation in which cars are not necessarily needed, appears counterintuitive; EV use in rural areas should arguably be examined more (Newman et al., 2014). Urban-rural differences in EV incentive access therefore may contradict a sustainable mobility transition.

Thus, this research builds on and contributes to theory and existing literature by: enhancing understanding of uptake and the complexity behind the process in the MLP, demonstrating how uptake can be achieved and accelerated using an incentive mix, and exploring the broader positive and negative impacts of EV incentives for uptake.

6.2 Implications beyond Norway

Considering the growth in EV uptake across the globe and Norway's leading role in EVs, it is also important to extend these findings beyond Norway and examine the broader applicability and implications of this research. Primarily, the 4 Cs framework (Consistency, Coherence, Credibility, and Comprehensiveness) and the study's specific indicators to examine the effectiveness of an incentive mix for EV uptake represent concrete assessment criteria and a good structure to evaluate an EV incentive mix elsewhere. By adapting the extended policy mix concept from Rogge and Reichardt (2016) for the analysis of an incentive mix and abductively reflecting on how the translation held up (see Section 2.4.1), this incentive mix effectiveness assessment framework can form the basis of comparable future research in other contexts.

Next, the case of Norway exemplifies the positive and accelerating impact that a mix of incentives can have on the rate of EV uptake, economic incentives being the predominant motive for EV adoption. Thus, where possible, this research encourages other countries to implement a combination of incentives to advance uptake due to their strong impact on human behavioural change, however also avoid offering too many. Based on the impacts of different incentive types found in this research and existing literature, as well as the context's driver user patterns, the most influential and necessary incentives can be identified.

In addition, the classification of incentives into financial, infrastructure and normative types can be employed in further research on EV incentives. By broadly exploring the incentive concept, a wider range of reasons for adopting the EV technology surface and the understanding of how to successfully boost uptake in a context is enhanced.

Furthermore, in order to enhance EV uptake, Norway's experience demonstrates the need for other countries to support both the EV, as well as infrastructure around it. Investments should be simultaneously carried out as they go hand-in-hand, the absence of one hindering widespread EV uptake. This research highlights the necessity of: building an extensive and standardised charging network that is accessible to all EV models, establishing a strong electricity grid system to fulfil increasing demands, developing individual parking and charging solutions, and investing in more road maintenance due to increased road wear.

Moreover, based on this research, political stability and predictability are paramount to achieving EV uptake through an incentive mix. Norway's case teaches other contexts that consistency in incentives is necessary for a population to be encouraged to pursue EVs, as well as transparency in the adjustments to be made over time, to avoid problems of and opposition to phasing out.

The findings additionally emphasise the importance of stakeholder inclusivity in the decision-making process on an incentive mix. Norway illuminates the broad range of stakeholders that are linked to the topic of EV incentives and impacted by adjustments to the incentive mix (see *Figure 4*), from national and local governments to car manufacturers to public transport. For this reason, EV transitions beyond Norway should keep this in mind and ensure direct collaboration among policymakers and relevant actors.

Next, by exhibiting the possibility of EVs functioning in more extreme weather and terrains, this research on Norway reinforces the broad applicability and potential of the technology around the world. As long as the infrastructure is in place, this case highlights that EVs are not limited to specific geographical contexts and thus, an EV incentive mix is widely relevant.

Despite opportunities to design a tax system that enables the financial EV incentives to be covered using ICE taxes and avoids revenue depletion, this research also finds that a country willing to pursue complete EV uptake and transition still needs sufficient economic and financial means to do so – as is the case in Norway. As previously outlined, a comprehensive network of infrastructure is crucial and thus, the decision to achieve an EV transition is associated with revenue losses – something that many countries cannot afford, limiting wider applicability of Norway's incentive mix design.

