



Ministry of Foreign Affairs

Quicksan of EV Market in British Columbia and Vancouver

Opportunities and challenges

Commissioned by the Netherlands Enterprise Agency

*>> Sustainable. Agricultural. Innovative.
International.*

A scenic view of the Vancouver skyline across a body of water, with a marina in the foreground. The water reflects the buildings and the sky. A blue banner is overlaid on the bottom half of the image.

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Opportunities and challenges

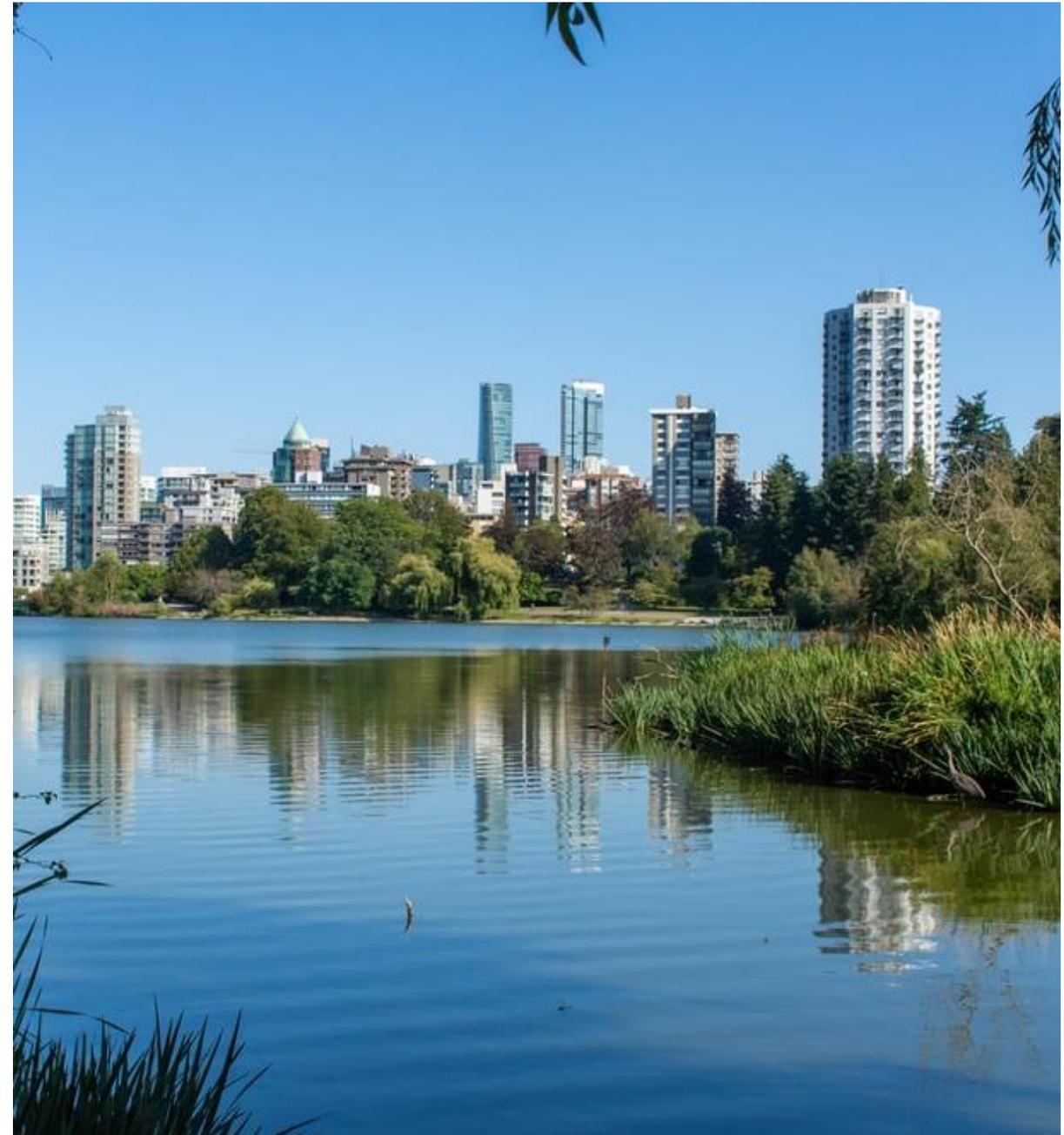
APPM, 29-5-2020



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Introduction

EV in British Columbia and Vancouver

Canada has ambitious goals in the field of zero emission mobility (ZEM) and the province of British Columbia (BC) is one of the most developed zero emission markets in the country. Vancouver plays a special role within the province as the largest urban area with its own goals and targets. As a result, substantial development of electric transport is expected to take place here in the coming years resulting in a clear need for innovative new technologies, policies, and specialized knowledge.

The Netherlands is on the forefront of ZEM and is distinguished worldwide in the areas of charging infrastructure, smart charging innovations, and EV transition strategies. **The intend of this quick scan is to gain insights into the BC EV-market. It will compare the BC EV-market to the market in The Netherlands and explore which knowledge and products developed in The Netherlands could help the Canadian EV (electric vehicle) -market accelerate.** The exploration is an initiative of The Consulate General of the Netherlands in Vancouver and carried out by APPM.

