Electric Vehicle Promotion

KEY CHARACTERISTICS

DIVERSE CONTEXTS

POLICIES TARGETING

Purchase costs

Use incentives

Road infrastructure

NATIONAL & LOCAL POLICY

KEY RESULTS

Countries able to meet ambitious targets

Different policy options for the same object

Early intervention by certain Member States led to highest uptake levels in EU27 - later policy intervention for other Member States is easier in the current, more mature market

Small adjustments to existing policies continued uptake increases

KEY PERFORMANCE METRICS

COUNTRY	NUMBER OF EV IN FLEET	NEW EV IN 2018	CHARGING STATIONS
EU27 + UK	450,938	1%	174,100
France	123,171	1.4%	29, 538
Netherlands	44,984	5.4%	43, 730
Norway	237,710	46%	12,337

Sources: Number of EV in fleet and new sales % EU 28, FR, NL from European Alternative Fuels Observatory (2019).
Norway's data from Norsk Elbilforenig (2019) and IEA (2019); Charging stations figures (EAFO, 2019)

SUCCESS FACTORS

Financial incentives work best in combination with softer measures (for example, aim to enhance other areas of EV ownership such as free parking or access to bus lanes)

EV purchases are still highly reliant on the design of supportive policies, even in countries with more established markets

Changes made to policies to support EVs are likely to affect clear changes to consumers purchasing patterns

Location and design of charging infrastructure is important. Stations should be in highly visible, busy locations to maximise use

IMPLEMENTATION & REPLICATION PROCESS

In design phase, consider mulitple aspects of EV ownership to be targetted

Work at national and local levels, consider different potential barriers in each

Develop policy monitoring plan and collect data from implementation

Use monitoting data to optimise incentives and other schemes

Electric Vehicle Promotion

Samantha Morgan-Price (Ricardo)

This case study is part of a series of six studies which show good practice examples for reducing greenhouse gas emissions in the sectors covered under the Effort Sharing Legislation. It has been developed on behalf of the European Commission, DG Climate Action.

Many countries have introduced monetary incentives for the purchase of electric vehicles. The range and magnitude of incentives is varied and may consist of reductions in taxes, exemptions from taxes, or grants. These are often implemented alongside complementary financial and non-financial use incentives to increase the attractiveness of owning an EV.

A selection of the most popular policies is detailed here through the examples of Norway, the Netherlands and France to highlight the different ways in which an incentive can be implemented. The following case study provides an overview of the different EV promotion policies in each of the countries, including the key actors involved, primary objectives, and how they interact with other schemes. The study then focuses on the implementation of the various policies, including both the successes and the limitations. Finally, it considers key factors to consider when replicating these policy options

Table 0-1: Abbreviations

EV	Electric Vehicle
OEM	Original Equipment Manufacturer
PHEV	Plug-in Hybrid Electric Vehicle

1 Description of Case Study

Transport is Europe's largest source of GHG emissions. The sector is responsible for 27% of the EU's total CO_2 emissions, with cars alone contributing around 12% of the total (EC, 2019).The widespread deployment of electric vehicles (EVs) forms a key part of both the EU and Member States plans to cut these emissions to meet emissions targets (European Parliment, 2019).

Many countries have introduced monetary incentives for the purchase of EVs. In 2019 all but three European member states had implemented some form of incentive for electric vehicles and/or low emission vehicles (see Annex 1). However, as the annex shows, the nature and level of support provided by the benefits and incentives still varies significantly between member states, and most countries only grant tax reductions or exemptions for electric cars.

Three countries are focused on in this case study. The first is **Norway**, often described as the country with the most complete EV incentives package and the most developed market. **France** and the **Netherlands** are also featured here in order to demonstrate a range of policy options within different contexts and with different start times. An overview of the measures in place in these countries is given below, and Annex I contains an overview for all EU Members.

The case study provides an overview of the different EV promotion policies in the three countries, including the key actors involved, primary objectives, and how they interact with other schemes. The study then focuses on the implementation of the various policies, including both the successes and the limitations. Finally, it considers key factors to consider when replicating these policy options.

1.1 Scheme Overview

Policies and measures to encourage electric vehicles come in various forms. The table below contains a summary of these EV incentives, grouped into the following four areas:

- **Financial purchase incentives.** These target the upfront cost of EV ownership, to bring it closer to the cost of a conventional vehicle.
- **Financial use/circulation incentives.** These target the cost of owning an EV to make it more financially attractive.
- **Non-Financial usage incentives.** These aim to enhance other areas of EV ownership to make ownership beneficial in other (non-financial) ways.
- **Funding support for charging infrastructure.** This seeks to encourage fast deployment of EV charging network.

Table 1-1: Summary of national EV incentives in France, The Netherlands and Norway

	France	Netherlands	Norway
Financial purchase incentives			
Registration/purchase tax relief	Regional	Y	
Purchase subsidies	Y		Y
VAT exemption			Y
Scrappage Schemes	Y		
Financial use/circulation incentives			
Partial circulation tax rebates/subsidies	Y	Y	Y

	France	Netherlands	Norway
Waivers of road use fees (tolls, parking, ferries)			Y
Tax credits/exemption on company cars	Y	Y	Y
Non-financial usage incentives			
Access to bus lanes			Y
Dedicated parking	Local		Y + Local
EV car sharing policies	Y		
Low emission zones	Local	Local	
Free public charges			Y
Reduced ferry rates			Y
Funding support for charging infrastructure			
Funding	Y	Y	Y

Purchase incentives have been implemented in various ways in the three countries.

