

Clean fuel deployment in the Baltic Sea Region

Review and assessment of status quo

Work Package 2 | Activity 2.4

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Capital Region of Denmark

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Table of content

1. Purpose of the status quo report	3
2. Introduction	4
A scattered picture	4
EU context – visions, goals and actions	4
AFI Directive - Alternative Fuels Infrastructure Directive	4
Current market share of alternative fuel vehicles in the Baltic Sea Region	6
3. Level of ambition in BSR countries – clean fuel targets	8
Denmark.....	8
Sweden	9
Germany	10
Finland	11
Poland	12
Latvia.....	13
Estonia	14
Lithuania.....	15
4. Development of clean fuel refueling and charging infrastructure and vehicles in BSR countries	16
Infrastructure	16
Electricity	16
Hydrogen	17
Biomethane and natural gas	18
Vehicles.....	19
Battery Electric Vehicles (BEVs) and Plug-in Hybrid Electric Vehicles (PHEVs).....	19
Fuel Cell Electric Vehicles (FCEVs)	20
CBG, CNG, LBG and LNG Vehicles	20
Summarizing the status of development in the BSR countries	21
5. Regulatory framework conditions – overview and assessment	22
6. Corridor perspective	25
7. Market situation and development	27
8. References	30

1. Purpose of the status quo report

The purpose of this document is to review and assess the current developments of clean fuel deployment in the eight countries along the core network areas in the Baltic Sea Region. Clean fuel policy, targets, ambitions, current market developments and successful supporting mechanism for the development of clean fuel will be reviewed.

This report forms the first part of three activities in group of activities 2.4, clean fuel deployment in the BSR, which is a part of the project BSR Access - Access to clean, efficient and multimodal transport corridors in the Baltic Sea Region. It will serve as a basis for involvement of public and private BSR stakeholders and the preparation of a BSR Clean Fuel Deployment Position Paper as the main deliverable for this work package. This work will provide inputs to the Clean Fuel Deployment Agora which will be held in the end of the project period.

The clean fuel deployment group of activities aims at creating alignments in the clean fuels systems across the countries of the Baltic Sea Region using the existing experiences and best practices with clean fuel deployment in the Region.

This report is based on current data from the eight BSR countries together with the existing knowledge and the comprehensive work derived from the Scandria2Act Clean Fuel Deployment Strategy and the GREAT Road Map on Policy Measures.

The development of clean fuel deployment in the BSR is ongoing, however, the data collection and gathering of information and knowledge for this status quo report has ended October 31 2019 due to further work within the activity.

2. Introduction

A scattered picture

Despite the Paris Agreement, high ambitions and clear targets, emissions – especially CO₂ - from road traffic continue to rise in many countries. The action plans are not strong enough, the pace in the implementation and deployment of clean fuels is not high enough in the light of the urgency for deliberate and coordinated actions – both on national and European level.

A recent study shows that all EU members states' National Policy Frameworks (NPF) combined would lead to only an EU wide reduction of CO₂ emissions by 0.4 %, NO_x emissions by 0.37% and PM_{2.5} emissions by 0.44% in EU by 2020 (Thiel et al. 2019).

Some countries and regions are forerunners, there are a lot of good examples, initiatives and successful projects, but the overall European picture is scattered.

EU context – visions, goals and actions

In autumn 2019 when this report was made a new European Parliament has started its work. A new EU commission is in place and the commissioner Ursula von der Leyen has presented a new initiative, a European Green Deal, as a higher ambition for EU concerning climate change. Von der Leyen has promised to deliver this plan in her first 100 days to make Europe the first climate-neutral continent by 2050. For the coming R&D program Horizon Europe a limited number of broader initiatives - Missions - are at the same time under discussion with climate change as one of the focused areas.

Altogether it points out that the ambitions, efforts and concrete actions for Clean Fuel Deployment will be even more in focus the next coming years than before. The EU has still to respond more concrete on the Paris Agreement and “decarbonization of transport” as a slogan must be followed by concrete and coordinated actions within the member states. Collaboration between public sector and the industry is crucial.

AFI Directive - Alternative Fuels Infrastructure Directive

The most important EU decision on alternative fuels is the Alternative Fuels Directive, 2014/94/EU. It lays out a plan for a comprehensive alternative fuel's strategy for Europe. Member states were required to formulate National Policy Frameworks (NPF) for the market development of alternative fuels by 18 November 2016. It should have been followed by a report on their implementation in November 2019, but the process is delayed until March 2020. What will happen then is not decided. The result can be a pan-European strategy for alternative fuels, but it can also be integrated into the Clean Vehicle Directive. The current Directive focus on electricity, gas, hydrogen and liquid biofuels and this report will include the latest status on these mentioned types of alternative fuels.

Electricity

Member states shall ensure, through their NPFs, that an appropriate number of charge points accessible to the public are put in place by 31 December 2020, in order to ensure that electric vehicles can circulate at least in urban/suburban agglomerations.

Hydrogen

Those member states which decide to include hydrogen refueling points accessible to the public in their NPF shall ensure that an appropriate number of such points are available to ensure the circulation of hydrogen powered motor vehicles, within networks determined by those member states, including cross-border links where appropriate, by 31 December 2025 at the latest.

Natural gas and biomethane (C/LNG)

Member States shall ensure, through their NPFs, that an appropriate number of CNG (Compressed natural gas) and LNG refueling points accessible to the public are put in place by 31 December 2025. Those refueling points will, as a minimum, cover the transport hubs of the TEN-T Core Network (cities and harbours), in order to ensure that LNG heavy-duty motor vehicles can circulate throughout the Union, unless the costs are disproportionate to the benefits, including environmental benefits.

Member states must provide charging and refueling points for alternative fuels summarized in the table below:

Alternative Fuels Directive Targets		
	Coverage	Timings
Electricity in urban/suburban and other densely populated areas	Appropriate number of publicly accessible points	By end 2020
CNG in urban/suburban and other densely populated areas	Appropriate number of points	By end 2020
CNG along the TEN-T core network	Appropriate number of points	By end 2025
Electricity at shore-side	Ports of the TEN-T core network and other ports	By end 2025
Hydrogen in the Member States who choose to develop it	Appropriate number of points	By end 2025
LNG at maritime ports	Ports of the TEN-T core network	By end 2025
LNG at inland ports	Ports of the TEN-T core network	By end 2030
LNG for heavy-duty vehicles	Appropriate number of points along the TEN-T core network	By end 2025

Current market share of alternative fuel vehicles in the Baltic Sea Region

In a five-year period (2015-2019), there has been an increase in the uptake of alternative fuel vehicles. This increase predominantly applies to BEVs and plug-in hybrids. However, the overall percentage uptake has been relatively small due to the overall expansion of the car fleet in the EU at the same time.

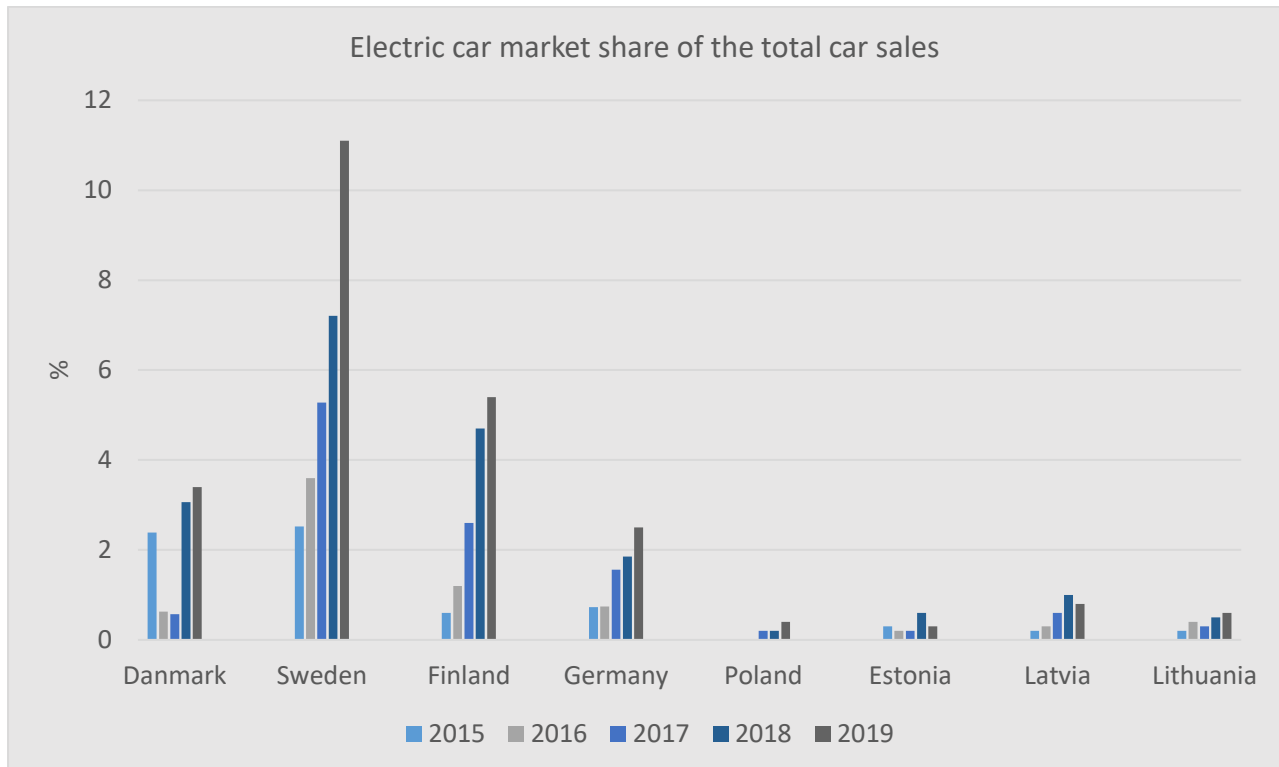


Figure 1 Market share of BEVs and PHEV in the BSR countries. Development from 2015 to 2019. Source [EAFO]

