

2018

**Transportation and the
Environment Task Force**

**Electrification of
Transportation:
A Survey of Policies,
Programs and Approaches**

October 2018

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Executive Summary

The Transportation and Environment Task Force conducted extensive research, surveys and reviews of electrification of transportation policies, programs and projects across Canada and select countries. A high-level list of examples to advance the electrification of transportation is summarized in Table ES-1.

Electrification of Transportation Policy and Program Examples

	Examples	Immediate	Medium Term	Long Term
Policy	<ul style="list-style-type: none"> Formulate and align electrification of transportation policies to achieve objectives of the Paris Agreement, Vancouver Declaration and Pan-Canadian Framework on Clean Growth and Climate Change, including reducing greenhouse gas emissions from the transportation sector and generating clean economic growth. Sound and consistent policy will help electric vehicles (EVs) to navigate safely and seamlessly no matter where they are operating. Harmonization will help allow EVs to reach their full potential while also maintaining the interests and safety of all road users. Beyond the scope of this TF consider future findings and relevant outcomes provided through the PPSC Connected and Autonomous Vehicles and Zero Emission Vehicle working groups. Note: While this report was being prepared, the Pan-Canadian Framework on Clean Growth and Climate Change was released, including a commitment to develop a pan-Canadian zero-emission vehicle strategy by 2018. 	<p>X</p> <p>X</p>	<p>X</p> <p>X</p> <p>X</p>	
Best Practices	<ul style="list-style-type: none"> France and Norway exemplify very ambitious and exhaustive policy and programs to advance the elimination of fossil-fueled vehicles. In the UK current federal policy is being designed to assist cities improve air quality and advance economic development by advancing electric vehicles and eliminating conventional internal combustion vehicles Quebec's example of collaboration with additional ministries and agencies has established a coordinated and comprehensive Transportation Electrification Action Plan. Other jurisdictions frame the electrification of transportation under Climate Change Plans, e.g. Ontario and British Columbia. 	<p>X</p> <p>X</p> <p>X</p> <p>X</p>		

	Examples	Immediate	Medium Term	Long Term
	<ul style="list-style-type: none"> In the US, some private sector electric utilities are implementing electric transportation programs that achieve efficient, economical electricity generation and end-use benefits. 	X		
Market and Industry Trends	<ul style="list-style-type: none"> Nationally, new vehicle sales are largely in the light-duty truck class. Full electric and plug-in electric options in this class are very limited with manufacturers offering options beginning in 2019. Policies and programs may want to consider local vehicle sales trends and available ZEV options. 	X	X	
Legislation and Regulation	<ul style="list-style-type: none"> Regulation of the supply and/or sale of electric vehicles (e.g. California, Québec) Regulation of the supply and/or sale of internal combustion engine vehicles (e.g. 2017 announcements by Germany, France, UK) Address legislative and regulatory barriers to advanced vehicle technologies. 		X X X	
Programs	<ul style="list-style-type: none"> Incentives/ rebates 	X	X	X
Projects	<ul style="list-style-type: none"> Encourage implementation and extension of vehicle charging infrastructure. Funding demonstration programs may advance deployment of municipal charging infrastructure. 	X X		
Consultation	<ul style="list-style-type: none"> Establish advisory groups that include a broad set of stakeholders as well as different levels of government. 	X		
Performance Measures	<ul style="list-style-type: none"> Establish database and reporting of electrification metrics. Increase granularity of emissions data (urban/non-urban split). 	X		X

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Introduction

The electrification of transportation is increasingly of interest to governments around the world as a means of contributing to the achievement of climate change goals. As of April 2017, 142 or 72% of the 197 Parties to the United Nations Framework Convention on Climate Change have ratified the Paris Agreement. The Paris Agreement entered into force on November 4, 2016 and aims to strengthen the global response to climate change including by “holding the increase in the global average temperature to well below 2°C above pre-industrial levels and pursuing efforts to limit the temperature increase to 1.5°C above pre-industrial levels”. Transportation is a significant source of greenhouse gas (GHG) emissions, but it is also the backbone of the global economy and local mobility. Electrification is widely seen as a promising pathway to reducing GHG emissions from transportation while continuing to support economic growth.

The PPSC Transportation and Environment Task Force was requested to research and report on Electrification of Transportation, primarily focused on light duty vehicles, according to the Terms of Reference. The electrification of transportation can apply to passenger transportation (personal vehicles, electric bicycles, electric scooters, low speed vehicles, electric public transport, school and regional transit buses as well as electric commuter and regional trains) and all modes of electrified freight transportation. For the purpose of this work, an electric vehicle is any mode of transportation that has a battery which can be charged by plugging in to the electrical grid (such as a plug-in hybrid electric vehicle (PHEV) or battery electric vehicle (BEV)), or one that is directly powered by electricity through overhead catenaries or a similar mechanism. As the majority of public policies on the electrification of transportation tend to focus on personal vehicles, the resulting report is heavily focused on electric vehicles. Where jurisdictions have policies on the electrification of other modes of transportation, these are mentioned briefly for information.

For the purposes of this report the information and analysis is conducted and presented in the context of a policy focus. Policies provide structure through adoption of overarching guidelines and principles for governance leading development of government business including legislation and regulations, programs, technical guidelines and projects.

The Business Dictionary describes [public policy](#) as the: “... Declared State objectives relating to the health, morals, and well-being of the citizenry. In the interest of public policy, legislatures and courts seek to nullify any action, contract, or trust that goes counter to these objectives even if there is no statute that expressly declares it void....”

In governance and politics the Business Dictionary goes on to define [policy](#) as the: “...basic principles by which governments are guided...”and “...declared objectives that governments seek to achieve and preserve in the interest of national / provincial / territorial [and municipal] communities...”

In conducting the background research, the Task Force attempted to clarify the policy drivers including safety, climate change, public health, and the roles and programs among a selected range of transportation ministries and authorities. The report summarizes these findings and presents high level policy considerations for Canadian federal, provincial and territorial transportation ministries.

This report will provide an understanding of global activities and initiatives and identify roles and opportunities for governments to consider in improving the penetration of transportation electrification. Although this report was prepared for transportation Ministers, policy levers may be held by other ministries (e.g. environment or energy), and there will likely be wider interest in the

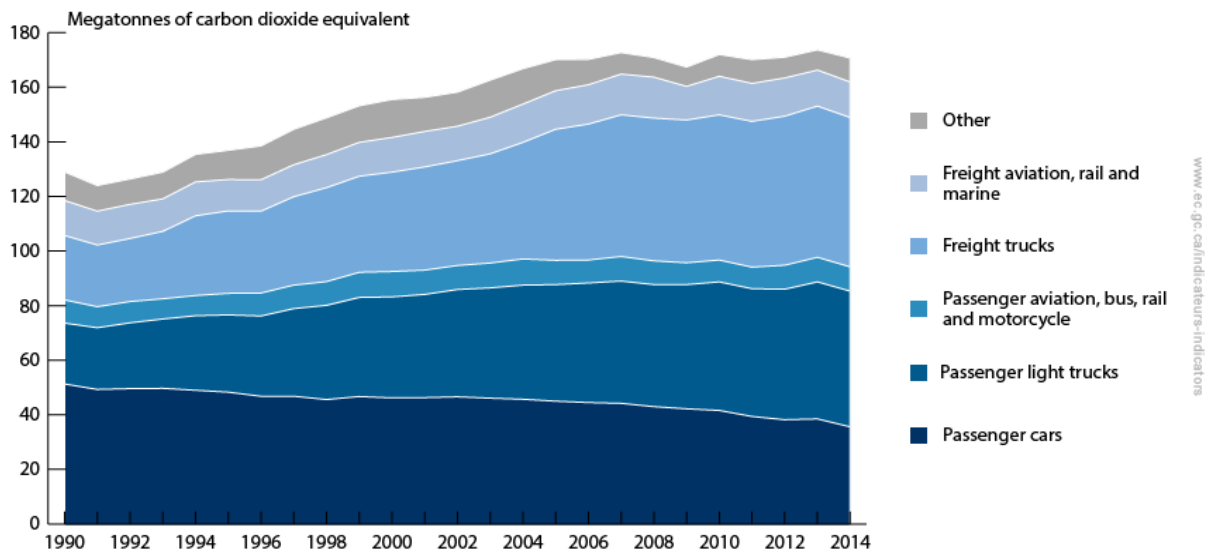
findings presented here. After an understanding of the activities related to the Electrification of Transport in other jurisdictions, this report will identify roles and opportunities for Federal-Provincial-Territorial Transportation Ministries.

Transportation and Climate Change in Canada

In 2014, Canada emitted 732 megatons (Mt) of greenhouse gas (GHG) emissions in total. The transportation sector was the second largest GHG emitter in Canada (after oil and gas), accounting for 171 Mt or 23% of total GHG emissions. Within the transportation sector, passenger and freight travel accounts for 95% of GHG emissions.

GHG emission from the transportation sector grew by 32% from 1990 to 2014¹. While total emissions from passenger modes grew by 15%, emissions from cars declined by 30%, and emissions from light trucks (e.g. trucks, vans, sport utility vehicles) increased by 123%.

Figure 1 – Transportation sector greenhouse gas emissions, Canada, 1990 to 2014



Source: Greenhouse Gas Emissions by Economic Sector <https://www.ec.gc.ca/indicateurs-indicators/default.asp?lang=en&n=F60DB708-1>

Emissions from passenger and freight travel depend on a number of factors, including population, economic growth, vehicle type, fuel efficiency, and fuel type. Drivers' preference for light trucks over more fuel-efficient passenger cars has played a significant role in GHG emissions increases. Since 1990, the increase in number of light trucks accounts for more than three times the increase in the number of passenger on-road vehicles.

Over the years, the fuel efficiency of both passenger cars and light trucks has continued to improve. However, these improvements were still not sufficient to offset the increases in GHG emissions.¹ Canada has a GHG emissions reduction target of 30% below 2005 levels by 2030. To achieve this goal, governments and industries must work together to implement measures to reduce GHG emissions in the transportation sector – for example, electric vehicle purchase incentives, investments in public transit expansion, investing and developing cycling infrastructure, etc.

¹ Natural Resources Canada (2015) Energy Efficiency Trends Analysis Tables – Transportation Sector – Energy Use Analysis

The profile of vehicle populations, kilometers traveled, and energy used in the transportation sector varies from province to province.

Greenhouse Gas Emission Reduction Potential

The burning of fossil fuels (gasoline, diesel, natural gas and propane) in conventional cars produces greenhouse gas and air pollutant emissions, including carbon dioxide, volatile organic compounds, nitrogen oxides and particulate matter. These chemicals contribute to air pollution and global warming.

Unlike gasoline or diesel cars, electric cars produce no emissions or pollutants when operating on electricity. There may be emissions associated with the electricity source. However, most of Canada's electricity comes from hydro and nuclear, which are both low-emitting energy sources.

Literature Review Findings

Overview of Findings

A literature review was conducted to provide an overview of what types of policies have been put in place to promote the uptake of electric vehicles in other countries. The focus of the literature review is on countries that have seen some success in increasing the number of electric vehicles on their roads: China, France, Germany, Japan, the Netherlands, Norway, the UK and the US. These 8 countries have the largest² total electric car stock in 2015 (see Table 2 below; Canada included for reference).

Table 1: Electric Car Stock (BEV and PHEV) by Country, 2005-2015 (thousands)

	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
US	1.12	1.12	1.12	2.58	2.58	3.77	21.50	74.74	171.44	290.22	404.09
China						1.43	6.50	16.40	31.74	104.91	312.29
Japan					1.08	3.52	16.14	40.58	69.46	101.74	126.40
Netherlands				0.01	0.15	0.27	1.14	6.26	28.67	43.76	87.53
Norway				0.25	0.39	0.79	2.80	7.21	15.42	35.21	70.82
France	0.01	0.01	0.01	0.01	0.11	0.30	2.93	9.25	18.88	31.50	54.29
UK					0.19	0.29	1.37	3.78	7.28	21.86	49.67
Germany	0.02	0.02	0.02	0.09	0.10	0.25	2.34	6.13	13.25	26.03	49.22
Canada							0.52	2.60	5.71	10.78	18.45

Source: International Energy Agency's Global EV Outlook 2016.

Each of the countries reviewed has taken a broad-based and highly interventionist approach to increasing the purchase of electric vehicles. Although the design and delivery of electric vehicle policies varies from country to country, all of the countries have in place a purchase incentive, have made investments in electric vehicle charging infrastructure and have implemented some degree of consumer education and outreach. In addition, all of the countries have pursued an additional package of policies, including complementary financial tools (e.g. France's surcharge for high-emitting vehicles), Additional Incentives (e.g. access to carpool lanes or preferential parking), legislation or regulations that facilitates EV use, bilateral or multinational agreements, setting clear targets for EV uptake, and promoting research and development.

Electric vehicle policies are delivered out of a wide range of government ministries, including transportation, energy, environment, industry and finance ministries. Often, the approach in a given jurisdiction involves action across more than one ministry.

² Largest of the 40 countries covered by the International Energy Agency's Global EV Outlook 2016. These 40 countries are estimated to account for about 98% of the global electric car stock.

Survey Results

Table 2: GHG Emissions Provinces/Territories, Selected Years

Province/Territory	GHG Emissions (Mt CO ₂ equivalent)								Change (%)
	1990	2005	2009	2010	2011	2012	2013	2014	1990-2014
GHG Total (Canada) ^{Table S-4 Note 1}	613	747	696	706	710	718	731	732	20%
NL	9.6	10.2	10.1	10.3	10.3	9.8	9.6	10.6	10%
PE	2.0	2.1	1.9	2.0	2.1	2.1	1.8	1.8	-8%
NS	20	23	21	20	21	19	18	17	-17%
NB	16	20	19	19	19	17	15	15	-9%
QC	89	90	87	82	84	82	83	83	-7%
ON	182	211	171	179	175	171	171	170	-6%
MB	19	21	20	20	19	21	21	21	15%
SK	45	70	70	70	69	72	74	76	68%
AB	175	233	234	242	246	260	272	274	56%
BC	53	65	61	61	61	63	63	63	19%
YT	0.5	0.5	0.3	0.3	0.4	0.4	0.4	0.3	-50%
NT ^{Table III-4 Note 2}	NA	1.7	1.2	1.4	1.4	1.5	1.4	1.5	-
NU ^{Table III-4 Note 2}	NA	0.3	0.4	0.4	0.2	0.2	0.2	0.3	-
NT & NU ^{Table S-4 Note 2}	1.6	NA	NA	NA	NA	NA	NA	NA	-

Note 1. Totals may not add up due to rounding.

Note 2. To account for the creation of Nunavut in 1999, a time series from 1999-2014 is provided for both Nunavut and the Northwest Territories and the years 1990-1998 are presented as a combined region (see Appendix 2 A11 for more information).

Objective

PPSC Transportation & Environment Task Force developed and administered a survey in order to ascertain the current state of the electrification of transportation in Canada. The responses assisted in the preparation of this report of best practices addressing policy relevant to electrification of transportation.

The task force, assisted by the Government of Manitoba, undertook development of an online survey and compilation of results generating a jurisdictional scan for the purposes of:

- Inventorying the current mandates and roles, including policy, legislation and regulations various transportation ministries have regarding electrification of transportation;
- Drawing a portrait of the most recent initiatives, undertaken and planned, by federal, and provincial transportation departments, and municipal governments across Canada that support electrification of transportation. Such initiatives would include policies, legislation, regulations and programs that support the consumer adoption of electrification of transportation, encourage the integration of electrification of transportation into transportation systems and/or incent the private sector to adopt electrification of transportation practices;

- Documenting additional federal and international initiatives addressing electrification of transportation, e.g. Natural resources Canada, Electric Mobility Canada; California/Oregon DOT, US FHWA, etc.

The task force drafted the survey instrument questions and prepared an email invitation targeted to federal, provincial, territorial and municipal governments, non-government organizations and other practitioners known to the task force. Manitoba Infrastructure facilitated distribution of the invitations to Manitoba, Ontario and New Brunswick through a special email address. Other task force members managed distribution of the invitation within their jurisdictions. Extensions and reminders were provided to encourage participation in the survey. The responses were collected on line and summarized on behalf of the task force.

Respondent Profile

The questionnaire was answered by 95 respondents. A breakdown of respondents by organization and geographic location is depicted below:

Table 3 – Respondent Profile

Type of Organization	Count	Percentage
Federal government department	2	1.92%
Provincial government department	17	16.35%
Municipality	50	48.08%
Government agency	6	5.77%
Non-Government agency	6	5.77%
Electricity Services	1	0.96%
Car Manufacturer or Company in the Automotive Sector	1	0.96%
Other	21	20.19%

Province or Territory of Organization's Main Activities	Count	Percentage
British Columbia	3	3.2
Alberta	3	3.2%
Manitoba	3	3.2%
Ontario	32	33.7%
Québec	38	40%
New Brunswick	3	3.2%
Prince Edward Island	6	6.3%
Nova Scotia	1	1%
Northwest Territories	1	1%
Yukon	1	1%
Canada	4	4.2%

The majority of respondents are primarily involved in the areas of transportation (32.41%) and environment (21.38%); however, other sectors such as energy (8.28%), health (5.52%) and education (4.14%) were also represented in the survey. Notably a large percentage (28.27%) of respondents identified as being involved in other activities.

Outside of Québec, the main areas of respondent's involvement in the electrification of transportation included policy development (18.75%), outreach and awareness (16.07%), research (14.29%), project implementation (14.29%) and program design (11.61%). Only 4.46% of respondents indicated that they were involved in funding. Almost 17% of respondents indicated that they were currently not involved in the electrification of transportation. The demographic of involvement from responses within Quebec varied compared to the rest of Canada. Of the total respondents 38.7% are involved in project implementation, 20.97% identified as being involved in "other" activities, and 16.13% indicated they are involved in outreach and awareness.

The responses revealed that electrification of transportation is being driven primarily by goals and objectives related to climate change (30.33%) and air quality (23.69%). These drivers were followed by economic development (14.69%) and human health (14.22%). Consumer demand and "other" represented 6.64% and 10.43% of answers respectively.

Current Landscape: Legislation, Regulation, Policies and Programs

Just over one quarter (26.32%) of respondents have policies, strategies or plans in place within their organizations which involve the electrification of transportation. For provincial respondents, electrification of the transportation sector is primarily identified in their provincial climate plans through planning and investments in bus and government fleet conversion, developing charging infrastructure and creating incentives to increase consumer demand.

The province of Québec, in partnership with agencies, has developed policies which incentivize and support the electrification of transportation. For example, Quebec has adopted a "green licence plate" for most types of rechargeable electric and hybrid vehicles, so that users can benefit from provincial incentives such as free tolls, free ferries, and free use of bus and taxi lanes. Société de l'assurance automobile du Québec has developed a regulation applicable to safety standards for Low Speed Vehicles (LSVs) that will have access to the road networks as currently, in Quebec, LSVs do not have authorized access.

Responses illustrate that there is limited legislation and regulation related to the electrification of transport in place with only 15.79% of participants providing positive responses; however, work is being done in some jurisdictions to develop new and amended legislative frameworks in order to promote the electrification of transportation. For example, the Government of B.C has introduced and enacted a number of climate-action legislation (Low Carbon Fuel Requirement, the Clean Energy Act and the Utilities Commission Act) which have implications for promoting the electrification of transport. Ontario has introduced legislation such as the Low-Carbon Economy Act which establishes funding mechanisms for infrastructure which supports the adoption and use of zero emission and plug-in hybrid vehicles, and low-carbon alternative fuels.

Existing federal regulation, such as the Passenger Automobile and Light Truck Greenhouse Gas Emission Regulations and the Heavy Duty Vehicle and Engine Greenhouse Gas Emission Regulations which aim to reduce GHG emissions by establishing mandatory GHG emission standards for vehicles, offer potential avenues to promote and incentivize the proliferation of demand for electric vehicles.

Based on survey responses at the municipal level parking bylaws are being used as a mechanism for municipalities to operationalize policy. For example, some municipalities have adopted new regulation to require new buildings exceeding a specified threshold to provide electric vehicle parking spaces for non-residential uses, and to provide electric vehicle ready parking spaces for multiple dwellings.

With reference to programming, roughly one quarter (26.32%) of respondents have programs in place to support the transition to electric transport. The majority of programming stated in the survey is aimed at increasing charging infrastructure and was provided by municipal organizations. The cities of London and Toronto have begun installing charging infrastructure through funds provided in partnership with the Government of Ontario through its commitments to build almost 500 charging stations throughout Ontario. Hamilton has plans to increase fuel efficiency in its cities fleet through its Corporate Energy Policy. Provincial and federal funding programs to support the electrification of transportation are in place in British Columbia (the Clean Energy Vehicle program) and federally (the Green Municipal Fund).

Funding

Funding is a commonly cited barrier. This is evident in that only 22.11% of respondents have direct or shared funding for the electrification of transportation. When responses from the province of Quebec are removed this number drops to 15.79%. Sources of targeted funding for the installation of charging infrastructure are being provided primarily through provincial programs such as EVCO in Ontario and grants through Hydro-Québec. Hydro-Québec is also providing financial support for a number of initiatives which support the electrification of transportation such as: partnering to support the development of electric motors; research on battery materials; supporting feasibility studies on public transit electrification; providing event sponsorships in electromobility.

Responses indicate that at the federal level funding has the potential to be allocated through the Eco Action Community Funding Program; however, this funding is not targeted specifically at electrifying transport.

Amongst respondents at the municipal level, Montreal has indicated that it has funding in place through a three year capital works program to fund the acquisition and installation of 1000 EVs charging stations at a cost of \$250,000 spread over two years.

Support for Infrastructure

Support for infrastructure varies across Canada. In Quebec 67.57% of respondents are currently delivering initiatives to support the infrastructure needed for the electrification of transportation. This number is high compared to responses gathered from participants throughout the rest of Canada in which 26.79% of participants provided positive responses.

Hydro- Québec is working to densify the charging station network in Quebec through the Electric Circuit initiative. Working with 130 partners this initiative has installed 577 charging stations in 140 municipalities. The province of Quebec provides financial assistance for the acquisition and installation of charging stations in the workplace offering 50% of eligible expenses up to a maximum of \$ 5,000 per charging station through the “Branchez-vous au travail” program.