- In **France,** there is a bonus-malus system based on CO_2 emissions. Within this scheme, vehicles with low CO_2 emissions (such as EVs) are entitled to a subsidy on purchase and those with high emissions are charged a tax. More detail on bonus-malus schemes is provided in **Box 1.** There are additional incentives when a diesel vehicle is scrapped and replaced with a low-emission vehicle.
- In the **Netherlands**, EVs and other zero-emission vehicles are exempt from vehicle purchase taxes. A CO_2-based taxation is in place for other vehicle types; at the lower end, this is defined as 6 EUR for vehicles that emit between 1 and 79g CO_2/km, and at most is 476 EUR for those that emit more than 174g CO_2/km (Ministry of Economic Affairs, 2019).
- The **Norwegian** vehicle taxation system taxes vehicles based on curb weight, engine power, CO_2 and NOx emissions. These taxes can contribute up to 10,000 EUR to the cost of conventional fuel cars. There is also a high 25% VAT rate on vehicle purchases. EVs are fully exempt from both of these taxes. There is a partial exemption on company car taxes for EVs, which can reduce discounted costs by as much as 7,000 EUR.

There are also differences between the implementation of financial incentives that target **circulation and use** across the three countries:

- In **France**, both EVs and PHEVs are eligible for either a 50% discount or are exempt from the license plate tax depending on the region. It should be noted that these taxes are low (2 EUR in Corsica - 51.20 EUR in Provence-Alpes-Côte d'Azur) compared to the bonus-malus tax. Furthermore, there is a CO_2 based tax levied on company cars, from which EVs are exempt, as are other vehicles emitting less than 20 g CO_2/km.
- In the **Netherlands**, there is an exemption on vehicle circulation tax for zero-emission cars, and a 50% discount for PHEVs. Additionally, there is a reduction in tax for the use of company cars: conventional fuelled cars pay 21-25% tax, while a rate of 4% is applied to EVs and 15% to PHEVs. EVs are also exempt from the recently implemented fixed surcharge of 360 EUR, that applies to all new cars emitting more than 1g CO_2/km (Ministry of Economic Affairs, 2019). For company cars, EVs receive a 12% reduction in tax compared to conventionally fuelled models.

- In **Norway**, circulation taxes take the form of tax rebates and are based on the type of fuel used by the vehicle. EVs and PHEVs are granted a reduction and pay the minimum amount, NOK 455 (~50 EUR). **Norway** has a company car tax, for which EVs get a 40% reduction (this was previously at the higher rate of 50%) and EVs get a 25% tax reduction on car leasing taxes.

Each of the three countries have used **non-financial usage incentives** to varying degrees**:**

- In **France,** the key usage is access to parking which is controlled at the regional and municipal level.
- The **Netherlands** has put less focus on non-financial usage incentives. Other complimentary policies (such as educational programmes) are in place, and are discussed in section 3.1.1.
- **Norway** has the most complete set of non-financial incentives usage incentives. The country is regarded as the originator of many of these types of measures, including access to bus lanes, priority parking, free charging and reduced ferry rates.

All countries have funding schemes to support the deployment of **charging infrastructure**:

- In **France** 50 million EUR has been announced to fund charging infrastructure. The scheme funds 50% of the costs of installing charging points at condominiums. There is also up to 40% funding for municipalities installing charging infrastructure at the request of EV drivers, within a 500m radius of their work or home. **France** aims to have 100,000 chargers available by 2022.
- In the **Netherlands**, the Charging Infrastructure Green Deal (2015) dedicated 33 million EUR of public funds for the installation and operation of public-private EV charging stations. The scheme is controlled by local authorities.
- **Norway** has gone through several rounds of charging infrastructure funding. Initial programmes that ran from 2010 to 2016 totalled around $ 7 million and supported 100% of the installation costs. More recently the national government supplies 40% of eligible costs for municipalities without fast chargers. In 2017 the national government aimed to establish two or more fast charging stations for every 50 km on all main roads in **Norway** (Norsk Ebilforening, 2019). **Norway** allows the installation of charging points in existing buildings without consent.

Box 1: Bonus-Malus Schemes

France has implemented a self-funding bonus-malus tax system, in which high-emission vehicles generate the tax revenue, through the payment of a 'malus', the proceeds fund the tax rebate or 'bonus' for low-emission vehicles. The scheme applies to the registration of new vehicles, or those which have been leased for two years or more.

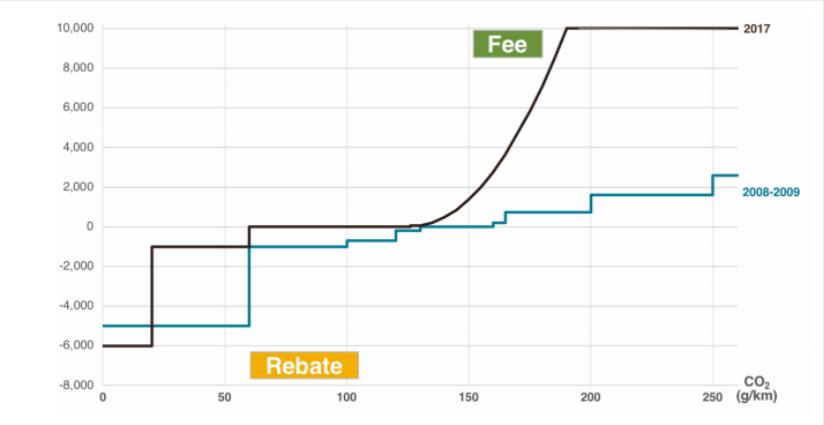
The schemes boundaries for bonus and malus payments are adjusted each year. This enables incremental increases in climate ambition of the scheme and enables balancing of the revenue steam. The CO_2 emission levels at which the government starts to impose fees and provide rebates have gradually decreased. For example, between 2018 and 2019, the emission threshold for cars was lowered by 3 grams, from 120 to 117 grams of CO_2 released per km. Vehicles at the threshold pay 50 EUR malus. The malus rises quickly with increasing CO_2 emissions. For vehicles with emissions over 154g/km the tax is 5,113 EUR and for 185g/km and over the tax is 10,500 EUR.