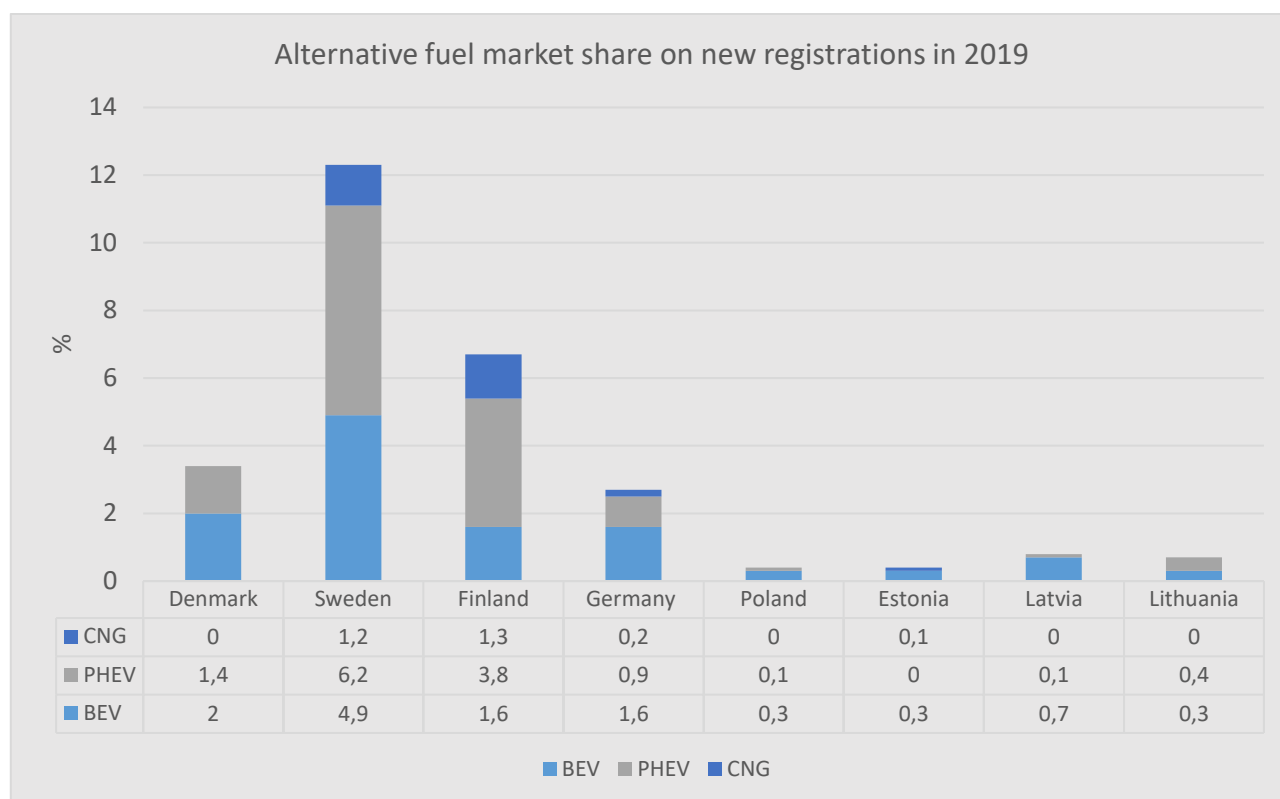


Figure 2 market share of BEVs, PHEVs and CNG vehicles in 2019. Source [EAFO]

As the two figures shows, the market share of new registrations of passenger cars with alternative fuels in the BSR countries reveals very different levels and trends among the countries. Some countries have succeeded in a steadily rising trend in the uptake while others have more fluctuations and a much lower vehicle uptake.

Poland, Estonia, Latvia and Lithuania stand out from the other countries in the region in terms of current uptake of vehicles. Estonia is at the same level as five years ago, indicating that the development of clean fuel policy and initiatives has stagnated in the country. Similar slow development trends can be seen for the other countries which have a remarkably low uptake of vehicles compared to the rest of BSR countries and other EU countries.

Sweden and Finland have the highest share of new registrations of alternative fuel vehicles, however for these countries it is worth noticing that the plug-in hybrids constitute most of the electric vehicles. It is also these two countries that have succeeded in the biggest increase during the five-year period.

The market share over time also reveals a potential correlation between the introduction and withdrawal of tax benefits and incentives. Some countries have significant fluctuations during the five-year period shown in figure 1. Changing, and unstable political direction over time influences in the uptake of vehicles on alternative fuels, and Denmark is a good example of this. Denmark have had a relatively small increase in the uptake of EV's during the last 4 years. The major incentive that has had a positive effect on Danish EV uptake is a partial exemption on registration fee for EV's. In the years up to 2015 there was a full exemption on registration fees for EV's in Denmark, and the sales of EV's increased significantly in 2015. In the end of 2015, however, the Danish parliament decided to phase out the full exemption for EV's and implement a plan that gradually normalised the level of registration fees between EV's and ICE cars. The result was that the sales of EV's fell drastically, and in 2018 the Danish government therefore decided to adjust the normalisation of registration fees for EV's to improve their market situation, see figure 1.

3. Level of ambition in BSR countries – clean fuel targets

Denmark



Policy framework
The new government have set up a goal of 70% CO ₂ emission reduction by 2030. Its package includes a ban on sales of new petrol and diesel cars from 2030 and support for electric vehicles
Clean fuel action plan(s)/targets
<p>Awaiting national strategies/plans for alternative fuels by the new government.</p> <p>Expecting a target of 500,000 green vehicles by 2030.</p> <p>No national investment plan for infrastructure for alternative fuels have ever been developed.</p> <p>No long-term framework conditions for alternative fuels</p>
Tax benefits and incentives
<p>Electric vehicles</p> <ul style="list-style-type: none"> Registration fees are differentiated based on fuel consumption and weight. BEVs pay a minimum amount and PHEVs pay less than an equivalent ICE car. The registration fee is currently maintained at 20 %, and the registration fee will be raised gradually until electric cars are fully covered by the tax in 2022. There is a tax deduction for small EV's that will counter the registration fee of small EV's in 2019 and 2020. Companies that supply EV charging can receive an electricity tax discount per kWh. Since 2016, a tax exemption for commercial charging, which in 2017 was extended to 2019. Exemption from electricity tax for electric car owners extended to 2021. Some municipalities offer free parking and free use of municipal chargers. Companies can be compensated for the tax on the electricity that is used for charging. BEV owners pay the lowest possible owner fee, while plug-in hybrid cars pay less in owner tax than a corresponding car with an internal combustion engine. In the period 2016-2019, a deduction of DKK 10,000 was given to the final tax for both EVs and plug-in hybrid cars. The grid connection fee is reduced by 50 % for installation of EV chargers compared to that of regular electrical installations. <p>Other:</p> <ul style="list-style-type: none"> Municipalities can differentiate the parking fee for green cars Reserved parking spots Bus lane use (a possibility for the municipality)
<p>Hydrogen fuel cell vehicles</p> <ul style="list-style-type: none"> Exception for registration fee until end of 2020, however the cars are taxed like any other car in the same price range
<p>Biogas and natural gas vehicles</p> <ul style="list-style-type: none"> No incentives

Sweden



Policy framework
<p>Sweden should be a climate neutral and fossil free country by 2045 – one of the first countries in the world</p> <p>Sweden should have a fossil independent vehicle fleet by 2030</p> <p>CO₂ emissions should be 70 % lower in 2030 compared to 2010</p>
Clean fuel action plan(s)/targets
<ul style="list-style-type: none"> Fossil Free Sweden – initiative from the government 2016. Partnership between public authorities and industry. A joint Declaration on actions etc.; roadmaps for different sectors including proposal regarding commitments and investments. All county administrations (21) have been given a mandatory task to before 31 December 2019 present a regional plan for infrastructure for renewable fuels and electric cars. These regional plans will be summarized on national level in 2020.
Tax benefits and incentives
<p>Electric vehicles</p> <ul style="list-style-type: none"> Bonus-malus system - offers electric car buyers a bonus of maximum €5550 (SEK 60.000). It ranges from SEK 60,000 for electric vehicles (BEV) with zero emission to plug-in hybrids (PHEV) with emission of 60g/km. Exemption from annual circulation tax for the first five years from registration 40% reduction is applied on company car taxation for electric cars and plug-in hybrids compared with the corresponding or comparable petrol or diesel car. Cheaper leasing of EVs for employees in a company. <p>Infrastructure:</p> <ul style="list-style-type: none"> Between 2018 and 2020, €8,7 million (SEK 90 million) will be annually allocated to support home chargers with up to 50 % or SEK 10.000 (€960) for hardware and installation costs.
<p>Hydrogen fuel cell vehicles</p> <ul style="list-style-type: none"> Bonus-malus system in place
<p>Biogas and natural gas vehicles</p> <ul style="list-style-type: none"> Bonus-malus system Biofuels for vehicles are exempted from energy and carbon dioxide tax until 2020