The department of Municipal Affairs in Alberta delivers through the Municipal Sustainability Initiative and the Federal Gas Tax Fund to support most types of municipal capital infrastructure, which could include infrastructure for the electrification of transportation. Under these programs municipalities choose which projects to fund based on their local priorities within the program criteria.

In British Columbia, several agencies including the Ministry of Energy, Mines and Petroleum Resources, the Ministry of Transportation and Infrastructure, and other partners are working on initiatives to develop the necessary infrastructure for electric vehicles such as: exploring opportunities to expand DC fast charging station network across the province; investigating challenges and barriers to EV charging,

and identifying opportunities for innovation and solutions; and, developing a technology road map to assess how the EV market will evolve and how utilities can accommodate those changes.

The Government of Canada has also endowed the Federation of Canadian Municipalities with \$550 million to establish the Green Municipal Fund (GMF) which supports municipal initiatives to improve local air, water and soil quality and promote renewable energy with grants and below-market loans. Areas of project eligibility include “sustainable transportation” and through this fund several funded projects have supported the development of electric vehicle infrastructure.

In the non-government organization sector, initiatives also exist. For example, Pollution Probe’s Pathways Initiative, is developing a public EV charging station siting methodology that is adaptable for jurisdictions of any size, from municipalities to the national level. The methodology makes the roll out of public charging infrastructure simple for entities with little experience in the area.

Outreach and Awareness

41% of organizations who responded are involved in outreach and awareness. In cities the primary mode of outreach is done through community focused awareness building such as special days and demonstrations. Municipal respondents are also working to promote electric vehicles through the installment of electric charging stations at municipal facilities. Non- government agencies, such as Pollution Probe and Plug and Drive, have indicated that work is being done partnership with provincial governments to advocate and educate the public and governments on the realities of electric transport. Communauto, an automotive company in Quebec, provides support to Campaigns of Equiterre which promotes electric vehicles and participates in events, congresses and exhibitions promoting electric vehicles.

Looking Forward

62.76% of organizations who participated in the survey have identified that opportunities exist to further advance the electrification of transport. Specifically, respondents indicated that opportunities are available via: strategic planning as it relates to climate change objectives; the allocation of funds for green infrastructure; and, partnerships between governments and stakeholders to promote knowledge sharing and the deployment of electric vehicles. Opportunities have also been identified in for government fleet conversion.

Areas of research which could provide opportunities for the promotion of electric transport were also identified in the survey. For example, Health Canada has indicated that expertise within their department exists and could potentially develop a health based rationale by assessing the potential health benefits and impacts associated with widespread use of electric vehicles.

56% of respondents have indicated that their organizations are currently working to develop the necessary support, legislative and regulatory frameworks, funding or programs that will promote the electrification of transportation. Government responses show, and in particular responses from the federal and provincial levels, that much of this work is in the preliminary stages in the form of either developing strategic plans with other partners or developing regulation. At the municipal level legislative work has begun, as has work to increase charging infrastructure.

Barriers

Survey responses identify a number of barriers in the following themes:

- Legislative frameworks:

In some instances legislation has created barriers to developing electrification of transportation. In PEI the Electric Power Act limits the sale of electricity to utilities companies. Though no other examples are provided in the survey it is possible that existing legislation in other jurisdictions may create impediments to the electrification of transport.

- **Lack of resources:**
The most commonly cited barrier is availability of funding. Also lack of expertise (design, manufacturing and maintenance), insufficient data, and technological barriers such as electrical/fuel storage capability and lack of charging infrastructure (autonomy in low density areas) were identified as obstacles in the development of electric transport.
- **High Costs**
High costs to acquire electric vehicles with limited returns on investment and costs of charging equipment/infrastructure were frequently cited as barriers in the survey.
- **Culture and Consumer hesitation**
In the survey consumer demand was not identified as a driver for the electrification of transport (only 8.4% of respondents identified it as a driver). This was reiterated again in responses about barriers. Several respondents indicated that high levels of public skepticism exists, and therefore low level of demand, may stem from the high costs associated with electric vehicle acquisition, length of charging time, anxiety about charging ranges and cold-weather reliability. The survey also highlighted that there are low levels of public acceptance, limited consumer awareness and a lack of knowledge of the options and the benefits of electric transport. Given that a substantial number of responses focused on consumer hesitation and other sections of the survey illustrated a general lack of consumer demand, jurisdictions and organizations should focus on overcoming these barriers through increased outreach and awareness with consumers.
- **Unclear direction and responsibility**
Respondents cited a lack of direction, leadership and political interest as well as uncertainty surrounding who should/ can take responsibility as potential barriers for the electrification of transportation within their jurisdictions. It was also indicated that a lack of certainty around which low-carbon transportation options will emerge as “winners” and become mainstream has led to hesitancy to invest in public infrastructure and R&D focused on electrified transportation.

Survey Limitations

Based on responses some limitations to the structure and nature of the survey can be identified. The methods/choices for distribution of the survey produced a respondent profile which was heavily concentrated to jurisdictions in Ontario and Quebec. Had more specific directives on who the survey should have been distributed to been established, more organizations from other jurisdictions may have participated which could have resulted in the survey producing a more comprehensive view of electrification of transportation throughout Canada. Furthermore, Question #4 (How is your organization currently involved in the electrification of transportation?) reveals that 16.96% of respondents (the second highest response rate) are not currently involved in the electrification of transportation. This could be explained by some organizations not yet possessing mandate or capacity in this field; however, this aspect of the survey may have led to responses that do not adequately reflect the current state of the electrification of the transportation sector in that jurisdiction.

Analysis of Survey Findings

- **What does it tell us?**

The electrification of transportation is still in its infancy throughout most of Canada; however, some jurisdictions are making strides. Responses from participants in Quebec illustrate that Quebec is making improvements in the expansion of charging infrastructure and therefore may offer learning opportunities for other jurisdictions. By and large, however, based on the findings of the survey, the electrification of transportation still faces significant obstacles in Canada. Critical barriers such as funding, lack of expertise, lack of legislative and regulatory frameworks, consumer skepticism, low incentives for consumers, and low supply of charging infrastructure need to be overcome.

- **Critical Success factors**

Overcoming key barriers identified in the survey is a critical factor underpinning the success of electrification of transportation. A prominent barrier identified by the vast majority of respondents is lack of affordability for consumers. Eliminating affordability barriers and improving access could increase uptake and offer useful co-benefits such as stimulating advancements in technology and create more optimal conditions for charging network expansion. Another barrier hindering the electrification of transportation is the stifling of EV driver autonomy for users due to a substantial lack of charging infrastructure. By targeting charging infrastructure jurisdictions may be able to overcome other barriers such as range anxiety and consumer skepticism. Funding also remains a barrier.

The electrification of transportation involves multiple actors, with diverse needs and interests. Input is required across a number of sectors (government, transportation, utilities, manufacturing, etc.) and therefore collaboration and cooperation are also critical factors for success. This in turn requires leadership and clear direction within and across jurisdictions.

- **Are there co-dependencies? What else has to be in place or simultaneous?**

Lack of charging infrastructure is likely linked to range anxiety and may contribute to low demand and consumer skepticism.

- **Collaborative Opportunities**

- Partnerships between provinces and municipalities, as well as coordination between municipalities, are integral to expand and densify charging networks
- Opportunities for collaboration between governments, industry and research institutions for innovation
- Dialogue and coordination between sectors (utilities companies, car dealerships, automotive manufacturing, etc.)

Literature Review

China

In 2016, there were 647,000 electric cars in China (483,000 battery electric vehicles and 166,000 plug-in hybrid electric vehicles), including 336,000 new registrations. Electric cars represent a market share of 1.37%

In 2016, there were 52,778 publicly accessible slow chargers and 88,476 publicly accessible fast chargers in China.

Legislation / Regulations

Proposed new legislation for low-speed electric vehicles

In March 2016, Industry and Information Technology Minister Miao Wei announced that China is developing regulations for low-speed electric vehicles and may possibly classify them as motorcycles. No specific details and timeline have been announced to date.

EVs with a maximum speed of 70 km/h are currently exempt from registration, crash-testing, and other safety standards. As a result, affordable low-speed battery-powered cars have gained popularity in China's rural areas and smaller towns and cities.

Purchase Incentive

In 2009, the Government of China introduced the *Ten Cities, Thousand Vehicles Program* to facilitate electric vehicle adoption through introducing pilot projects in ten cities in order to identify and address technology and safety issues associated with electric vehicles. These ten cities were: Beijing, Shenzhen, Shanghai, Jinan, Chongqing, Wuhan, Changchun, Hefei, Dalian, and Hangzhou.

Under this program, each of the ten cities was challenged with reaching 1,000 electric vehicles. At the time, electric vehicles were still in the early adoption stage and were subject to a shorter driving range. The program focused on government fleet vehicles with predictable driving patterns such as buses and garbage trucks.

Following the rollout of these ten cities, the program was expanded to include another ten cities: Changsha, Kunming, Nanchang, Tianjin, Haikou, Zhengzhou, Xiamen, Suzhou, Tangshan, and Guangzhou. The program was also expanded to focus on consumer adoption of EVs, and the federal government introduced subsidies as purchase incentives for EVs.

As part of the *Ten Cities, Thousand Vehicles Program*, the federal government introduced purchase subsidies of \$60,000 RMB (\$11,160 CAD) per vehicle for Battery Electric Vehicles (BEV) and \$50,000 (\$9,300 CAD) per vehicle for Plug-in Hybrid Electric Vehicles (PHEV). On top of this, the state governments provide additional subsidies. For example, the Shenzhen State provides additional subsidies of \$60,000 RMB (\$11,160 CAD) for BEV and \$20,000 RMB (\$3,720 CAD) for PHEV. In total, purchasers of BEVs in Shenzhen receive \$120,000 RMB (\$22,320 CAD) and \$70,000 RMB (\$13,020 CAD) for PHEV. By comparison, the price of an EV in China ranges from \$30,000-\$100,000 CAD, depending on the brand or model.

In addition, the government also offer acquisition tax and excise tax exemptions (\$35,000 - \$60,000 RMB), depending on engine displacement and price.

In 2017, the government reduced subsidies by 20%, with the plan to adjust policies according to market response until 2020.

Public Infrastructure Investment / Planning

In December 2015, the Chinese government introduced new standards for electric vehicle charging stations that aim to accelerate adoption and development, as well as enhance safety standards. The standards came into force on January 1, 2016.

The National Energy Administration is planning to make the new standards compulsory, promote upgrades to existing charging stations and examine the compatibility of charging facilities.

Additional Incentives

Municipal governments offer a number of additional incentives for drivers of electric vehicles, including exemptions from licence plate access restrictions, exemption from access restrictions at peak times, access to bus lanes, free charging and free parking.

In Beijing, high levels of air pollution and traffic congestion are major problems and the city enforces tough restrictions for drivers. It is challenging and costly to obtain a license plate in cities like Beijing (about 200 drivers apply for one licence plate, and each plate is valued at \$15,000 US (\$18,297 CAD) or more in some cases). Also, since 2008, cars with odd and even license plate numbers are banned from Beijing roads during rush hours on alternate days. Small passenger EVs (including electric taxi fleets) are exempted from this restriction.

Targets

The Chinese government has set a target of having 5 million “new-energy vehicles” (vehicles that are partially or fully electric-powered vehicles) on China’s roads by 2020.

In March 2015, the Chinese Ministry of Transport announced that it aims to add 2 million buses and 1 million taxis powered by alternative fuels by 2020.

Governance

The federal government sets national targets and overarching policies regarding electric vehicles, and provides subsidies for the purchase of electric vehicles and the procurement of electric buses. A considerable amount of efforts to support electric vehicles adoption has also happened at the provincial and municipal level. At the provincial level, some states provide subsidies to EV purchases in addition to the subsidies provided by the federal government. Municipal governments also set targets for their respective cities and develop local policies for EVs such as reduced parking fees, access to bus and high-occupancy vehicle (HOV) lanes, exemptions from commuter restrictions (it is common in Chinese cities for vehicles with odd/even number license plates to be limited to driving on the roads on certain days of the week).

Research and Development

The *China Committee of Electric Vehicles 100* (“China EV100”), founded in 2014, is an organization dedicated to advancing research, market development and deployment of electric vehicles in China.

Government Procurement

In November 2015, the Chinese Ministry of Transport, the Ministry of Finance and the Ministry of Industry and Information Technology jointly released a new regulation that aims to get local governments and relevant stakeholders on board to promote the integration of electric buses in public transport fleets. The regulation requires new buses to comply with energy efficiency and vehicle standards.

The federal government is supporting the procurement of electric buses through providing support to charging infrastructure development and various subsidies. In 2016, the federal government was providing up to \$500,000 RMB (\$93,000 CAD) for electric buses that meet certain criteria (e.g. a minimum range of 250 kilometres, vehicle length of 10–12 metres).

A reporting system was also introduced along with this regulation. The reporting system requires local governments and public transit companies to submit relevant data on the status of electric buses in their jurisdiction. This helps monitor the progress of electric bus adoption and also helps identify additional policy measures necessary to further promote the integration of electric buses in public transit systems.

Multi-Jurisdictional Agreements

On November 17, 2009, U.S. President Barack Obama and Chinese President Hu Jintao announced the launch of a China-U.S. Electric Vehicles Initiative, and emphasized the two countries’ shared interest in accelerating the deployment of electric vehicles in order to reduce oil dependence, cut GHG emissions and promote economic growth. Joint progress to date includes technical research aimed at improving battery performance, electric vehicle mechanics and optimizing charging stations network and efficiency.

France

In 2016, 84,000 electric cars were registered in France (17,030 plug-in hybrid electric vehicles and 66,970 battery electric vehicles), representing a market share of 1.46%. There were also 15,843 publicly accessible chargers (including 1,231 fast chargers).

Legislation/Regulations

The law on energy transition and green growth (Loi relative à la transition énergétique pour la croissance verte) defines key strategic elements for the development of clean transportation, including electrification. It requires that, by 2030, at least seven million charge points be installed in parking spaces of housing projects, other types of buildings, public places or parking spaces reserved for professionals. There are provisions to encourage “electric vehicle sharing and pooling” (Article 41), the procurement of low emission public buses (Article 37), for employers to consider the travelling costs of employees travelling by electric assisted bicycles (Article 50 with the “indemnité kilométrique vélo”), as well as for ships and boats electric charging at ports (Article 52). It also introduced the concept of “zones with restricted circulation to preserve air quality” (Article 48).

The incentives and penalties (“Bonus-Malus”) for the acquisition or rental of electric vehicles (less than nine seats and not heavier than 3.5 tonnes) are defined in the Energy Code (Code de l’énergie, Articles D251-7 to D251-13). The Décret n° 2015-361 also introduced a cumulative incentive (“Superbonus”) for the replacement of old diesel vehicles (on the road before January 1st, 2006) with electric vehicles, as well as an incentive for low income households.

For companies, the Fiscal Code (Code général des impôts, Law n°2015-1785(December 29th, 2015), Article 117), introduced lower annual vehicle taxes for electric vehicles. Companies buying or renting electric vehicle can also ask for the sale’s tax refund (Taxe sur la valeur ajoutée (TVA)).

The Environment Code (Code de l’environnement, Articles L224-7 and L224-8) requires the government and other public organisation (federal and regional levels included) to integrate low emission vehicles into the public fleets of light vehicles and buses.

The “communes” (regions) also have the legal right to install and maintain charging infrastructure, as well as to organise services for all-electric and hybrid vehicles, if the offer is nonexistent or insufficient (Code général des collectivités territoriales, Article L2224-37). In the process of urban mobility planning (PDU – Plan de déplacements urbains, the French version of the European SUMP - Sustainable Urban Mobility Plan), local authorities for mobility have to support the deployment, configuration and localization of charging infrastructures for all-electric and hybrid vehicles (Code des transports, Article L1217-2).

The Building and Housing Code describes the dispositions for new buildings for electric infrastructures in parking lots that will enable future deployment of charging infrastructure (code de la construction et de l’habitat, Article R111-14-2 and 3).

Furthermore, France reviewed dispositions for the land planning, building and road security codes to promote electrification of transportation (e.g.: signs, emission categories for vehicles).

Purchase Incentive

At the national level, France is currently reviewing its incentives with low emission vehicles, as well as taxation rates for gasoline and diesel, as part of its new climate change plan (released in July 2017).

- In 2016, with the “Bonus-Malus” policy, France offers incentives for the purchase or long-term rental (2 years or more) for all-electric cars and light trucks with low emissions (0 to 20g CO₂/kg) of € 6,300 (max. 27 % of the acquisition cost), and of € 1,000 or € 750 for hybrid vehicles (between 21 and 60g CO₂/km, or between 61 and 110g CO₂/km). With the “Malus”, the vehicle registration certificates of new vehicles emitting more than 131g CO₂/km have an overcost of € 150 (for vehicles emitting between 131 and 135g CO₂/km) up to € 8,000 (201g CO₂/km or more). The malus criteria will be stricter in 2017, with a lower malus threshold (131 -> 127 g CO₂/km). The € 6,300 bonus will decrease to € 6,000, but the superbonus will increase to maintain a total of € 10,000.
- The replacement of a 10 years old (or older) diesel vehicle by an electric vehicle can also be eligible for a grant. The total maximum incentive for the acquisition of an all-electric vehicle with this “superbonus” is € 10 000, and € 3,500 for a hybrid vehicle. This total maximum incentive can also include a low income household’s incentive (€ 1,000 or € 500, depending on the vehicle characteristics).

- The incentives and penalties are reviewed annually.
- In 2017, motorized two-wheel vehicles could also be eligible to a grant.

At the regional and local level, some regions also offer additional incentives. For example:

- The region Haute-Normandie and the commune Saint-Maur (Indre) can offer grants for the acquisition of new electric vehicles.
- The City of Paris offers grants for two wheel electric bicycles and road scooters (max. € 400 or 33 % of the acquisition costs). The communes of Villeneuve-lez-Avignon, Cannes, Arras, Aix-les-Bains and Ales also provide incentives for electric two wheels.
- The City of Paris encourages taxi drivers to buy hybrids (gasoline-electric) emitting less than 61 g/km de CO₂ (max. € 4,000 or 20 % of the acquisition costs) or all-electric taxis (max. € 6,300 or 20 % of the acquisition costs), as well as encourages enterprises to turn to light electric trucks (max. depending on the weight of the vehicle, up to € 9,000 or 15 % of the acquisition costs).

Personal Infrastructure Subsidy

At the national level:

- Individuals (owners and tenants) of a house or collective housing can have a tax credit for the installation of a charging infrastructure (“crédit d’impôt” up to 30% the acquisition costs).
- Furthermore, with the programme ADVENIR (Programme Aide au Développement des Véhicules Électriques grâce à de Nouvelles Infrastructures de Recharge), France offers also grants to enterprises (max. up to € 1,860 or 40% of the acquisition costs) and eligible collective housing (max. up to € 1,660 or 50% of the acquisition costs).

At the regional level: The region Poitou-Charentes and the city of Paris also offered grants in the past to encourage the installation of charging infrastructure.

Public Infrastructure Investment / Planning

The French Strategic roadmap for charging infrastructure focuses on standardization (at the national and European levels), the integration of the market system (with the vehicles, batteries, charging infrastructure and services, etc.), and to match infrastructure supply with demand. Local authorities for mobility have to define their strategy to support the deployment, configuration and localization of charging infrastructure for all-electric and hybrid vehicles.

Traffic signs were installed on the roads to indicate distances to the next electric charging infrastructure and driving directions to reach them.

A fund managed by ADEME was created to help municipalities to install charging infrastructure. It led to the installation of 5,000 terminals in 15 different projects (This fund was in force until December 31th, 2015). This action was renewed in 2016.

In Paris, shared electric vehicles and charging infrastructure are made available, in collaboration with the City, Autolib, Belib and other partners.

Information and Awareness

The website of the Association nationale pour le développement de la mobilité électrique (AVERE) promotes electric mobility, provides information and awareness material on electric vehicles, charging infrastructure, government programs and incentives, etc.

Additional Incentives

At the regional level:

- In France, the cost of the vehicle matriculation certificate (Tarif de la carte grise) can vary with the French Region. Many of the regions offer rebates for electric vehicles ranging from 50 to 100%.
- Some cities offer electric charging of vehicles at no cost.
- In the city of La Rochelle, the parking can be free for electric vehicles in public zones with odometers and public parking (a free vignette is required and offered by the city). Other cities offer free parking or at reduced fee for electric vehicles (Bourges, Royan ...)
- The concept of “zones with restricted circulation to preserve air quality” (Loi relative à la transition énergétique pour la croissance verte, Article 48) can also be used by cities to promote electrification of transportation.
- For the freight transportation:
 - In the afternoon, the City of Toulouse allows deliveries only with non-thermal vehicles (accreditations are required with the city depending on vehicle and activity types).
 - In Paris, only zero or lower emission vehicles with an area less than 29 m² are allowed 24 hours by 24 for deliveries (includes electric vehicle, gas, or hybrids meeting the latest Euro standard)

Targets

France aims that:

- Between 2016 and 2020: 21% of all vehicles purchased will be electric vehicles
- By 2018: to install 12,000 private charging points (with the ADVENIR program)
- By 2020: electric vehicles will represent 6% of all vehicles on the road (2 million electric vehicles)
- By 2030: 7 million charging stations
- By 2040: to ban sales of petrol and diesel cars

A fund of € 50 million is dedicated to install new charging stations (with the “Fonds du programme des investissements d’avenir”) and will contribute to reduce the GHG emission of the country by 40% (below the level of 1990).

The RATP and the STIF, collaborating together in the Île-de-France/Paris region to operate 350 bus lines, with a fleet of 4,500 vehicles, have the goal of a 100% eco-friendly bus fleet by 2025 (approximately 80% electric and 20% biogas).

Governance

The Ministère de l'Environnement, de l'Énergie et de la Mer is responsible for the political on environmental and energy transition. The Agence de l'Environnement et de la Maîtrise de l'Énergie (ADEME) is “the operator of the French government” to support this transition. ADEME provides guidance to businesses, local governments, public authorities and the public.

The private industry also plays an important role. For example: AVERE, a national association for the development of electric mobility, manages the program ADVENIR, with an expected budget of € 15.6 million, financed by EDF (an energy producer and distributor) and other partners (€ 9.75 million is from EDF). AVERE provides expertise and is involved in promoting the program.