There is an additional 'super malus' to target powerful and expensive cars: an additional malus of 500 EUR, per 'fiscal horse power' of the car over 35 fiscal horse powers. This is capped at 8,000 EUR.

The level of bonus is capped at 6,000 EUR or 27% of the acquisition cost, and is only granted for vehicles emitting less than 20 gCO_2/km. An additional bonus of 1,000 EUR is available when an old diesel (pre-2001) or petrol (pre-1997) is scrapped and replaced with a low emission vehicle.

During the first three years of these scheme, the bonus payments exceeded the malus revenues. Various adjustments were applied in the following years to increase the income stream. Since 2014 the Bonus-Malus System has generated revenues for the French Government. From 2018, the malus was set at a level that would cover the costs of the bonus payments (€ 261 million in 2018) and the additional bonus for scrapped vehicles (€ 127 million in 2018) (Husson, 2018)

Figure 1-1: Evolution of the **French** Bonus-Malus System from 2008 to 2017



Source: (EUKI, 2018)

1.2 Primary objective(s) of the schemes

The main barrier addressed by policies targeting upfront costs and on-going costs is the high initial purchase price of EVs. In surveys this is regularly ranked as consumers' main concern regarding EV ownership (PWC, 2019). This is understandable given that on average, the purchase price of an EV is 40% higher than a comparable conventional car (JRC, 2018). Non-financial measures targeting the use of EVs seek to provide benefits for owners of EV, in order to make them more appealing in other ways, e.g. with a faster commute via use of bus lanes.Support measures

Policies that support the deployment of EV charging infrastructure seek to make EV ownership more appealing by overcoming issues around ease of charging and 'range anxiety' of EV ownership. There is a concern that EVs can become stranded with insufficient battery power remaining to reach the destination if chargers are not available. This is seen as a significant drawback by many consumers. Inadequate charging infrastructure could therefore delay a widespread shift to electric vehicles.

EVs also play into wider policy considerations including delivering air quality improvements, having implications for energy security and supporting automotive industries (JRC, 2017). Finally, these policies form part of countries' plans to reduce emissions in transport (see section 3.1.2).

1.3 Eligibility criteria and target groups

Reductions in car registration taxes, exemptions from taxes and purchase grants are typically targeted at car owners at the point of purchase (and prospective car owners). Businesses are also specifically targeted by some types of monetary incentives. The non-financial incentives target the use phase of the vehicles and provides the benefits to the day-to-day users of EVs.

The focus does, however, vary between the case study countries. In **Norway** the incentive schemes mainly target consumers. Whereas in the **Netherlands** the majority of EV purchases are company cars, as it is common for employees to receive a company car as part of their work benefits. The registration tax scheme in **France** covers both private and company cars equally, but the incentives address more on-going costs for private EV owners.

While these kinds of measures all target the end-user, an increase in consumer interest in EVs will encourage car producers to respond to increasing demand (European Parliment, 2019). Other legislative measures are also in place to encourage changes in manufacturing, at the EU and member state level. Schemes to support electric vehicle infrastructure typically begin by focusing on development of charging networks in major cities, as uptake of EVs is likely to be higher in such areas than in rural areas.

1.4 Key actors involved in the delivery of the scheme

Initiatives in most countries have followed a top down approach, in which governments aim to build engagement in electromobility within society, mainly through setting up targets and incentives. Support for the deployment of EVs are commonly established at a number of levels of government. **France**, the **Netherlands** and **Norway**, all have policies being implemented on the national, district and city levels. Beyond governments, the following actors have been identified as important to the development of the EV market:

- **Original Equipment Manufacturers (OEMs)**: Despite numerous policies aimed at supporting the uptake of EVs sales did not take off in **Norway**, **France** or the **Netherlands** until the traditional vehicles manufacturers entered the EV market in 2011 and increased the number of models available to consumers (JRC, 2017). These players are important due to the combination of their existing large manufacturing capacity and nationwide dealer and service networks, which meant they were able to take advantage of existing incentives (TØI, 2015).
- **Associations:** In the early years of the **Norwegian** scheme an EV association was started that later evolved into a consumer interest group (Figenbaum & Kolbenstvedt 2013, 2014 & 2015). The strength of this organisation was boosted by giving free membership to the EV association with every EV sold.
- **NGOs:** NGOs successfully campaigned for some beneficial measures to be implemented. The establishment of free parking and free passing on toll roads in Oslo (**Norway**) has largely been attributed to the actions of an NGO who campaigned for these benefits by driving their EV on toll roads and parking in municipal parking spaces without paying. Pressure from this NGO led the local government to request the ability to change relevant regulations in their municipality.
- **EV station installers:** The deployment of EV charging stations often involves private companies who design, manufacture and install charge points. However, private companies engaging in these activities so far can struggle to establish profitable business models (TØI, 2015) and therefore supportive public policy is required. While the network is still in its infancy, all three countries have supported deployment via grants and/or subsidies. Partnering with private firms in this way has also ensured consistency and compatibility across the charging infrastructure.

1.5 Interaction with EU instruments

This section presents EU level interactions, section 3.1.2 discusses local and national level.