Germany



Policy framework
The government's strategy is to reduce CO ₂ emissions by at least 55 % in 2030 compared to the 1990 level
Clean fuel action plan(s)/targets
<ul style="list-style-type: none"> Goal of 1 million electric cars by 2020 and 10 million zero emission cars on the roads by 2030 1 million publicly available charging stations by 2030 Extent the current network of hydrogen stations to 400 stations by 2023 Establishment of LNG filling stations in a network with a max. distance of 400 km between the stations
Tax benefits and incentives
<p>Electric Vehicles</p> <ul style="list-style-type: none"> Purchase subsidies for BEV is €4,000 for private owners and €3,000 for business and PHEVs, for vehicles with a maximum price of €60,000 (between 2016-2019). This bonus will be increased and extended to 2025. BEVs under €40,000 will rise from 4,000 to €6,000, and bonus of €5,000 for cars over €40,000 EVs and PHEV exempt from the annual circulation tax until 2026 In 2016, a financial incentive for private PHEV owners was made. Owners that charge their vehicles at their employer premises could be exempted from declaring this perk as a cash benefit in their tax return. If an employer provide this perk, they can discount 25 % of from your income tax. (2017- 2020). Financial support programmes for trucks on alternatives fuels 2018-2020 <p>Infrastructure:</p> <ul style="list-style-type: none"> A public charging incentive program at around 300,000 euro (2017-2020) will be spend on approximately 10,000 regular charging points and 5,000 DC quick charging points. A possibility to get a €3,000 purchase subsidy for charging stations up to 22 kW. €12,000 subsidy for establishing a DC quick charger up to 100 kW and €30,000 subsidy for establishing a DC quick charger with the capacity above 100 kW. A connection to grid subsidy up to €5,000 for a low voltage charger and up to €50,000 subsidy for medium voltage. More support is also to be given to individuals installing private charging points. <p>Other:</p> <ul style="list-style-type: none"> Free parking, reserved parking spots and bus lane use
<p>Hydrogen fuel cell vehicles</p> <ul style="list-style-type: none"> Subsidy for the purchase of HFCVs Support programmes for infrastructure and hydrogen production 1st and 2nd phase 2006-2026
<p>Biogas and natural gas vehicles</p> <ul style="list-style-type: none"> Financial support to pilot projects in LNG since 2016 Regressive tax reduction for natural gas until 2026

Sources:

EAFO (2019) Germany. Accessed 27.10.2019 from <https://www.eafo.eu/countries/germany/1734/incentives>,

Scandria2Act Clean Fuel Deployment Strategy (2018)

German Government (2019) <https://www.bundesregierung.de/breg-en/news/bundesregierung-foedert-e-autos-1688910>

Policy framework
<p>In 2016, the government set goal a of 250,000 electric vehicles and 50,000 biogas vehicles on the road by 2030</p> <p>The entire car fleet should consist of near-zero emission vehicles by 2050</p> <p>By 2030 all new vehicles should be compatible with alternative fuels</p>
Clean fuel action plan(s)/targets
<ul style="list-style-type: none"> Goal of 25,000 publicly available charging points in 2030 20 hydrogen stations by 2030 (3 stations in 2019) Finland reached the goal of 50 natural gas and biogas stations in total by 2020.
Tax benefits and incentives
<p>Electric Vehicles</p> <ul style="list-style-type: none"> For the period 2018–2021, people who are either buying a new electric car or signing a long-term lease agreement for an electric car may receive a €2,000 purchase subsidy if the purchase price of the car is €50,000 or less. Annual vehicle tax beneficial for low emission cars since 2011. Electric vehicle buyers pay the minimum rate (5%) of the CO₂ based registration tax. <p>Infrastructure</p> <ul style="list-style-type: none"> 30-35% subsidy for operators installing smart public charging infrastructure in 2017-2019.
<p>Hydrogen fuel cell vehicles</p> <ul style="list-style-type: none"> Registration tax linked to vehicle-specific emissions of all types of passenger cars. Annual vehicle tax beneficial for low emission cars since 2011. Purchase subsidy of €2,000 if the car is €50,000 or less. Same subsidy as for BEVs
<p>Biogas and natural gas vehicles</p> <ul style="list-style-type: none"> €1,000 subsidy for converting an ICE car to a gas vehicle (2018-2021). No tax on natural gas or biogas.

Sources:

Scandria2Act Clean Fuel Deployment Strategy (2018)

EAFO (2019) Finland. Accessed 27.10.2019 from <https://www.eafo.eu/countries/finland/1732/incentives>

Poland



Policy framework
<p>“Energy Policy of Poland until 2040” is the main strategic document. A draft was made in 2018 and the document is still yet to be finally completed. The policy states an objective of reducing CO₂ emissions by 30% by 2030 (compared to 1990)</p>
Clean fuel action plan(s)/targets
<ul style="list-style-type: none"> Electromobility Development Plan (2018) states a target of 1 million EVs on the road by 2025. The Ministry’s target is 6,400 charging stations including 400 fast chargers by 2020. The network development plan does not provide specific target for the number of charging infrastructure after 2020.
Tax benefits and incentives
<p>Electric Vehicles</p> <ul style="list-style-type: none"> BEVs and plug-in electric vehicles are exempt for purchasing tax until the beginning of 2021. <p>Other</p> <ul style="list-style-type: none"> Access to bus lanes The cities can approve emission-free zones that will not be accessible to internal combustion engines.
<p>Hydrogen fuel cell vehicles</p> <ul style="list-style-type: none"> No special commitment to hydrogen The two first stations are planned to open in 2021
<p>Biogas and natural gas vehicles</p>

Sources:

Ministry of Energy (2018) Electromobility Development Plan in Poland

Ministry of Energy (2018) Energy Policy of Poland until 2040

Sipiński, Dominik and Bolesta, Krzysztof (2016) Silent revolution in electricity sector - Electromobility in Poland. Polityka Insight. Accessed 27.10.2019 from https://www.politykainsight.pl/multimedia/_resource/res/20123070

Udenrigsministeriet, Danmark (2017) One million electric vehicles in Poland by 2025. Accessed 27.01.2019 from <https://polen.um.dk/da/nyheder/newsdisplaypage/?newsid=65057e7d-4582-4037-a998-dd93f5a9b367>

EAFO (2019) Poland. Accessed 27.10.2019 from <https://www.eafo.eu/countries/poland/1748/incentives>

h2stations.org. Accessed 27.10.2019 from <https://www.netinform.net/h2/h2stations/h2stations.aspx>

Latvia



Policy framework
<p>The “Alternative Fuels Development Plan 2017-2020” will determine the further direction.</p> <p>Absence of a national policy plan on the development of CNG, LNG, and hydrogen as types of alternative fuels in transport.</p>
Clean fuel action plan(s)/targets
<ul style="list-style-type: none"> National network of fast charging infrastructure developed between 2014-2016. (State policy ensuring an early focus on establishing national charging infrastructure) By 2021 it is planned to establish 150 fast charging (at least 50 kW) stations throughout Latvia. Most recent plans aim at establishing a Latvian national network of 235 electric charging stations. Target of 5 CNG refueling points accessible to the public by 2020 The local government of Riga has joined the European Association for Hydrogen and fuel cells and Electro-mobility (HyER) and is participating in several international projects
Tax benefits and incentives
<p>Electric vehicles</p> <ul style="list-style-type: none"> Pure electric vehicles pay the lowest fee for technical annual inspections and the lowest amount for the company car tax (€10) Vehicle ownership tax is not charged, exemption for cars emitting 50g CO₂/km or less. The first-time registration is free of charge. The first set of special and visually different license plates is free of charge. EV has a reduced company car tax rate - €10.00 per month <p>Other</p> <ul style="list-style-type: none"> It is allowed to use public transport lanes for driving. Free parking in some of the main cities
<p>Hydrogen fuel cell vehicles</p> <ul style="list-style-type: none"> No incentives. Until 2017 hydrogen as a fuel for transport has not been considered, but according to the plan, hydrogen is seen as a great potential in the future development and plan on alternative fuels in Latvia.
<p>Biogas and natural gas</p> <ul style="list-style-type: none"> No incentives and lack of national strategies. At the moment one publicly available CNG/LNG refueling station in Latvia.

Sources:

EFAO (2019) Latvia. Accessed 27.10.2019 from <https://www.eafo.eu/countries/latvia/1741/incentives>

Elektrum (2019) Electric car. Accessed 27.10.2019 from <https://www.elektrum.lv/en/for-home/energy-efficiency/electric-car>

Cabinet of Ministers Latvia (2017) Alternative Fuels Development Plan 2017-2020

Estonia



Policy framework
<p>The Estonian national energy and climate plan (NECP 2030) set up a target - to reduce the emission of GHG by 80% by 2050 in comparison with the emission levels of 1990.</p> <p>Target of 14% share of renewable fuels for transport by 2030, to be achieved through investments in liquid biofuels, bio-methane and electricity.</p>
Clean fuel action plan(s)/targets
<ul style="list-style-type: none"> Already in 2011 Estonia launched a nationwide e-mobility program and developed a nationwide DC charging network to promote the use of electric vehicles (167 DC chargers). 200 in total will be installed along all primary and secondary roads at 40–60 km interval. No documents in English contain any future estimates for alternative fuels infrastructure or number of vehicles.
Tax benefits and incentives
<ul style="list-style-type: none"> No grants towards the purchase of plug-in or electric vehicles as of 2016. Electric vehicles are exempt from the city public parking fees and can use bus lanes.
Hydrogen fuel cell vehicles
Biogas and natural gas

Sources:

ELMO (2019) Estonian Electromobility Program; ELMO Program, Ministry of Economic Affairs and Communications: Accessed 27.10.2019 from <http://elmo.ee/charging-network/>

EAFO (2019) Estonia. Accessed 27.10.2019 from <https://www.eafo.eu/countries/estonia/1731/incentives>

Estonia's Communication to the European Commission (2018) Estonian national energy and climate plan (NECP 2030) https://ec.europa.eu/energy/sites/ener/files/documents/ec_courtesy_translation_ee_necp.pdf

ACEA (2019) Electric Vehicles: Tax benefits & incentives in the EU https://www.acea.be/uploads/publications/Electric_vehiclesTax_benefits_incentives_in_the_EU-2019.pdf

