



# **Electric Vehicle** tourism in Queensland

University of Queensland students - Tour 7040 program

# ELECTRIC VEHICLE TOURISM IN QUEENSLAND

Prepared for

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## SUMMARY FINDINGS

- FINDING 1      The Queensland government should provide policy support in line with local conditions to effectively increase the adoption of EV.
- FINDING 2      City planning must account for destination type and EV use in future design.
- FINDING 3      Appropriate communication channels will raise public awareness of EVs and tourism.
- FINDING 4      Tourism industries should adopt customer-centric approaches.
- FINDING 5      Public private partnerships provide opportunities to develop EV tourism.

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## ACRONYMS AND ABBREVIATIONS

BEV	Battery-electric vehicle
EV	Electric vehicles, describing all types of plug-in electric vehicles
ICE	Internal combustion engine, a traditional gasoline-power vehicle
NYS	New York State
ZEV	Zero Emission Vehicle
EVSE	Electric vehicle supply equipment, a technical term for electric vehicle charging stations
CVRP	California Clean Vehicle Rebate Project
DEO	Drive Electric Orlando
QLD	Queensland
EVRT	Electric Vehicle Road Trip
UAE	United Arab Emirates
DC	Fast-operating direct current system
AC	Slower-operating alternating current system

## EXECUTIVE SUMMARY

Our study investigates the potential of Electric Vehicle (EV) tourism in Queensland. Research shows that the EV use in tourism positively impacts the environment and enhances sustainability for economic and social development. Improved infrastructure, greater numbers of charging stations and a broader range of new vehicle models, bring many opportunities for EV use in tourism. However, there are several constraints for EV adoption due to the immaturity of related technology. Community perceptions of EVs significantly impact individuals' purchasing decisions. Factors that negatively influence consumer decision making include range anxiety, high upfront costs and rapid depreciation. In the long term, advances in technology will overcome many of the current constraints.

To understand where destinations had successfully incorporated EV use in tourism, the project team investigated a number of programs including:

- **New York State's Charge NY program** – supporting the Hudson Valley local tourism;
- **Orlando's DEO program** - improving theme park tourism through EV car rental services;
- **California government's** public-private partnership program on EV tourism practices; and
- **Adelaide's Green Travel** program to increase the convenience of inner-city EV experience.

These programs demonstrate the importance of government policy in increasing EV adoption in the tourism sector. Substantial evidence suggests other regions are devoting significant time and effort to stimulate EV use in tourism. Many tourist destinations are increasing their focus and investment in green tourism.

We investigated the implementation of EV tourism in five case studies: Norway, Japan, China, the United Arab Emirates and Australia. A key finding is that collaboration between government and private industries (hospitality sectors, tour operators, etc.) is a major contributor to program success. We also reviewed a number of successful strategies for EV use including car sharing in Ishigaki City; EV service and hotel collaboration in Amsterdam; EVs road transport for wineries in Sydney; and EV public transport in Shenzhen. We also discovered other influential factors for EV tourism success, such as the global Electric Vehicle Road Trip (EVRT) campaign. This marketing program illustrated how promotional material plays a vital role in increasing EV adoption and raising awareness of the benefits of EV use. We also discuss a comparative case study with a struggling rental car company in Okinawa. The operators were able to revive the failing business through understanding customer fears and addressing these. This study demonstrates the importance of consumer-centric approaches for EV market development.

Although Australia has been conservative in the adoption of EVs, we can learn from other destinations to understand how governments have supported EV tourism. Queensland has the potential to develop EV tourism through nurturing partnerships between the private and public sector and also within government. The electric superhighway plan (2017) is one example of impact of potential EV collaboration.

## RECOMMENDATIONS:

### **Queensland Government should:**

- develop policies to increase tourism inclusion of EV transport;
- build a cross-department coordination mechanisms for greater collaboration amongst departments; and
- consider supporting the improvement of tourism destinations to include EV infrastructure.

### **Tourism businesses should:**

- develop promotional material to raise consumer awareness of the benefits of EV use;
- apply customer-centric approaches to EV products- particularly addressing consumer myths and fears; and
- explore EVs as an opportunity for new business models in tourism.

# INTRODUCTION

TO THE REPORT





## INTRODUCTION

Tourism is one of the most significant industries in Australia. According to Tourism Research Australia (2018), the total tourism output, including tourism consumption as well as net taxes generated from tourism business, is \$AU210 billion since 2017. Queensland, with its breathtaking natural resources and warm climate, has generated \$AU30.6 billion from worldwide travellers, making it the primary tourist destination with the highest gross value (4.2%) compared to other Australian states (Tourism and Events Queensland, 2019). However, natural-resource-based tourism businesses are at risk due to the impacts of climate change. A key issue for Queensland tourism businesses is how to remain sustainable whilst minimizing the impact of the increasing hazards created by changes in the natural environment.

One of the major causes for global warming is exhaust gas emission from petrol-powered vehicles, which is considered the primary choice of transportation in daily life for more than 70% of Queenslanders (Australian Bureau of Statistics [ABS], 2018). In addition to the vast number of traditional vehicles in the market, according to the study from State of the Environment (2018), 19% of CO<sub>2</sub> emissions are produced by transport. Vehicles are the major factor causing increase in CO<sub>2</sub>. In 2017, the average CO<sub>2</sub> emission from a light vehicle was 182 grams per kilometre (g/km) (Green Vehicle Guild, 2019)

Although fossil fuels are convenient they are a key factor in global warming due to the production of carbon dioxide, carbon monoxide and sulphides as well as the burning of fossil fuels. The ongoing use of fossil fuels continues to damage the ecosystem and reduce resource sustainability for tourism businesses (Turkenburg, 1997). A devastating example of the impact of climate change on Queensland tourism is the increased sea surface temperatures. As a consequence, the higher sea temperatures increase ocean acidification which damages the Great Barrier Reef (Queensland Government, 2019a). Continued use of fossil fuels puts at risk many of our natural resources.