This report provides the results of the quick scan. It consists of a general introduction to the BC market through a general analysis of the EV-market. It will provide an overview of specific segments of the charging market and compare these segments to The Netherlands. Finally it ends with a chapter on doing business in Canada. Through this report, we hope to facilitate future collaboration between companies and governments to drive the electrification of the mobility systems in BC and The Netherlands.



COVID-19 disclaimer

The coronavirus (COVID-19) outbreak has prompted global health concerns. The duration and full effects of the outbreak are yet unknown, but at the moment of writing this report, almost all travel is halted, and offices are closed.

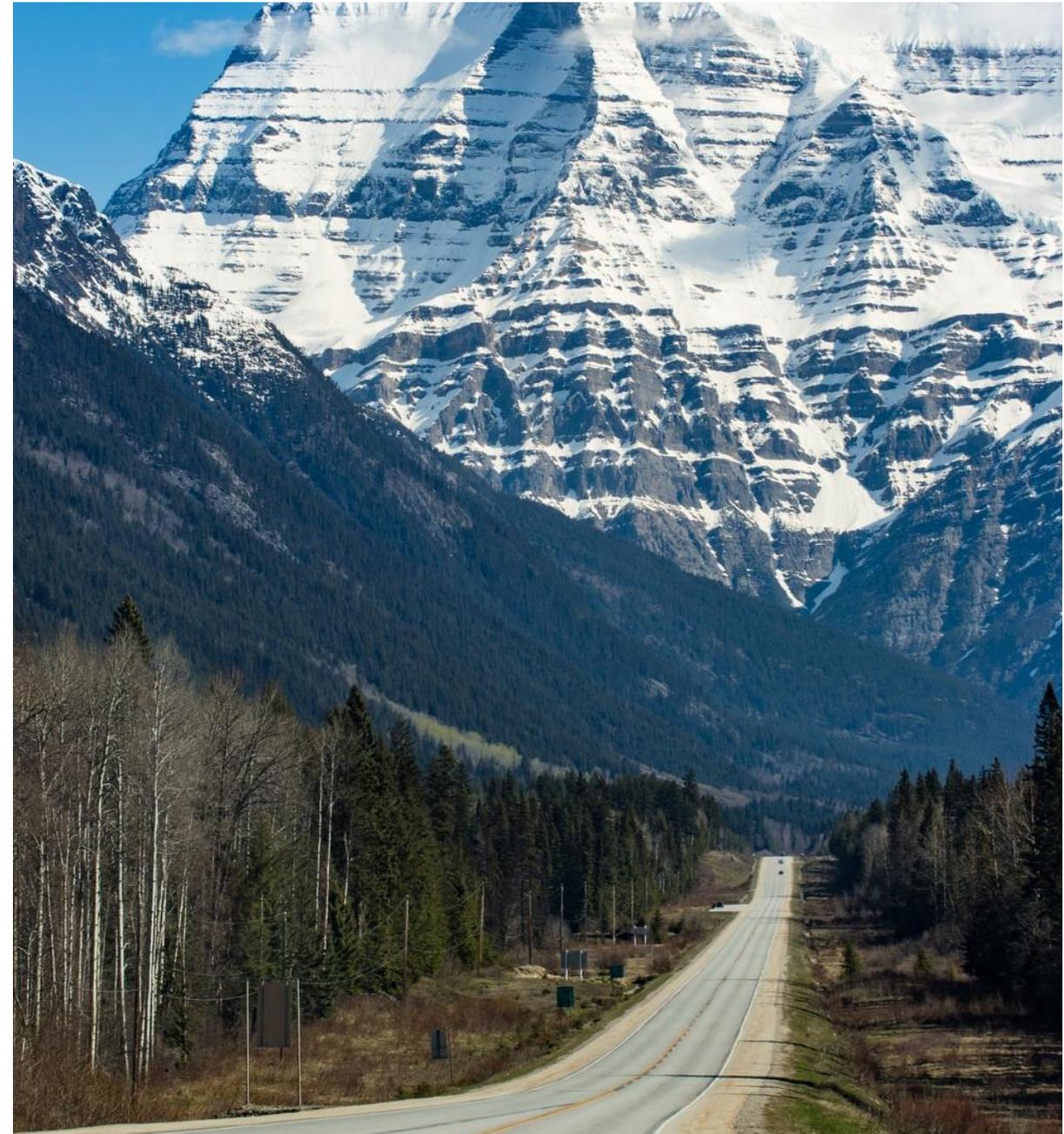
Initially a visit was planned to visit British Colombia and to interview all experts in person. Due to the COVID-crisis it was decided to cancel the visit and to organize all interviews online. Although we feel that our findings are conclusive, this limitation may have affected the findings in this report.

Approach of Quick Scan

EV in British Columbia and Vancouver

For this research, we have worked with a transatlantic team to ensure that local knowledge from a North American and Dutch perspective has been included in the analysis. During this work, the following approach was used:

- The first step was an inventory of existing knowledge available at APPM and a desk research based on documents available online. This gave a first understanding of the EV-market;
- Fifteen structured virtual interviews with local BC experts, entrepreneurs, and policy makers were organized to better understand the market and to make a deep dive on the different topics.
- The findings were analyzed and summarized in this report.