Measures at the EU level to encourage the promotion of EVs tend to form part of wider plans for a sustainable transport sector. For instance, the decarbonisation strand of the Europe on the Move package (EC, 2017) contains various proposals for increasing CO_2 standards, supporting deployment of clean vehicles and alternative fuels infrastructure. In 2017 the European Parliament called for 'an ambitious action plan for the market uptake of electric vehicles' and encouraged 'fiscal incentives for zero- and low-emission vehicles' (European Parliment, 2017). Additionally, as part of the European Strategy for Low-emission Mobility (EC, 2016), the Commission called on member states to invest in EV infrastructure, to review tax systems in favour of incentives for low-emissions vehicles and increase consumer awareness of EVs technological advancements (e.g. increased ranges).

The EU is providing financial support for e-mobility in a number of ways, for example the Connecting Europe Facility project has supported the deployment of charging infrastructure in six member states (EC, 2019). Funding is also available from Horizon 2020's Green Vehicles call and the European Investment Bank. These schemes provide support for electric vehicles, infrastructure and related research activities. (European Parliment, 2019).

Furthermore, the EU has introduced technical measures that should support the EV market. There are existing EU regulations targeting the manufacture of new vehicles. These aim to limit CO_2 emissions from new cars and vans (including giving incentives for low- and/or zero-emission vehicles) and to

stimulate the market uptake of clean vehicles. Since 2009 the EU has set mandatory CO_2 emissions reduction targets for new fleets (EC, 2019). Currently, a fleet average target of 130 gCO_2 /km applies. In 2021, the stricter target of 95g/km CO_2 will apply. The regulation also rewards manufactures with 'credits' if they average less than 50g/km CO_2 and issues penalties to those who exceed targets.

Norway is not an EU Member State and their policy goes further than the EU's target of 95g/km CO_2 in 2021. In the **Norwegian** White Paper on Climate Policy a more ambitious target of 85 gCO_2e/km by 2020 was introduced (Norwegian Government, 2017). **Norway**'s EV package is a key part of the road map to achieving this target.

2 Implementation

2.1 Drivers and key actors for setting up the scheme

An increase in electromobility forms a key part of many member states' plans to achieve their GHG emissions reductions targets in transport. At the inception of these policies several other drivers were also of importance. The **French** plan for decarbonising vehicles set out to increase energy independence, ensure the competitiveness of the **French** automotive industry and to cut CO_2 emissions to meet EU criteria. In the **Netherlands**, the aims were to reduce CO_2 emissions, improve energy efficiency, reduce the use of fossil fuels and tackle noise pollution. The main motivation for **Norway**'s commitment to EVs is to meet its climate goals, although originally the EV incentives dating back to 1990 were also intended to establish a **Norwegian** EV industry.

2.2 Lead times and EV promotion

Establishing a charging infrastructure and a significant EV market share can take time. This means, they are unlikely to play a significant role in cutting GHG emissions before 2030 for countries with a current low market share. However, as road transport is responsible for over 70% of the EUs transport emissions (EEA, 2019), policy action cannot wait; for EVs to be able to contribute to long-term emissions targets, action is needed to stimulate the market in the short term.

This important point was recognised in **Norway** as far back as 1990, where the first exemption to registration tax was granted (Norsk Elbilforening, 2019). This has been followed by a series of policy interventions and programmes, national transport strategies and budget plans, that are designed to encourage uptake. As a result, the 'policy package' in **Norway** is constantly in development and review. This piecemeal approach has meant policies have been in place and active while new or updated ones are developed to full operational capacity.

Later adopters were able to launch more complete packages: The **Dutch** government introduced its first action plan on EVs in 2009 (Dutch government, 2009). This outlined key activities that were planned for 2009 to 2011, which included the setting up an EV task force, EV promotional activities, research and development, incentives launch and establishing targets. The **French** bonus-malus was first announced in October 2007 and launched in early 2008 (Ministère de l'Écologie et du Développement Durable, 2007). It can be considered a more complete package because it encourages adoption of low emission vehicles and adds barriers in terms of costs to the purchase of high emission vehicles.

2.3 Lessons to be learned from design and implementation

Experience from forerunner countries and the policy developers within such countries should serve as a helpful resource for in the implementation of EV promotion schemes. For example the implementation of some measures may clash with national laws, as was the case for the free parking scheme in **Norway**, which was not legal according to the national law before 1998. Similar issues have been faced by Denmark and Germany more recently when facilitating free parking. Legal barriers to introducing EVs, their infrastructure or incentives to promote them, should be identified early in the diffusion process as it may take a long time to change laws (TØI, 2015).

Infrastructure deployment has also encountered challenges. A challenge encountered in **Norway** was the lack of charging infrastructure compared to the high numbers of EVs on **Norwegian** roads. Another key challenge experienced in each of the three countries is that EV stations cannot yet operate at a profit without public support. In the **Netherlands**, this meant further investment from local and national government was required (ClimateXchange, 2017). A group of industry stakeholders suggested 900 EUR per charging station in the first year reducing to 300 EUR per charging station by the end of the Green Infrastructure deal (ClimateXChange, 2017).

2.4 Adjustments made during the scheme

The **French** bonus-malus scheme is designed to be constantly adjusted to gradually to improve the CO_2 emissions of the national fleet, whilst remaining cost neutral. As previously mentioned, the scheme operated at a loss initially in order to support industry: the bonus was greater than the malus as manufactures adjusted CO_2 emissions to the minimum required to reach the bonus payments. The malus payments were then increased to enable the system to generate enough revenue to cover bonus costs. Since this point the design and size of the bonus and malus is reviewed on an annual basis.

There have been changes to the types of low emission vehicles included within the policies. The original form of the incentives in **Norway** mainly supported EV, leading to low numbers of PHEV registrations. From 2016, the **Norwegian** incentive policy was extended to also provide more substantial support for PHEV. This led to a rapid increase in PHEV sales in 2016 and 2017 (JRC, 2018).