Research and Development

ADEME finances new technology development, with the “Programme d'investissements d'avenir (PIA)” and the “Programme véhicule routier du futur”. As an example of a project supported in the past:

- The project “Infinidrive” initiated in 2011 with ERDF (renamed Enedis; an energy producer and distributor), La Poste (a mail delivery operator) and other partners for the development of new technologies and standards for the electrification and charging of a fleet. This project mobilized 350 actors and involved 100 electric vehicles and 450 combustion vehicles spread over twelve locations in four cities (Paris, Nantes, Nice and Grenoble). Corporate fleets and communities were proactive and contributed to the success of the project.

EDF, is also an important factor in the electrification of transport in France (e.g.: R&D, experimentation, awareness, facilitating the integration of electric cars, electric car sharing, charging infrastructure and electric boats).

Demonstration Programs/Procurement

The bill on the energy transition involves the replacement by the French government of “one out of two vehicle” by a low emission vehicle (all-electric, hybrid-electric or other; Article 37).

By the end of 2016, the RATP and STIF aim to operate, in real condition, in Paris the “line 341” with twenty-three 100% electric public buses. The new buses will have a capacity of over 90 passengers and an average of 180 km (the charging is planned only at night, out of the “electric peak hours”). It will be a European first for a fleet of this size and is also part of the ZeEUS (Zero Emission Urban Bus System: European Union program to accelerate the introduction of zero emission buses in the major cities). The RATP and STIF also aim to continue the demonstration of several models of electric buses and charging technologies on other bus lines (e.g.: lines 21 and 147). As part of the Bus Plan 2025, RATP aims to have a bus fleet of 4,500 electric vehicles by 2025 consisting of 80% electric buses and 20% biogas. RATP currently has 9,000 buses in the region Ile-de-France.

Multi-Jurisdictional Agreements

France hosted and presided the United Nations conference on climate change of Paris (COP21/CMP11: November 30th to December 12th, 2015) and is involved in several multi-jurisdictional initiatives.

At the European level, the Innovation and Networks Executive Agency (INEA), created by the European Commission, is also proactive in supporting innovative transportation projects through its Horizon 2020 program (total of € 77 billion for research and innovation for 2014-2020) and Connecting Europe programs (total for CEF Transport of € 24.05 billion for 2014-2020).

Germany

In 2016, 72,730 electric cars were registered in Germany (31,810 plug-in hybrid electric vehicles and 40,920 battery electric vehicles), representing a market share of 0.73%. There were also 17,953 publicly accessible chargers (including 1,403 fast chargers).

Legislation/Regulations

The 2011 revision of the Energy Industry Act (Energiewirtschaftsgesetz) introduced rules for smart grids and for contracts on grid use for recharging electric vehicles. The legal basis for safe and secure of charging and billing of electricity for electric vehicles were also reviewed (in the Act on the Re-organisation of Statutory Metrology).

The 2013 Annual Tax Act introduced financial advantages with regards to the taxation of staff cars for electric and hybrid electric vehicles.

Germany uses the charging model approved by the European Union, which is becoming a world standard.

The Electric Mobility Act and other regulation (“Elektromobilitätsgesetz” and “Gesetz zur Bevorrechtigung der Verwendung elektrisch betriebener Fahrzeuge”) define incentives in electrification of transportation.

The government also intends to modify the Land Use Act and trade law regulations so that the operation of charging points and the supply of electricity are in regulatory compliance.

Purchase Incentive

For all-electric vehicles (all classes) first registered before December 31st, 2015, an exemption from vehicle taxation of 10 years is granted. In June 2016, the government announced in the German EV incentive scheme that this measure would be extended retroactively to January 1st 2016.

An extended exemption of the Motor Vehicle Tax is also offered, and the transfer of license plates is allowed.

The German incentive scheme to boost EV sales was introduced in June 2016. The government offers a subsidy of € 4 000 for a full electric vehicle and € 3 000 for a plug-in-hybrid. In addition, the subsidy is limited to vehicles less than € 60 000. Aid will be allocated in order of arrival of applications until full use of available funds or arrival on the program deadline of 30 June 2019.

Personal Infrastructure Subsidy

Germany is planning to modify its Law on Property and leases to facilitate the installation of home charging infrastructure, for new constructions and renovations. It also wants to empower tenants to

install charging stations and to make sure that everything can be done smoothly with the building owners.

Germany is also evaluating to change the tax law to allocate a refund for people recharging their company vehicle at home.

Public Infrastructure Investment / Planning

The German Federal Government with the “Electric Mobility in Pilot Regions” program allocated € 130 million to eight pilot electric mobility projects located across Germany to help create the necessary infrastructure for electric mobility.

Between 2010 and 2014, € 1.5 billion were invested in the sector of electric vehicles by the government and € 17 billion by the industry.

The government seeks the collaboration of the private sector to build the network of charging stations, not profitable in the short term (but expected to be profitable eventually).

Most charging stations are located in urban areas. Germany will continue its efforts to adapt and improve the public infrastructures to follow the increasing number of electric vehicles.

In June 2016, the government announced that it will add € 300 million to speed up building the infrastructure of electric car charging stations in cities and on autobahn highway stops, € 200 million for fast charging points and € 100 million for regular charging stations.

Information and Awareness

The government finances and promotes various pilot projects in electrification of transportation with the municipalities.

Germany Trade & Invest also provides information to companies about business opportunities outside Germany.

Additional Incentives

In September 2015, amendments to the regulations on road transportation have been adopted to provide more dedicated parking spaces for electric vehicles, and to promote the use of electric delivery trucks. Restrictions on entry or access to selected areas were also removed.

Since 2015, Germany allows electric vehicles to drive on selected reserved bus lanes.

Targets

Germany has set ambitious targets, including becoming the first world market in electrification of transportation and the world’s leading electric mobility supplier by 2020. Germany also aims by 2020:

- to reach 1 million electric vehicles, representing 2 % of all vehicles in circulation and 7 % of annual sales for electric vehicles of 7 % (of the total annual sales of vehicles);
- to install 70,000 alternative current (AC) charging infrastructures and 7,100 direct current charging infrastructures;
- to reduce its total GHG emissions by 40 % (compared to the 1990 level).

For 2030:

- to reach 6 million electric vehicles
- to ban new internal combustion engine cars

Governance

In 2009, the National Electromobility Development Plan was released by the German Federal Government to “*speed up research and development in battery electric vehicles and their market preparation and introduction in Germany*”, and was identified as one of the several measures to stimulate the Germany’s economy during the 2008-2009 “financial crisis”.

In 2010, the Joint Agency for Electric Mobility was created by the Ministry of Economics and Technology, and the Ministry of Transportation, to support the German National Platform for Electric Mobility, in collaboration with the industry, the federal government, the scientific community and the population.

This Agency supports leaders of the private sector and the government with recommendations, while promoting the German electric vehicle industry and electrification of transportation in general in Germany. It also monitors and evaluates the progresses in electrification of transportation of the country, including with the objectives of the *National Development Plan for Electric Mobility*.

The German National Platform for Electric Mobility (Nationale Plattform Elektromobilität) guides the development of electric mobility and provides advice to the Federal Government, with the collaboration of 150 representatives from industry, science, politics, trade unions and trade associations for strategic dialogue. It is supported by the Joint Agency for Electric Mobility (GGEMO).

Research and Development

German researchers are working on a wide range of projects and electric mobility issues, including projects on high performance engines, batteries capacity, light materials, design of electric vehicles, smart energy efficiency, safety and reliability. For example:

- The Federal Ministry for Economic Affairs and Energy is funding projects to optimize the entire production chain (with the ELECTRIC POWER program, and a budget of € 23 million, until mid-2016).
- Scientific institutes and the private sector companies are collaborating to develop a new technology of fast charging batteries (as part of the SLAM project, and with a € 9 million funding of the Government).
- In order to adapt to a possible increase in the number of electric vehicles, Germany also conducts research to develop third- and fourth-generation batteries (respectively 280 and 300 Wh / l). These researches are financed by public and private sectors.
- With the program Information and communications technologies (ICT) for electric mobility II, Germany also wants to integrate information technology to develop intelligent networks (smart grids), smart EV and smart systems informing drivers of the real-time traffic.
- The University of Stuttgart analyzes the results of a pilot project of a house producing twice the electricity it consumes to supply an electric vehicle.

The database (Wissmer) listing the main scientific articles, conferences and reports from various sources was created to support and keep informed with the latest advances all the key players in the electrification of transportation and other organizations in Germany.

With the ATEM program - drive technology for electric mobility, the government seeks to improve the efficiency and capacity, as well as the driving experience and safety of electrical vehicles.

Small companies and new businesses are supported by the government with the financing programs of the *Central Innovation Programme for SMEs (ZIM)* and the *Co-operative Industrial Research (IGF)*.

Between 2012 and 2015, the government allocated to four “showcases” regions a total of € 157 million for researches that should lead to the development of new powertrains and for electric vehicle testing in normal everyday conditions.

Demonstration Programs/Procurement

Germany is part of the “green public procurement (GPP 2020)” initiative, aiming to encourage low-carbon procurement across Europe (other members include Austria, Croatia, Italy, Netherlands, Portugal, Slovenia and Spain).

The majority of German cities already have or committed to purchase at least one electric vehicle, and are involved with the network development of charging infrastructures. For example:

- In the metropolitan area of Hannover-Braunschweig-Göttingen-Wolfsburg, 80 municipal and district authorities are currently integrating electric vehicles to their fleets as part of a joint collective development project to promote their region and electrification of transportation. The initiative involves the acquisition of new electric vehicles (e.g.: cars, buses), as well as other new measures (e.g.: improved land planning and development plans, reserved lanes for electric vehicles, better integration of electric bicycles, making more visible the installations related to electrification of transportation).

A total of € 130 million, was allocated to the program “Electric Mobility in Pilot Regions” for eight pilot electric mobility projects in Germany (Hamburg, Bremen/Oldenburg, Rhine-Ruhr (Aachen and Münster), Rhine-Main, Saxony (Dresden and Leipzig), Stuttgart, Munich, Berlin-Potsdam) and are testing battery-driven mobility applications. Furthermore, smart grid infrastructure as well as information and communications technology for electric mobility are tested in thirteen other locations, in collaboration with carmakers (including BMW, Daimler and Volkswagen), utilities, research institutes, as well as national and federal state ministries.

The German government is also evaluating to make mandatory the installation of charging stations in the parking lots and garages owned by the government (e.g.: including various airport parking lots, train stations, government buildings).

By 2017, the federal government aims to replace 30% of its fleet with electric vehicles. In addition, 10% of new vehicles purchased must emit less than 50g CO₂ / km.

Multi-Jurisdictional Agreements

Germany is proactive and involved in several multi-jurisdictional efforts in electrification of transportation, including:

- Germany is a member of the International Zero-Emission Vehicle Alliance (ZEV Alliance), a collaboration alliance of 14 national and subnational governments working together to accelerate

adoption of ZEVs, with British Columbia, Quebec as well as other jurisdictions in the United States and in Europe.

- Discussions with China, Japan and the United States for new standard or standard harmonisation related to electrification of transportation (e.g.: with the CCS, Industrie 4.0 and electric mobility)
- Germany and China have established a partnership, the Sino-German EV Charging Project, which aims to find effective solutions for charging batteries in both the private and public network, in addition to maintaining an active dialogue to harmonize their standards.
- Germany is a founding member of the Electric Vehicle Initiative, a platform of exchange involving 15 countries discuss and compare the initiatives that have been implemented in each of them
- The German Federal Ministry for Economic Affairs and Energy is a member of the Electric Mobility and Funding Initiative (part of the ERA-NET program of the European Commission) which seeks to establish a platform for cooperation between European countries
- Germany ratified the Agreement for Co-operation on Hybrid and Electric Vehicle Technologies and Programmes (IA-HEV), a program of the International Energy Agency, with several other countries, promoting information exchanges in electromobility and pooling financial resources (€ 20 million) to develop projects.

Japan

Cumulative light-duty plug-in electric vehicle sales in Japan totaled about 151,250 units between July 2009 and December 2016, consisting of 86,390 all-electric cars (57.1%) and 64,860 plug-in hybrids (42.9%).^[13] At the end of 2016, Japan ranked as the world's third largest light-duty plug-in vehicle country market after the China and the U.S.^[4] As of September 2016, total Japanese sales of light-duty plug-in vehicles represent 8.1% of the global stock of plug-ins.^[15] The plug-in segment sales climbed from 1,080 units in 2009 to 12,630 in 2011, and reached 24,440 in 2012. Only all-electric cars were sold in the country between 2009 and 2011.^[16] Global sales of pure electric cars in 2012 were led by Japan with a 28% market share of the segment sales. Japan ranked second after the U.S. in terms of its share of plug-in hybrid sales in 2012, with 12% of global sales.^[12]

As of 2016, there are 17,260 publicly accessible slow chargers, and 5,990 publicly accessible fast chargers.

Legislation / Regulations

In May 2009, the federal government passed the *Green Vehicle Purchasing Promotion Measure* that established tax deductions and exemptions for environmentally friendly and fuel efficient vehicles. The deductions and exemptions are determined based on a set of environmental performance criteria, and the requirements are applied equally to both foreign and domestically produced vehicles. The program provides purchasing subsidies for two type of cases, consumers purchasing a new passenger car without trade-in (non-replacement program), and for those consumers buying a new car trading a used car registered 13 years ago or earlier (scrappage program).

Purchase Incentive

Under the *Clean Energy Subsidies Program*, EV purchasers may receive up to \$850,000 yen (\$10,000 CAD) upon the purchase of a new EV.

In addition, EV purchasers also enjoy exemption and reduction from certain auto-related taxes. For example, EVs are exempt from automobile acquisition tax (5% of the purchase price) and from automobile weight tax. EVs also have substantial reduction from annual automobile tax.

Public Infrastructure Investment / Planning

The “Promotion Project to Develop Charging Infrastructure for Next-generation Vehicles” program was developed to fund charging station infrastructure. 100.5 billion Y was allocated from 2013-2015 (the program is currently under review).

Information and Awareness

On August 6, 2013, METI hosted the *EV & PHV Town Symposium* in Takayama City, Gifu Prefecture to introduce the suite of measures and incentives available for EVs and PHVs.

Additional Incentives

In addition to the subsidies, EV purchasers enjoy exemption and reduction from certain auto-related taxes. For example, EV's are exempt from automobile acquisition tax (5% of the purchase price) and from automobile weight tax. EVs also have substantial reduction from annual automobile tax.

Targets

The *Japan Revitalization Strategy 2015* sets a target of 50-70% of new vehicle sales to be electric vehicles and plug-in hybrid vehicles by 2030.

The 50-70% target is as an increased target for EVs and PHEVs adoption. Japan has exceeded its previous target of one million EVs and PHVs ownership by 2020, reaching a total of 140,000 EVs and PHVs sales by the end of February 2016.

Governance

The Ministry of Economy, Trade and Industry (METI) is the lead for initiatives promoting adoption of EVs and PHVs in Japan.

The government established a Study Group on the Road Map for EVs and PHVs to develop strategies (until 2020) to promote EVs and PHVs adoption, with the aim to effectively reduce CO₂ emissions.

Research and Development

A Clean Energy Vehicle Promotion Subsidy is offered to manufacturers to reduce the prices so that a solid next generation vehicle market will be formed without government subsidies. The subsidies aim to urge large businesses to reduce prices and improve the performance of the vehicles in the long term. Support in subsidies is to be provided for the development of battery materials, all lead by private enterprises. Thus, lowering the costs of car mounted parts as well as developing new technologies to create batteries that excel. The government has allocated funds to specifically **Develop Advanced Technology for Application and Commercialization of Lithium-Ion Batteries** of \$2.5 billion Yen (\$30 million) in 2014 as well as \$3.5 billion Yen (\$42 million) in 2014 for **Advanced Basic Scientific Research in Innovative Storage Batteries**.

Japan Automobile Research Institute (JARI), established through the reorganization of the former Automobile High-Speed Proving Ground Foundation in April 1969, engages in general research on automobiles. It started as a public-service corporation of a test-research organization intended to

contribute to healthy development of the automotive society. It has since progressed with the development of automobiles in Japan.

Multi-Jurisdictional Agreements

Electric Vehicles Initiatives (EVI) is a forum which Japan is a part of for global cooperation on the development and deployment of electric vehicles. The establishment of the forum was proposed by the U.S. and China during the 1st Clean Energy Ministerial (CEM) in July 2010. Major activities to date include:

- **EV Pilot City Program:** Select pilot cities for demonstration experiments and share with EVI members. From Japan, Kanagawa Prefecture and Nagasaki Prefecture are registered.
- **Strategic public investment in EV innovation:** For efficient public investment in EV related matters, member countries share information on the current R&D investment levels and roadmaps.
- **Information sharing on targets and best practices:** IEA (Secretariat) takes initiatives in information gathering and sharing on diffusion targets/policies, charger information, consumer behaviors, etc., and then publish a Data Book.

Japanese auto makers have been very successful worldwide, due to their advanced technological innovation, and have thus helped drive international growth and employment, notably in Europe where in 2009 Japan Automobile Manufacturers Association (JAMA) members employed 136,000 people and made cumulative investments of €21.49 billion. The Next-Generation Vehicle Strategy will help in maintaining this momentum and the leading role of JAMA members in the clean and energy-efficient vehicle sector.

Netherlands

In 2016, 112,010 electric cars were registered in the Netherlands (98,900 plug-in hybrid electric vehicles and 13,110 battery electric vehicles), representing a market share of 6.39%. There were also 26,789 publicly accessible chargers (including 701 fast chargers).

Legislation/Regulations

In 2009, the Netherlands released a National Action Plan for Electric Driving. Since 2003, two European directives governing Renewable Energy for transport and Air Pollution from Fuels (European Fuel Quality Directive (FQD) and European Renewable Energy Directive (RED)) have been enforced into Dutch laws and regulations (responsibility of the Dutch Emissions Authority (NEA)).

Tax rules were also implemented for EVs and hybrid vehicles. Electric vehicles and plug in hybrid vehicles are free of Motor Vehicle Tax and purchase tax.

Purchase Incentive

The new owners of all-electric vehicles do not pay the registration fee (“registration tax”) and do not pay “road tax”, while the new plug-in hybrid vehicle owners pay half of the two taxes.

Also, the government offers a tax exemption for the purchase of vehicles calculated in € / gram of CO₂ emitted, and depending on the report issued gram (g) CO₂ / km per vehicle (see Table 5). The maximum registration tax reduction for the highest fuel-economy car label category is € 5,000

Table 4: Tax Exemption for the Purchase of an EV

Vehicle Category	CO ₂ emissions (g CO ₂ / km)	Maximum fee (€ / g CO ₂)
Category 1	< 1	0
Category 2	1-80	6 € / g CO ₂

There is a fee (“Malus”) for vehicles emitting over 80 g CO₂ / km (with four categories of € / gram of CO₂).

The Government provides total exemption of the “road tax” for vehicles emitting less than 50g CO₂ / km. This fee varies between € 400 and € 1,200 beyond that rate.

Discounts for environmental investments are also offered and can be cumulated to the other incentives (maximum € 50,000 or approximately 36%) as well as various other regional and local incentives. For example, the City of Amsterdam offers a grant for companies to change their conventional cars with electric cars.

Public Infrastructure Investment / Planning

The policy “Green Deal on Public Charging Infrastructure 2015-2018” aims to support charging station installations. The government will subsidize the terminal location along with the private sector investments. The National Plan aims also to lower the costs of charging stations. The government announced to finance a total budget of € 5.7 million for public charging infrastructure.

Information and Awareness

With the project “LomboXnet”, the government inaugurated of the first “V2G” terminal in a district of the City of Utrecht.

During the day “Instapdag”, in collaboration with the government, electric vehicle owners are offering their vehicle for test drives to promote electric vehicles (and help to respond to questions related to electric vehicles).

Additional Incentives

Electric car owners have exclusive access to “green zones”, areas defined by the government with greenhouse gas (GHG) emission and noise caps for vehicles. Some cities also prioritize electric vehicles when allocating parking permits.

Targets

In 2020, the objectives are:

- The aspiration for 2020 is that 10% of all new cars sold will have an electric powertrain and there will be 10,150 full time jobs in Netherland’s EV industry
- Companies delivering fuels to the transport sector in the Netherlands must raise their share of renewable energy by 10 % in the transport sector

In 2025, the government aims to reach:

- 1 million electric vehicles
- 50% of all new cars sold in 2025 will have an electric powertrain and a plug, and that at least 30% of these vehicles (15% of the total) will be fully electric. The aspiration for 2020 is that 10% of all new cars sold will have an electric powertrain and a plug

For 2030, the Netherlands have a GHG reduction target of 17% compared to 1990. It also signed the European Directive to combat further air pollution and ensure cleaner air with other Member States, the European Commission and the European Parliament. The global target of the partners is to reduce the number of early deaths on account of air pollution by more than half by 2030 by imposing ceilings, for example, on particulates, nitrogen and ammonia.

Under the Electric Transport Green Deal (2016-2020) all new cars registered after 2035 are capable to drive zero emission.

For 2050, it is aimed that all vehicles on the road will be electric vehicles. It is estimated that the zero-emission vehicles will lead to a GHG emission reduction of the transportation sector by 60% compared to 1990.

Governance

The electrification of transport policy is based on cooperation of several entities interacting together, including:

- The Netherlands Enterprise Agency
- The Ministry of Infrastructure and the Environment (MIE)
- The Ministry of Economic Affairs (MEA)
- The Ministry of Finance
- The Formula E-Team (FET), an advisory board of the MIE and MEA.
- Other business networks and non- governmental organizations.

Netherlands seeks to encourage the dynamism of electrification of transportation through economic development, as well as by promoting trade at national and international levels. Furthermore, Netherlands offers tax incentives to companies, supports the development of new technologies and promotion of innovation.

Research and Development

The Dutch Innovation Centre for Electric Road and several universities are collaborating together in research projects in electrification of transportation.

In 2014, the Plug-in Coalition studied PHEVs driver behavior (e.g.: recharging habits, vehicle usage, and billing).

Utrecht University and the Netherlands Enterprise Agency analyzed 1 million charging transactions to study that EV owners recharge routine behavior, and concluded that the “fear of exhausted charge battery” of drivers has significantly been reduced and is no longer a critical issue. The potential of “Smart charging” was also highlighted. The study revealed that 88% of the battery recharging

transactions were three times longer than the charging itself (with the EV remaining plugged in even when fully charged).