Lastly, based on the findings, it is suggested other countries recognise the balance that should be struck between EVs and other transport modes. Considering the environmental and social consequences of increased EV use, it is vital to ensure that more sustainable means of transport are promoted over EVs, such as public transport or cycling. Since they are still private transport, it is important to avoid an overemphasis on EVs and prevent a shift from public transport to EVs or the more affluent predominantly benefitting from the incentives. EVs represent an appropriate solution where public transport modes are not accessible, such as rural areas, however where sustainable alternatives to private transport exist, other contexts should limit the focus on EVs, such as urban settings.

Overall, this research on Norway's EV incentive mix has a range of broader implications, in terms of future research and lessons for contexts beyond Norway – reinforcing the scientific and practical relevance of the study.

6.3 Reflections on Research Approach

Considering the conducted research, it is important to also critically reflect on the research approach employed and identify potential limitations of it. As demonstrated by the shape of a cylinder, the angle one takes to observe a matter determines how it will be perceived – when looking at a cylinder from above, it appears to be a circle, however from the side, it resembles a rectangle. This analogy can be directly applied to this research, the process of EV uptake being examined here through the particular lens of transitions theory and thus, analysed from one specific angle and risking that distinct or decisive aspects are missed. As the theory outlines, an EV transition requires deep structural changes in a transport system – a reconfiguration of the sector, including: technology, markets, policy, infrastructure, consumer practices, scientific knowledge and cultural meaning (Elzen et al., 2004). Its complexity thus signals the possibility of drawing on other relevant theories and fields to enhance completeness of the analysis and specifically the incentive mix effectiveness assessment framework.

To offer examples, firstly, based on the significance of the political context for an effective EV incentive mix, addressing this topic from a more politics-focussed lens would contribute to research findings. More specifically, the theory of political integration would offer additional, valuable insights, it representing the political uniting and organisation of a group of two or more units (Ilievski, 2015). By involving the development of a decision-making centre, common institutions and a unified law frame, this theoretical perspective could enhance the analysis of coherence, specifically inclusivity and transparency in the incentive mix decision-making process, and credibility, particularly the necessity for national and local political support (Ilievski, 2015). The theory of policy credibility would additionally be of relevance to this research, as a way to identify more components of credibility and expand the indicators used to determine the characteristic's presence in Norway's EV incentive mix (Nemet et al., 2017). In doing so, additional indicators such as robustness, transparency and trust could be explored, enabling a more complete assessment of the incentive mix's effectiveness (Nemet et al., 2017).

Furthermore, in light of the importance of altering consumer practices and traditional habits to overcome barriers to uptake and move towards an EV transition, theories of behavioural change would also be of significance (Bunton et al., 1991). In order to maximise the impact of interventions, such as incentives, it is necessary to understand what exactly influences human behaviour and in doing so, determine how it be changed (Davis et al., 2015). Thus, this theoretical perspective would contribute by expanding the analysis on comparing the effectiveness of different incentive types. Overall, this reflection recognises the possibility for other fields to expand understanding of EV uptake and transition – potential opportunities for future research on the topic.

7.0 Conclusion

This research sought to determine the effectiveness of Norway's incentive mix for EV uptake and transition, as well as uncover the implications for EV transitions in other countries, using extensive primary data collection. To do so, firstly, the types of EV incentives employed in Norway are identified, including financial, infrastructure and normative ones – economic incentives having the largest influence on EV uptake there. Secondly, the positive and negative implications of Norway's incentive mix for EV uptake and transition are examined, using an incentive mix effectiveness assessment framework and specific indicators related to: consistency, coherence, credibility and comprehensiveness. Strong effectiveness, the presence of the 4 Cs, is exemplified through features such as rapid growth in EV adoption, consensus across differing political parties, and widespread support. However, weak effectiveness is manifested through, for instance, emerging problems being insufficiently tackled or unaddressed, resistance from specific political parties existing, and numerous suggested improvements. Thirdly, regarding Norway's incentive mix, a range of lessons are identified for other countries to consider when pursuing EV uptake and transition. These include: the necessity for widespread charging infrastructure to stimulate EV uptake, striking a balance between EVs and other modes of transport, and learning from Norway's mistakes to avoid encountering the same ones, such as transit lane congestion.