The original form of the policy in the **Netherlands** resulted in very high shares in PHEV compared to EV. The scheme was changed in 2016 to prioritise EVs over PHEVs, to move to zero-emission transport with the aim of reaching its national GHG reduction. This led to a significant reduction in PHEV sales. However, the increase in EV purchases did not match the difference and the overall market share of low emissions vehicles went down (JRC, 2018). These examples show that the design of the policy can have a measurable and rapid impact on the market shares of different low emissions vehicles. It also suggests that consumers may still favour PHEVs over EVs.

Generally, it is expected that these measures will eventually be reduced or phased out. The long-term goal of these measures is to increase rates of EV ownership to the point where it becomes a self-sustaining market that does not require public sector support (TØI, 2015). Some measures have already been tightened in **Norway** due to the increase in the numbers of EVs. In Oslo, the number of EVs using bus lanes raised concerns about increased congestion. As a result the rules were amended so that from 2015 EVs could only access to bus lanes when the vehicle contained at least two people. The key aim is to support the industry now; once the market is more developed, measures can be withdrawn.

3 Assessment

3.1 Successes

In this section, the success of these schemes is considered according to:

- Achievement of objectives
- Achievement of national transport targets
- Stakeholder acceptance
- Emissions reduction

Achievement of objectives

Upfront costs

All three countries have successfully reduced the upfront costs of buying an EV. The incentives in **Norway** are by far the highest, covering between 39–67% of the upfront price of an EV (JRC, 2017) and perhaps explain the huge success of EV adoption in **Norway**. In the **Netherlands** and **France** incentives cover between 10% and 40% of the upfront cost of an EV (JRC, 2017).

Infrastructure

Policies across the three countries also seek to address the challenges of deploying a suitable charging infrastructure. Table 3-1 shows the number of charging stations in each country. The **Netherlands** have installed over 43,000, this is the highest of any country in Europe. Interestingly, **France** installed a significant proportion (11,987) of its charge points within the last year (OSV, 2019).

Table 3-1: Number of charging points and ratio to number of EVs in2019

Country	Charging stations	EVs per charging point
EU27 + UK	174,100	~7
France	29, 538	~7
Netherlands	43, 730	4
Norway	12,337	25

Source: (EAFO, 2019)

EV deployment

Ultimately, all of these schemes here aim to increase the number of EVs on the roads. As shown in Table 3-2, each has achieved greater EV uptake than the EU average. Most substantially in **Norway**, where electric cars accounted for 46% of new car sales in 2018[1].

Table 3-2: Uptake of EVs

Country	Number of EV in national fleet	% fleet EV	% new cars electric (2018)
EU27 + UK	450,938	*Not available*	1%
France	123,171	*Not available*	2.1% (ACEA, 2019)
Netherlands	44,984	1.6% (JRC, 2018)	6.7% (ACEA, 2019)
Norway	237,710 (Norsk Elbilforenig, 2019)	6.4% (JRC, 2018)	46% (IEA, 2019)

Source: (European Alternative Fuels Observatory, 2019) *unless otherwise stated*

EV promotion policies (see Annex 1: Overview of incentives for EV promotion in the EU and the UK I) in other EU countries have not led to the same levels of deployment. Research into the types of measures has found that the most important instruments to promote the use of EVs are financial incentives for purchasing and taxes (both VAT and registration) (Norsk Elbilforening, 2017) and infrastructure. Furthermore, when considering the tax based measures higher penetration levels of EVs appear in countries where the registration and/or ownership taxes include CO2 emissions in the calculation of the cost (Cansino, 2018).

Achievement of national transport targets

The schemes can also be considered successful in relation to the national targets set: **Norway**'s initial target was to uphold its financial incentives until 2018, or until a total EV car stock of 50,000 vehicles was achieved. This target was reached early in 2015, but the **Norwegian** Parliament decided to continue the incentives until 2020 (Norsk Elbilforening, 2017), whilst establishing a more ambitious target of achieving 100% of new vehicle sales to be zero-emission vehicles by 2025. The **Dutch** government's target within the action plan on EVs contained an ambitious target of 20,000 registered EVs by 2015. This was met two years in advance and by the start of 2015 45,915 EVs were registered in the **Netherlands** (NEA , 2015). It appears that **France** has dropped the target set in 2009 of bringing 2 million EVs to **French** roads by 2020 (France Strategie, 2018).

Stakeholder Acceptance

[1] This may appear low compared to the fleet percentage of 6.4%, however vehicle lifetimes and fleet turnover rates mean that there is a substantial delay between a new vehicle technology gaining share in the sales of new vehicles and gaining share in the overall vehicle fleet.

All three schemes are largely considered successful by stakeholders. The **French** automotive industry is largely supportive of the scheme. Consultation with industry found this is, in part, because the malus levied on high emission vehicles funds bonus payments incentivising low emissions car purchases, rather than purely generating profit for the government (EUKI, 2018). In contrast, consumers often do not understand how the scheme works and how it relates to air quality measures for passenger vehicles, representing a barrier to understanding the benefits.

In **Norway** there is a high level of support for the promotion of EVs among the public as well as industrial and political stakeholders (ClimateXChange, 2017). This has been tested several times in surveys of EV and non-EV owners (TØI, 2015; IEA, 201). A recent survey conducted in **Norway** found that financial incentives such as value-added tax (VAT) and vehicle registration tax exemptions where the most popular factors encouraging EV purchases, followed by measures reducing operational costs such as free access to toll roads and circulation tax rebates (IEA, 2018). In a recent survey of the **Dutch** public 82% indicated that they either owned an EV or would consider buying one (Kamer, 2018).

Emissions Reductions

The table below contains the average CO_2 emissions of new passenger cars sold in the featured member states. Compared to the than the EU27+UK average, each member state presented has a lower gCO_2/km value and has seen equal or more significant reductions in average emissions. **Norway** has nearly halved their GHG emissions over ten years.