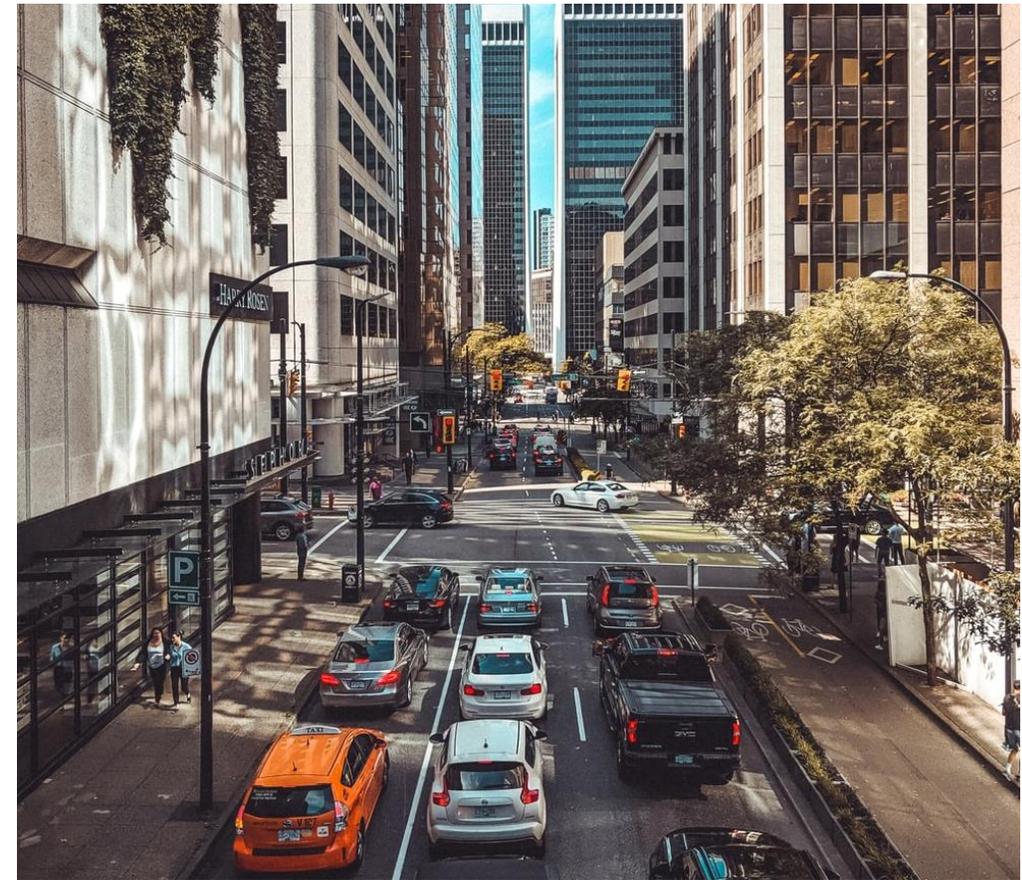


Key Takeaways

Four opportunities for collaboration with Dutch EV experiences

- **Smart charging networks** – As EV adaptation is picking up in the region, the strain on the electricity network and the need for data sharing is increasing. Dutch knowledge of smart charging and protocols developed in The Netherlands can help to create a smart and flexible charging network.
- **Public charging** – Currently most EV-drivers charge their car at home with a level 1 charger. With the growing sales, the need for public charging is increasing fast. There is a great need for knowledge on how develop and support a growing network of public charging stations.
- **EV-strategies** – While the region is on the forefront of the EV transition, many areas don't have a clear vision tailored to the regional characteristics. Local municipalities are looking for help in writing and implementing regional EV-strategies.
- **EV-Hardware** – There are a number of Dutch companies with developed EV-hardware that are of interest for the Canadian market. For example innovative charging infrastructure for cars or busses.