As a result, this study contributes to existing literature and theory by enhancing understanding of uptake: how a niche innovation can scale up to the mainstream through an incentive mix, the complexity behind it in terms of positive and negative implications, and thus, the uncertainty around the process. The research moves beyond existing literature's predominant focus on assessing incentives based on their impact on adoption rates, and sheds more light on the broader impacts and potential adverse effects of an incentive mix. In doing so, current research's limited findings on the topic are confirmed, as well as new, unexplored implications are uncovered, such as: the belief that the rich disproportionately benefit from incentives, the importance of good stewardship to enhance EV uptake, and the rural-urban differences in access to EV incentives. While the topic of EV uptake and transition is examined through the particular lens of transitions theory, the approach and outcomes of this research are broadly applicable and can guide relevant future research and formulate considerations for contexts pursuing EV uptake beyond Norway. For instance, further research can employ this study's 4 Cs framework and specific indicators to assess the effectiveness of an incentive mix for EV uptake and transition, as well as adopt the broader incentive type categorisation.

Based on the findings, in order to answer the overarching research question, this research argues that Norway's incentive mix is effective in the sense that it has rapidly increased EV uptake in the country, resulting in benefits such as local air quality improvements. The country has stimulated EV market development globally, its incentives protecting the niche EV technology and enabling the industry to become increasingly competitive over time. By stimulating widespread uptake, Norway's approach has encouraged car manufacturers to adapt to changing demands and thus, contributed to the development of new and improved EV models, with longer ranges, lower prices and more features – EVs becoming a viable alternative to ICEs. However, despite its successes, it is crucial to acknowledge the costly nature of Norway's incentive mix, both in monetary terms

and its negative implications. The country's EV incentive mix is associated with: increased car use and congestion, noise, battery waste, local revenue losses, a shift from public transport to EVs, private parking and charging difficulties, social and environmental consequences of EV production, charging standardisation issues, and rich-poor equity discussions. The transition to EVs also stimulates an increasing car fleet, due to the lagging nature of the system where an ICE is not directly replaced by an EV. Thus, the effectiveness of Norway's EV incentive mix is considered to be limited.

Considering these strengths and weaknesses, it is also crucial to highlight the fact that Norway is a pioneering case globally with EVs and associated incentives. Being several years ahead of the rest of the world, the country can be seen as a testing site for EVs and by adopting this frontrunner role, Norway undoubtedly ran the risk of making mistakes and encountering issues. Based on this, the following question arises: is an imperfect step towards shifting the mainstream better than a perfect step that does not happen? Despite the room for improvement, it is argued that Norway's efforts are worthwhile as they serve as lessons for other countries and enable the same mistakes to be avoided elsewhere. Norway's experiences allow other contexts to benefit from an improved technology and vast knowledge on the implications of incentives, laying the foundations for effective incentive mixes for EV uptake and transition around the world.

In conclusion, while this research demonstrates that EV incentives have a significant impact on EV uptake, it is paramount that the broader implications of different incentives, beyond EV adoption rates, are considered. The Norwegian case illustrates the need to recognise that EVs are not the single solution for a sustainable transition in the transport sector. While they may achieve GHG reductions, EVs remain a form of private transport and when taking a more holistic view of transport and an environmental standpoint, public transport or cycling are undeniably the better solutions. While EVs represent a suitable replacement for necessary ICE travels, public over private transport should be emphasised where possible, to encourage a shift away from a car-dominated society. *"EVs are not to be looked at as the one solution; it should be the one small solution in a big system that we have to change"* (NGO 3).

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9.0 Appendix

9.1 Interview guide

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Master Thesis Interview Guide

Evaluating the effectiveness of Norway's incentives for EV uptake and transition

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Introduction

1. Could you tell me a bit about yourself, your background and your current role?
    a. Probing: How are you involved with electric vehicles (EVs) in Norway?
    b. Probing: Are you involved in formulating EV incentives in Norway? If yes, what role do you have in the process?