Table 3-3: Average CO_2 emissions of new passenger cars sold between 2006 and 2016 [gCO_2/km]

	2006	2016	Difference	% difference
EU-27 + UK	161.3	118	-43.3	-27%
Netherlands	166.7	105.9	-60.8	-36%
France	149.9	109.8	-40.1	-27%
Norway	177.0	93.0	-84.0	-47%

Source: EEA (2018)

These improvements cannot be assumed to be solely due to the promotion of EVs, as there are other factors that affect these figures. Evaluations of the EV promotion schemes have been conducted to disentangle their effects from the effects of other forces.

In **France** a steady fall in average new car CO_2 emission has been observed alongside the introduction of the bonus-malus scheme. From 2007 to 2009, the average emission rate dropped by 8.7 g CO_2/km, 90% of which has been attributed the bonus-malus (EEA, 2018). In the **Netherlands**, the average CO_2 emissions of a passenger vehicle have fallen more rapidly than the EU average for the last ten years. A study commissioned by the ICCT found there had been a 46.8 g CO2/km reduction over the period 2005-2012, of which around 5-20% was attributed to CO_2 based taxation (Cambridge Econometrics, 2013).

During these evaluations differing methodologies were used and it is therefore difficult to directly compare the results of these different evaluations.

3.1.1 Support measures

The roll-out of EVs was also supported by a number of 'softer' use measures in **France**, the **Netherlands** and **Norway**. Measures such as the use of bus lanes that reduce 'time costs' and provide advantages over conventional vehicles have been important factors in increasing the attractiveness of EVs (TØI, 2015). Hence there is a context to support measures and the benefits they may bring. In **Norway** the exemption from road tolls are particularly attractive to those who live on the country's small islands with costly toll road connections to the mainland (TØI, 2015). Whereas access to bus lanes has been found to be more important to users in urban areas with significant congestion, as they gain the benefit of reduced commuter journey times.

Dissemination programmes raising awareness of EVs were important in gaining acceptance amongst consumers in both **Norway** and the **Netherlands** (TØI, 2015). In the **Netherlands** the website **Netherlands** electric (Nederland elektrisch) educates consumers on electric mobility and summarizes financial incentives for EVs. There have also been events arranged including trade shows, EV Test Drive Day and Clean Air Rallies (NEA, 2015). In **Norway**, the government initially funded communication campaigns such as a website called Grønn Bil (Green Car), which published statistics on EV registrations and information on charging points. This service was withdrawn in 2016 as the government found it could rely on existing public awareness and regional awareness schemes. Other policies (for example, the EV specific number plates and charging stations) were found to have the co-benefit of maintaining awareness (TØI, 2015).

3.1.2 Interactions with other schemes/instruments

Within the countries EV promotion policy packages, the individual policies appear to be interacting in a complementary way. While the incentives tackling upfront costs may be seen as the most important factor in increasing uptake rates, the accompanying ownership and use incentives are also valued by consumers. In fact, research conducted on behalf of the The European Climate Initiative (EUKI) into the **French** bonus-malus scheme, concluded that the system works best when 'combined with further measures in the sector to help to achieve the 2030 effort sharing targets' (EUKI, 2018). This agrees with research by the UK Department for Transport which reviewed existing European EV purchase incentives and found they have less impact when implemented alone (UK DfT, 2015).

At the national level, measures encouraging the promotion of EVs form part of wider plans for a sustainable transport sector. In the **Netherlands** sustainable transport goals include all new cars to be zero emission in 2035, and for all cars on the roads to be 'capable of' zero-emissions by 2050. The country's fiscal e-mobility purchase and use schemes are a key part of the government's plan for achieving these targets (Ministry of Economic Affairs, 2019). During the 'Grenelle de l'environnement', an environmental roundtable that took place in October 2007, the **French** bonus-malus scheme was discussed as one of the main measures to lower the average CO_2 emissions of passenger vehicles from 176g to 130g CO_2/km by 2020 (Ministère de l'Écologie et du Développement Durable, 2007). This now forms part of the wider Climate Plan in 2017, which also includes plans for EVs (France Strategie, 2018).

3.2 Limitations

3.2.1 Aspects for Improvement

One limitation of these schemes is the way in which they mainly benefit wealthier consumers. This can be exacerbated by the design of these measures; the exemption from the flat tax rates in **Norway** and the **Netherlands** covers a larger proportion of the overall price of large-segment vehicles, and therefore favours expensive EVs (JRC, 2017). This issue is being addressed somewhat in **France** where the purchase incentives on new cars favours smaller, and cheaper, EVs and with the 'super bonus' which adds extra costs to the most expensive non-electric vehicles.

There are also concerns that these schemes are only suitable for wealthier nations. ACEA found that all countries with an ECV market share of less than 1% have a GDP below €29,000, including EU member states in Central and Eastern Europe, but also Spain, Italy and Greece (ACEA, 2019), showing that wealth affordability is a major barrier to EV deployment. **Norway** has been able to achieve cost-parity with conventional vehicles through high levels of incentive funding, but this level of support is unlikely to be matched in all countries. Some **Norwegian** analysis found lower purchase incentives would support EV deployment (Norsk Elbilforening, 2017). There is further evidence that purchase incentives have less impact when implemented alone (EUKI, 2018). Uptake can be supported in cost-effective ways by including incentives and non-financial measures in a complete policy package. Soft benefits have been found to be valued by consumers, when working alongside financial incentives (UK DfT, 2015).

The pressure on government budgets can be reduced by designing incentives that are offset by taxes on polluting vehicles, such as the bonus-malus schemes (see Box 1-1). The added benefit of this approach is a higher public and political acceptance for a tax when its revenues are earmarked to a specific cause (Norsk Elbilforening, 2017).