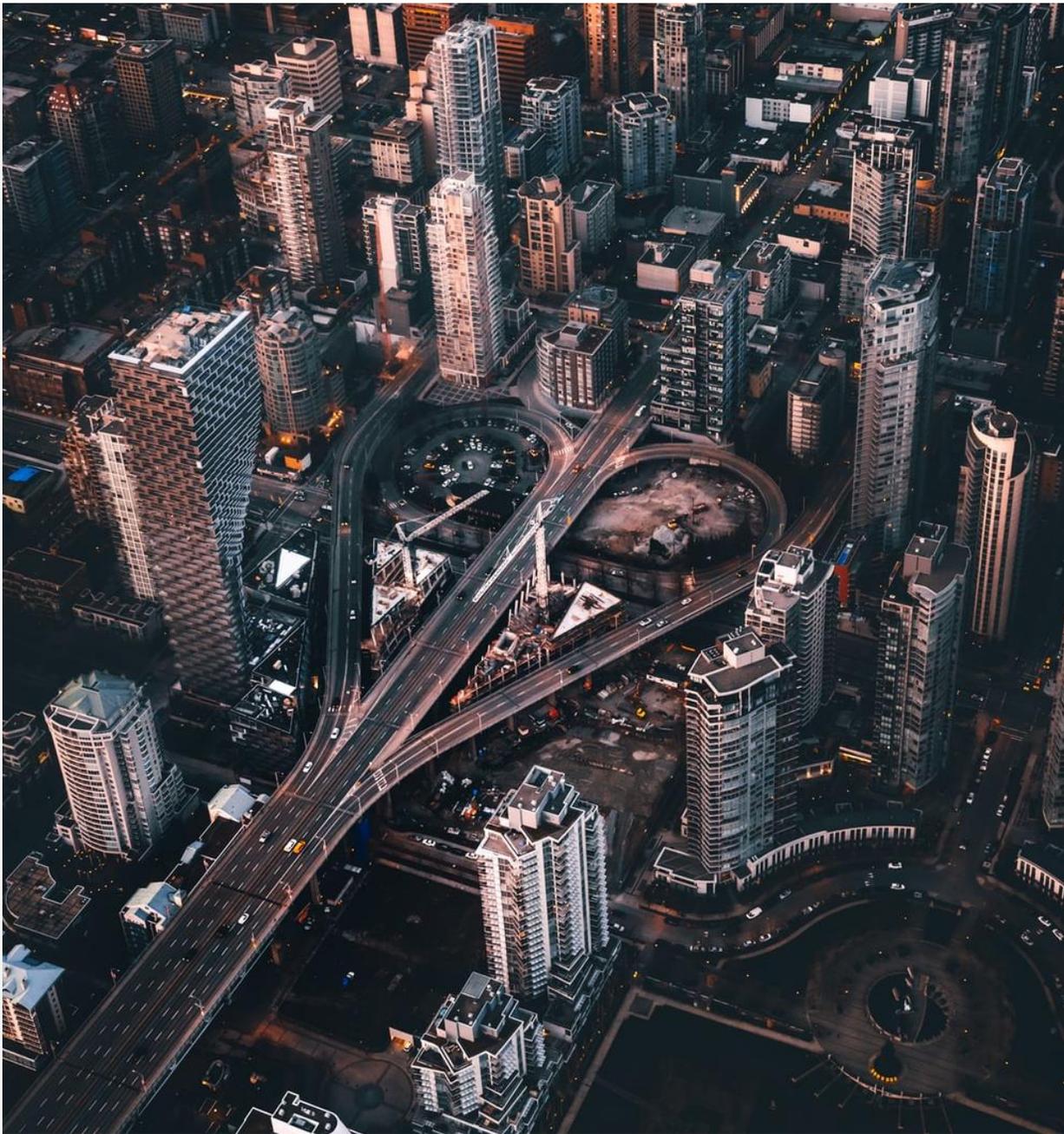
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BC EV-market

Currently there are more than 30,000 electric vehicles on the road in BC. In 2019 electric vehicles made up nine percent of all light-duty vehicles sales in the province. With this number of electric vehicle sales, BC has the highest per capita market share in North America.

The provincial government has set goals of reducing greenhouse-gas emissions by 60 percent by 2040 with all new vehicles sold in BC being zero-emission vehicles. Therefore it is expected that EV adaptation will significantly increase in the coming years.



Chapter II: General EV-market context

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General Analysis Canada, British Columbia, and Metro Vancouver

A modern economy with a progressive population

Canada has a modern economy with a land mass that is more than 200 times larger than The Netherlands. Of the 35.2 million residents, more than 80% of Canadians live in urban or suburban areas. Canada has a large oil and natural gas sector but wants to develop its diverse energy resources while maintaining its commitment to the environment. This causes Canada to make an economically difficult decision to strive for a green economy. Large differences per province exist and it is therefore logical from an EV development perspective to approach Canada by region.

BC is the westernmost province of Canada with main cities of Vancouver and Victoria. Although the economy has traditionally been dominated by natural resources, it has diversified considerably in recent decades, now with an extensive industrial and service economy. The province is 25 times larger than The Netherlands with most of the population living in the southern part near the American border.

The largest city in BC is Vancouver, a coastal seaport on the mainland. Metro Vancouver is the third largest metropolitan area in the country with a metro population of 2.5 million. The area has a diverse financial and service economy. It is one of the warmest region in Canada with a climate comparable with The Netherlands.



Country	Inhabitants	Size
Canada	35.2 million	9,985 million km ²
British Columbia	4.6 million	944,735 km ²
Metro Vancouver	2.5 million	2,883 km ²
Vancouver	675,218	115 km ²
The Netherlands	17.3 million	41,543 km ²

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Government Structure

Three levels of government

The government in Canada is organized into three levels: federal, provincial, and municipal:

- **Federal** (Canada): This level government deals with areas of law listed in the constitution and that generally affect the whole country.
- **Provincial** (BC): In each of the 10 provinces in Canada, the provincial government is responsible for areas such as education, health care, some natural resources, and road regulations. Sometimes they share responsibility with the federal government.
- **Municipal** (Vancouver): This is the level of government that is usually based in a city, town or district. Municipal governments are responsible for areas such as libraries, parks, community water systems, local police, roadways and parking. They receive authority for these areas from the provincial governments.

Next to these three levels, Metro Vancouver is a cluster of municipalities that work together on shared challenges like air quality, plans for urban growth, manages a regional parks system and provides affordable housing.