In April 2015, several “Green Deals (public private partnerships)” were in place for new smart grids, EV charging infrastructures and contributing to GHG emissions reduction of public transport system (with zero emission goals), including in Amsterdam, Rotterdam, Utrecht, in the provinces of Brabant and Friesland.

At the end of 2015, in Rotterdam, the testing of a network with wireless charging infrastructures (using electromagnetic fields) was initiated. The performance of the network with the inductive loading terminals, the payment mode and the interoperability with the public electricity network is being evaluated.

The Dutch government and businesses are also eligible for research funding from the European Union (e.g.: Horizon2020, Electric Mobility Europe (EME) and ERDF programs).

Demonstration Programs/Procurement

The Netherlands are part of the “green public procurement (GPP 2020)” initiative, aiming to encourage low-carbon procurement across Europe (other members include Austria, Croatia, Germany, Italy, Portugal, Slovenia and Spain).

The fleet of the City of Rotterdam has reached 40 electric cars and wants to add 350 more in the future. The City aims to have a 100% electric public transportation system by 2025.

Multi-Jurisdictional Agreements

The Netherlands are a member of the International Zero-Emission Vehicle Alliance.

The Dutch Organisation for Electric Transport, an association of companies involved in the electrification of transportation, is a member of the European Association for the electric vehicle industry (AVERE).

Netherlands is a member of forums for exchange promoting electrification of transportation with the International Energy Agency, including:

- the Co-operation on Hybrid and Electric Vehicle Technologies and Programmes (IA-HEV)(a program and agreement grouping 18 Western countries and promoting “exchange of information”); and,
- the Electric Vehicle Initiative.

A partnership between California and Netherlands (“programme Partners for International Business”) was also implemented following numerous trade missions and conferences. It has generated new opportunities for Dutch companies and a € 24 million investment fund was created.

With the “Electromobility+” framework, initiated in December 2010, 11 European countries and regions, including Netherlands, as well as the European Commission have joined for funding transnational research projects (€ 20 million).

Netherlands is also part of:

- The Green Growth Group, a group of environment ministers from 15 European countries exchanging on best practices to achieve sustainable growth in partnership with other key players and companies.
- The International Zero-Emission Vehicle Alliance (ZEV Alliance), including 14 countries and regions (with Quebec and British Columbia).

The public Transport sector, municipality's, province and the Ministry of Infrastructure and The Environment have signed an agreement Zero Emission Public Transport (April 2016). In 2025 all new busses are zero emission.

Norway

Norway has the highest number of electric vehicles per capita in the world. The vast majority of electric vehicles are all electric vehicles.

In 2016, 133,260 electric cars were registered in Norway (34,380 plug-in hybrid electric vehicles and 98,880 battery electric vehicles), representing a market share of 28.76%. There were also 8,157 publicly accessible chargers (including 1,052 fast chargers).

Legislation/Regulations

Political agreements on climate changes and electrification of transportation were enforced by the Norwegian Parliament in 2008, 2012 and 2015. The 2012 agreement protected existing tax-incentives until 2018 or until 50,000 EVs reached, and set the target for 2020 an average emission for new passenger cars of < 85 gram CO₂/km. The 2015 agreement involves the following elements:

- No VAT on leasing of electric cars
- Tax incentives to kept until 2018, and thereafter gradually reduced
- Norwegian EV owners will benefit from tax exemptions until 2017. In 2018 EV owners will be required to pay half the road licence fees and by 2020 the exemption completely expires
- Purchase tax exemption prolonged to 2020.
- Change from no VAT to a system with a grant scheme?
- Local municipalities will have central influence over the "access to public transport lanes".
- Local municipalities decides free parking etc.
- Looking at environmental effect of a system with differentiated taxes in the toll rings and on the ferries."

Norway reached 50,000 EVs in April 2015 but it is expected that the main existing incentives will remain until 2018 and then gradually be reduced.

Furthermore, new light duty vehicles (cars and vans) must meet the pollution emission standard Euro 6 and heavy duty vehicles, the standard Euro VI.

Purchase Incentive

Electric vehicles are exempt from the "registration tax" (between € 400 and € 180,000, effective until 2020). There is also no value-added tax (VAT) for electric vehicle (the VAT is 25% for conventional cars).

Electric vehicle license fees for driving lower emission vehicles (approximately € 52 instead of € 360-420 for conventional average cars) and there is a lower annual road tax.

The imposed benefit taxation for a private citizen using a company electric car is halved in relation to other types of vehicles (only half the vehicle's value is counted when calculating the benefit).

Personal Infrastructure Subsidy

Norway provides financial support for the implementation of residential terminals. Several municipalities do also. For example, in 2014, the City of Oslo was funding up to 60% of the implementation of new charging point (maximum 10,000 NOK or € 1,200).

The 2015 survey results of the Norwegian Electric Vehicle Association indicated that *“The typical Norwegian EV owner buys his or her electric car as an addition to their petrol or diesel car”* and that *“Most electric car owners charge at home and starts with full battery every morning”*.

Public Infrastructure Investment / Planning

In 2015, Enova contributed to the installation of 77 new quick-charging stations. It collaborates with developers (e.g. Fortum, Grønn Kontakt) to accelerate the integration of new quick-charging stations on key corridors (e.g. corridors between the cities of Stavanger and Trondheim (E39), as well as Trondheim and Tromsø (E6), and other connected corridors to Oslo). Enova's investment priority is “between cities” (no program to increase capacity within cities).

The database NOBIL, developed and maintained by the Norwegian Electric Vehicle Association, contributes to the effectiveness of the charging station infrastructures. NOBIL provides real-time information on availability and other detailed information for the charging stations. Interactive maps, charging status and billing services can also be accessed with Internet and smartphones (e.g. Ladestasjoner, Bilkraft, GoCharge, EasyPark).

Information and Awareness

The Norwegian Electric Vehicle Association, a non-profit organization created over 20 years ago, promotes electric vehicles and represents the electric car owners in Norway. It plays an important role by sharing information on electric vehicles to its members, journalists and the government. It organizes events where people can try electric vehicles.

The ZERO Emission Resource Organization is a non-profit organization also promoting to the public the use of electric and organizing promotional events.

The European Alternative Fuels Observatory web data base of the European Commission summarises the main statistics for Norway on EVs, vehicle models and incentives.

Additional Incentives

The owners of EVs are exempted from road tolls, can benefit of free public parking spaces, access to bus lanes and do not pay the boarding fees on ferries. They also benefit from rate reductions for their electricity (energy supply reductions).

Targets

For 2020, the targets of Norway are:

- 100,000 electric vehicles in circulation (To be revised because it was reached in April 2016).
- Average emission for new passenger cars of < 85 gram CO₂/km.

By 2025, Norway aims to phase out from gasoline and diesel powered cars. The Norwegian Parliament have decided on a goal that all new cars sold by 2025 should be zero (electric or hydrogen) or low (plug-in hybrids) emission.

By 2030, Norway aims a 40% GHG emission reduction compared to 1990 levels.

By 2050, Norway aims to achieve carbon neutrality (Denmark and Sweden as well) and that all new passenger vehicles be zero emission vehicles (with the International Zero-Emission Vehicle Alliance (ZEV Alliance) members).

Governance

Enova, a public enterprise owned by the Ministry of Petroleum and Energy, is responsible of the elaboration of the charging infrastructure strategy for Norway, financing and promotion of the use of EVs.

Its current main initiatives and objectives include to:

- Facilitate commercial development of charging services
- Fund important transport corridors by 2016
- Evaluate the need for continued support in 2016
- Contribute to removing range anxiety
- “Make it easier” to choose EVs when buying a car

Enova also promotes more efficient energy consumption and increased production of renewable energy.

The Norwegian Public Roads Administration (Statens vegvesen) seeks *“to ensure that all those who walk, cycle, travel by car or use public transport should get to their destination safely” (including electric vehicles)* by planning, building, operating and maintaining the national and county roads in Norway. It is also responsible for carrying out driver tests and inspection of vehicles and road users.

Research and Development

The Research Council of Norway supports research in electrification of transportation (and other fields), for example, with the ENERGIX research program on energy, energy efficiency and energy politics.

The Institute of Transport Economics (TØI) studied how Norwegian craftsmen could innovate for more efficient and sustainable transportation as well as the potential for the use of electric vans in the craftsman enterprises, with other partners on the “Carfttrans” Project (with the University of Oxford, representatives from the automotive industry, craftsman enterprises using vans, etc.).

Other example of research and development include the following projects: E-Car (on the influence on the environment and the energy sector); RENERGI(contribution to reduce the knowledge gaps); REKKEVIDDE(RANGE); Innobike; electric taxi; and , electric postal distribution.

Demonstration Programs/Procurement

In Norway, the purchase of EV is decentralized: towns, state companies and counties act independently. However, they have the same purchase incentives that have individuals. In 2013, Norway Post has been replacing 1,300 fuel diesel vehicles with EVs.

Enova offers grants for pilot and demonstration projects for electric buses, lorries, ferries, etc.

Multi-Jurisdictional Agreements

Norway is a member of:

- the *Electric Vehicles Initiative*, a forum that focuses on public policy on electrification of transportation and bringing together 16 countries, most of which are important markets for EVs;
- the *European Association for Electromobility (AVERE)*;
- the *World Electric Vehicle Association (WEVA)*;
- *Electromobility+*, a group of 11 states founded in December 2010 that agree to pool their financial resources to develop transnational projects (€ 20 millions); and,
- ZEV Alliance with British Columbia, Québec, California and other jurisdictions

Although Norway is not a member state of the European Union (EU), it is closely associated with the efforts of the Union for low-emission mobility (the European Strategy for Low-emission mobility was released in July 2016).

The Norwegian Government's strategy for cooperation with the European Union (EU) for 2014-2017 highlights that *"Norway has useful experience that it can share with the EU, particularly as regards the roll-out of Europe's largest electric vehicle fleet"*.

Furthermore, on the project *"Competitive Electric Town Transport (COMPETT)"*, Norway partnered with Austria and Denmark with a total of five partners representing research, local authorities and businesses to study the most favorable locations to implement charging stations. The objective is to *"shed new light on the appropriate role of the government in the take-off stage and the creation of a self-sustaining market for e-vehicles. COMPETT's recommendations will address the different role of the different stakeholders or actors."*

In 2012, *Electric Mobility Norway*, a group of companies working in the EV industry, joined the Arena program promoting the development of innovation through increased cooperation among businesses, research institutes and the public sector.

United Kingdom

As of the end of 2015, the number of registered plug-in vehicles in the United Kingdom (UK) is 53,600, there are 10,500 charge points and 38 plug-in models are available to consumers. Plug-in vehicles now account for just over 1% of new car registrations, well up from 0.2% in early 2014. Ultra-low emission vehicles are an area of growth for UK automotive sector, which contributes over £11 billion (\$18 billion CAD) to the country's economy every year. Currently 1 in 4 of all European electric vehicles are manufactured in the UK.

In the 2015 Spending Review, the government committed to spending more than £600 million between 2015-16 and 2020-21 to support uptake and manufacturing of ultra-low emission vehicles in the UK; which is an increase from the £400 million (\$653 million CAD) the government committed to spending between 2011 and 2015.

Legislation/Regulations

In 2008, the UK introduced the *Climate Change Act*, which formally sets out the country's goal of achieving an 80% reduction in greenhouse gas emissions over 1990 levels by 2050. The Act does not have specific provisions for the transportation sector, but serves as the overarching framework for the country's emissions reductions activities.

Purchase Incentive

The UK offers grants to consumers to reduce the purchase price of plug-in electric vehicles and vans. These rates were last revised March 1, 2016 and will be maintained until March 2017 or until the sales threshold has been reached (40,000 Category 1 vehicles or 45,000 combined sales of Categories 2 and 3), at which point the grant levels will be reassessed.

Table 5: Plug-In Electric Vehicle Purchase Rebates in the UK Current to March 1, 2016

Vehicle Category	CO ₂ emissions (g/km)	Zero emission range ^a (miles)	Grant	Maximum Grant	Applies to Vehicles More Than £60,000 (\$97,920 CAD)
Category 1	< 50	70+	35% of purchase price	£4,500 (\$8392 CAD)	Yes
Category 2	< 50	10 to 69	35% of purchase price	£2,500 (\$4662 CAD)	No
Category 3	50 to 75	20+	35% of purchase price	£2,500 (\$4662 CAD)	No
Van	< 75	10+	20% of purchase price	£8,000 (\$14,920 CAD)	Yes

- Zero emission range is the distance the vehicle can travel without producing any CO₂ emissions
- The cost is the full purchase price of a basic vehicle including number plates, vehicle excise duty and VAT and does not include delivery charges, the first registration fee or any optional extras.

Further, the amount of vehicle tax consumers must pay is dependent on the emissions level of the car they choose. Electric vehicles, where the electricity comes from an external source or an electric storage battery not connected to any source of power when the vehicle is moving, are not exempt from any vehicle tax.

Funding has also been provided to support the uptake of low-emission buses (through the Green Bus Fund and now the Low Emission Bus Scheme) and taxis (Ultra Low Emission Taxi Scheme).

Personal Infrastructure Subsidy

The registered keeper, lessee or have primary use of an eligible electric vehicle may receive up to 75% (capped at £500 (\$816 CAD), including value-added tax) off the total capital costs of the charge point and associated installation costs. The grant is limited to one installation at a domestic residence per eligible vehicle, up to a maximum of two charge points.

Public Infrastructure Investment / Planning

In 2015-16, the Office of Low-Emission Vehicles invited cities to submit funding proposals to support greener vehicles (the “Go Ultra Low City Scheme”). The winning cities have been awarded a share of a £40M (\$65.3 M CAD) fund that will go towards infrastructure installation, EV demonstration projects and other strategies to increase EV uptake. Prior activities to encourage infrastructure deployment include the “Plugged-In Places” Program, a four-year program initiated in 2010, to provide match-funding to businesses and public sector partners to install plug-in vehicle charge points. By the end of March 2013, over 4000 charge points had been provided through the 8 Plugged-in Places projects.

Information and Awareness

In 2014, the UK government and vehicle manufacturers working in association with the Society of Motor Manufacturers and Traders launched the Go Ultra-Low Campaign to increase awareness and uptake of electric vehicles. The primary mechanism of the campaign is their website (www.goultralow.com), which serves as a central hub for consumers to find information on EVs and charging stations.

Additional Incentives

The City of London offers an Ultra Low Emission Discount on the congestion charge that vehicles normally have to pay to drive in the downtown core (£11.50 per day (\$18.8 CAD)). Electric and other low-emission vehicles are not required to pay the congestion charge, but must still pay the £10 (\$16.3 CAD) annual registration fee. Some of the measures being adopted in other cities include allowing electric cars to drive in bus lanes (Milton Keynes and Derby) and allowing electric cars to park for free (Bristol and Milton Keynes).

Targets

The UK government recently accelerated their target by 10 years, from all new sales of vehicles being effectively emission-free by 2050 to achieving this by 2040.

Governance

In 2010, the UK set up the Office for Low Emission Vehicles (OLEV), which is a dedicated “team working across government to support the early market for ultra-low emission vehicles”. The Office is staffed from and part of the Department for Transport, the Department for Business, Innovation & Skills and the Department of Energy & Climate Change.

In 2013, OLEV published [Driving the Future Today: A strategy for ultra low emission vehicles in the UK](#) to outline a vision, overarching principles and key commitments for reducing emissions from on-road transportation. One of the stated principles of the strategy is technological neutrality, including a commitment to develop policies based on output rather than technology.

Research and Development

The Low Carbon Vehicles Innovation Platform, launched in 2007, provides collaborative funding to the automotive industry to increase energy efficiency, reduce emissions and optimise vehicle use.

In September 2015, the Office for Low-Emission Vehicles and Innovate UK (the UK government's innovation agency) invited companies to propose innovative ideas to cut vehicle emissions. 130 car manufacturers, technology companies and research centres across the country have won a share of the £38.2 million (\$62.3 M CAD) fund. This competition was not restricted to EVs but some of the winning projects are focused on electrification, such as a £1.3 million (\$2.1 M CAD) project looking to significantly reduce the cost of electric vehicle batteries by using cheaper sodium-ion technology.

Demonstration Programs/Procurement

The Low Carbon Vehicle Public Procurement Programme (LCVPPP) provided financial assistance to public sector organisations to procure lower-carbon and all-electric vans from 2008 to 2013. The LCVPPP placed 637 hybrid and 63 electric vans within 77 public sector fleets and reported successes in terms of testing the vans and learning for fleet operators. In 2015, the government announced £5 million (\$8.2 CAD) in funding for fifteen government departments and agencies to add ultra-low emission vehicles to their fleets.

Multi-Jurisdictional Agreements

In September 2015, 9 U.S. states, 1 Canadian province (Québec) and 4 European countries (UK, Germany, Norway and the Netherlands) formed the International Zero-Emission Vehicle Alliance. Alliance members aim to make all passenger vehicles sales in their jurisdiction zero-emission vehicles (ZEVs) as soon as possible, and by 2050 at the latest. ZEVs include battery-electric, plug-in hybrid and fuel cell vehicles. Notably, the Alliance also aims to deploy ZEVs, where possible, in the medium- and heavy-duty transportation, including public transit. In December 2015, British Columbia became the 14th jurisdiction to join the ZEV alliance.

United States (Federal)

As of September 2016, there are more than 500,000 electric vehicles (BEVs and PHEVs) on the road in the US, halfway to the Department of Energy's goal of 1 million EVs by 2020.

Legislation/Regulations

Vehicle Incremental Cost Allocation: requires U.S. General Services Administration and other federal agencies to allocate the incremental costs of purchasing EVs, and other alternative fuel vehicles (AFVs), across the entire fleet of vehicles procured.

Procurement Preference for Electric and Hybrid Electric Vehicles: the U.S. Department of Defense must exhibit a preference for the lease or procurement of non-tactical motor vehicles with electric or hybrid propulsion systems.

DRIVE (Developing a Reliable and Innovative Vision for the Economy) Act (2015): the U.S. Department of Transportation must designate, by December 2016, national electric vehicle charging and natural gas fuelling corridors that identify the need for electric vehicle infrastructure and natural gas fuelling infrastructure at strategic locations along major national highways.

Vehicle Acquisition and Fuel Use Requirements for Federal Fleets: under the Energy Policy Act of 1992, 75% of new light-duty vehicle acquired by specified federal fleet must be AFVs, including hybrid electric vehicles. Executive Order 13693 also requires specified fleets to ensure that 20% of light-duty vehicle acquisitions are ZEVs or PHEVs by December 31, 2020, and 50% by December 31, 2025.

Purchase Incentive

Qualified Plug-In Electric Drive Motor Vehicle Tax Credit: a tax credit between \$2500 and \$7500 (\$3,050 to \$9,149 CAD) is available for the purchase of new qualifying plug-in electric drive motor vehicles with at least 5 kilowatt-hours of capacity. \$2,500 (\$3,050 CAD) is the base credit, plus \$417 (\$509 CAD) for a vehicle which draws propulsion energy from a battery with at least 5 kilowatt hours of capacity, plus an additional \$417(\$509 CAD) added for every kilowatt hour of battery capacity in excess of 5 kilowatt hours. The full credit (\$7,500 (\$9,149 CAD)) is available to some models of both battery electric and plug-in hybrid electric vehicles. The credit will begin to phase out for a specific manufacturer once the number of its qualifying vehicles sold over a one-year period reaches 200,000.

Qualified Two-Wheel Plug-In Electric Drive Motor Vehicle Tax Credit: a tax credit is available for 10% of the purchase cost of a qualifying two-wheeled electric vehicle with at least 2.5 kilowatt-hours of capacity, up to \$2500. This credit applies to vehicles purchased between January 1, 2015 and December 31, 2016.

Airport Zero Emission Vehicle (ZEV) and Infrastructure Incentives: program provides funding to airports for 50% of the eligible cost to acquire on-road ZEVs used exclusively for airport purposes. Airports may also use funding to install or modify fuelling infrastructure to support ZEVs.

Public Infrastructure Investment / Planning

Alternative Fuel Infrastructure Tax Credit: fuelling equipment for electricity, as well as other alternative fuels, installed by December 31, 2016 is eligible for a tax credit of 30% of the cost, up to a maximum of \$30,000 (\$36,594 CAD). Consumers may also receive a tax credit of up to \$1000 (\$1,220 CAD) for the purchase of eligible residential fuelling equipment.

Information and Awareness

The US Department of Energy hosts a web page named “EV Everywhere” that provides a range of information on EV models, charging, costs, environmental benefits and other topics. There is also a dedicated page for “Stakeholder Solutions”, which includes links and information about a variety of tools available to States and municipalities, fleets, employers, utilities and electrical contractors and inspectors.

One of the tools available to communities is the [Plug-In Electric Vehicle Readiness Scorecard](#), which helps evaluate a community’s readiness for electric vehicles and supporting infrastructure, provides a source of feedback on strengths and areas of improvement and helps track and record progress.

All stakeholders can request free EV Everywhere bumper stickers or window clings to help spread awareness about the benefits of the electrification of transportation. Stakeholders can also make use of the EV Everywhere Communications Guidance document, which encourages individuals and organizations to undertake promotional events on the electrification of transportation and provides background information, suggested talking points and points to additional tools and resources.

Grand Challenges

In 2012, the US Department of Energy launched the EV Everywhere Grand Challenge with the technical goal of having the U.S. become the first nation in the world to produce electric vehicles that are as affordable for the average American family by 2022 as a 2012 baseline gasoline-powered vehicle.

The Workplace Charging Challenge, launched in 2013, aims to have 500 U.S. employers join the initiative as partners by 2018. Partners set a minimum goal of providing charging for a portion of plug-in electric vehicle driving employees and a best practice goal of meeting all employee demand. As of January 2016, more than 250 employers joined as Challenge partners and the installation of workplace charging as a sustainable business practice is growing across the country. Partner efforts have resulted in more than 600 workplaces with over 5,500 charging stations accessible to nearly one million employees.

Research & Development

Vehicle Technologies Office (Department of Energy): provides funding in partnership with industry to reduce the cost, volume and weight of batteries, and to improve electric traction drive systems.

Advanced Energy Research Project Grants: program to fund projects that will develop transformational technologies, including, but not limited to, vehicle technologies, that reduce dependency on foreign energy imports and energy related emissions, improve energy efficiency, and maintain leadership in developing and deploying advanced energy technologies. The program had a budget for \$280 million for fiscal years 2014 and 2015.