Lithuania



Policy framework
40% reduction of GHG by 2030 and 80% reduction by 2050 below 1990 level.
Clean fuel action plan(s)/targets
<p>By 2020, all registered electric vehicles in Lithuania should make 5% of all new cars sold per year, and 10 % by 2025. This includes:</p> <ul style="list-style-type: none"> - to expand the network of electric vehicle charging stations by 19 in 2017 and by 28 in 2020. - to install at least 100 public charging points in cities and suburban agglomerations of Lithuania with more than 25 thousand inhabitants of the population by the end of 2020. - about 300 public charging points are planned to be installed after 2020. <p>Plans for Installation of liquefied natural gas refueling points on motor roads is targeted for 2025</p> <p>No focus on hydrogen for transport</p>
Tax benefits and incentives
<p>Electric vehicles</p> <ul style="list-style-type: none"> • Reduced parking fees in major cities • Bus lane use in Vilnius
Hydrogen fuel cell vehicles
Biogas and natural gas

Sources:

ACEA (2019) Electric Vehicles: Tax benefits & incentives in the EU
https://www.acea.be/uploads/publications/Electric_vehiclesTax_benefits_incentives_in_the_EU-2019.pdf

Ministry of Energy and Ministry of Environment, Lithuania (2018) Accessed 28.10.2019 from
https://ec.europa.eu/energy/sites/ener/files/documents/lithuania_draftnecp_en.pdf

Ministry of Environment of the Republic of Lithuania and the Lithuanian Environmental Protection Agency (2019) Accessed 28.10.2019 from
<https://am.lrv.lt/uploads/am/documents/files/KLIMATO%20KAITA/Studijos%2C%20metodin%C4%97%20med%C5%BEiaga/LT%20PaMs%20and%20projections%20report%202019%20%E2%80%93%20kopija.pdf>

EAFO (2019) Lithuania. Accessed 27.10.2019 from <https://www.eafo.eu/countries/lithuania/1742/incentives>

4. Development of clean fuel refueling and charging infrastructure and vehicles in BSR countries

In the following chapter the development of infrastructure and vehicles will be reviewed by comparing two years of the development in all BSR countries. However, in some cases no or inadequate data was available. In these cases, the field is marked blank.

Infrastructure

Electricity

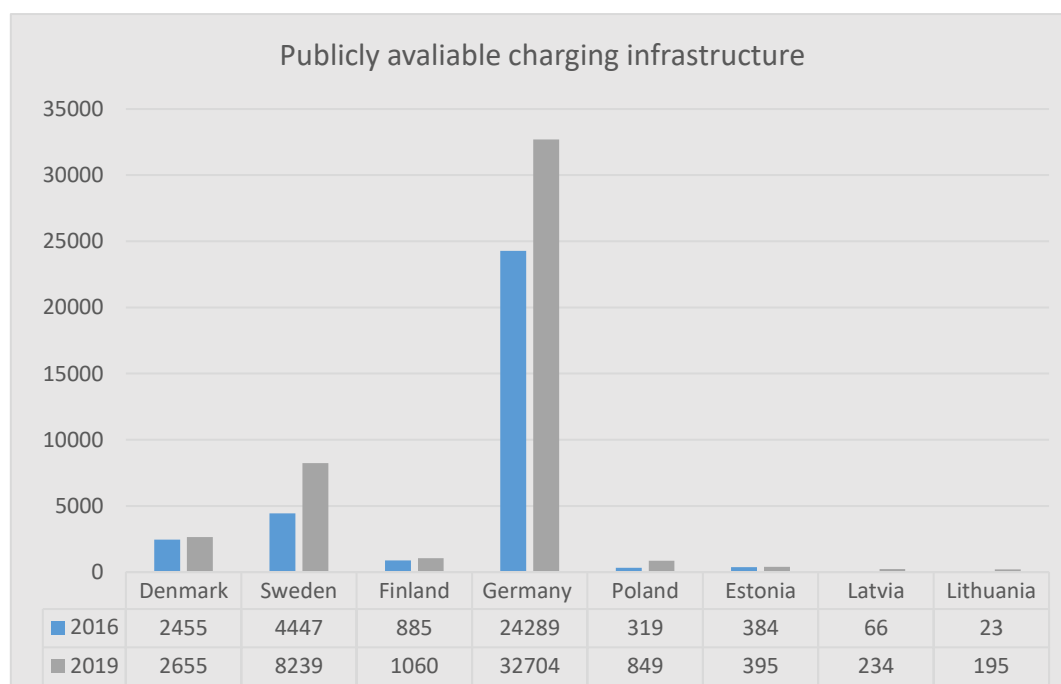


Figure 3 Publicly available charging points in the Baltic Sea Region covering normal and fast public charging points in 2016 and 2019. Source: [EAFO]

The level of charging infrastructure deployment varies in the different countries. The primary development of charging infrastructure in Denmark occurred before 2016, and the need for additional charging infrastructure was low due to the relatively low number of electric cars on the roads, which explains the small increase. In Sweden, we see an almost doubling of the number of public charging points. Finland has a goal of 25,000 public charging stations by 2030, and with approximately 1000 stations at the moment, suggesting that development should be accelerated if this goal is to be met. The number of charging stations in Germany has increased by approximately 8,500 during the past three years, which immediately seems like a lot compared to the other countries. However, Germany has a goal of 1,000,000 public charging points by 2030, one charging point for every ten vehicles, which suggests that also Germany, should accelerate the deployment within the near future in order to reach the national goals.

The numbers in figure 3 indicate that the development in Estonia has stopped or moving slowly. Poland, Latvia and Lithuania have the highest percentage increase in the number of charging stations among all

countries. However, when looking at all BSR countries, the numbers indicate that Estonia, Latvia, Lithuania and Poland are at an earlier stage of development and or that development in overall not is progressing very fast. Poland however, stands out with relatively ambitious goals of 6,400 public charging stations in 2025. The latest tripling of charging stations over the past three years indicates that in Poland there is a development underway that has not been seen so far in the North Sea Baltic Corridor.

In general, all countries must reinforce their efforts to ensure a sufficient number of publicly accessible charging stations.

Hydrogen

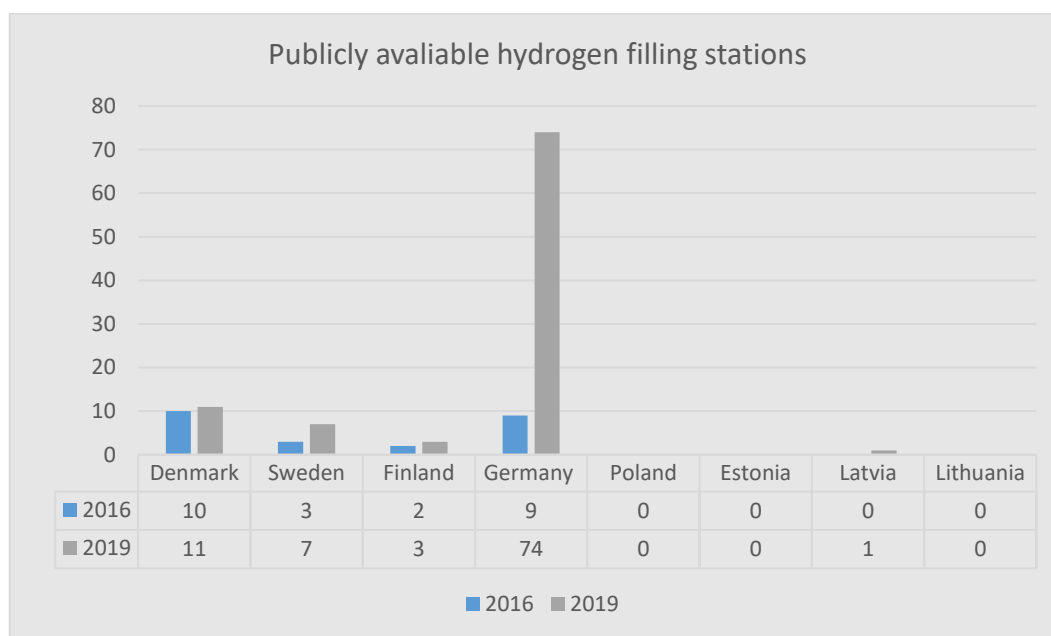


Figure 4 Publicly available hydrogen refueling stations in the Baltic Sea Region in 2016 and 2019. Source: [\[https://www.netinform.net/h2/h2stations/h2stations.aspx?Continent=EU\]](https://www.netinform.net/h2/h2stations/h2stations.aspx?Continent=EU)

Especially in Germany there is an increase in the establishment of infrastructure for hydrogen. Since 2016, there has been a significant political focus and an increase from 9 to the end of 2019 to have an estimated number of about 100 filling stations distributed throughout Germany, with plan of extent the current network to 400 stations by 2023. In Germany, hydrogen has been a political priority and several large hydrogen infrastructure projects have received financial support.

In Sweden the number of hydrogen filling stations have increased from 3 to 7 stations, while Finland and Latvia have insignificant increases, although Finland plans to have 20 filling stations by 2030. The number of hydrogen stations in Denmark is relatively high compared to the size of the country and the other BSR countries, however, the number of stations is almost the same due to lack of political focus.

There is no special commitment to hydrogen in Poland, Latvia, Estonia or Lithuania. Until 2017/2018 no focus at all in these countries, however, several plans and statements indicate that hydrogen now is starting to be recognized as a great potential for future development of alternative fuels in this geography.