Cost is a key factor in the development of charge points. Costs to governments can be reduced through partnering with private companies. Some costs can also be recovered by charging users for use of electricity. Another limiting factor to consider regarding infrastructure, are user's charging habits. Typically, charging is carried out at home or at work. Public charging infrastructure should be located strategically to maximise visibility and usability. Ideal locations are near places of work, in major shopping areas, or transportation hub (service stations, train stations, airports).

Finally, the length of time required to support the EVs can be seen as a limitation. The **French**, **Dutch** and **Norwegian** examples explored here in detail have all been in operation for a number of years. Late adopters may be able to take advantage of a more developed EV market, in which there are now an increased number of models available, longer vehicle ranges, reduced costs, and an increase in awareness and acceptance amongst consumers (TØI, 2015).

3.2.2 External factors

As demonstrated in section 2.4, EV uptake is still highly reliant on support measures. Withdrawal or reduction at this early stage in the development of the market can easily halt EV sales. This means that these policies require long-term thinking and the long term resources to support them.

Furthermore, the total emissions savings created by moving a fleet towards electric vehicles is dependent on the electricity mix of a country. The impact of an EV in **Norway**, for example, is lower than the EU average due to the country's virtually fossil free power supply. However, as the electricity supply is decarbonisation in line with EU targets, the environmental performance of EVs will increase.

The roll out of the charging infrastructure can be impeded by geography. In **Norway**, the installation cost incentive scheme to construct ultra-fast chargers has failed to attract any private partners in the remote far north Lofoten Islands. Construction has begun in all other areas. Policy support for infrastructure development is more important in remote and/or sparsely populated areas.

3.2.3 Negative interactions

Policies that reduce operating costs and those that increase the attractiveness of EVs can have a negative impact on the other measures that seek to encourage use of alternative modes of transport. Measures such as access to bus lanes and free use of toll roads can provide an incentive to use private cars instead of public transport or cycling. To minimise negative effects, measures that support EVs should be implemented alongside investment and promotion of public transport.

There are wider considerations of increased use of EVs, relating to increasing electricity demand, and difficulties of recycling the materials used in the battery. Wide-spread adoption may therefore create new pressure on the materials, waste and power sectors.

3.3 Future Potentials

As the annex shows, although fiscal measures to stimulate EV sales are available in nearly all EU member states, the nature and level of support provided by the benefits and incentives still varies significantly. This results in significant variation in EV uptake between member states.

Table 3-4 below summarises the policies discussed in this case study and the key factors which make them easy or difficult to replicate effectively.

Table 3-4: EV promotion policy options and replicability

Measures	Replicability
EV Purchase Incentives	
Registration tax / purchase rebates / credits	Several EU countries already provide subsidies for EV and low-emission vehicles. Exemptions or rebates from registration taxes, if acting alone, are only effective when the default registration taxes are high. Member states have low registration taxes. For example, an exemption from the German registration levy of €26 would not provide a significant incentive.
VAT exemption	Reduced rates for VAT already exist in several member states. VAT exemptions are an effective argument for car buyers to choose an EV in **Norway** (Norsk Elbilforening, 2018). However, the transferability of the instrument to member states may not be straightforward as the introduction of reduced VAT is linked to EU provisions. Currently, EU countries are not allowed to apply rates less than 5%.
Bonus-Malus	The Bonus-Malus System is easily transferable to other national contexts (e.g. Sweden implemented a similar scheme in 2018). A particular benefit is how the level of bonus payments and malus fees can also be adjusted and so the scheme ensures revenue covers (or is equal to) the cost of subsidies. The system can be designed to be revenue neutral or even revenue generating
Purchase subsidies	Several EU countries already provide subsidies for EV and low-emissions vehicles, but do not recover costs. Revenues to cover the costs of exemptions can be generated through connected (e.g. like bonus-malus) or unconnected (e.g. **Netherlands**' surcharge on diesel cars) schemes by applying a levy on high-emission vehicles.
Ownership incentives	
Circulation tax rebates / exemptions	These should be relatively easy to transfer. However, these schemes can be politically unpopular due to the loss of yearly revenues, particularly as a scheme matures (ClimateXChange, 2017). The influence of circulation taxes is largely understood to be lower than those that tackle the cost of purchase, as a result of the savings offered typically being much lower than registration savings offered.
Waivers of road use fees (tolls, parking, ferries)	Tolls on road throughout the EU are low compared to the environmental cost of the transport that uses them (Ricardo, forthcoming). The effect of waivers, and the extent to which they are perceived as beneficial, will depend on the size of the tolls and number of roads they are applied to. However, dramatic increases in the cost of tolls and/or roads they are applied to are unlikely to be popular. Phased rises or introducing a differentiated pricing based on environmental (e.g.CO_2 emission) system, may increase consumer acceptance.
Usage Incentives	
Access to bus lanes Dedicated/free parking EV car sharing policies Low emission zones	The ability to implement these policies is largely dependent on the national legislation and the power given to municipalities. Even where municipalities have the power to enact these changes there can be resistance due to other factors (e.g. effects on congestion, loss of income, or reaction from the public or industry stakeholders).
EV Infrastructure	
In general, slow-charging schemes have been found to be cheaper but less effective at stimulating uptake of electric vehicles. A mix of fast- and slow- charging points therefore strikes a balance between cost and effectiveness. Rates for use of fast chargers tend to be higher than slow. Charging infrastructure should be located strategically to maximise visibility and usability.	