Improved Energy Technology Loans: program provides loan guarantees to eligible projects that reduce emissions and support early commercial advanced technologies, including alternative fuel vehicles.

California

As of March 2015, California had around 200,000 plug-in electric vehicles on the road, just under half of all the plug-in electric vehicles on the road in the United States. There are almost 3,200 public charging stations in the State. Of the 31 models available to consumers and eligible for State rebates (not counting motorcycles and low-speed vehicles), 4 are fuel-cell electric, 17 are battery electric and 10 are plug-in hybrids.

Legislation/Regulations

California's Zero Emission Vehicle regulation, first adopted in 1990, requires an increasing proportion of vehicles made available for sale in California by large vehicle manufacturers to be zero-emission vehicles. Some of the requirement to manufacture zero-emission vehicles may be met with low-emission vehicles such as plug-in hybrids, however the substitution is not one-for-one.

Purchase Incentive

The California Clean Vehicle Rebate Program provides up to \$6,500 USD (\$7,929 CAD) towards the purchase of an eligible vehicle. As of March 29, 2016, the program increased rebates for low-moderate income households for most eligible vehicles and applied an income cap to rebates, except for the rebate on hydrogen fuel cell cars.

Table 6: California Clean Vehicle Rebates Current to April 1, 2016 (\$USD)

Vehicle Type	Low/Moderate Income Rebate ^a	Standard Rebate	Income Cap Rebate ^b
Hydrogen Fuel Cell	\$6,500 (\$7,929 CAD)	\$5,000 (\$6,099 CAD)	\$5,000 (\$6,099 CAD)
Battery Electric	\$4,000 (\$4,879 CAD)	\$2,500 (\$3,050 CAD)	Not eligible
Plug-In Hybrid Electric	\$3,000 (\$3,659 CAD)	\$1,500 (\$1,830 CAD)	Not eligible
Zero-Emission Motorcycles	\$900 (\$1,098 CAD)	\$900 (\$1,098 CAD)	Not eligible
Neighbourhood Electric Vehicles	\$900 (\$1,098 CAD)	\$900 (\$1,098 CAD)	Not eligible

- Applies to household incomes less than or equal to 300 percent of the federal poverty level.
- Applies to gross annual income of more than \$250,000 for single filers, \$340,000 for head-of-household filers and \$500,000 for joint filers.
- A Neighbourhood Electric Vehicle is a low-speed vehicle restricted to top speeds less than 25 mph and limited to roads with speed limits of 35 mph or less.

Personal Infrastructure Subsidy

Financial incentives to assist with the cost of installing Level 2 electric vehicle charging stations in personal residences are available in some communities, either from the local public utility or from the South Coast Air Quality Management District. The rebates range from \$200-\$500 (\$244 to \$610 CAD).

Public Infrastructure Investment / Planning

California's Energy Commission is providing funding for the deployment of public direct current (DC) fast charging infrastructure along key corridors. In February 2016, almost \$9 million USD (\$10.98 million CAD) was awarded to four companies for projects along the North-South corridor. Deploying DC fast chargers along California's interregional corridors will be the subject of an upcoming grant opportunity.

Information and Awareness

Consumers can find information on electric vehicles on the DriveClean.ca.gov website's [Plug-In Electric Vehicle Resource Centre](#). The website includes a buyer's guide, information on costs, incentives, safety, environmental benefits and charging stations.

The California Plug-In Electric Vehicle Collaborative is a public/private partnership that focuses on providing information and convening stakeholders to accelerate the adoption of plug-in electric vehicles in the State.

Additional Incentives

The California Department of Motor Vehicles issues White and Green Clean Air Vehicle decals to eligible vehicles, which allows the vehicle to travel in high occupancy vehicle (HOV/carpool) lanes even when the driver is the only occupant. Vehicles eligible for White decals are typically 100% battery electric, hydrogen fuel cell or compressed natural gas vehicles (called “Inherently Low Emission Vehicles” or ILEVs). A limited quantity of Green decals (85,000) may be issued to vehicles that meet California’s transitional zero emission vehicle requirement, generally plug-in hybrids. The statutory limit of Green decals was reached on December 18, 2015; there is no limit for White decals.

Targets & Public Procurement

In 2012, the Governor of California issued Executive Order B-16-2012 outlining the State’s plan for the rapid commercialization of zero-emission vehicles. The Order established a target of 1.5 million zero-emission vehicles on the road by 2025, and in the interim, that charging infrastructure be able to support 1 million zero-emission vehicles by 2020.

The Order also established targets for State procurement: at least 10 percent of fleet purchases of light-duty vehicles were to be zero-emission by 2015 and at least 25 percent of fleet purchases of light-duty vehicles are to be zero-emission by 2020.

Governance

California electrification of transportation policies are managed largely out of the California Air Resources Board, with some funding being managed through the California Energy Commission.

Research and Development

The California Energy Commission funds projects that develop and deploy alternative fuel technologies through the Alternative and Renewable Fuel and Vehicle Technology Program, which has a budget of approximately \$100 million (\$122 million CAD) a year.

The Low Carbon Transportation Investments and Air Quality Improvement Program provide funding for a range of projects, including Advanced Technology Demonstration projects, a pilot project supporting low-carbon light duty transportation in disadvantaged communities, and a pilot project to encourage trade-ups of high-emitting off-road mobile agricultural equipment.

Multi-Jurisdictional Agreements

Prior to signing on to the International Zero-Emission Alliance mentioned above, in 2013 California entered into a Memorandum of Understanding with seven other States (Connecticut, Maryland, Rhode Island, Oregon, Vermont, Massachusetts and New York). The MOU formalized the States’ commitment to zero-emission vehicle programs and provides a venue for coordination and collaboration. The signatory States agreed to a collective target of 3.3 million zero-emission vehicles on the road by 2025.

Canadian Jurisdictional Scan – Policies, Programs and Experience

Government of Canada

On December 9, 2016, First Ministers adopted the Pan-Canadian Framework on Clean Growth and Climate Change. The Framework takes a collaborative approach to reducing GHG emissions across Canada, and is based on four themes: carbon pricing, mitigation measures, adaptation and resilience, and clean technology. There are numerous transportation actions in the Framework, including the following that are related to the electrification of transportation:

- Setting emissions standards and improving efficiency – The federal government will:
 - Continue its work to implement increasingly stringent emissions standards for light-duty vehicles.
 - Work with provinces, territories, and industry to develop new requirements for heavy-duty trucks to install fuel-saving devices.
- Putting more zero-emission vehicles (ZEVs) on the road – Federal, provincial, and territorial governments will:
 - Work with stakeholders to develop a Canada-wide strategy for ZEVs by 2018.
 - Work together, with private sector partners, to accelerate demonstration and deployment of infrastructure to support ZEVs, such as electric-charging stations.
- Shifting from higher- to lower- emitting modes and investing in infrastructure – Federal, provincial, and territorial governments will:
 - Consider opportunities with the private sector to support refueling stations for alternative fuels including natural gas, electricity, and hydrogen.

The Pan-Canadian Framework on Clean Growth and Climate Change (PCF) included a commitment for federal, provincial, and territorial (FPT) governments to work with industry and other stakeholders to develop a Canada-wide strategy for zero emission vehicles (ZEVs) in 2018.

The ZEV Strategy was included alongside a separate PCF commitment for FPT governments to work together, including with private-sector partners, to accelerate demonstration and deployment of ZEV supporting infrastructure (e.g. refueling/charging stations).

The Government of Canada has invested in the further deployment of ZEVs by providing \$62.5 million through Budget 2016 for infrastructure and demonstration projects. Budget 2017 commits an additional \$120 million to deploy and demonstrate charging and refueling infrastructure. The ZEV Strategy will build on these and other existing initiatives, such as light-duty vehicle greenhouse gas emission regulations and efforts to examine grid capacity for electricity and hydrogen fuel supply.

Alberta	
Policy	Alberta Transportation does not have a policy statement specific to the electrification of transportation in Alberta. However, it is actively monitoring developments at the Federal Government and major urban centres (e.g. Calgary and Edmonton) to see where it could develop policies that further facilitate the adoption of electric vehicles. It is also monitoring the development and implementation of alternative fuel buses among Alberta's transit agencies.
Legislation & Regulation	There is currently no legislation or regulations for the use of low- or zero-emission vehicles. Municipal transit agencies are responsible for the procurement and management of their transit fleets.
Programs	GreenTRIP is a funding program that completed its third and final call as the provincial contribution to Phase 1 of the Public Transit Infrastructure Fund. This funding was used alongside PTIF Phase 1 federal funding for public transportation projects. Projects could include low- and zero-emission buses if municipalities applied for funding.
Projects	<ul style="list-style-type: none"> • The Government of Alberta is not facilitating any projects at this time. However, the following is information on low- and zero-emission initiatives from Alberta transit agencies: <ul style="list-style-type: none"> ○ Part of Alberta's carbon levy revenue will be used to support green infrastructure developments, and this could include looking into support for electric vehicle technology. ○ The City of Edmonton conducted an electric bus feasibility study during winter 2016. The recommendations made in the City of Edmonton report, released in June 2016, endorses the inclusion of electric buses into ETS's bus fleet. The study led the City of Edmonton to purchase 40 electric buses using funding from PTIF. ○ In 2014 and 2015, St. Albert conducted tests of two electric buses using GreenTRIP funding. Based on the findings of this testing, St. Albert ordered three electric buses from BYD, which are expected to be delivered by May 2017. St. Albert is expecting to purchase four additional buses in the following year and plans to eventually transition to a 100% electric fleet. ○ In 2016 Grande Prairie investigated the feasibility of incorporating electric buses into their fleet and discovered that an on-grid bus (i.e., a bus charged by electricity from a private power company) would save the city about \$360,000 over its 18-year lifespan, while an off-grid bus (i.e., a bus charged by solar power) would save \$486,000. • The City of Edmonton is developing an electric vehicle strategy which will be an important element of Edmonton's Community Energy Transition Strategy and the City's strategic objective to mitigate energy use in transportation. In the near future the city may be launching a pilot project to install 30 electric vehicle charging stations on City-

	<p>owned buildings.</p> <ul style="list-style-type: none"> The City of Calgary is developing an Electric Vehicle Strategy as part of its Climate Program. The City is working with the Calgary Regional Partnership, Alberta SouthWest Regional Economic Development Alliance and SouthGrow Regional Initiative to setup a network of 15 to 20 DC Fast Charging Stations across southern Alberta. Pending approval of a grant application, these stations will make it possible for EVs to travel across southern Alberta, and into British Columbia and the United States. The network will be accessible by any type of electric vehicle, and will complement Tesla Supercharger stations being installed in Alberta for Tesla vehicles. The City, on behalf of the regional partners, has issued an Expression of Interest in March, 2017, asking for submissions from firms that are interested in installing, owning, operating and maintaining the proposed network of charging stations across southern Alberta.
Best Practices	-
Budget Appropriations	-
Consultation	-
Performance Measures	-
Commitments	-
Other	-

British Columbia	
Policy	<p>The Province of British Columbia developed the Clean Energy Vehicle Program in 2011, which continues to expand.</p> <p>The main policy in place in B.C. currently regarding electrification of transportation pertains to the list of clean energy vehicles that are eligible for point of purchase incentives, incentive amounts, and other clean energy vehicle benefits.³</p>
Legislation & Regulation	<p>Motor Vehicle Act Greenhouse Gas Reduction Targets Act Clean Energy Act</p>
Programs	<ul style="list-style-type: none"> • Clean Energy Vehicle (CEV) Program.⁴ This program consists of a number of elements to encourage and accelerate the adoption of clean energy vehicles in B.C. for environmental and economic benefits. Components of the CEV Program include: <ul style="list-style-type: none"> ○ CEVforBC™ vehicle point-of-sale incentives (up to \$6000 off the purchase price of a qualifying new clean energy vehicle). ○ Charging infrastructure investments: residential, community, and direct-current fast charging stations. ○ Hydrogen fuelling infrastructure investments ○ Fleet adoption support & incentives ○ Research, training & economic development ○ Emotive public outreach & awareness • The Scrap-it⁵ program incentivizes vehicle owners to scrap their older gas or diesel vehicle, and receive in exchange credit toward a more sustainable mode of transportation, including transit passes, a bicycle, car-share credits, etc. One of the types of incentives available is an incentive to purchase a new (\$6000) or used (\$3000) battery electric vehicle. • Clean Energy Vehicles in High Occupancy Vehicle Lanes Program.⁶ Qualifying Clean Energy Vehicles (the same ones as qualify for a purchase incentive) are eligible to drive in High Occupancy Vehicle lanes, regardless of the number of passengers, with a ministry-issued decal. The program is free of charge.
Projects	<ul style="list-style-type: none"> • The Ministry of Transportation and Infrastructure is pursuing truck stop electrification at select locations. • Ministry of Energy, Mines and Petroleum Resources and Ministry of

³ <http://www2.gov.bc.ca/gov/content/industry/electricity-alternative-energy/transportation-energies/clean-transportation-policies-programs/clean-energy-vehicle-program>

⁴ <http://www2.gov.bc.ca/gov/content/industry/electricity-alternative-energy/transportation-energies/clean-transportation-policies-programs/clean-energy-vehicle-program>

⁵ <https://scrapit.ca/>

⁶ <http://www2.gov.bc.ca/gov/content/transportation/driving-and-cycling/traveller-information/routes-and-driving-conditions/hov-lanes/electric>

	<p>Transportation and Infrastructure are developing a network of electric vehicle charging stations across the province. Ministry of Transportation and Infrastructure is looking to support charging stations in applicable rest stops.</p> <ul style="list-style-type: none"> • Shore power for cruise ships at the Port Metro Vancouver - one of the first ports to undertake this. Project was a partnership between Port Metro Vancouver; cruise ship companies and the federal and provincial governments. • Shore power for container vessels at Port Prince Rupert. A partnership between the Port and the Province of British Columbia. • TransLink battery operated bus pilot project. For three months starting in May 2017, TransLink is trialing a battery electric bus to assess its performance, with a second trial planned for 2018.⁷
Best Practices	<p>Electrification of transportation in B.C. currently involves initiatives from a number of ministries who collaborate to increase electrification in the transportation sector, thereby reducing emissions:</p> <ul style="list-style-type: none"> • Ministry of Energy, Mines and Petroleum Resources • Ministry of Environment and Climate Change Strategy • Ministry of Transportation and Infrastructure (MOTI) <p>In addition, TransLink (the Metro Vancouver Regional Transportation Authority) is conducting a battery electric bus trial in 2017 and already currently approximately 19% of the bus fleet of 1400 consists of electric trolley buses.⁸ TransLink is also currently developing a Low-Carbon Fleet Strategy.</p>
Budget Appropriations	<ul style="list-style-type: none"> • Ministry of Energy, Mines and Petroleum Resources: CEV Program: \$31 million (2011-2017), \$40 million in additional funding announced February 2017 for all aspects of the Program. • Ministry of Transportation and Infrastructure: \$700,000 in 2017/2018 for electric vehicle charging infrastructure in rest areas and for truck stop electrification (combined).
Consultation	<p>Public and stakeholder consultation was completed around the development of the B.C.'s climate change plans.</p> <p>Consultation was conducted in developing A Gap Analysis for B.C.'s Electric Vehicle Direct Current Fast Charging Network (2015).⁹</p>
Performance Measures	<ul style="list-style-type: none"> • Percentage of new vehicle sales being clean energy vehicles

⁷ <http://www.translink.ca/en/About-Us/Media/2017/May/TransLink-showcases-electric-bus-trial.aspx>

⁸ <http://www.translink.ca/en/About-Us/Media/2017/May/TransLink-showcases-electric-bus-trial.aspx>

⁹ http://pluginbc.ca/wp/wp-content/uploads/2015/10/BC-DCFC-Gap-Analysis-Report-FBC_Aug-2015.pdf

	<ul style="list-style-type: none"> ○ British Columbia has set a target of 5% of new light duty vehicles being clean energy vehicles by 2020.¹⁰ ● Total number of Clean Energy Vehicles in B.C. ● Number CEV in HOV lanes decals issued ● Number of electric vehicle charging stations ● Number and length of transportation routes with sufficient charging infrastructure for long-distance electric vehicle travel ● Number of truck stops electrified (and stalls served)
Commitments	
Other	

¹⁰ <https://www.cevforbc.ca/clean-energy-vehicle-program>

New Brunswick	
Policy	The Province does not currently have a policy statement regarding the electrification of transportation in New Brunswick, but its Climate Change Action Plan released in December 2016 commits the Province to developing a Green Transportation policy, that would include a strategy to electrify the government fleet of vehicles. Furthermore, the plan commits to a strategy to have 2,500 electric vehicles on the road by 2020 and 20,000 by 2030.
Legislation & Regulation	There is currently no legislation or regulations for the use of low- or zero-emission vehicles in New Brunswick.
Programs	<p>NB Power, a crown electrical utility, received financial assistance from NRCan to build 10 new fast-charging stations across the province. The ten rapid chargers will be positioned every 65 kilometres along Route 2 and are expected to be installed by end of 2017.</p> <p>There are currently 50 charging stations in the province, and NB Power's goal is to reach 300-500 over the next decade which will help encourage more interest in electric vehicles by reducing range anxiety.</p> <p>Other incentive programs may be offered once the province develops its policy and strategy documents in support of its Climate Change Action Plan.</p>
Projects	The Province purchased two electric school buses in fiscal 2017-2018 and introduced these into service in the fall of 2017 as a pilot project. The province is also expected to take delivery of 11 PHEVs that will be introduced into the government fleet in fiscal 2017-2018. For 2018-2019, through its Vehicle Management Agency, the Province will be considering adding 10-15 PHEV passenger vehicles to its fleet.
Best Practices	New Brunswick released its climate change action plan in December 2016 which includes actions to electrify transportation in the province. The department is closely monitoring the experiences in other jurisdictions who were early adopters of electric vehicles to learn best practices that will help ensure successful deployment. DTI will also use the results of its electric school bus pilot to help inform future decisions.
Budget Appropriations	To be determined following full costing of the Climate Change Action Plan and the development of a carbon pricing scheme expected in 2018.
Consultation	A legislative committee was established in 2016 and the committee completed an extensive consultation initiative that included presentations from expert witnesses, government departments, industry and other associations, and private citizens. The information was used to develop the province's Climate Change Action Plan.
Performance Measures	See targets in the Climate Change Action Plan (commitments section)
Commitments	<ul style="list-style-type: none"> • Prepare a green transportation policy that will include measures to:

	<ul style="list-style-type: none"> ○ develop a government electric vehicle program relating to fleet vehicles and recharging infrastructure ○ implement new fleet procurement, consistent with the Green Procurement Policy, and management systems including alternative fuel vehicles that improve fuel efficiency and lower GHG emissions ○ promote a culture of minimized travel by public servants, through measures such as enhanced teleconference capabilities in government offices, alternative work arrangements, a strengthened employee travel policy and encouragement of alternative methods of commuting to work <ul style="list-style-type: none"> ● Work to have 2,500 electric vehicles⁴ on the road in New Brunswick by 2020 and 20,000 by 2030. Implement an electric vehicle strategy that specifies the required incentives, regulations, policies, programs and charging infrastructure to achieve the above-mentioned targets for electric vehicles
Other	<p>On April 4, 2017 NB Power and Natural Resources Canada jointly announced that they will invest in fast chargers for electric vehicles in New Brunswick. NB Power will build 10 fast chargers along the Trans-Canada Highway, in which Natural Resources Canada will contribute \$335,000. This is part of the \$120M that has been committed by Natural Resources Canada to fund electric vehicle charging projects, demonstrations and research initiatives. The charging stations will be located less than 65km from each other and NB Power expects them to be fully operational by July 2017.</p>

Northwest Territories	
Policy	The Government of the Northwest Territories does not currently have a policy statement specific to the electrification of transportation in the Northwest Territories.
Legislation & Regulation	There is currently no legislation governing the use of low- or zero-emission vehicles.
Programs	<p>Pilot Grant Program</p> <p><i>As part of the GNWT's draft 2030 Energy Strategy: A Path to More Affordable, Secure and Sustainable Energy in the Northwest Territories that was released for public comment in September 2017, the GNWT is proposing a pilot grant program for the purchase of hybrid gasoline-electric vehicles in communities that are serviced by hydroelectricity. The program will provide a subsidy for eligible vehicles and installation of charging stations in order to encourage the purchase of these vehicles and reduce the cost disincentive of their higher purchase price relative to conventional gasoline vehicles.</i></p>
Projects	<p>Electric-Gasoline Hybrid Vehicle Testing</p> <p>In 2014, the Arctic Energy Alliance (AEA) leased a 2015 Chevrolet Volt and installed a charging station at its Yellowknife office. The AEA used the vehicle for a year and a half to get around while conducting its home energy audits in Yellowknife. A data logger tracked the vehicle's performance and monthly reports were posted on the AEA web site.</p> <p>The Chevrolet Volt's internal combustion engine generates electricity for the electric motor and does not mechanically power the vehicle. It can drive solely on electricity until the battery is depleted. After that, the engine generates the electricity using gasoline. During the winter, considerably more gasoline is used since the battery has to charge more often due to the cold temperatures, resulting in a fuel consumption that is comparable to a four cylinder car. The batteries do not last as long and the charge is not as rich in the winter. Despite this, it was found that the technology works in the Northwest Territories climate and does result in a reduction of greenhouse gas emissions in hydro-powered communities.</p> <p>The vehicle was purchased from AEA by the Government of the Northwest Territories (GNWT) Department of Infrastructure on March 31, 2016. GNWT employees are being trained to operate the vehicle and further assessments will eventually be made on the costs associated with driving and maintaining the vehicle.</p>
Best Practices	The use of zero-emissions vehicles in the Northwest Territories is still under investigation. One challenge preventing the widespread adaptation of electric vehicles in the Northwest Territories is that many communities are reliant on diesel. Other barriers and challenges to adapting to zero-emissions vehicles are the lack of charging stations, long distances between communities on the highway system without connections to