Buildings

MURB's or Multi-Unit Residential Buildings are a common sight in Metro Vancouver. Of the circa 600,000 houses in Metro Vancouver, 29% are apartment and 15% are apartment-duplex units. Currently more than half of new housing that is being built in Vancouver are multiplexes.

Multiple municipalities in BC, including Vancouver, require EV-charging infrastructure in new builds (commercial and residential).

EV Goals Canada, British Columbia, and Vancouver

Focus on zero emission

Canada, British Columbia, and Vancouver are committed to lowering their CO2 emissions. They believe EVs have an essential role to play in the transition to a carbon neutral economy and have, therefore, introduced ambitious EV-targets.

- **Both Canada and BC mandate that zero-emission vehicles account for 100 per cent of provincial vehicle sales by 2040, with benchmark targets of 10 per cent adoption by 2025 and 30 per cent by 2030.**

The city of Vancouver has introduced its own targets:

- **By 2030, 50% of kilometers driven on Vancouver's roads will be by zero emissions vehicles.**
- **By 2050, 100% of the energy in the city needs to be from renewable sources.**

EVs were introduced in BC in 2009 and these ambitions ensure that the EV-market will continue to grow rapidly in the years to come.



Climate

The climate of Metro Vancouver is a moderate oceanic climate. Summer months are typically dry, often resulting in moderate drought conditions, usually in July and August. In contrast, the rest of the year is rainy, especially between October and March. This largely corresponds to the climate in The Netherlands. The temperate BC climate is more favorable for EVs compared to most regions in Canada.

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EV Support Measures

Three categories of incentives to stimulate electric vehicle adoption in British Columbia

There are multiple support measures in place on federal, regional, and city levels, in the form of both financial- and non-financial support.

Vehicle incentives

- The federal government offers consumers who purchase an EV incentives of \$*2,500 to \$5,000.
- BC offers up to \$3,000 off the purchase price of a qualifying new battery electric vehicle and up to \$1,500 for a plug-in hybrid electric vehicle.
- BC has a voluntary early retirement vehicle program that provides consumers who trade in their polluting car up to a \$ 6,000 advantage.
- BC has vehicle incentive programs to help reduce the cost of purchasing an EV for companies and fleets for up to \$ 50,000

Infrastructure incentives

- The Canadian federal government sets up request for proposals (RFP) for new public charging locations.
- CleanBC, BC Hydro, and Fortis BC provide financial incentives toward retrofitting existing buildings with EV-charging equipment. Up to \$350 for single homes and \$2,000 for MURP`s. These rebates are combined with support services for retrofit planning and implementation.
- ZapBC provides a full rebate for the purchase of select charging stations but all available rebates for 2020 have been accounted for.

Others

- Electric vehicle drivers in BC can apply for an HOV-lane** electric vehicle permit, which comes with a sticker that allows them to use HOV lanes, even if there's only one person in the car.
- As of January 1, 2019, all new development permit applications for multi-family buildings must include EV-charging infrastructure in 100% of parking stalls in Vancouver.
- EVs have access to special lanes and there is dedicated parking in some areas in Vancouver.

*All \$ signs in this report stand for Canadian dollars

** A high-occupancy vehicle lane (HOV lane) is a restricted traffic lane reserved for vehicles with a driver and one or more passengers



EV-Fleet in British Columbia

BC on the forefront in Canada

As of the end of 2019 there were over 31,200 electric vehicles in BC of which 20,000 Battery Electric Vehicle (BEV) and 11,200 Plug-in Hybrid Electric Vehicle (PHEV). In the first nine months of 2019, EV sales made up 9% of all light-duty vehicle sales in the province, up from 4% in 2018. This made them the highest per capita sales in all of North America, exceeding Quebec (7%) and California (8%). The EV-sales in Canada as a whole were around 3.5 percent in 2019 with a total of 94,000 EVs on the road.

According to Natural Resources Canada, Office of Energy Resources, the average mileage driven per year in Canada is about 15,200 kilometers. Distance traveled is the lowest in BC with 13,100 kilometers traveled. 95% of all car trips in BC's urban areas are less than 30km.

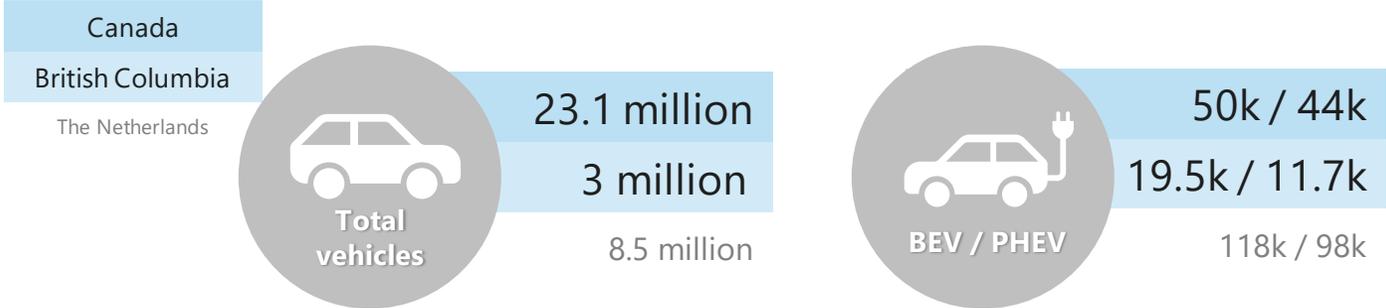


Energy and gasoline

The electricity market in BC is strongly regulated. BC Hydro has a monopoly in most of the region and generates hydro energy. Fortis BC is a smaller energy supplier.