Biomethane and natural gas

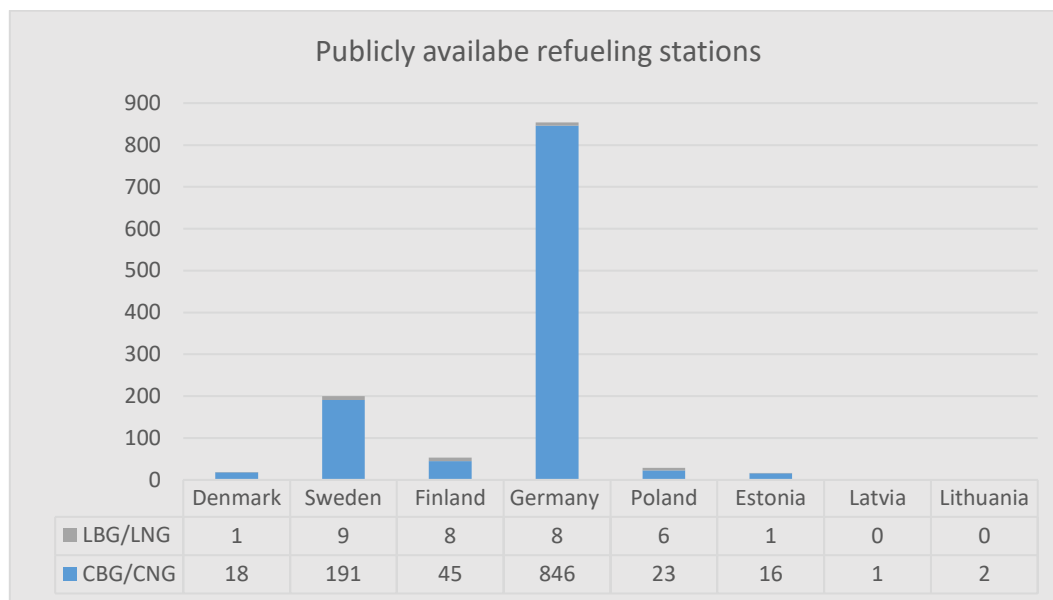


Figure 5 Publicly available CBG/CNG and LBG/LNG refueling stations in the Baltic Sea Region in 2019.
Source: [NGVA Europe, <https://www.ngva.eu/stations-map/>]

The proportion of filling stations is primarily concentrated in Germany, but also Sweden and partly Finland has a relatively high number of stations. These three countries also have financial incentives for hydrogen, natural gas and biogas in place. Latvia plans to establish five refueling stations by 2020 and Lithuania plans to install refueling points along the motor ways, meeting the minimal requirements of the AFI Directive.

Vehicles

Battery Electric Vehicles (BEVs) and Plug-in Hybrid Electric Vehicles (PHEVs)

Until now the development has been relatively slow. A recent study shows that all EU members states' National Policy Frameworks (NPF) combined will lead to only 1.2 % EVs of the total passenger vehicle fleet in the EU by 2020 (Thiel et al. 2019). The following diagram and table show the status and development in electric vehicles including battery electric and plug-in hybrids. In all BSR countries the number of electric vehicles has increased, however there are big differences among the countries in how large an increase. Especially Sweden, Germany and Poland have experienced the largest relative increase in passenger vehicles the past three to four years. Common for Denmark, Finland, Estonia, Latvia and Lithuania is that the development of EVs has been very slow during the past 4 years.

Poland has an ambitious goal of 1,000,000 EVs by 2025 and as of 2019 there are approximately 8,000 vehicles. Germany has a target of 1,000,000 electric vehicles by 2020, and 10,000,000 in 2030. This means that in order to reach the goals the number of vehicles needs to accelerate and increase far more than it has done the past four years. Denmark has an expected target of 500,000 green cars by 2030, and looking at the numbers of vehicles, new impactful support measures and financial framework needs to be put in place to reach the ambitions. Finland has a target of 250,000 electric vehicles by 2030, and the current level of vehicles according to European Alternative Fuels Observatory (EAFO) is around 16,000 vehicles including BEVs and PHEVs.

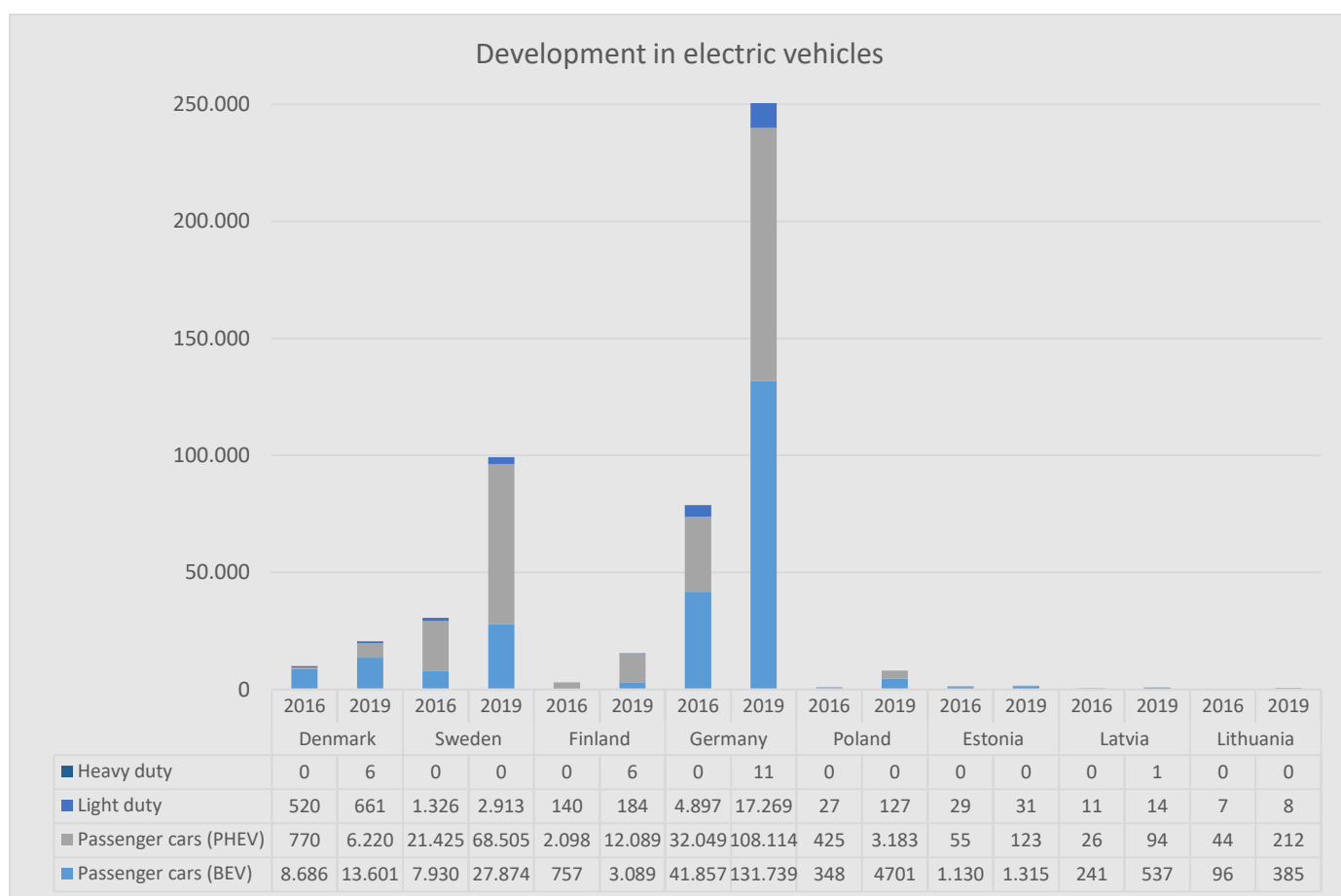


Figure 6 BEV passenger cars, light duty and heavy-duty vehicles in the Baltic Sea Region by country in 2016 and 2019 including both electric and plug-in hybrids. Source [EAFO]

Fuel Cell Electric Vehicles (FCEVs)

The numbers of FCEVs are still at a very low level and has increased inconsiderable little since 2016.

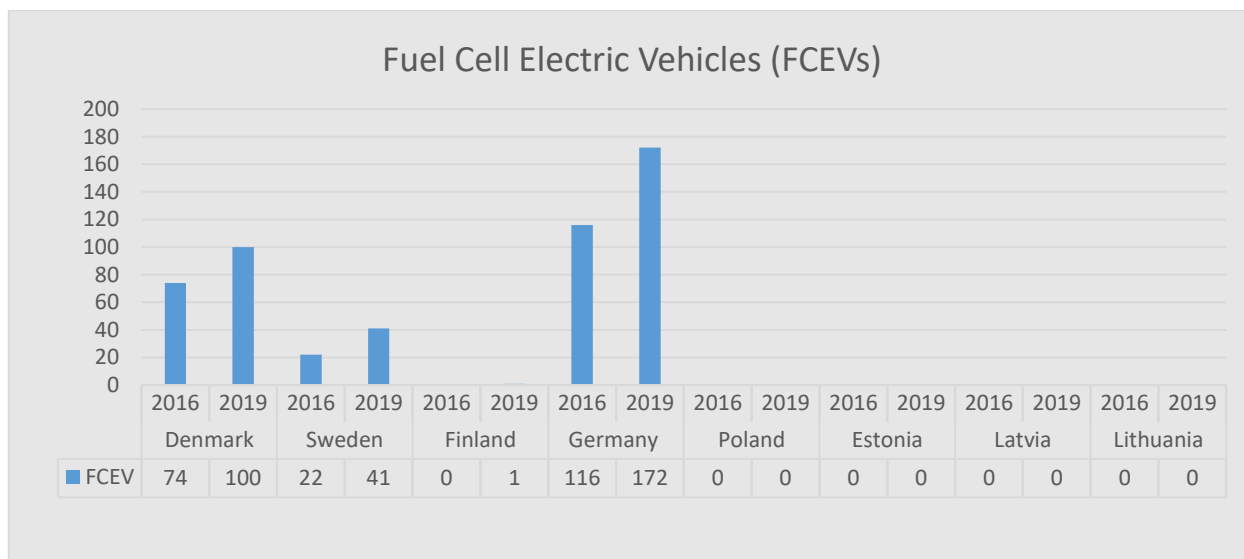


Figure 7 Number of FCEVs in each BSR country in 2016 and 2019. Source [EAFO]