	<p>hydro power, the inability to provide power along the territory's many winter roads and the public's confidence in the reliability of electric vehicles in a cold climate.</p> <p>The Department of Infrastructure has developed a draft Energy Strategy, which sets out a long-term approach to addressing the affordability, security and sustainability of energy supply and use in the Northwest Territories. The Strategy will guide the development of affordable, secure and sustainable energy for all modes, including transportation and address the resiliency of hydroelectricity in the NWT. The Energy Strategy will be finalized in early 2018.</p>
Budget Appropriations	-
Consultation	The Government of the Northwest Territories undertook extensive engagement with stakeholders and the general public in 2016-17 to support the development of its draft Energy Strategy. This included discussion of ways to support local renewable energy alternatives that would reduce the reliance of communities on diesel, a major barrier to the widespread use of electric vehicles in the territory.
Performance Measures	As referenced under "Projects," assessments are being conducted on the 2015 Chevy Volt purchased by the GNWT. Implementation of the Pilot Grant Program for the purchase of hybrid gasoline-electric vehicles in communities would provide opportunities to develop performance measurements helping track the success of the program.
Commitments	-
Other	-

Nova Scotia	
Policy	<ul style="list-style-type: none"> • The Department of Energy is the lead department on the electrification of transportation in Nova Scotia. The Province is currently reviewing potential policy and program options. • The Department is involved in the Zero Emission Vehicle Working Group (as part of the Pan-Canadian Framework) • The Department is also actively engaged with counterparts in the other Atlantic Provinces to see where we can best coordinate efforts with transportation electrification
Legislation & Regulation	<p>Environmental Goals and Sustainability Prosperity Act (EGSPA)</p> <ul style="list-style-type: none"> • http://nslegislature.ca/legc/statutes/environmental%20goals%20and%20sustainable%20prosperity.pdf • The objectives of the Act outlined in article 4(1): <ul style="list-style-type: none"> ○ 4(1) The long-term environmental and economic objective of the province is to achieve sustainable prosperity and to this end to: 1. Establish clear goals that foster an integrated approach to environmental sustainability and economic well-being; and 2. Work towards continuous improvement in measures of social, environmental and economic indicators of prosperity. • One of the <u>Cleaner Energy Goals</u> under EGSPA is as follows: <ul style="list-style-type: none"> ○ The province adopts and implements a framework to support a transition to cleaner sources and sustainable uses of energy to produce greater economic, social, and environmental benefits for Nova Scotians by supporting and enabling (i) energy efficiency and conservation to assist in energy affordability and competitiveness through increased productivity, (ii) sustainable transportation options, (iii) increased renewable energy, (iv) enhanced use of natural gas to displace oil and coal, and (v) enhanced innovation through globally competitive energy research and development.
Programs	<ul style="list-style-type: none"> • Connect2 (Department of Energy) - is a grant program that is based on a vision that all trips under two kilometres to key destinations in Nova Scotia communities can be made using sustainable modes of transportation. Connect2 will cost share up to 50% of the cost of a project. The program considers applications under two categories: <ul style="list-style-type: none"> ○ Sustainable Transportation Infrastructure and Design: Support for active transportation (AT) infrastructure or design, AT or transit plans, modeling or design for transportation improvements and transportation demand management, shared mobility services, engineering, and feasibility studies. ○ Sustainable Transportation Enabling: Education, public engagement, social marketing, data collection and evaluation, informational supports (signage, maps, technology), ideas or best practices that require more studies to advance sustainable transportation in Nova Scotia. ○ Electric cars and associated infrastructure are <u>not</u> eligible for funding under Connect2

Projects	<ul style="list-style-type: none"> • Nova Scotia Power currently has two Level 3 (high speed) charging stations, one in Truro and one in Halifax. They have announced that they will install 12 new high speed charging stations by spring 2018 (locations to be announced later this fall). EV owners will be able to drive from coast to coast in NS along the 100-series highways. The Province is aware and supportive of this initiative of NSP to develop an EV charging network. • Tesla is expanding their Supercharger Station network into Atlantic Canada. Two stations are planned for Truro and Halifax in 2018. https://www.tesla.com/en_CA/supercharger?redirect=no • DalTRAC project (funded, in part, by Connect2 in 2017-8): The project began with 3 ConnectSmart public engagement sessions to promote diversified transportation options and create a knowledge-base regarding the integration of new mobility options and services within Nova Scotia. Additionally, DalTRAC will host an online ConnectSmart website and social media dialogue promoting active transportation, transit and shared mobility as well as awareness on future mobility options, <u>including electric vehicles</u>. • Nova Scotia Moves (former sustainable transportation grant program) projects: <ul style="list-style-type: none"> ○ 2014-5: Clean Nova Scotia Project, using data analysis and CBSM to apply tailored engagement tools and provide the business and environmental case to enable municipal decision makers and fleet managers to plan for integration of clean tech into their service fleets http://www.nspower.ca/site/media/Parent/Municipal%20Fleet%20Case%20Study.pdf ○ 2013-4: NS EV Highway Services, two projects for EV infrastructure: <ul style="list-style-type: none"> -Installation of an electric vehicle fast charging DC station at the Truro Power Centre. -Installation of a network of 12 AC charging stations throughout Nova Scotia. • The Port of Halifax implemented shore power for cruise ships in 2014. It was a project funded in part by Transport Canada, the Province and the Port of Halifax. <p>Budget Funding mechanisms for electric vehicle charging infrastructure are available under the Federal Government’s funding programs (NRCan and Infrastructure Canada). Some funding for municipalities may be available under the Federal of Canadian Municipalities’ Green Municipal Fund.</p>
Best Practices	-
Budget Appropriations	-
Consultation	-
Performance Measures	-
Commitments	-
Other	-

Ontario	
Policy	The Ontario Ministry of Transportation (MTO) is continuing a number of existing initiatives and undertaking new actions to help reduce greenhouse gas emissions and promote alternative modes of travel.
Legislation & Regulation	-
Programs	-
Projects	-
Best Practices	<p>To make EVs more affordable, Ontario has offered the Electric Vehicle Incentive Program (EVIP) since 2010 and the Electric Vehicle Charging Incentive Program (EVCIP) since 2013. The EVIP provides purchase incentives for eligible EVs from \$3,000 to \$14,000 while the EVCIP helps to lower costs for Level 2 charging stations at home by providing up to \$1,000 or 50% of the cost for both purchase and installation of eligible charging stations (up to \$500 for purchase and up to \$500 for installation).</p> <p>Through Ontario's <i>Climate Change Action Plan</i> (CCAP), the province will invest up to \$20 million to support low- and moderate-income households by offering rebates to replace older and less fuel-efficient vehicles with new or used electric vehicles or plug-in hybrid electric vehicles. Ontario has also been offering Green Vehicle License Plates since 2010. Under this program, EV owners may apply for an optional green licence plate that allows single-occupant EVs on provincial HOV and HOT lanes.</p> <p>In addition, the province will work with the federal government to explore ways to provide relief from the HST (which is federally legislated and administered) to purchasers of new battery electric vehicles, with the objective of introducing this relief by 2018.</p> <p>Through the Electric Vehicle Chargers Ontario (EVCO) Program, the province has invested close to \$20 million to expand the availability of public charging infrastructure across the province as part of the Green Investment Fund announced in 2015. The CCAP identified up to an additional \$80 million for future rounds of the EVCO Program to continue to grow the network.</p> <p>The province is also working on developing an awareness campaign to educate the public on the benefits of EVs and partnering with the non-profit sector to establish a showcase facility to demonstrate the benefits of EVs to the public.</p> <p>Additional efforts under the CCAP to electrify the transportation sector include: requiring EV charging in new homes, condos and workplaces; providing incentives for businesses to purchase electric commercial vehicles and trucks; piloting the use of electric school buses; and, accelerating the deployment of Regional Express Rail electrification.</p>
Budget Appropriations	
Consultation	On October 14, 2016, MTO posted a discussion paper on EV Incentives, Infrastructure and Awareness on the Environmental Registry for a 30-day

	comment period. The paper outlined MTO's proposed approach to the implementation of EV-related programs included in the province's Climate Change Action Plan. Approximately 100 responses were received.
Performance Measures	MTO tracks the number of EVs registered in Ontario and the number of green licence plates. Also, the CCAP sets a province-wide electric and hydrogen passenger vehicle sales target of five per cent by 2020.
Commitments	-
Other	-

Quebec	
Policy	<p>The Transportation Electrification Action Plan 2015 2020, launched on October 9, 2015, aims to promote electric transportation, to develop the industry associated with this economic sector and to create an environment conducive to the transition from gasoline- and diesel-powered vehicles towards electric vehicles.</p>
Legislation & Regulation	<p>The Act to increase the number of zero-emission motor vehicles in Québec, also known as the ZEV Act, was adopted to reduce greenhouse gas and other pollutant emissions. In addition to contributing to the fight against climate change, the act will spur vehicle offerings and lead to greater availability of clean automobiles in Québec for the benefit of the population.</p> <p>Furthermore, the Regulation respecting low-speed vehicles (LSV) introduces rules that supplement those prescribed by Transport Canada with regard to LSV equipment and performance. These additional standards applicable in Québec apply only to vehicles that are intended for travel on certain public roadways and cover braking capacity, driver visibility and vehicle perceptibility, and occupant safety in the event of a collision. The standards ensure minimum safety levels for the occupants of LSVs as well as other road users.</p> <p>The following measures also aim to promote transportation electrification and sustainable mobility in Québec:</p> <ul style="list-style-type: none"> • Review Construction Code • Review Highway Safety Code • Adopt government policy directions in land use planning • Adopt government sustainable mobility policy
Programs	<p>The Transportation Electrification Action Plan 2015 2020 contains 37 different measures centered on three policy directions (strategic orientations) based on the challenges and objectives to be met. There are:</p> <ul style="list-style-type: none"> • Promote electric transportation • Develop the industry • Create a favorable environment
Projects	<p>The main projects and the programs are listed in the Québec Appendix.</p>
Best Practices	<p>The Transportation Electrification Action Plan 2015 2020 is the result of collaboration among twelve ministries and agencies that are actively engaged in transportation electrification. The Ministère des Transports du Québec (MTQ) leads this effort and ensures government coordination.</p> <p>The list of participating ministries and agencies are:</p> <ul style="list-style-type: none"> • Centre de gestion de l'équipement roulant (CGER) • Hydro-Québec • Investissement Québec • Ministère de l'Économie et de l'Innovation (MEI) • Ministère de l'Éducation et de l'Enseignement supérieur (MEES)

	<ul style="list-style-type: none"> • Ministère de l'Énergie et des Ressources naturelles (MERN) • Ministère des Affaires municipales et de l'Habitation (MAMH) • Ministère des Transports du Québec (MTQ) • Ministère de l'Environnement et de la Lutte contre les changements climatiques (MELCC) • Régie du bâtiment du Québec (RBQ) • Société de l'assurance automobile du Québec (SAAQ) • Société québécoise des infrastructures (SQI) <p>Each of these ministries and agencies is responsible for measures related to its mission.</p> <p>Three committees (deputy ministers, technical, and communication) are in place to ensure the success of the Plan.</p>
Budget Appropriations	A financial framework has been adopted for the Action Plan. Québec will be investing over \$420 million, most of it (60 % or 253.5 M\$) from the Fonds vert, which is funded through the cap-and-trade system, also known as the carbon market.
Consultation	Different groups of stakeholders have been met for the elaboration of the Action Plan.
Performance Measures	<p>The Transportation Electrification Action Plan 2015 2020 has four targets:</p> <ul style="list-style-type: none"> • Reach 100 000 plug-in electric and hybrid vehicles registered in Québec by 2020. • Reduce the annual greenhouse gas emissions produced by transportation by 150 000 tonnes • Reduce by 66 million the number of litres of fuel consumed annually • Reach 5 000 jobs in the electric vehicle industry and bring about investments for a total of \$500 million <p>For these targets, the appropriate information is collected on regular basis. Furthermore, ministries and agencies collaborating to the Action Plan have to calculate annually for each measure: the number of employees, expenses, investments and results.</p>
Commitments	The Transportation Electrification Action Plan 2015 2020 is part of a series of measures, including the 2013 2020 Climate Change Action Plan and the 2030 Energy Policy, whose combined effects will enable Québec to achieve a 20 % reduction below the 1990 level by 2020, and to reduce by 40 % the amount of petroleum products consumed in Québec by 2030.
Other	<p>For more information</p> <ul style="list-style-type: none"> • Transportation Electrification Action Plan 2015 2020 : http://www.transportselectriques.gouv.qc.ca/en/

PROMOTE ELECTRIC TRANSPORTATION

Encourage individuals and businesses to consider alternatives to gasoline – powered vehicles and favour electric vehicles to travel.

MEASURES	MINISTRY OR AGENCY RESPONSIBLE	BUDGET Millions \$
INCREASE THE AVAILABILITY OF ELECTRIC PUBLIC TRANSPORTATION		156
Program to support public transportation showcase projects (2015)	MTQ	24,5
Program to support the acquisition of electric school buses (2015)	MTQ	30
Support to carry out pilot projects for the electrification of taxi fleets (2015)	MTQ	6,6
Montréal City Mobility program	MTQ	11,9
Major public transportation projects under study: (2015)	MTQ	83
<ul style="list-style-type: none"> ➤ Public transportation system on the new Champlain Bridge ➤ Extension of Montréal's metro network ➤ Electric public transit system to Montréal's West Island 		
DEVELOP INNOVATIVE SOLUTIONS FOR FREIGHT TRANSPORTATION		38,4
Measures to support showcase projects in the freight transportation sector	MTQ	12,5
Electrification incentives as part of general programs: maritime, air and rail transportation, intermodal transportation and green trucking	MTQ	25,9
PROMOTE THE USE OF LIGHT ELECTRIC VEHICLES		115,9
Support the installation of fast charging stations along the main roads (2015)	MTQ	2,5
Support the installation of charging stations in residential buildings, new office buildings and for on-street parking (2015)	MERN	5,4
Implement a concerted approach and structuring actions with partners to increase the number of zero emission vehicles (2015)	MDELCC	3
"Roulez électrique" program	MERN	93
"Branché au travail" program	MERN	9
Expand the Electric Circuit network	Hydro-Québec	3
<ul style="list-style-type: none"> ➤ 785 charging stations by December 31st, 2016, including 60 fast charging stations ➤ Assistance to municipalities to plan the development of charging sites 		
	TOTAL	310,3

DEVELOP THE INDUSTRY

Increase the research potential in an emergent technology and develop a manufacturing industry dedicated to electric transportation that is innovative and competitive on international markets.

Measures	MINISTRY OR AGENCY RESPONSIBLE	BUDGET Millions \$
INTENSIFY RESEARCH, DEVELOPMENT AND INNOVATION OF THE SMEs		52,1
Support industrial innovation projects related to transportation electrification and intelligent transport systems (2015)	MEIE	16,5
Implement mobilizing projects in transportation electrification	MEIE	20
Support the development of new technologies or innovative processes in terms of energy efficiency (Technoclimat program)	MERN	5
Support SMEs to help them acquire, implement and market equipment/technologies allowing to reduce greenhouse gas emissions (2015)	MEIE	10
Support the organization of scientific and technical international events in Québec (2015)	MTQ	0,6
SUPPORT THE MARKETING AND EXPORT OF INNOVATIVE PRODUCTS		4,75
Support businesses in the transportation electrification sector to help them develop markets outside Québec	MEIE	0,75
Support the introduction of innovative products to the market -- C3E	MERN	4
STIMULATE INVESTMENTS		30
Support investment projects related to transportation electrification	MEIE	10
Encourage foreign companies to settle in Québec	MEIE	20
TRAIN SKILLED LABOUR		0
Introduce a college technical curriculum in electrification of transportation (2015)	MEESR	0
Introduce an engineering curriculum master's degree of 15 credits (2015)	MEESR	0
	TOTAL	86,85

CREATE A FAVOURABLE ENVIRONMENT

Create a favourable environment for electric transportation and make the Québec an example to follow.

Measures	MINISTRY OR AGENCY RESPONSIBLE	BUDGET Millions \$
LEAD BY EXAMPLE		15
Proceed with the electrification of the government's fleet	MTQ-CGER	15
Install public charging stations in government buildings	SQI	-*
PROMOTE ELECTRIC VEHICLES AND GOVERNMENT ACTION		8,6
Establish a government communication strategy and implement the action plan	MTQ	6
Support awareness initiatives for electric vehicles	MERN	2,6
	TOTAL	23,6
MEANS OF INTERVENTION		MINISTRY OR AGENCY RESPONSIBLE
PROPOSE THE IMPLEMENTATION OF LEGAL AND REGULATORY FRAMEWORK PROMOTING TRANSPORTATION ELECTRIFICATION*		
Provide electric vehicles with privileged access to reserved lanes where carpool is authorized		MTQ
Review the Construction Code to provide for the installation of charging stations in new residential buildings		RBQ
Modify the Highway Safety Code to enable low speed vehicles to travel on public roads		SAAQ/MTQ
Modify the Highway Safety Code to regulate access to parking spaces equipped with charging stations for electric vehicles (2015)		SAAQ/MTQ
Modify the diesel compensation program for school buses		MEESR
Implement measures to support urban planning favouring ecomobility:		
➤ Program for the sustainable development of communities		MAMOT
➤ Distribution of development tools intended for municipalities		MAMOT
Adopt new government policy directions in land use planning that will promote transportation electrification		MAMOT

* Considering that these measures are part of the government's regular activities, no specific budget will be allocated for them.

Notes:

The Transportation Electrification Action Plan 2015-2020 is dynamic and since its release, other measures have been added, including new investments, with:

- International Strategy (Ministère des relations internationales et de la Francophonie)
- Support for the development of the new cluster of electric and intelligent vehicles (4,4 M\$, MESI and partnership with the main stakeholders of this industry)
- Pilot project to promote the purchase of fully electric used vehicles (4 M\$, MERN : <http://vehiculeselectriques.gouv.qc.ca/english/particuliers/projet-pilote-occasion.asp>)
- Added funding to encourage the acquisition and use of electric vehicles, including by extending the Roulez vert program (66 M\$(budget 2017)+ 94 M\$(budget 2018) = 160 M\$)
- Revision of the additional registration fee for luxury vehicles (Ministère des Finances)
- New objectives in the deployment of the Electric Circuit in Québec : 2 500 stations on the 2020 horizon (Hydro-Québec, The Strategic Plan 2016-2020 : <http://www.hydroquebec.com/publications/en/docs/strategic-plan/plan-strategique-2016-2020.pdf>)

Yukon	
Policy	The Government of Yukon, Department of Highways and Public Works currently has no policy to incorporate electrification of transportation considerations into transportation infrastructure in Yukon.
Legislation & Regulation	There is currently no legislation or regulations in Yukon that pertain to or regulate the use of electric vehicles.
Programs	The Government of Yukon, Department of Highways and Public Works does not currently have any programs that are related to or focused on the implementation of electric vehicles or electrification of transportation within the Territory.
Projects	<p>Although the Department of Highways and Public Works does not have a formal policy, program or best practices related to the electrification of transportation, there are ongoing projects and research that are considering the potential use and implementation of electric vehicles and associated infrastructure in the Territory.</p> <ul style="list-style-type: none"> • Yukon Transportation Museum, Department of Tourism and Culture, Yukon Government, with support from Yukon Energy Corporation, Yukon College Cold Climate Innovation Centre and Department of Highways and Public Works, Yukon Government, is initiating an electric vehicle feasibility study. The project proposes to install and make use of solar panels as a charging source, as well as make use of and monitor an electric vehicle, in an effort to test the effectiveness of electrified transportation in Yukon and the North. • As a part of a pilot project, Government of Yukon has added an electric vehicle to their fleet. The vehicle is being used by Energy Branch and Climate Change Secretariat and aspects being studied and tested include range, battery recharge times and functionality in Yukon’s climate. To date, monitoring has shown that the range of the vehicle varies in relation to temperature, but performs well over short to medium distance trips. • The Energy Branch of the Government of Yukon is currently pursuing funding to investigate and construct 5 demonstration electric vehicle charging stations for the cities of Whitehorse and Dawson. If funded and constructed, the charging stations will be available for use by the public and will serve to promote the consideration and potential for electric vehicle use and adoption within the Territory. • In 2016, Yukon Energy Corporation commissioned a study entitled “Electric Vehicle Investigation”; the purpose of the study was to investigate the feasibility of plug-in electric vehicles in Yukon as well as associated opportunities, and the potential impacts to the existing electrical grid. Factors considered included a review of cold weather impacts on electrical vehicles and charging infrastructure, a market assessment that included vehicle

	<p>forecasts and greenhouse gas impacts of electric vehicle deployment within the Territory and a grid impact assessment with respect to future energy requirements. Some of the key findings of the report were:</p> <ul style="list-style-type: none"> ○ Maintaining normal electric vehicle functionality will be difficult during the coldest months of the year, with the potential for vehicle range being reduced by half at below freezing temperatures; ○ Because approximately 60% of new vehicles registered in the Territory are light-duty trucks, limited electric vehicle offerings, particularly in this field, could affect the potential for electric vehicle adoption within the Territory; ○ Adoption of electric vehicles, even at a low level, could affect and substantially reduce greenhouse gas emissions within the Territory; ○ Forecasted levels of electric vehicle use within the Territory will only have minimal impacts on the electrical grid; ○ All of the key findings and the full report can be found at the following link; http://yukonenergy.ca/media/site_documents/Yukon_EV_Inv estigation_Report.pdf;
Best Practices	The Government of Yukon, Department of Highways and Public Works, has not developed or adopted any best practices with respect to the electrification of transportation.
Budget Appropriations	-
Consultation	To date, no consultation has taken place between the Department of Highways and Public Works and other stakeholders.
Performance Measures	No performance measures have been developed to date, but as discussed in Projects, pilot projects are monitoring and assessing electric vehicle performance within the Territory.
Commitments	-
Other	-

Appendix 1
Summary of Electrification of Transportation Policies across
Jurisdictions

Legislation / Regulations	Vehicle Purchase Incentive	Personal Infrastructure Subsidy	Public Infrastructure Investment / Planning	Information and Awareness	Additional Incentives	Targets	Governance	Research and Development	Government Procurement	Multi-Jurisdictional Agreements
China										
Proposed new legislation for low-speed electric vehicles (unknown timeline for introduction/ implementation)	Ten Cities, Thousand Vehicles Program Federal subsidies of \$60,000 RMB (\$12,000 CAD) for BEV and \$50,000 (\$10,000 CAD) for PHEV, in addition to subsidies from the provincial governments		New standards (in effect January 1, 2016) to promote upgrades to existing charging stations and examine compatibility of charging facilities		Additional Incentives offered by municipal governments: free license plates, exemptions to rush hour travel restrictions	1 million annual sales (2020) 3 million annual sales (2025)	The federal government sets national target and overarching policies, and provide subsidies to EV purchases and procurement of electric buses. Provincial governments provide additional subsidies. Municipal governments also set targets for EV adoption and develop local policies for EVs (e.g. reduced parking fees, access to bus and HOV lanes, exemptions from commuter restrictions)	<i>China Committee of Electric Vehicles 100</i> conducts research on EV development and adoption	New regulation released in 2015 to aim to promote the integration of electric buses in public transport fleets, including subsidies of \$500,000 RMB (\$100,000 CAD) for electric buses that meet certain criteria	China-U.S. Electric Vehicles Initiative, 2009