The average residential price of electricity in Canada is \$0.174 per kWh. This price includes both fixed and variable costs and is based on an average monthly consumption of 1,000 kWh. At this moment there are no time-of-use incentives in the province.

On the other hand, gasoline prices are among the highest in North America. Due to this, the average B.C. Electric vehicle owners save about \$1,800 on fuel costs every year.

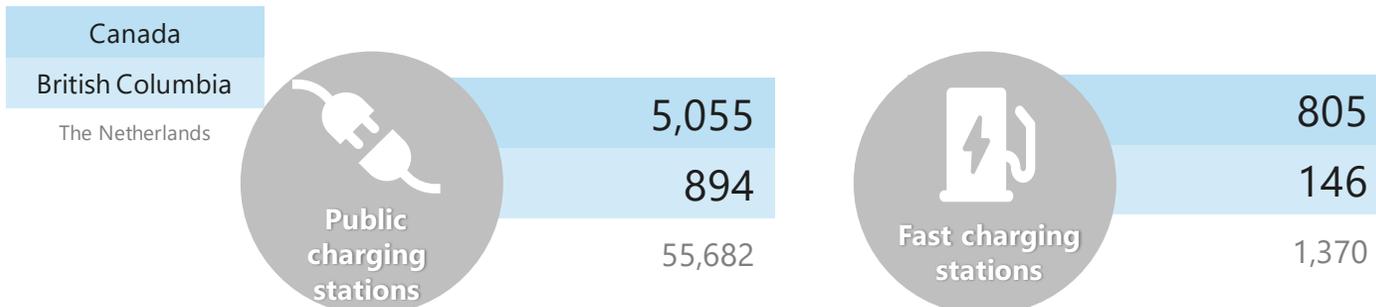


Charging Infrastructure

Growing but no standardization

Most cars are owned by consumers who charge their car at home or at work. They often have a level 1 charger at home and park their car in their driveway or garage. As EVs become more common, people are increasingly relying on public charging stations. There are over 894 level 2 public charge points with 2,076 charging outlets and 146 fast charging stations with 354 charging outlets.

With the number of charging locations and the use of these new stations, there is an increasing need for data sharing and smart charging. At this moment there is no mandatory interoperability, no standardized protocols, and data sharing is not common in the charging market. Different charge point operators are starting to work together and with it is possible to use the payment solution of the major players in different locations.



Charging for charging

Until recently, EV-charging locations and operators were not allowed to charge money for charging. This changed in 2019 and now the first payed charging locations are being placed in the market.

This is, however, just starting up and with the low electricity prices in BC (thanks to the abundance of hydro energy), there is almost no business model for more charging locations based on a fee per charge.

Opportunities and Barriers for EV Uptake in British Columbia

Specific regional characteristics that could drive or hinder the EV adoption

There are several regional characteristics in BC (both positive and negative) that play a role in the EV-adoption.

Pros for EV adoption

- **Ambitious population.** Progressive and environmentally conscious population that is very willing to accept EVs. Multiple interest groups were formed years ago, and these are still active. This has ensured that the political interest in the topic is maintained.
- **Sustainable and cheap electricity.** BC Hydro is owned by the government and people of British Columbia. They provide almost the entire province with hydro power that is green with the third lowest electricity rates in North America. Furthermore, gasoline is relatively expensive in BC, a positive factor for EV uptake.
- **Frontrunner in North America.** Currently one of the frontrunners in North America with circa 30,000 EVs in the province. Additionally, public transport companies have ambitious goals in transitioning their bus fleet to completely electric.
- **Building polices for new buildings.** Building laws require parking lots in new homes to include EV-charging infrastructure.

Barriers for EV adoption

- **Government leadership lagging behind.** After a head start, new ambitions are needed. For example, the target that by 2025 10% of new light-duty passenger vehicle sales in BC will be ZEVs is almost met in 2019 (9%). With their current policy goals, BC is falling behind to other EV regions.
- **No standardization in Infrastructure.** Companies were not allowed to resell electricity until recently and most charging stations that are run by the public sector provide free (or cheap) electricity. No standards and protocols are required reducing interoperability and data sharing. As EV use is increasing, smart charging is becoming more relevant and necessary.
- **No electric pickup trucks.** Because of the large number of SUVs and pick-up trucks vehicles in Canada, it has the highest average fuel consumption worldwide. There aren't many electric pick-up alternatives currently available on the market.
- **Geography and buildings are a challenge.** Even though there are some major urban centers, large parts of the province are sparsely populated. Making many charging spots not financially feasible. A large segment of the population lives in multi-unit residential buildings making accessibility to charging infrastructure sometimes difficult.



Chapter III: Charging Infrastructure

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No Uniformity and Smart Charging

A need for structured market interfaces

A Charge Point Operator (CPO) is a company operating a pool of charging points. There are currently three predominant networks in BC: ChargePoint, FLO, and GreenLots. Specific fast charging networks are set up by Tesla, Petro-Canada, and BC Hydro. Next to these networks, multiple municipalities and retailers manage their own charging locations.