CBG, CNG, LBG and LNG Vehicles

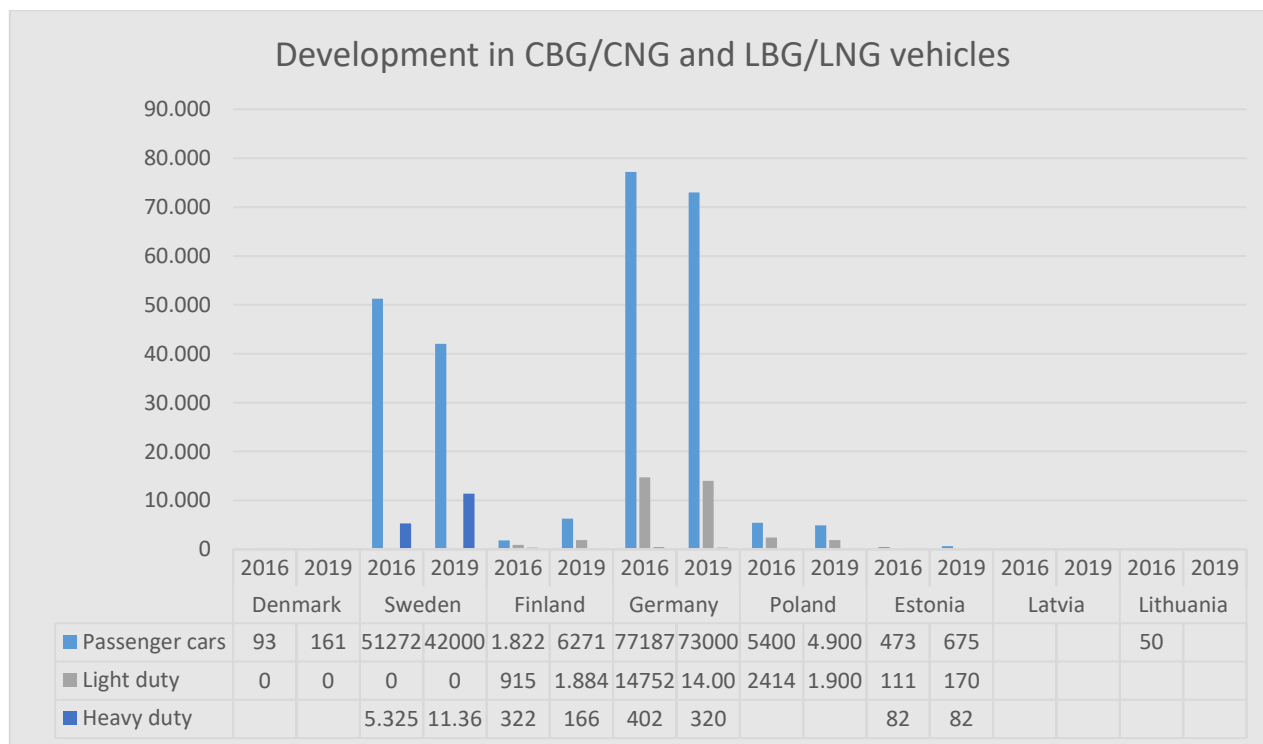


Figure 8 Number of vehicles driving on bio fuels and natural gas in 2016 and 2019. Empty spaces indicate a lack of available data in this. [Source: EAFO]

Summarizing the status of development in the BSR countries

When reviewing the policy frameworks, clean fuel targets, action plans and the development of clean fuels in the past 3-4 years, it is clear that there are major differences in the stage of development and in the establishment of the supporting mechanisms that may help to support the clean fuel development. Some countries have started the transition to electrification of the transport remarkably early (Latvia and Estonia), as some of the first in the world to install a nationwide charging network for EVs. A development that seems to have been severely decelerated, as the development in policy measures, incentives and actual vehicles on the roads did not follow the investments in infrastructure.

Only few countries including Finland, Germany and partly Sweden seems to prioritize or at least support all types of alternative fuels mentioned in the AFI Directive, and especially differences between the different corridors are evident.

The level of ambitions in the national strategies towards clean fuel deployment differs among the countries and the coherence between the national policy frameworks is low. Some countries' efforts reflect an ambition to simply live up to the minimum requirements of the AFI Directive, which is not enough if the EU is to live up to its part of the Paris Agreement, while others have plans of higher ratios of public infrastructure than required by the AFI Directive.

From a BSR perspective, the main challenges are:

- Different ambitions in targets and goals across countries and corridors
- Some countries do not have tax benefits or incentives for alternative fuels in place
- Lack of concrete targets for infrastructure and vehicles for alternative fuels for transport
- Many countries are characterized by short-term plans and incentives.

5. Regulatory framework conditions – overview and assessment

This chapter gives an overview and assessment of politics for Clean Fuel Deployment in the different countries in BSR. It is based on the GREAT Road Map¹ and the in dept analysis done and presented in the report Scandria2Act Clean Fuel Deployment Strategy². For the countries that are not involved in the ScanMed corridor and by that not covered by these two projects and reports some general comments and reflections are added here already in chapter 2 and 3. One important remark is that Poland and the Baltic states are countries with weaker economy and until recently a much less developed transport infrastructure. That explains to some extent why they are still lagging behind even if they have started a development including the deployment of clean fuels.

Efficient instruments should substantially contribute towards reducing GHG emissions. Accordingly, the higher the proven or expected GHG reduction of an instrument are, the more the instrument can be assessed as being effective. In order to rate an instrument not only as effective, but also efficient, the cost of such an instrument must be considered. Thus, particularly efficient instruments have low costs in relation to the size of their impact on GHG emission reduction. This does not mean that the actions for Clean Fuel Deployment will be cheap. A lot of investments will be needed, and they should strive to get as much “bang for the buck” as possible.

Perhaps this sounds easy, but it is not. A correct assessment of an instrument’s effectiveness turns out to be challenging. Environmental or market trends are never monocausal and it is thus hard to argue that only the application of an instrument led to a certain development. Therefore, an assessment can only approximate the instrument’s actual impact. Besides internal factors as other policies (taxes, subsidies) external factors like oil/gas prices and technological innovations can also influence GHG emission and market developments.

In the *Scandria2Act Clean Fuel Deployment Strategy*, analysis and assessment aims to give an overview of the most powerful actions to support clean fuel deployment in the Scandria countries which are Germany, Denmark, Sweden, Finland and Norway. The selected instruments are part of a broader policy designed to increase the uptake of alternative fuels and ultimately reduce harmful emissions. They are assessed by the means of the following four criteria: cost, effect, acceptance and time to point out their advantages and disadvantages. Thus, by comparing political efforts in different countries in relation to their success, it is possible to estimate their initial transferability to other regions or countries.

The result of the assessment of selected instruments on national and regional level can be found in the report mentioned above. Here only the key messages are stressed:

Key messages from national instrument assessment

- All Scandria countries have purchase incentives for electric vehicles, either in form of direct subsidies or registration tax rebates. These instruments are usually effective, proportional to the amount of the financial incentive. Further differences between countries arise from the fact that some instruments have been suspended on short notice due to depletion of funding, creating uncertainty for potential buyers.
- A similar picture arises for vehicle ownership taxes. All countries surveyed have rebates for electric vehicles. Overall, they are less effective than financial incentives at the time of purchase, as they are smaller in size and accrue only over a time horizon of several years.

¹ GREAT Road Map report on Policy measures (2018)

² Scandria2Act Clean Fuel Deployment Strategy (2018)

- Most national governments offer matching funding for private in publicly accessible EV charging infrastructure, and public chargers do not directly link to increased adoption of electrical vehicles.
- The effect of other instruments, such as parking privileges, is highly dependent on the local circumstances and the resulting financial benefit. Mostly these instruments enhance clean fuel deployment in the early market phase but are seldom a main argument for investments in clean vehicles.
- For FCEVs, the same conditions as for EVs usually apply. As the fuel cell technology is still more expensive, and thus further from the mass market, these incentives have only little effect.
- Nationally implemented measures for CNG in transportation vary widely between countries. Sweden and Germany are the only countries with a strong record of effective CNG policy. Other countries, such as Norway, have only weak measures in place.

Key messages from regional instrument assessment

- Regional initiatives and actions can highly influence and promote clean fuels deployment today, especially when their actions affect many private and commercial users (such as commuters or logistics providers)
- Today most regional actions accompany national instruments. They usually reinforce national financial support. Because the success of regional actions also depends on the market conditions and clean fuel vehicle range, political actions in dense settled regions and communities can be a starting point for national actions.
- For EVs, there are several cases in the Northern Scandria region where local initiatives provided strong and effective incentives, e.g. in Oslo/Akershus and Copenhagen. Their implementation can be swifter than some national measures, and better targeted to the specific mobility requirements of the population. Several measures, such as designated parking areas for electric vehicles, are comparatively inexpensive to execute.
- Regional measures seem better suited for promoting hydrogen than national ones in the current market situation. This is because, besides direct financial incentives, filling infrastructure needs to be considered and vehicle availability remains limited.
- While CNG is the most competitive alternative fuel, regional public procurement and other initiatives could be an efficient instrument to quickly reduce emissions with a comparatively mature technology.

While the project Scandria 2Act has made a Clean Fuel Deployment Strategy based on existing policies and political goals in the different countries and an assessment of available instruments and measures the other big CEF funded project GREAT (Green REgions with Alternative fuels for Transport), has chosen an alternative approach – to create a road map.

The GREAT road map is based on a vision and decided goal for 2030 and then by backcasting identified necessary measures within 5 innovation domains: infrastructure adaption, regulations, taxes & subsidies, knowledge sharing & pilot projects and procurement. Moreover, the GREAT project describes how the identified effective measures could evolve in 2020, 2025 and 2030.