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Annex 1: Overview of incentives for EV promotion in the EU and the UK

Table A1 – Abbreviations

Abbreviation	
BEV	Battery electric vehicle
EV	Electric vehicle
FCEV	Fuel cell electric vehicle
HEV	Hydrogen electric vehicle
PHEV	Plug-in hybrid electric vehicle
ZE	Zero emission

Table A2 – Overview of incentives in the EU and UK (note table is correct as of February 2020)

	Austria	Belgium	Bulgaria	Cyprus	Czechia	Denmark	Estonia	Finland	France
Purchase incentives									
Registration/ purchase tax relief	BEV exemption	Reduction in Brussels and Wallonia, exemption in Flanders		Exemption for low (120gCO_2/km) emissions vehicles	Exemption from registration	Partial tax relief. Currently 20% tax, but this will increase over the coming years.		Minimum rates applied to ZE vehicles	Regionally applied. Alternatively, fuelled vehicles discounted <50%.
Purchase subsidies	Up to €3,000 off BEV purchase, €1,500 for PHEVs							Purchase incentive of € 2,000 (for cars less than €5,000)	Bonus/Malus - Up to €6,000 for vehicles emitting <20gCO_2/km. Penalty applied high emitters.
VAT (reduction or exclusion)	VAT reduction								

	Austria	Belgium	Bulgaria	Cyprus	Czechia	Denmark	Estonia	Finland	France
Scrappage Schemes									Up to €5,000 for purchase of BEV and PHEV
Use and circulation financial incentives									
Circulation tax relief/rebates/ subsidies	Zero emission cars Exempt	Reduction in Brussels and Wallonia, exemption in Flanders	Exemption for EV	Minimum tax rate for low (less than 120gCO_2/km) emissions vehicles	Exemption for alternatively fuelled vehicles (including EV)	Minimum tax rates applied to EV fuel chains		Minimum tax rates applied to ZE vehicles	
Waivers of road use fees*									
Company cars tax benefits	Exemption on zero emissions	120% deductible from corporate tax (100% from 2020)							Exemption from CO2-based tax component for vehicles emitting less than 20gCO_2/km.
Charging Infrastructure Support									
Charging infrastructure incentives	Yes	Yes				Yes			Yes

	Germany	Greece	Hungary	Ireland	Italy	Latvia	Lithuania	Luxembourg	Malta
Purchase incentives									
Registration/purchase tax relief		Exemption from tax for EVs	Exemption from tax for BEV and PHEV	Reduction of up to €5,000 BEV, €2,00 for PHEV and €1,500 Hydrogen EV (HEV)				Reduction of up to €5,00 for BEV and Fuel EV (FCEV). €2,500 for PHEV	Minimum rate applied to those emission less than 100gCO_2/km
Purchase subsidies	Environmental purchase bonus (€4,000 for BEV, 3,000 for PHEV)			Up to €5,000 for BEV & PHEVs	Bonus Malus in place. (€6,000 for cars emitting 20gCO_2/km or less) Malus < €2,500 for cars emitting over 250g				
VAT (reduction or exclusion)									
Scrappage Schemes									
Use and circulation financial incentives									
Circulation tax relief/rebates/subsidies	Exemption for BEVs	Exemption of those emitting less than 90gCO_2/km	Exemption from tax for BEV and PHEV	Minimum rate applied	5- year exemption for EV, then 75% reduction	Exemption for cars emitting 50gCO_2/km or less		Minimum rate applied for BEV and FCEV	Minimum tax rate applied to those emission less than 100gCO_2/km
Waivers of road use fees*									
Company cars tax benefits	Exemption from CO2 based tax component for those less		Exemption from company car tax for			Minimum rate for BEVs		Minimum rate for BEV and FCEV	

	Germany	Greece	Hungary	Ireland	Italy	Latvia	Lithuania	Luxembourg	Malta
	than 20gCO_2/km		BEV and PHEV						
Charging Infrastructure Support									
Charging infrastructure funding/ incentives	Yes			Yes	Yes				Yes

	Netherlands	Poland	Portugal	Romania	Slovakia	Slovenia	Spain	Sweden	UK
Purchase incentives									
Registration/purchase tax relief	ZE vehicles exempt	Exemption for BEVs and PHEVs			Minimum rate applied to BEV	Minimum rate applied to vehicles emitting less than 100gCO_2/km	Exemption for vehicles emitting less than 120gCO_2/km		Exemption for BEVs and cars emitting less than 50gCO_2/km
Purchase subsidies						Up to €7,500 for BEV cars, €45,00 for vans, €3,000 for BEV quadracycles	EVs: Up to €5,500 for cars, €6,000 vans, €8,000 medium vehicles	Bonus/Malus. Up to 60,000 SEK for BEVs & 10,000 for PHEVs emitting < 60gCO_2/km	
VAT (reduction or exclusion)			VAT reduction for BEV (worth less than €62,000) and PHEV (less than €50,000)						
Scrappage Schemes				€10,000 for BEV. Additional €1,500 for > 8 year old.					
Use and circulation financial incentives									
Circulation tax relief/rebates/ subsidies	ZEV exempt			Exemption for EV	Exemption for BEVs		75% reduction for BEV in some areas		Exemption for ZEV
Waivers of road use fees*									

	Netherlands	Poland	Portugal	Romania	Slovakia	Slovenia	Spain	Sweden	UK
Company cars tax benefits	Partial exemption from company car tax for BEV and PHEV		Company car tax exemption for BEV					Up to 40% Reduction for BEV and PHEV	Minimum rate applies for ZEV
Charging Infrastructure Support									
Charging infrastructure incentives	Yes						Yes		Yes

* E.g. tolls, parking, ferries

Data presented here is adapted from:

European Automobile Manufacturers Association (ACEA) (2019), Overview – Electric vehicles: tax benefits and incentives in the EU, URL: https://www.acea.be/publications/article/overview-of-incentives-for-buying-electric-vehicles

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