Most CPO`s have their own payment solution which can be a dedicated card, a credit card, or an app. Interoperability is becoming more common as different charge point operators open-up their payment systems to each other. BC Hydro plays an important role in this process as FLO, Chargepoint, and Greenlots stations can all be accessed and activated using their payment app.

Data sharing and standardized protocols are essentially not required at the moment and smart charging is not common. Currently there is almost no need for smart charging, with cheap and sustainable energy readily available in the form of hydro energy. As more people are starting to drive EVs, the need for smart charging solutions and knowledge is increasing. This results in new requirements for tenders for new public charging locations.

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Comparison with The Netherlands

There are some differences in how the market is structured:

- Energy supplier in BC is a monopoly in the form of BC Hydro. In The Netherlands, this market can choose different energy suppliers.
- In The Netherlands, the CPO and the e-mobility service provider (eMSP) are often separated, in Canada they are not.
- Roaming between networks of different charge point operators are often required by location owners, in Canada they are not.
- Ad-hoc payment solutions are more common in Canada, in The Netherlands eMSP contracts are more common.
- Integration of fluctuating renewable energy supply is a major driver for smart charging in The Netherlands. In BC, hydro energy creates a more stable supply of sustainable energy.

Private Charging Stations

Fractured market with no data sharing

The vast majority (more than 90%) of electric car charging happens at home or at work. There is no uniformity in this market and there are big differences between the type of charging stations, how they are bought, and whether they are connected to a network. Most of them are simple level 1 chargers that are plugged-in at home and or not connected to any network. Private charging stations are the back-bone of the EV-charging infrastructure as they form the majority of charging capability in Canada.

Rebates

The BC government and the different utilities provide rebate funding for people who want to install electric-vehicle charging stations at home or at work. Homeowners can apply for a \$350 rebate to install a Level 2 charging station in a single-family home. Because of the great number of multi-unit residential buildings there is a special program to support chargers in these locations. People installing a Level 2 charger in an apartment or workplace building that will be used by multiple users can apply for a \$2,000 rebate and five hours of free support services from an EV charging station advisor.



Comparison with The Netherlands

Charging at home in The Netherlands is relatively small due to the lack of private parking spaces compared to that in BC. The type of chargers are very different as Level 1 chargers are rarely installed in The Netherlands. People who do charge at home are either:

- Leasing their cars which are provided by employers. These leasing companies provide level 2 home chargers with a back-end connection and authentication
- Private individuals with an EV install often a Level 2 charger enabling faster charging at homes. At the moment this is a low percentage of the EV drivers.
- Dominant sales channels for EVSEs is different in Canada. (Online) B2C selling of charging equipment is more common in Canada.

Public Charging Stations

A growing market

While the majority of EV-charging happens at home or at work, the importance of public charging is increasing with the number of EV-drivers. Most public charging stations belong to one of the major networks and are funded through tenders. Many of these charging stations are free to use but users must use a card or app to access. Low uptake, low gasoline prices, and low electricity prices are limiting the ability to operate chargers commercially on a fee per charge business model. Data sharing and standardization in protocols is not widespread nor required. Semi-public charging stations are often from shops and restaurants that see it as an extra service for their customers.

Funding

The federal Zero Emission Vehicle Infrastructure Program (ZEVIP) may fund up to \$5,000,000 for EV-charging infrastructure projects in Canada. The multi-unit residential building, workplace, and light-duty fleet RFP seeks to install a minimum of 20 charging stations per project throughout the country. Applicants can apply to receive up to \$5,000 per connector for Level 2 connectors. In recent tenders, there is increasing attention for interoperability and data sharing.

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Comparison with The Netherlands

- In The Netherlands, charging infrastructure is increasingly industry financed. Some locations and municipalities are paid for the right to operate chargers by industries. Consumers pay a fee (mostly per kWh) when charging.
- A large part of the EV-market relies on public chargers due to lack of privately owned driveways.
- Governments coordinate the roll-out, therefore a coherent national charging infrastructure is created.
- Open protocols are required by government led roll-outs in The Netherlands preventing lock-ins and enabling roaming.
- Smart charging at public chargers is increasingly necessary. The roll-out in urban areas with many EVs is starting to add a peak load which cannot be fulfilled due to local grid capacity constraints.

Fast Charging Stations

No business case for fast chargers

There is almost no business case to be made for fast charging as population and EV density is too low in most of the province. BC Hydro, Tesla and Petro-Canada have fast charging networks in BC. The BC Hydro network is now located in and around metro Vancouver, but they see it as their responsibility to expand the network outside of the major urban areas. Petro-Canada has installed a coast-to-coast network of fast-charging stations, which stretches from British Columbia to Nova Scotia. Tesla developed their own proprietary network of fast chargers focused on Tesla-drivers, with a network extending North America.

Funding

Currently, federal DC fast charging funding is available through Natural Resources Canada (NRCan). With one program applicants can apply to receive up to \$50,000 for DC Fast Charging stations for workplaces, multi-unit residential buildings, and for light-duty fleets. Another program provides funding up to \$50,000 to offset the cost of purchasing and installing fast chargers along Canada's highway corridors. Organizations can apply for these programs in the form of an RFP. In the past, the BC Ministry of Energy, Mines, and Petroleum Resources also provided funding for fast charging locations.