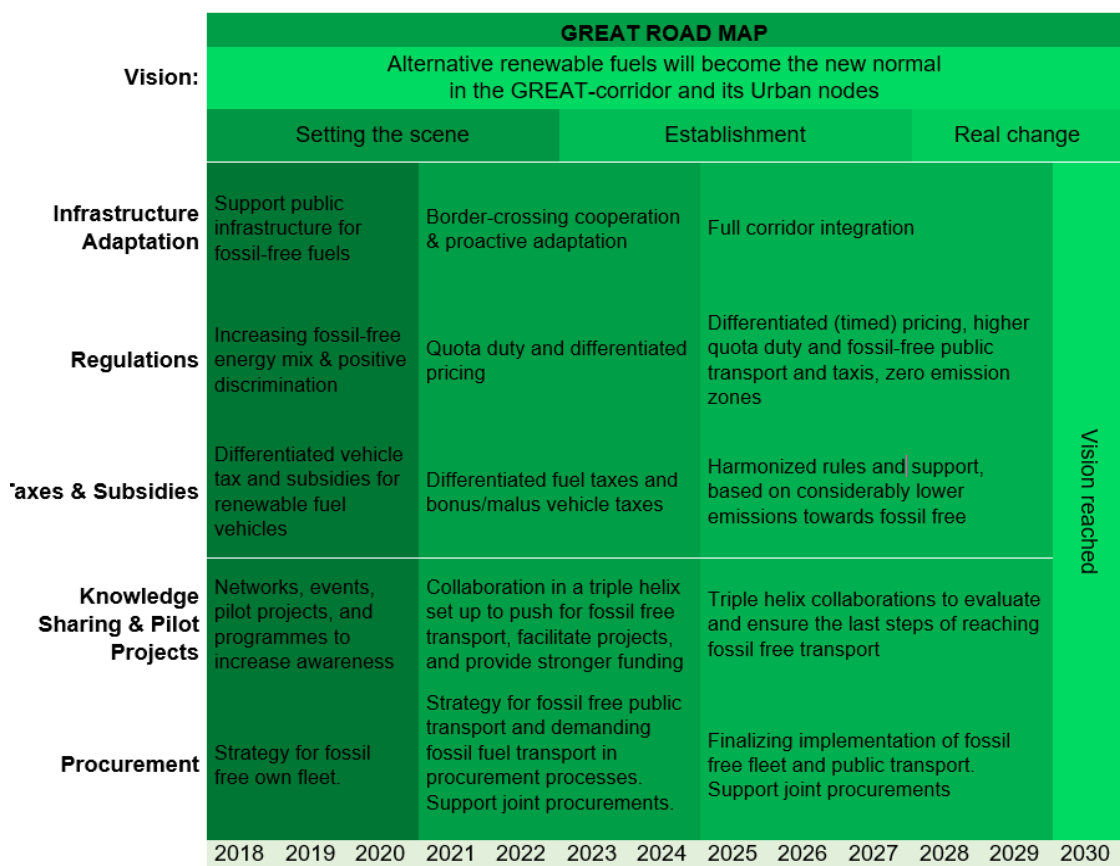


Figure 9 GREAT Roadmap. Innovation domains and evolvement of policy measures towards 2030.

The public partners are recommended to use this road map as a guide of actions to implement in the future to reach the GREAT vision by 2030: “Alternative renewable fuels will become the new normal in the GREAT-corridor and its Urban nodes”. In the areas of Infrastructure Adaptation, Regulations, Knowledge Sharing & Pilot projects, and Procurement, the public partners have the ability to take action and drive progress directly. Furthermore, they have the capability of becoming role models within the areas of Procurement and Knowledge Sharing & Pilot Projects.

The top policy measures from the perspective of the public partners which have been considered extra efficient and selected based on their highly transferable character are:

- Transition of public authorities’ fleets
- Establish programmes
- Funding and subsidies

To summarize, this chapter is of great value for stakeholders also in other countries that have not been involved in Scandria 2Act or GREAT to study the reports and recommendations. The findings and messages will also be used as a background for discussions among stakeholders in the planned workshops within the BSR Access project in order to support dissemination of knowledge and experiences within all the Baltic Sea Region countries.

6. Corridor perspective

Infrastructure for border-crossing access to clean fuels including payment services (roaming) is a necessity. In the *CNC Coordinator Issues Papers (2016)*³ there is one chapter titled “Boosting new technologies and innovation” written by Catherine Trautmann, coordinator for the North Sea – Baltic corridor.

The Clean Power for Transport Package launched by the Commission in January 2013 lays out a comprehensive alternative fuel’s strategy for the long-term substitution of oil as energy source for transport, for all transport modes.

The main tool to achieve the strategy above is Directive 2014/94/EU of the European Parliament and of the Council of 22 October 2014 on the deployment of alternative fuels infrastructure. It sets out minimum requirements for the building-up of alternative fuels infrastructure (for electric and natural gas) and pursues several interlinked objectives:

- to break the "hen or egg" problem that there are no alternative fuel vehicles because there is no infrastructure and vice versa;
- to make sure that common technical standards are being developed;
- and to make certain that EU-wide mobility with alternative fuel vehicles is possible.

The importance of the core network corridors as forerunner also in the context of clean fuel deployment is underlined. With the AFI Directive as the starting point the shared responsibility for EU and the member states is stressed.

This chapter of the coordinators Issues Papers concludes with the following recommendations:

Recommendations on alternative fuels issues

- An ex-post evaluation of CEF-funded projects in relation to the deployment of alternative fuels infrastructure (and hence in support to MS to implement the Directive 2014/94/EU) should be performed. This assessment should be comprehensive - assess the impact of the EU financial support to projects dealing with alternative fuels infrastructure irrespective whether they concern nodes, long distance, core or comprehensive networks, cohesion or general envelope.
- The deployment of alternative fuels infrastructure in line with vehicle/vessel technology maturity & cost and in line/in support of EU legislation should be fostered.
- A reflection should be undertaken on prioritization and extra tools/incentives needed.
- The funding for projects on alternative fuels infrastructure deployment for road and Inland Waterways (as for LNG under Motorways of the Sea) should be streamlined.

³ CNC Coordinators Issues Papers (2016)

- Interoperable solutions along the corridors (beyond the already mandated standards for the connectors; i.e. interoperability for payment and use) should be promoted.

With this background it is interesting to look at the actual status for the Baltic Sea Region which comprises two corridors, the ScanMed and the North Sea – Baltic corridors.

ScanMed:

Both Scandria2Act and the GREAT project have had a clear corridor perspective in their project activities. For GREAT not only to identify and propose instruments that can be implemented and developed by countries along the corridor but also by investment and establishment of border-crossing fast charging infrastructure.

Scandria2Act has in their Clean Fuel Deployment Strategy given the following recommendations:

Scandria corridor recommendations

The study analysis shows that Clean Fuel Deployment in the Scandria corridor to date has not been on the same level with regard to infrastructure and vehicles. This is due to political and economic reasons as well as country specifics. In comparison to the past, the technological development of clean vehicles has made considerable progress. However, the challenges, are still big. Deeper cooperation and concerted actions between communities and country representatives in the corridor are therefore highly recommended. The following actions could be game changers and catalysts to accelerate clean fuel deployment.

- Intensive discussion between the most important communities along the Scandria corridor regarding clean transport actions
- Development of a common Scandria corridor clean fuel vision with clean fuel deployment goals. It could be complemented by a common roadmap for clean fuel deployment with concerted actions, including awareness campaigns, in the coming years.
- Collective lobbying for ambitious goals to integrate the external costs of GHG emission into road toll charging – especially with regard to the directive on the charging of heavy goods vehicles for use of certain infrastructures.
- Cooperation on using a common road toll system in future that is also GHG emission-based.
- Because road freight transport requires an international perspective, collective analysis of heavy-duty vehicle transport flows in the Scandria corridor could be valuable in supporting international infrastructure deployment (at strategically important sites)
- Public support for multi-fuel stations at strategically important sites along the Scandria corridor, as well as common standards for these multi-fuel stations, could stimulate future investments by energy providers
- Closer cooperation and support of cross-border pilot projects could help raise awareness of clean transport for market players in freight movement and private transport.
- Even with a rapid market uptake of electrified vehicles, there will probably be a huge demand for liquid and gasified fuels in 2030 and thereafter. So, all countries and communities in the corridor should lobby for instruments and projects to increase the amount of sustainable renewable fuels especially e-fuels, on the EU and national level. Approaches include the national implementation of RED II, extra feed-in guarantees for e-fuels or increasing CO₂ prices for fuels.⁴

⁴ Scandria2Act Clean Fuel Deployment Strategy (2018) p. 52-53

After the finalization of the two projects the work will continue for some partners within this project BSR Access and for some partners in Scandria Alliance or/and the STRING Network to promote and support a strong development along this corridor based on action plans for 2030 and beyond. That means that the corridor recommendations above will – or could – be implemented in the ScanMed corridor and also in the STRING corridor. And if not all of them will be implemented they will at least be taken into account by different stakeholders along the corridor.

North Sea – Baltic:

Within the North Sea – Baltic corridor the situation is completely different. The conditions when talking about existing transport infrastructure vary very much. If you travel from west to east, you will start in Amsterdam. Through the Netherlands and Germany, the standard of the road network is very high and when passing the border to Poland, the picture changes immediately. The lower road standard will follow you when passing Lithuania, Latvia and Estonia. Finally, when reaching Finland, the standard will become high again. Lot of investments are already done aiming to levelling. But for investments in infrastructure for clean fuels these historical differences are hindering. No corridor-based initiative so far has been taken. Here it is a concrete proposal made by coordinator Trautmann in the Issues Paper where she states that pilots and studies for the deployment of alternative fuels infrastructure on the TEN-T are crucial:

“Pilot projects should demonstrate business cases, clearly address consumers’ need and solve the “chicken and hen” dilemma.