Legislation / Regulations	Vehicle Purchase Incentive	Personal Infrastructure Subsidy	Public Infrastructure Investment / Planning	Information and Awareness	Additional Incentives	Targets	Governance	Research and Development	Government Procurement	Multi-Jurisdictional Agreements
France										
<ul style="list-style-type: none"> • Law on energy transition and green growth • “Bonus-Malus” for the acquisition or rental of electric vehicles defined in the Energy Code • “Super bonus” for the replacement of old diesel vehicles and incentive for low income households. defined by decree <p>Other dispositions in the Fiscal Code, Environment Code and the Code for the regions (“collectivités territoriales”)</p>	<p>Up to €10,000 at the national level.</p> <p>Other cumulative grants can also be offered for low income families and by regional or local authorities</p>	<p>tax credit for individuals</p>	<p>Seeking standardization (at the national and European levels), the integration of the market system (with the vehicles, batteries, charging infrastructures and services, etc.), and to match infrastructure supply with demand.</p> <p>Infrastructures for Electric mobility to be addressed by local authorities for mobility (PDU)</p>	<p>Association nationale pour le développement de la mobilité électrique (AVERE)</p> <p>EDF</p>	<p>Several Additional Incentives at the regional level</p>	<p>1-2 million cumulative sales (2020)</p>	<p>Ministère de l’Environnement, de l’Énergie et de la Mer</p> <p>Agence de l’Environnement et de la Maîtrise de l’Énergie (ADEME)</p>	<ul style="list-style-type: none"> • ADEME finances new technology development, with the “Programme d’investissements d’avenir (PIA)” and the “Programme véhicule routier du future” • EDF is also an important actor for R&D and experimentation 		<p>France hosted and presided the United Nations conference on climate change of Paris (COP21/CMP11: November 30th to December 12th, 2015) and is involved in several multi-jurisdictional initiatives</p>

Legislation / Regulations	Vehicle Purchase Incentive	Personal Infrastructure Subsidy	Public Infrastructure Investment / Planning	Information and Awareness	Additional Incentives	Targets	Governance	Research and Development	Government Procurement	Multi-Jurisdictional Agreements
Germany										
<ul style="list-style-type: none"> Smart grids and grid use for recharging electric vehicles dispositions in the Energy Industry Act Legal basis for safe and secure of charging and billing of electricity for electric vehicles reviewed with the Act on the Re-organisation of Statutory Metrology The 2013 Annual Tax Act for the pecuniary advantage of staff cars Electric Mobility Act and other regulation (“Elektromobilitätsgesetz” and “Gesetz zur Bevorrechtigung der Verwendung elektrisch betriebener Fahrzeuge”) define incentives in electrification of transportation 	<p>exemption from vehicle taxation</p> <p>Subsidy of € 4 000 for a full electric vehicle and € 3 000 for a plug-in-hybrid.</p>		<p>Electric Mobility in Pilot Regions program</p> <p>Electromobility government program</p>		<ul style="list-style-type: none"> Dedicated parking spaces Access to selected reserved bus lanes 	<ul style="list-style-type: none"> 1 million cumulative sales (2020) 6 million cumulative sales (2030) 	<ul style="list-style-type: none"> The Joint Agency for Electric Mobility was created by the Ministry of Economics and Technology, and the Ministry of Transportation 	<ul style="list-style-type: none"> Financed by the Federal Ministry for Economic Affairs and Energy 	<ul style="list-style-type: none"> the “green public procurement (GPP 2020)” initiative 	<ul style="list-style-type: none"> Zero Emission Vehicle (ZEV) Alliance ERA-NET Agreement for Co-operation on Hybrid and Electric Vehicle Technologies and Programmes (IA-HEV)

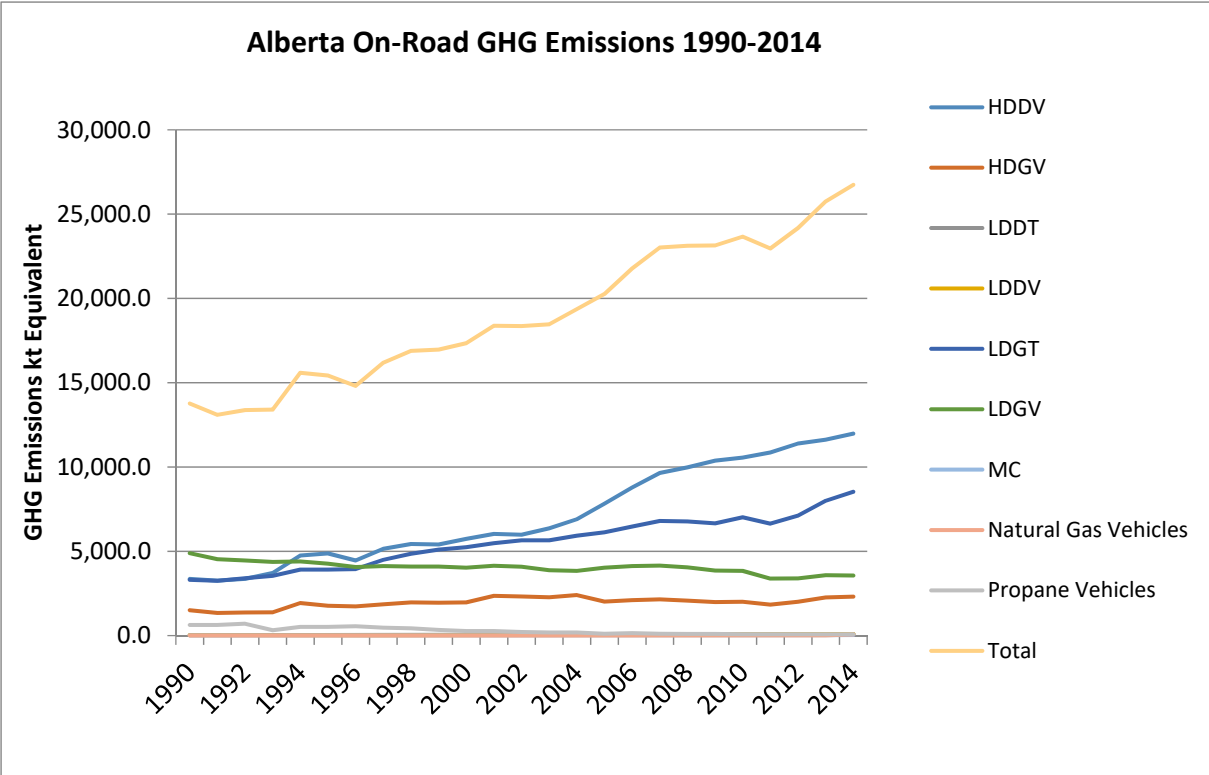
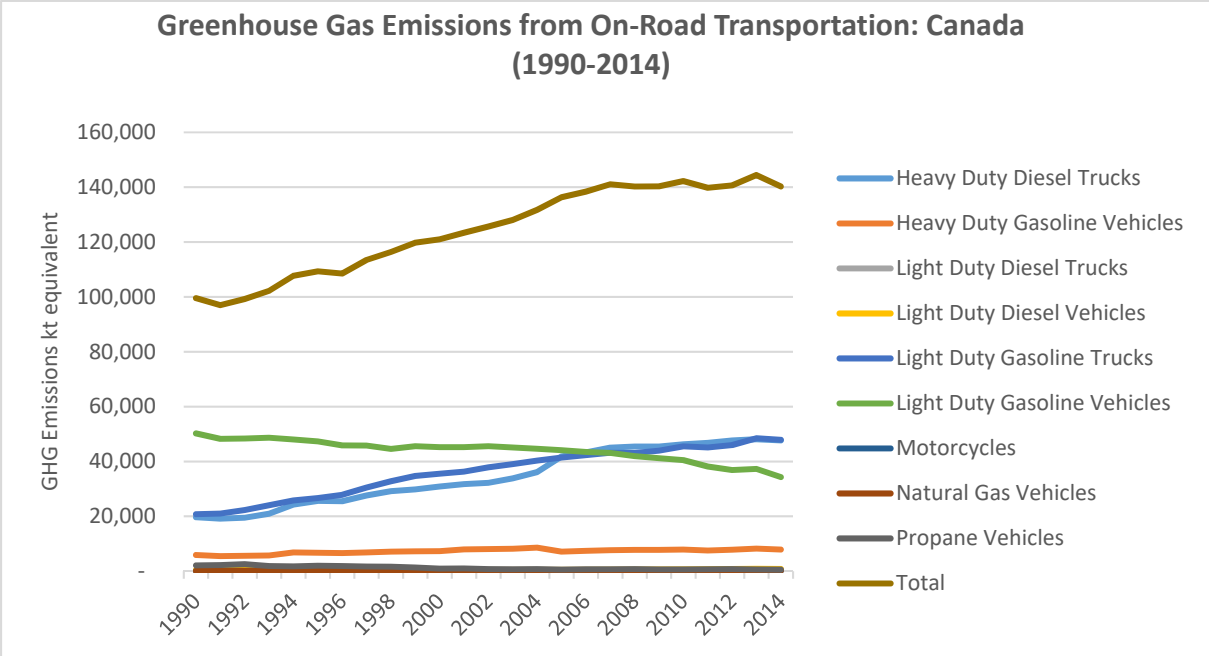
Legislation / Regulations	Vehicle Purchase Incentive	Personal Infrastructure Subsidy	Public Infrastructure Investment / Planning	Information and Awareness	Additional Incentives	Targets	Governance	Research and Development	Government Procurement	Multi-Jurisdictional Agreements
Japan										
The federal government passed the "Green Vehicle Purchasing Promotion Measure" that went into effect on June 19, 2009. The program established tax deductions and exemptions for <u>environmentally friendly</u> and fuel efficient vehicles, according to a set of stipulated environmental performance criteria.	Up to \$850,000 yen (\$10,000 CAD) upon the purchase of a new EV.		The Promotion Project to Develop Charging Infrastructure for Next-generation Vehicles program was developed to fund charging station infrastructure. \$100.5 billion yen (\$1B CAD) was allocated from 2013-2015 (the program is currently under review).	<i>EV & PHV Town Symposium</i> in Takayama City, Gifu Prefecture, 2013	EVs are exempt from automobile acquisition tax (basically 5% of the purchase price) and from automobile weight tax. EV's also have substantial reduction from annual automobile tax.	<ul style="list-style-type: none"> • 15-20% annual vehicle sales (2020) • 20-30% annual vehicle sales (2030) 	The Ministry of Economy, Trade and Industry (METI) is the lead for initiatives promoting adoption of EVs and PHVs in Japan.	The government has allocated funds to specifically Develop Advanced Technology for Application and Commercialization of Lithium-Ion Batteries of 2.5 billion Y in 2014 as well as 3.5 billion Y in 2014 for Advanced Basic Scientific Research in Innovative Storage Batteries.		EVI (Electric Vehicles Initiatives) is a forum which Japan is a part of for global cooperation on the development and deployment of electric vehicles. The establishment of the forum was proposed by the U.S. and China during the 1st Clean Energy Ministerial (CEM) in July 2010 and agreed.

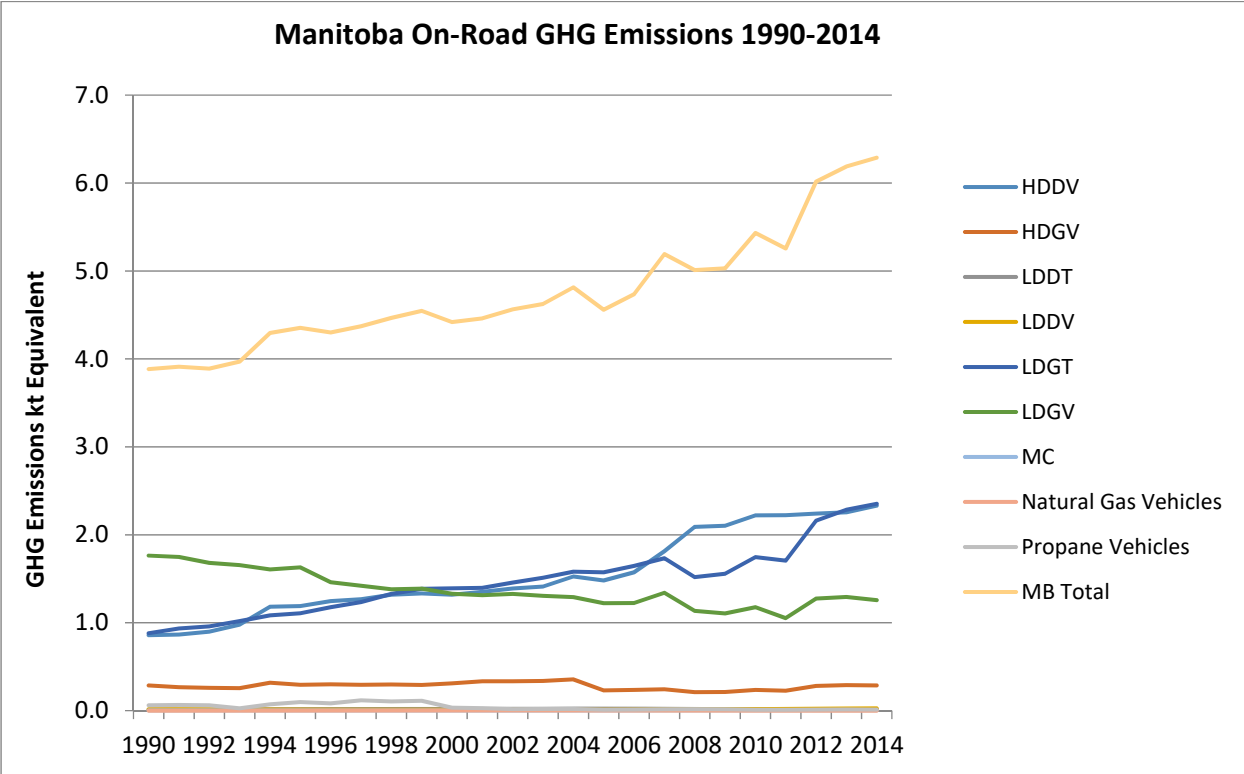
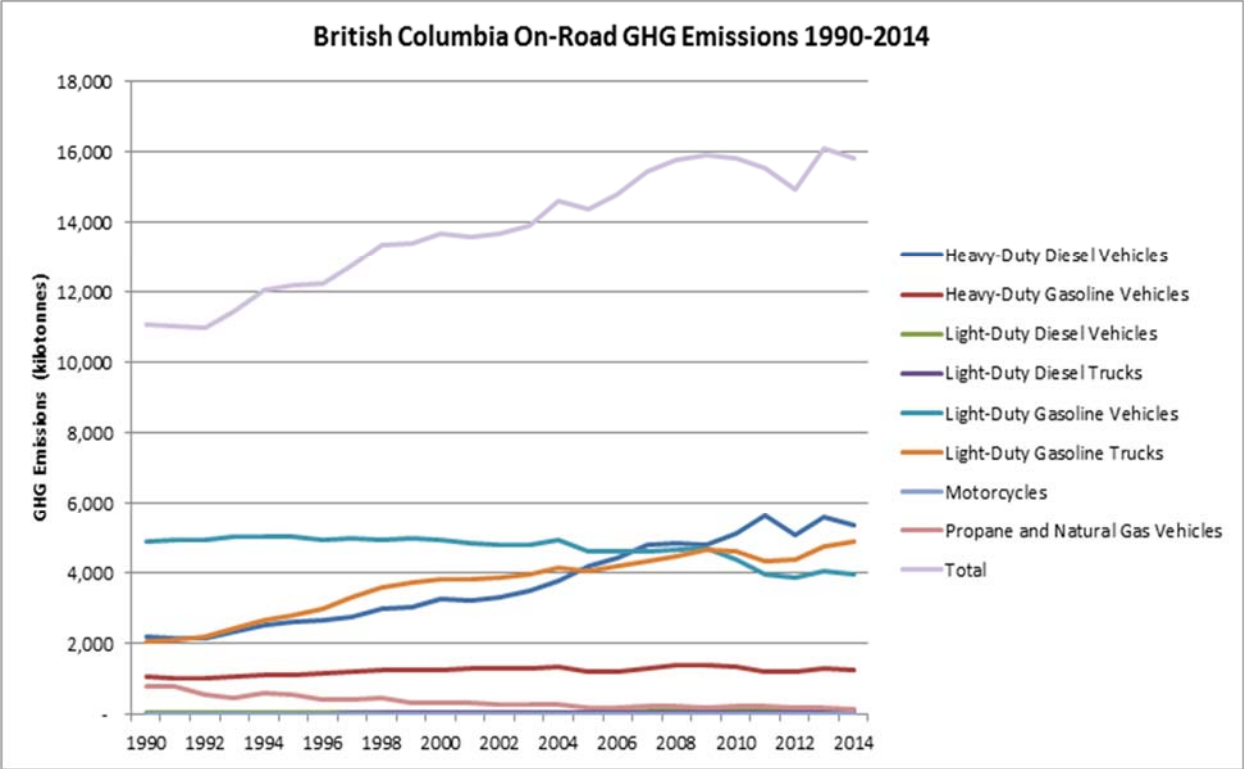
Legislation / Regulations	Vehicle Purchase Incentive	Personal Infrastructure Subsidy	Public Infrastructure Investment / Planning	Information and Awareness	Additional Incentives	Targets	Governance	Research and Development	Government Procurement	Multi-Jurisdictional Agreements
Netherlands										
<ul style="list-style-type: none"> • Dutch laws and regulations to enforce the European directives governing Renewable Energy for transport and Air Pollution from Fuels (European Fuel Quality Directive (FQD) and European Renewable Energy Directive (RED)) • Tax rules for EVs and hybrid vehicles. • Electric vehicles and plug in hybrid vehicles are free of Motor Vehicle Tax and purchase tax. Dutch laws and regulations to enforce the European directives governing Renewable Energy for transport and Air Pollution from Fuels (European Fuel Quality Directive (FQD) and European Renewable Energy Directive (RED)) • Tax rules for EVs and hybrid vehicles. 	<ul style="list-style-type: none"> • Maximum registration tax reduction of € 5,000. (for the highest fuel-economy car label category) • Maximum registration tax reduction of € 5,000. (for the highest fuel-economy car label category) 				<ul style="list-style-type: none"> • Exclusive access to “green zones” • Priority in some cities for parking permits. • Exclusive access to “green zones” • Priority in some cities for parking permits. 	<ul style="list-style-type: none"> • that 10% of all new cars sold will have an electric powertrain and a plug in 2020 • 50% of all new cars sold will have an electric powertrain and a plug in 2025 (1 million cumulative sales) • 200,000 cumulative sales (2020) • 1 million cumulative sales (2025) 	<ul style="list-style-type: none"> • The electrification of transport policy is based on cooperation of several entities interacting together • 	<ul style="list-style-type: none"> • Dutch Innovation Centre for Electric Road and several universities • Dutch Innovation Centre for Electric Road and several universities 	<ul style="list-style-type: none"> the “green public procurement (GPP 2020)” initiative the “green public procurement (GPP 2020)” initiative 	<ul style="list-style-type: none"> • Zero Emission Vehicle (ZEV) Alliance • Agreement for Co-operation on Hybrid and Electric Vehicle Technologies and Programmes (IA-HEV) • Partnership with California • Zero Emission Vehicle (ZEV) Alliance • Agreement for Co-operation on Hybrid and Electric Vehicle Technologies and Programmes (IA-HEV) • Partnership with California