Comparison with The Netherlands

The market for fast charging in The Netherlands is different than that in Canada. The following reasons for these differences can be seen:

- Fast Charging investments are done by many different companies. There is significant competition between operators for the best locations.
- Population and EV density is higher in The Netherlands and therefore leads to more uptake potential.
- Travel distances are lower in The Netherlands making fast charging for long distance travelling less necessary.
- Fast charging is sometimes becoming an alternative solution for public charging as many Dutch citizens have no option for private charging.

Public Transportation

Two ambitious organizations

There are two major public transport companies in BC. Translink is responsible for the regional transportation network of the metropolitan area of Vancouver. BC Transit runs services across the province outside of Metro Vancouver.

Translink has developed multiple scenarios but all scenarios anticipate only battery bus purchases after 2030 and to achieve complete electrification of these fleets by 2050. TransLink aims to purchase up to 635 battery-powered buses and install the charging infrastructure needed to operate this infrastructure along the routes. In the first phase, they are working on a fully electric bus depot. At the moment, they have 2 battery buses and 2 buses that are charging while they are driving. The total investment can be up to \$ 447 million and funding is not yet secured.

BC Transit currently has over 1,000 busses in service and starting in 2023 they will start switching to electric buses. This way they can create a fully electric fleet in all vehicle classes by 2040. The first ten electric buses will go into operation in 2021.



Comparison with The Netherlands

The Netherlands strives for all regional bus transport to be completely emission-free in 2030, or as soon as possible. Therefore, by 2025 all new buses will be emission-free and use 100% renewable energy or fuel which will be generated regionally as much as possible. Differences with the Canadian market are:

- The Netherlands has fewer long and medium distance bus routes compared to Canada, most is local.
- Smart charging on terminals, cross-usage between different modes, and interoperability of charging are major areas of research.



Chapter IV: Doing Business in Canada

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Factors that make BC an interesting market for Dutch businesses

Cooperating with and doing business poses a great opportunity to learn and expand. It also brings risks. Canada is a great place for Dutch organizations as it is an open and stable country:

- Canada has an international culture and workforce. Many people in Western Canada have European roots. In the last 20 years, immigration from Asia has increased with strong overall integration.
- Canada has a stable economy with significant infrastructure investments along with a strong and growing interest in sustainability.
- CETA Agreements make trade and professional exchange more possible and BC is specifically looking to European expertise.
- With proximity to the US and Pacific Rim, there are large number of Americans and Asians living and working in Vancouver. Therefore, there is the potential for Dutch firms to leverage work in Vancouver as a launch pad to work in Asia and the US.
- First in the G7 and G20 countries, 8th among 149 countries for overall prosperity. Based on economic quality, business environment, governance, education, health, safety and security, personal freedom, social capital, and natural environment. Source: Legatum Prosperity Index

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Practical

- Canada uses the metric system.
- The electric grid operates at a different voltage and amperage in Canada than Europe.
- English is spoken almost entirely across the country.
- Highly educated and wealthy population with a high interest for sustainability.
- Easier culture to adapt to and a great steppingstone to the North American market.
- Direct flight from Amsterdam to Vancouver International Airport.

Culture

Cooperating and doing business in other countries deserves attention for cultural differences.

There are some aspects which one might need to be aware of when working in Canada:

- Canadians are less direct than Dutch citizens (or Americans) and are reluctant to say no in your face but would rather say: "Very interesting...."
- Canadian culture is very open and friendly, but rules and regulations are strictly enforced.
- Doing business in Canada seems slower than doing business in (e.g.) the US. It is important to build up trust and work with local partners.
- In general, the tax pressure in Canada is lower than in The Netherlands and the government plays a smaller role.
- Governments are more risk averse than Dutch governments. Most cities are reluctant to start with demonstration projects and budgets for innovative projects seem smaller.
- Only technologies with demonstrated success in North America will be applied. Products need to be certified for the North American market.
- Be sure to speak with counterparts at the right level. Budget responsibilities are often kept at a higher director level than in The Netherlands.

Within Canada there are differences, for example in Vancouver:

- Pace in Vancouver is more relaxed than in the east coast and often compared to west coast of the US.
- Vancouver is a young and prosperous city, not much urban sprawl and no highways through the city, more like a European city, less like LA. The city has a long history with progressive city planning and is often considered one of the best cities to live.
- City policies are directed to sustainability, with a focus on European sustainable initiatives, and often do extensive research.

Be there for you

There is a Dutch Consulate in Vancouver which has vast experience with doing business in Canada. In case you are planning to do business, it might help you with contacts, cultural insights and knowledge about general aspects of Canada. The consulate is very interested to hear from Dutch organizations willing to discover BC and Canada and is there for you to help.

For questions and information contact Maarten den Ouden and René Borghouts through van-ez@minbuza.nl



Sources

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- Trevor Barry - BC Climate Action Secretariat

Colophon

This report is an analysis of the EV-market in British Columbia and Vancouver with a special focus on charging infrastructure, smart charging and EV-knowledge and strategy.

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