Types of EV incentives

2. How does the Norwegian government encourage the population to adopt EVs? What incentives are used?
    a. Probing:
        i. Financial incentives: reduced purchase and ownership costs of EVs e.g. tax reductions, free charging, charging infrastructure grants
        ii. Infrastructure incentives: infrastructure benefits of EVs e.g. access to bus lanes, more parking opportunities
        iii. Normative incentives: environmental and health benefits of EVs
    b. Probing: To what extent do these different incentive types align with each other?

Alignment in different senses

3. How would you describe Norway's vision for EVs?
    a. Probing: is there general support across stakeholder groups?

4. Which actors are involved in the process of formulating EV incentives in Norway and in what way?
    a. Does collaboration in decision-making occur? If yes, what does this look like?
    b. How does the public sector (government) interact with the private sector (businesses)?
    c. How are the EV incentives communicated to the public?
    d. How do developments in the EV branch influence EV incentives in Norway?

5. How compatible are Norway's EV incentives with other targets and policies of the Norwegian government?
    a. Probing: does the EV transition plan match with other sectors' goals?

6. To what extent are Norway's national government and local governments (e.g. municipalities) aligned in terms of EV incentives?

7. How do EV incentives compare between urban and rural areas in Norway?

Degree of success

8. In your opinion, how successful has the current mix of EV incentives been in Norway? Why?
    a. Probing: What are the strengths of Norway's EV incentives?
    b. Probing: What are the weaknesses of Norway's EV incentives? Have there been any problems resulting from the EV incentives and the rise in EV adoption?
    c. Probing: If problems have occurred, have they been addressed? If so, how have they been addressed and which actors have been involved in doing so?

9. To what extent do you feel that Norway's EV incentives are complete? How could they be improved?
    a. Probing: To what extent is the current mix of incentives going to get Norway to where we want to e.g. achieve a full EV transition?
    b. Probing: To what extent can Norway, with its EV incentives, offer lessons to other countries?

Conclusion

10. Is there anything else you would like to mention that we have not talked about?

11. Is there anyone else that you think I should talk to about this topic?

9.2 Project Information Sheet

Universiteit Utrecht

Rachel Christina Fuhrmann

Master Thesis Project Information Sheet

Evaluating the effectiveness of Norway's incentives for EV uptake and transition

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Overview

Within road transport, electric vehicles (EVs) have been increasingly promoted as a long-term solution for sustainable personal mobility. To cut the relative cost of EVs, a wide range of government incentives are arguably necessary to stimulate EV adoption and achieve a transition from fossil fuel passenger road vehicles. Norway specifically has taken the lead globally through its diverse and strong incentives for promoting EV purchase and ownership. As a result, the proportion of plug-in EVs in passenger vehicle sales has grown rapidly. Due to the rise in EV numbers and the government's non-binding decision to end the sale of fossil fuel passenger road vehicles by 2025, Norway can potentially offer lessons to other countries. Therefore, **this research will explore how Norway's EV incentives are playing out in practice and examine their strengths and weaknesses for EV uptake.** The following research question is addressed:

How effective are Norway's incentives for EV uptake and transition, and what are the implications for EV transitions in other countries?

Approach

To answer this question in a complete way, **interviews will be conducted with a range of stakeholders related to this topic**, including: national and local governments, car manufacturers, EV users, scholars, EV association employees, NGOs, EV equipment manufacturers and the general Norwegian population. The interviews will focus on gathering different opinions on Norway's EV incentives in order to evaluate them and, due to current circumstances, **all interviews will be conducted online**.

Participation in this research

Participating in this research involves **an interview of approximately 45 minutes**, which may be shortened or extended according to your preference. If consented, the audio of the interview will be recorded to facilitate data analysis. Participation in the interview is entirely voluntary and you have the right to withdraw from the research at any time, without consequences. Following ethical requirements of the Master in Sustainable Business and Innovation at Utrecht University, the information provided during the interview will be carefully and securely handled to ensure confidentiality. All data obtained from the interview will be anonymized, meaning it will not be coupled with your name, and will only be used to gather insights for this specific research. If interested, a copy of the final thesis can be provided. By participating in this study, you will contribute to research on the effectiveness of EV incentives, specifically in Norway and the implications the case has for other countries.