As an example of a pilot project, the Rapid Charge Network project, co-financed by the TEN-T funds, successfully deployed 74 rapid charge points in 64 locations along the TEN-T route in the UK. Realising a similar project involving one or more alternative fuel infrastructure along the whole TEN-T Corridor could potentially bring numerous benefits and is therefore worth considering. The North Sea-Baltic Corridor, due to its localisation (connecting countries that are more advanced when it comes to alternative fuels with those that are less developed in that regard) and massive flows of passengers and freight, could be a proper place for such a project. In this context the role of TEN-T Coordinators is crucial as a catalyst for deployment of innovative alternative fuel solutions along the Corridors”

Again, when comparing these two corridors there is a lot to learn. About the impact of big economic and other differences between the countries. And it may be a basement for proposal on new initiative within the Baltic Sea Region arguing not only on CO₂ reduction but also cohesion.

7. Market situation and development

Analyses of the alternative vehicle, the clean fuel markets and the instruments to develop the markets, reveal large differences between the countries in the Baltic Sea Region. And by that also along the corridors, e.g. the ScanMed corridor and the North Sea – Baltic corridor.

Regarding the availability of alternative vehicles, vehicle costs and costs of infrastructure the countries have nearly the same framework conditions today. What makes the difference are the political actions and political frameworks with greater or less ambition to drive or stimulate the market. As a result of the political actions in the past the countries have different level of vehicle and infrastructure penetration today. Furthermore, there are not only differences between the countries but also between different alternative fuels in each country. And to conclude – the entire EU shows the same picture.

Examples in Denmark and Norway show how important it is to have a long-term policy oriented to market success rather than short-term political or financial constraints. The effectiveness of instruments broadly depends on their ability to bridge the gap between conventionally fueled vehicles and those using alternative fuels. Therefore, it is important to introduce measures that make it more attractive to invest in clean fuel vehicles according to the polluter pays principle, e.g. bonus-malus systems. It also seems to be important to have technology neutral policies and by that support all clean fuel technologies, even as there is no “ideal” technology available but rather technologies that have “use-specific” advantages. This is especially important in an international context, as it is necessary to avoid a situation where a certain technology is limited to only some of the countries and by that will become a barrier for border-crossing transports and travel. Lack of common technical systems or different technical standards can be major limitation to clean fuel deployment.

The interplay between public (governments, regions) and private actors will be crucial to stimulate and support the growing interest from consumers and users. The market is still immature but rather fast growing in most countries, especially for electrical cars including infrastructure for charging.

In the Scandria 2Act Clean Fuel Development Strategy there is a catalogue of strategic measures which are recommended. Even if, as is said, no specific recommendation fit all countries. And it is stressed that “market supporting mechanisms should stimulate the market in order to allow a market-driven achievement of goals. However, especially in imperfect markets, regulatory instruments are necessary to guarantee GHG emission reduction and technology development.”

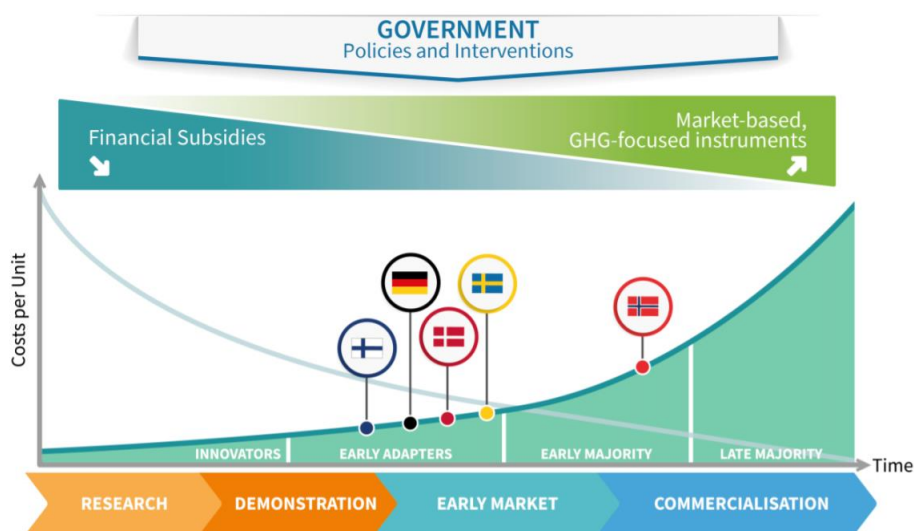


Figure 10 Current market stage of alternative vehicles in the Scandria countries. Source [Scandria2Act Clean Fuel Deployment Strategy (2018) p. 48.]

The market is growing, and a lot of interesting initiatives and actions come from the industry and companies.

One of the most interesting initiatives is coming from IONITY⁵. IONITY is based in Munich and was founded in 2017. It is a joint venture of the BMW Group, Daimler, Ford and the Volkswagen Group incl. Porsche. The goal of the joint venture is to build an extensive and reliable 350 kW High-Power-Charging network (HPC) for electric vehicles in Europe to make comfortable long-distance EV travel a reality. IONITY is currently establishing at around 400 locations throughout Europe by 2020. IONITY’s HPC Chargers are compatible with any current and future electric and hybrid vehicle equipped with the CCS (Combined Charging System) plug.

⁵ www.ionity.eu

IONITY is building 80 high power charging stations in Germany with each station equipped with up to six chargers offering a charging capacity of up to 350 kW per charger. IOINTY is an example of a system enabling clean fuel transport across national borders. The importance of building a coherent infrastructure for alternative fuels and not be underestimated. In a globalised world, the scope must be greater than covering national or regional interests. Cross-border limitations on the availability of alternative fuels cannot be a threshold when choosing to buy an alternative fuel vehicle. It is therefore essential to continue to have cross border cooperation/projects, have a technology neutral – multi fuel perspective and support roaming with smooth payment solutions across borders and operators. The market will play a crucial active and progressive role, in collaboration with public actors to drive the development at an unprecedented pace.

8. References

European Commission (2016) Issues papers of European Coordinators. TEN-T Corridors: *Forerunners of a forward-looking European Transport System*

ACEA (2019) Electric Vehicles: Tax benefits & incentives in the EU. Accessed 28.10.2019 from https://www.acea.be/uploads/publications/Electric_vehiclesTax_benefits_incentives_in_the_EU-2019.pdf

Cabinet of Ministers, Latvia (2017) *Alternative Fuels Development Plan 2017-2020*

DENA, Deutsche Energie-Agentur. (2018) *Scandria2Act Clean fuel Deployment Strategy*

EAFO (2019) Denmark. Accessed 27.10.2019 from <https://www.eafo.eu/countries/denmark/1730/summary>

EAFO (2019) Estonia. Accessed 27.10.2019 from <https://www.eafo.eu/countries/estonia/1731/summary>

EAFO (2019) Finland. Accessed 27.10.2019 from <https://www.eafo.eu/countries/finland/1732/summary>

EAFO (2019) Germany. Accessed 27.10.2019 from <https://www.eafo.eu/countries/germany/1734/summary>

EAFO (2019) Latvia. Accessed 27.10.2019 from <https://www.eafo.eu/countries/latvia/1741/summary>

EAFO (2019) Lithuania. Accessed 27.10.2019 from <https://www.eafo.eu/countries/lithuania/1742/summary>

EAFO (2019) Poland. Accessed 27.10.2019 from <https://www.eafo.eu/countries/poland/1748/summary>

EAFO (2019) Sweden. Accessed 27.10.2019 from <https://www.eafo.eu/countries/sweden/1755/summary>

Elektrum (2019) *Electric car*. Accessed 27.10.2019 from <https://www.elektrum.lv/en/for-home/energy-efficiency/electric-car>

ELMO (2019) Estonian Electromobility Program; ELMO Program, Ministry of Economic Affairs and Communications: Accessed 27.10.2019 from <http://elmo.ee/charging-network/>

Estonia's Communication to the European Commission (2018) Estonian national energy and climate plan (NECP 2030). Accessed 28.10.2019 from https://ec.europa.eu/energy/sites/ener/files/documents/ec_courtesy_translation_ee_necp.pdf

German Government (2019). Accessed 05.11.2019 <https://www.bundesregierung.de/breg-en/news/bundesregierung-foedert-e-autos-1688910>

h2stations.org. Accessed 27.10.2019 from <https://www.netinform.net/h2/h2stations/h2stations.aspx>

IONITY (2019). Accessed 01.10.2019 from <https://ionity.eu/>

Ministry of Energy and Ministry of Environment, Lithuania (2018). Accessed 28.10.2019 from https://ec.europa.eu/energy/sites/ener/files/documents/lithuania_draftnecp_en.pdf

Ministry of Energy, Poland (2018) *Electromobility Development Plan in Poland*

Ministry of Energy, Poland (2018) *Energy Policy of Poland until 2040*

Ministry of Environment of the Republic of Lithuania and the Lithuanian Environmental Protection Agency (2019). Accessed 28.10.2019 from <https://am.lrv.lt/uploads/am/documents/files/KLIMATO%20KAITA/Studijos%2C%20metodin%C4%97%20med%C5%BEiaga/LT%20PaMs%20and%20projections%20report%202019%20%E2%80%93%20kopija.pdf>

NGVA Europe (2019). Accessed 28.10.2019 from <https://www.ngva.eu/stations-map/>

Region Skåne and Capital Region of Denmark (2018) *GREAT Road Map on policy measures*

Sipiński, Dominik and Bolesta, Krzysztof (2016) *Silent revolution in electricity sector - Electromobility in Poland*. Polityka Insight. Accessed 27.10.2019 from
https://www.politykainsight.pl/multimedia/_resource/res/20123070

Thiel, C. et al. (2019) Assessing the Impacts of Electric Vehicle Recharging Infrastructure Deployment Efforts in the European Union. *Energies* 2019, 12, 2409; doi:10.3390/en12122409

Udenrigsministeriet, Danmark (2017) *One million electric vehicles in Poland by 2025*. Accessed 27.01.2019 from <https://polen.um.dk/da/nyheder/newsdisplaypage/?newsid=65057e7d-4582-4037-a998-dd93f5a9b367>