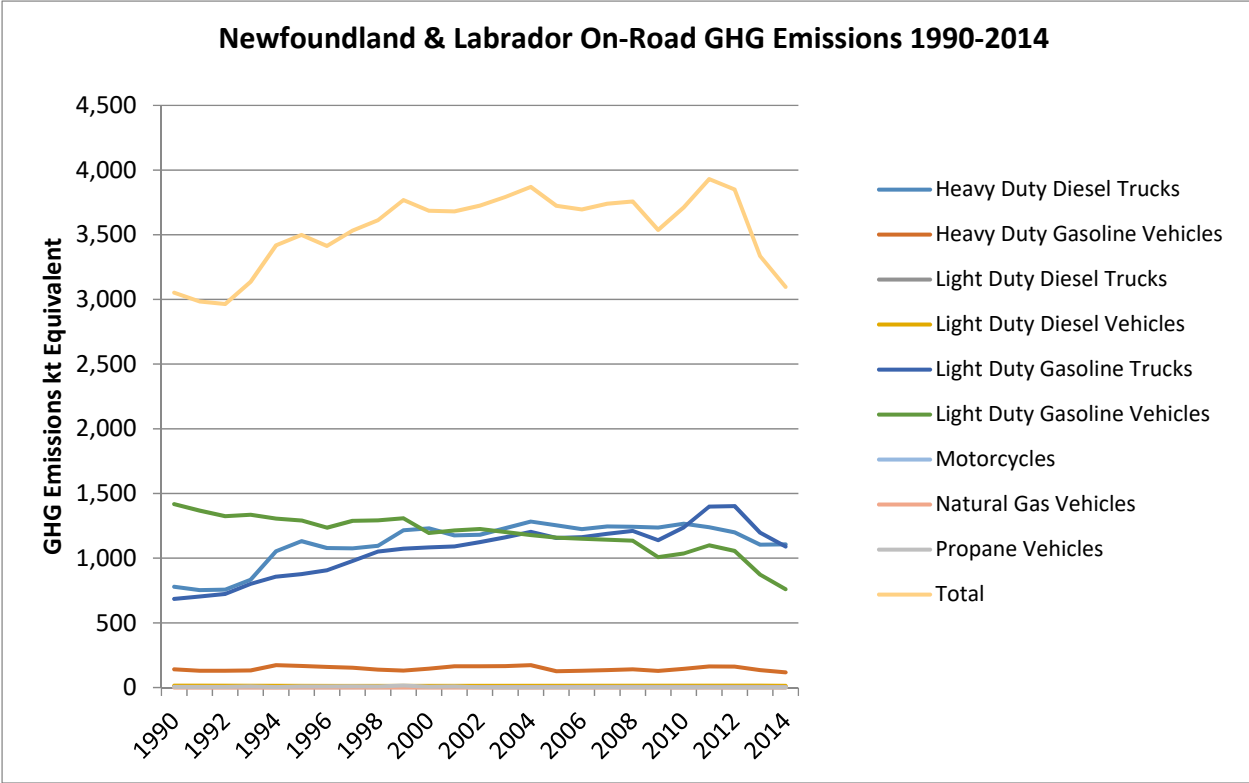
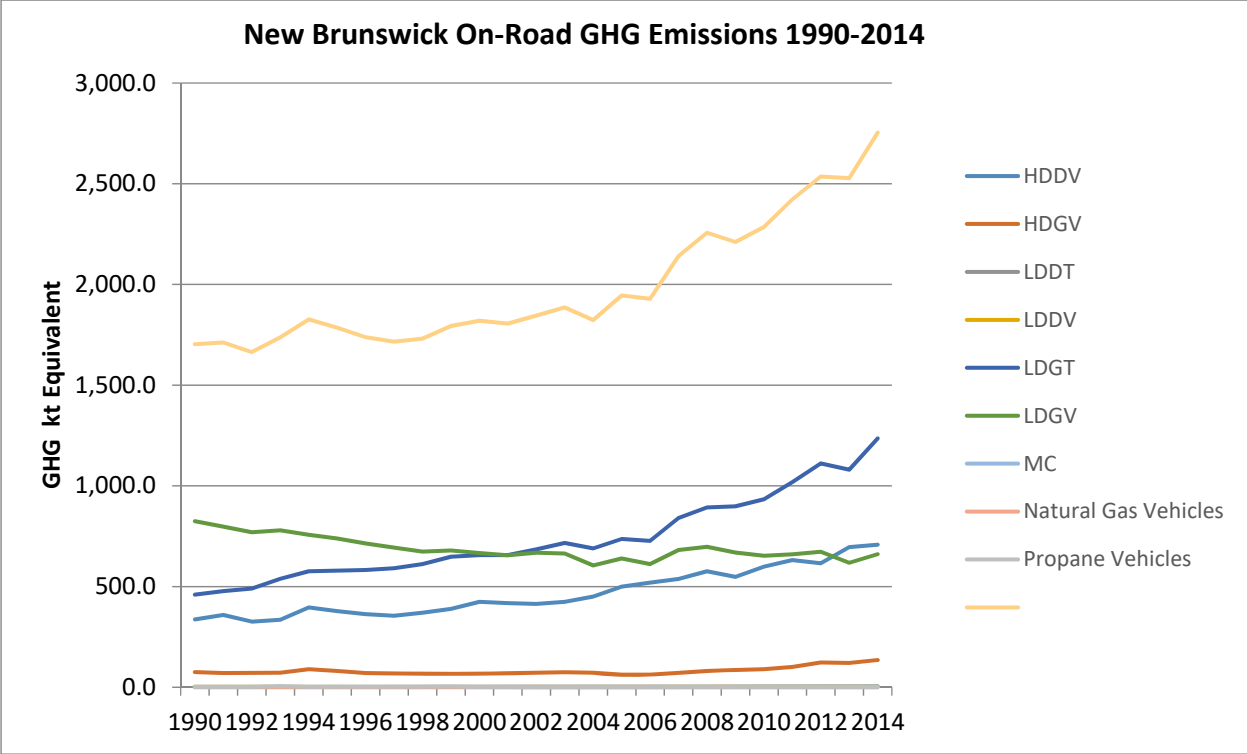
Legislation / Regulations	Vehicle Purchase Incentive	Personal Infrastructure Subsidy	Public Infrastructure Investment / Planning	Information and Awareness	Additional Incentives	Targets	Governance	Research and Development	Government Procurement	Multi-Jurisdictional Agreements
Norway										
Political agreements on climate changes and electrification of transportation	Exemption of the registration tax	City of Oslo: Maximum 10,000 NOK (or €1,200)	Charging infrastructure strategy for Norway (responsibility of Enova)	<ul style="list-style-type: none"> Norwegian Electric Vehicle Association ZERO Emission Resource Organization 	Exemptions for road tolls and boarding fees on ferries <ul style="list-style-type: none"> Can benefit of free public parking spaces Access to selected bus lanes 		Enova, a public enterprise owned by the Ministry of Petroleum and Energy Norwegian Public Roads Administration	The Research Council of Norway supports research		<ul style="list-style-type: none"> Zero Emission Vehicle (ZEV) Alliance <i>Electric Vehicles Initiative,</i>
United Kingdom										
<ul style="list-style-type: none"> None specific to the electrification of transportation 	<ul style="list-style-type: none"> 35% of the cost of a plug-in car, up to a maximum of £4,500 depending on the model 20% of the cost of a plug-in van, up to a maximum of £8,000 	75% contribution towards the cost of one charge point and its installation up to a maximum of £500 (including VAT) per household/eligible vehicle, up to a maximum of 2 charge points	<ul style="list-style-type: none"> National plug-in vehicle infrastructure strategy Plugged-in Places: match-funding for charging points 	Go Ultra Low campaign	<ul style="list-style-type: none"> 100% discount on the London Congestion Charge Some London boroughs offer free or reduced-charge parking for EV 	<ul style="list-style-type: none"> 5% annual vehicle sales (2020) All passenger vehicle sales zero emission vehicles by 2040 	Office for Low Emission Vehicles (national)	Low Carbon Vehicles Innovation Platform	<ul style="list-style-type: none"> Low carbon vehicle public procurement programme Grant scheme for charge point installation in the UK government and public sector 	Zero Emission Vehicle (ZEV) Alliance

Legislation / Regulations	Vehicle Purchase Incentive	Personal Infrastructure Subsidy	Public Infrastructure Investment / Planning	Information and Awareness	Additional Incentives	Targets	Governance	Research and Development	Government Procurement	Multi-Jurisdictional Agreements
United States (federal)										
<ul style="list-style-type: none"> National Alternative Fuels Corridors (DRIVE Act) Energy Policy Act (requirement for federal fleets) Others 	Tax credit up to \$7,500	None	National Alternative Fuels Corridors (DRIVE Act)	EV Everywhere website	None; however federal legislation enables States to exempt certain vehicles from carpool lane occupancy requirements	<ul style="list-style-type: none"> EVs as affordable as 2012 gasoline-powered vehicles by 2022 500 employers providing workplace charging 	<ul style="list-style-type: none"> Majority of policies run out of Department of Energy 	<ul style="list-style-type: none"> Department of Energy's Vehicle Technologies Office 	<ul style="list-style-type: none"> Energy Policy Act (requirement for federal fleets) 	None
United States (California)										
Zero-Emission Vehicle Regulation	Up to \$6,500 depending on vehicle type, consumer income level	Some local/regional rebates available; \$200-500	Investment in public fast charging infrastructure along key State corridors	<ul style="list-style-type: none"> Plug-In Electric Vehicle Resource Centre California Plug-In Vehicle Collaborative California Fuel Cell Partnership 	White and Green Clean Air Vehicle Decals allow low- to zero-emission single occupancy vehicles to travel in carpool lanes	<ul style="list-style-type: none"> Zero-emission infrastructure can support 1 million vehicles (2020) 1.5 million zero emission vehicles on road (2025) 	<ul style="list-style-type: none"> California Air Resources Board California Energy Commission 	Alternative and Renewable Fuel and Vehicle Technology Program	<ul style="list-style-type: none"> Minimum 25% of fleet purchases of light-duty vehicles are to be zero-emission by 2020 	Zero Emission Vehicle (ZEV) Alliance

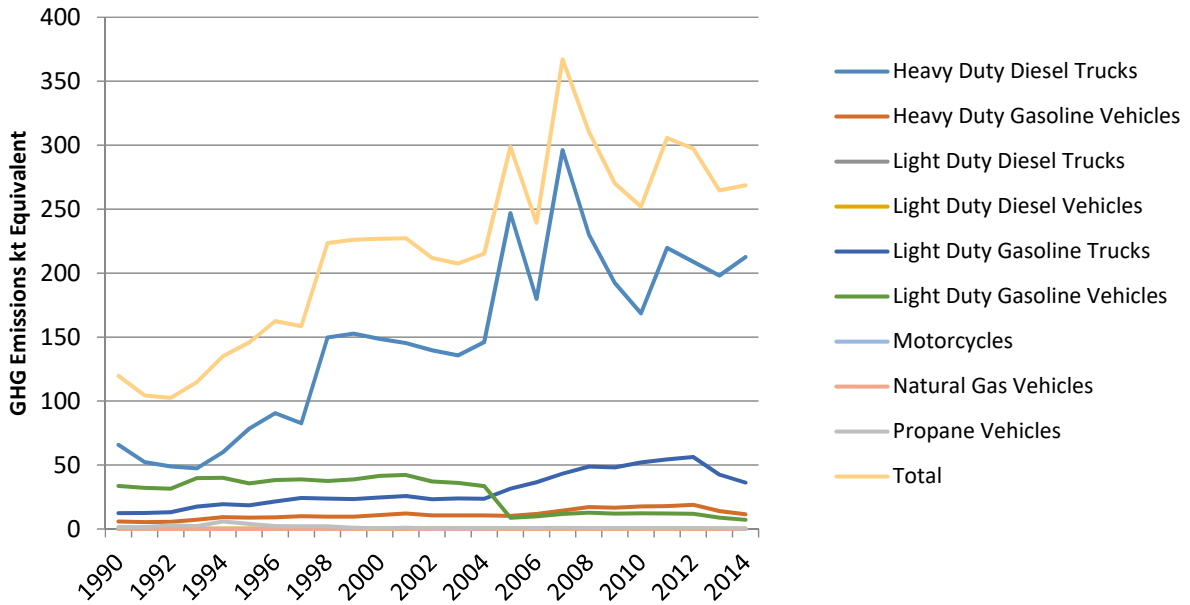
Appendix 2
On-Road GHG Emissions 1990 – 2014



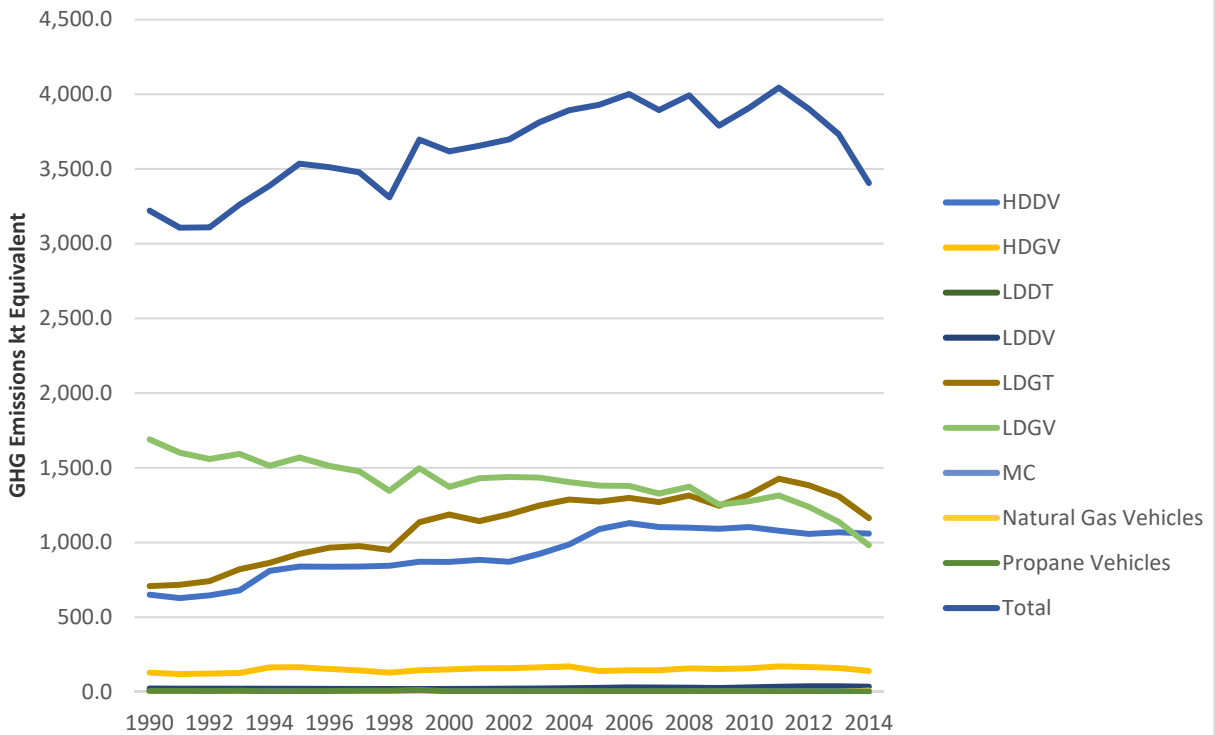


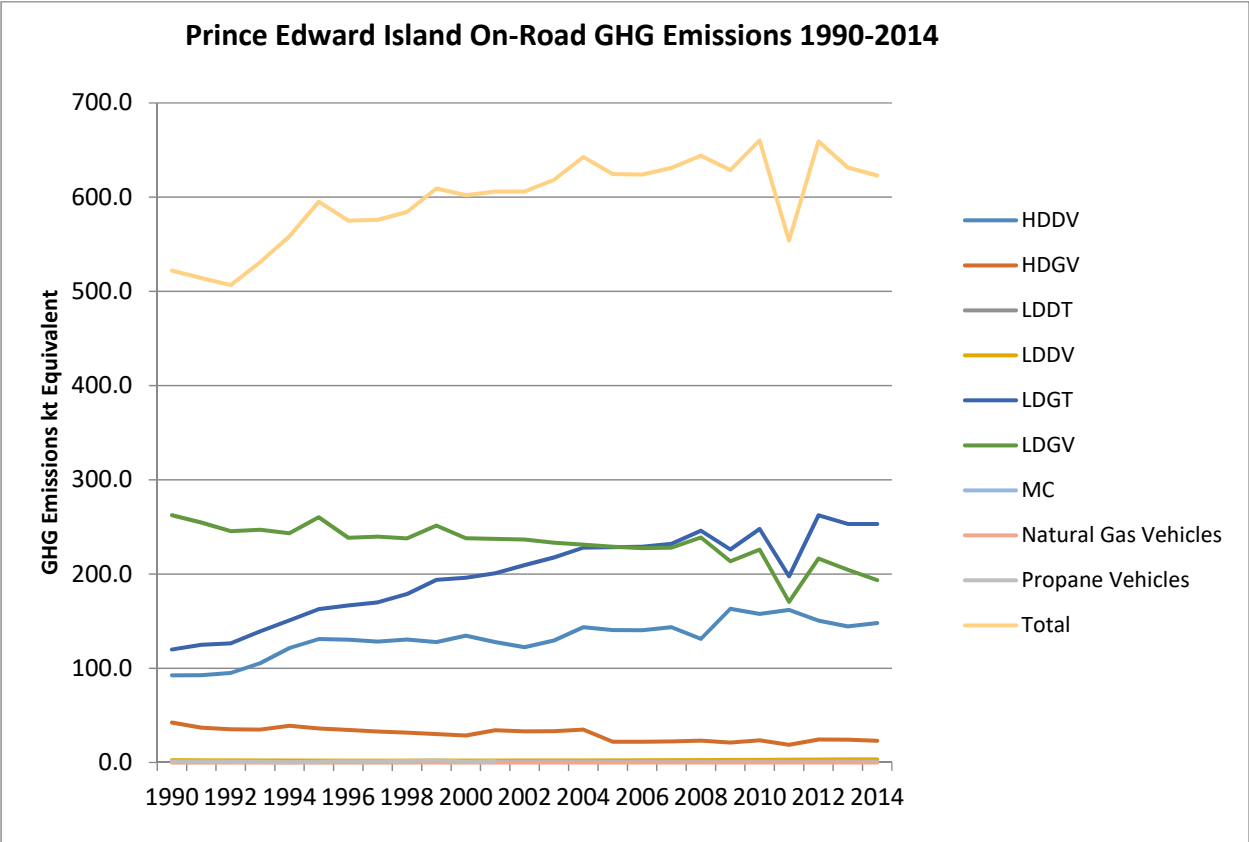
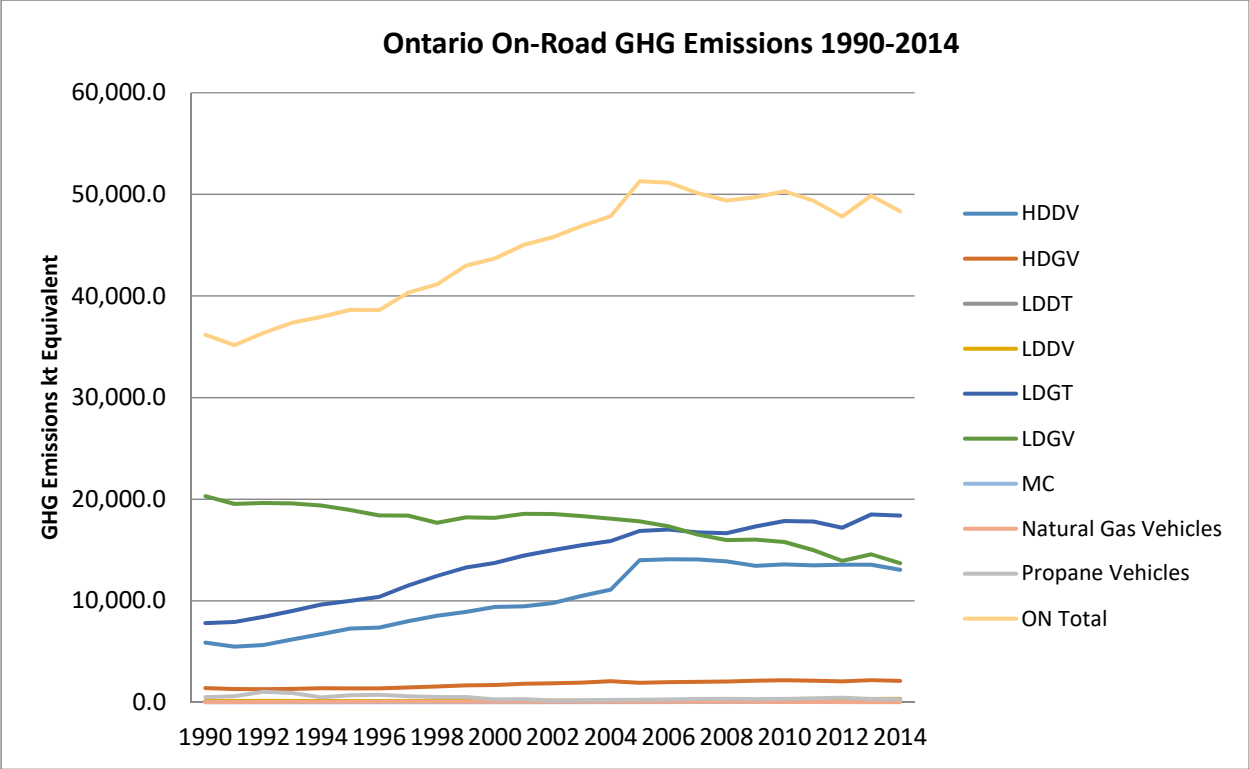


Northwest Territories On-Road GHG Emissions 1990-2017

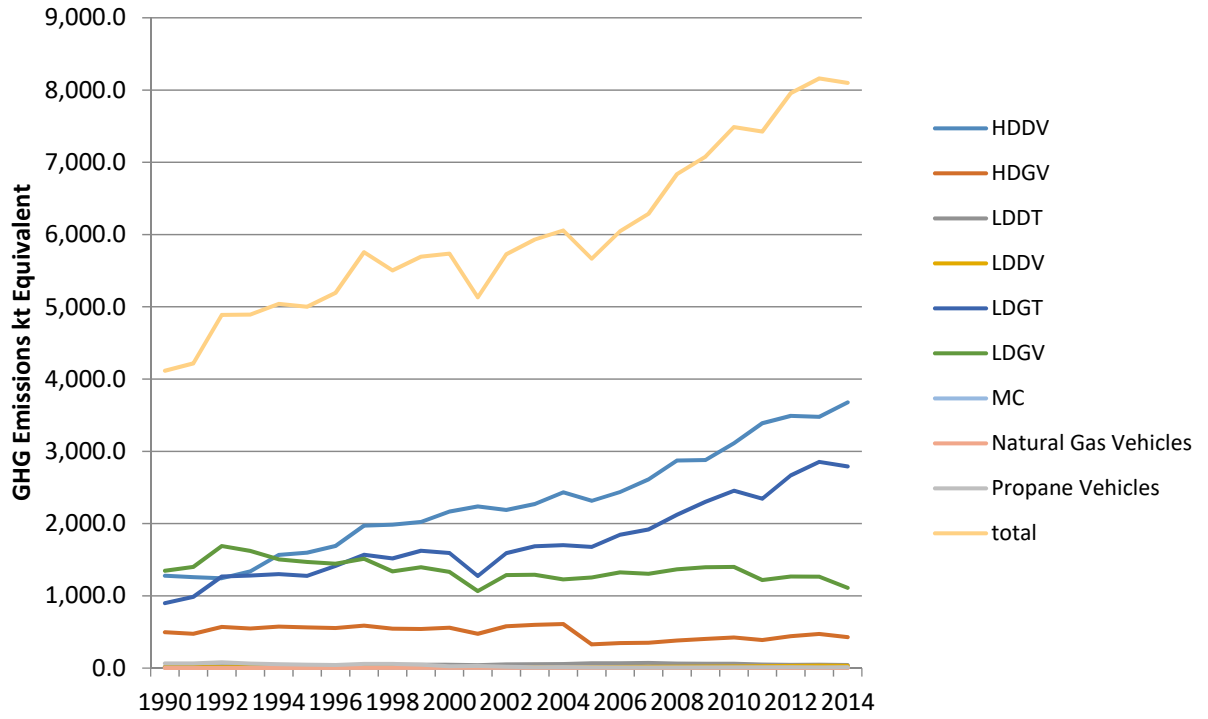


Nova Scotia On-Road GHG Emissions 1990-2014





Saskatchewan On-Road GHG Emissions 1990-2014



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