Contact information

To further discuss your participation, feel free to reach out to the researcher (Rachel Christina Fuhrmann) or her supervisor (James Patterson) using the contact details below. In case of additional questions, you are also welcome to contact Dr. Martin Wassen –

Universiteit Utrecht

Rachel Christina Fuhrmann

a member of the Ethics Review Board of Utrecht University, specifically for the Geosciences faculty.

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9.3 Interview Participation Consent Form

Universiteit Utrecht

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Interview Participation Consent Form

Evaluating the effectiveness of Norway's incentives for EV uptake and transition

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To be completed by the participant:

I confirm that:

- I am satisfied with the received information about the research;
- I have been given the opportunity to ask questions about the research and that any questions that have been risen have been answer satisfactorily;
- I had the opportunity to think carefully about participating in the study.

I agree that:

- the data to be collected, completely anonymously, will be obtained and used for scientific purposes;
- an audio recording of the interview will be made for qualitative analysis.

I understand that:

- participation in this research will involve a semi-structured interview of approximately 45 minutes;
- procedures are in place to protect the confidentiality, privacy and anonymity of what I say during the interview;
- I have the right to withdraw my consent at any time without consequences, through written or verbal notification;
- I am free to change any statements or information at any time after the interview is conducted;
- I have the right to see the research report afterwards.

Name: _____

Date: _____

9.4 Thematic Coding Sample Table

Characteristic: Consistency

Sub-characteristic: 1st Level: Consistency of the EV strategy

Translation to research (indicator): The EV transition plan in Norway is a good match with other targets of the Norwegian government.

Point	Interviewee	Quote
EV incentives make it cheaper for people to drive; by encouraging people to drive, conflicts with the goal to limit the use of private cars and encourage public transport/ bikes and avoid traffic, congestion, noise etc.	Scholar 1	*…the only conflict I could see is that, I mean, we have we have a policy where we want to reduce the use of, to limit not reduce, but to limit the use of private cars to avoid congestion in our cities. And, so, in my view it's a conflict here between this goal. Otherwise, I can't see that there are some conflicts really. That's a conflict I could see, I mean, with this policy, we are encouraging people, households, to have more cars – two cars, three cars. To make it cheap to drive, we are encouraging them to drive more, which in my view is a great conflict with a policy where we want to households to use bikes and to use public transport to avoid traffic congestion and noise and so forth.*
Easy to look at personal cars to reduce GHG emissions but need to look at other industries too (e.g. oil); the car represents a small part of emissions so it is easy to attack. Need to look at transport and power electricity sectors for a more sustainable future.	Car manufacturer 1	*On the other hand, you have our oil industry, of course, which kind of comes in conflict with part of the Paris agreement and so on… It's very easy to have focus on the car and the car alone. So, when we are saying that we are, due to the Paris agreement, we are reducing our CO2 emissions and so on, it's very easy to see that you can do something on the personal cars. But have a look at the other industries, have a look at the ferries and all of that. So, the car actually represents quite a small part of the CO2 emissions in Norway so it's very easy to attack it… it's very easy to attack and just have focus on the car; but, for the coming years, if we're moving Norway to a more sustainable future, also the whole transport sector and the whole power electricity sector also needs to be part of that picture.*
Norway is moving in all directions; concerned about nature but produce oil and build superhighways, do not invest in railroads but build new airports close to ski areas. A coherent direction is lacking.	NGO 2	*I think Norway is really… it's a, how can we say that… we are moving in all directions at the same time. You know, it's a really strange place to be, where we're really all so concerned about nature and of course, we are going to jail for more oil because we have the most environmental friendly oil on the planet and we do it better than everybody else. Same time. We are building new superhighways close to the big cities. We want everybody to drive EVs and we're not giving money to build railroads that runs on electricity, but we're building new airports close to the ski areas. So, it's like, it's all over the place. There's no coherent direction for Norway in any way and the EV policies are part of that.*
…	…	…