Tourism Multiplier Effect Theory (Rusu, 2011) foretells how damage to the environment, results in consequential loss of billions of dollars in reduced tourism revenue. Diminished tourism revenue will create high unemployment, reduce quality of life, and

create further social security issues. These issues may create a destructive cycle for the local economy (Ke, C. Pan, J. Pan, Zheng, & Zhang, 2011). Therefore, tourism businesses must consider strategies for "going green". Applying transformative strategies with innovative technology such as EVs will protect the natural environment and enhance the long-term sustainability of resource-based tourism businesses (Todorut & Cîrnu, 2012).

## AUSTRALIAN EV MARKET DEVELOPMENT

Electric Vehicles are a new way for businesses to respond to climate change and sustain competitiveness through eco-friendly transport and activities (Queensland Government, 2019a). According to the Electric Vehicle Council (2018a), the numbers of EVs sold in Australia have increased since 2011, with the highest number of EVs in 2017 (n=2284). Additionally, the variety of EV models for sale has risen to 19 in 2019 (Electric Vehicle Council, 2018a). The increased use of EVs indicates consumers are becoming more environmentally-conscious and willing to consider purchasing alternatives to ICE vehicles (E. Belch, H. Belch, Kerr & Powell, 2014).

However, the EV market in Australia is moderate. The population of Australia was 25,101,900 in 2018 (ABS, 2019) compared to other EV early adopter countries, such as the U.S, or China, Australia has a relatively small population, which means it is unlikely to reach the number of privately-owned EVs in other countries. Furthermore, the Australian landmass is a barrier for extending the EV charger network. The small population, combined with the distances for traveling, means less funding for essential infrastructure, such as long-haul highways. The lack of charging points, and the fear of being stranded without fuel, creates anxiety for many potential EV buyers. In addition, most car service spots do not have appropriate technology to handle EV technical issues. Often EVs must be towed to the manufacturer or even returned overseas for repair.

In addition to accessibility to charging stations, the mixture of plugs and connector hardware in Australia is another obstacle for EV universal use. Many manufacturers produce their own own specific charging ports and connectors which limits interoperability for charging vehicles (i.e., Tesla plug connector is different from Nissan's). This is a serious concern for EV owners, as they must have

foreknowledge of their vehicle's compatibility with public charging stations (Queensland Government, 2019b). Most consumers charge their vehicles at home but may need to charge while in transit (e.g., parks, workplace, schools) and therefore require matching connectors (Electric Vehicle Council, 2018a). Battery depreciation and replacement costs also discourage EV purchases in Australia. (Electric Vehicle Council, 2018b).

Widespread EV adoption requires a change in consumer perception for EVs comparison with traditional petrol-powered vehicles. Consumers must believe that they will be supported with the appropriate infrastructure and that the technology is appropriate for the Australian conditions.

## THE FUTURE IS ELECTRIC QUEENSLAND'S ELECTRIC VEHICLE STRATEGY

To support consumers to buy electric vehicles, Department of Innovation, Tourism Industry Development and the Commonwealth Games (DITID) released The Future is Electric-Queensland's Electric Vehicle Strategy, introducing 16 cost-effective

initiatives to increase EV use (Queensland Government, 2019b).

### These initiatives aim to:

Empower consumers working with Queensland Government, industry and the local community to increase awareness about new technology;

Enable Queensland's transition towards EVs: build infrastructure to overcome the barrier of limited EV charging infrastructure, including Queensland Electric Super Highway network, charging station or workplace EV charging trail;

Explore cost-effective programs that benefit local economic development and a higher EV uptake in Queensland; and

Envisage future sustainable action to ensure Queenslanders long-term's benefits from the transition.

Our project developed this report to support the above strategy and provide the Queensland government with knowledge about international EV use and government strategies for EV development.



## PROJECT BACKGROUND AND CONTEXT

The Department of Innovation, Tourism, Industry Development and the Commonwealth Games (DITID) engaged the University of Queensland, Business School to investigate the potential of Electric Vehicles (EVs) use in local tourism and businesses. One of the signature programs highlighted by DITID is the Queensland Electric Super Highway, which allows tourists to travel from Coolangatta to Cairns and from Brisbane to Toowoomba. The EV charging network is an opportunity to encourage tourists visiting on low or zero emission vehicles to enhance resource sustainability and eco-tourism experiences (Queensland Government, 2019b). However, a flat adoption rate has become a barrier for boosting the use of EVs in tourism. Therefore, the Queensland Government needs a realistic and feasible plan to cultivate EV use. Our project reviewed international research into EV use, policies, and strategies to provide recommendations for DITID to encourage increased use of EVs in Queensland tourism.

## PURPOSE, SCOPE AND OBJECTIVES

This project investigates the potential use of EVs in Queensland tourism to provide insights for increased uptake of EVs for sustainability. The project examines trends in the EV market and analyses the potential use of EVs in tourism. International case studies of tourism business and infrastructure provides insights and strategies for adoption by the Queensland tourism industry.

The project objectives are to:

Analyse local and international government programs to increase the uptake of EVs;

Identify key benefits, customer behaviours and trends, for the development of strategies to increase the uptake of EVs for tourism;

Identify and understand opportunities or constraints for the tourism industry with use of EVs and any related consequences; and

Use case studies to analyse and explore the features of successful EV use in local and international tourism organisations.



## METHODOLOGY

The project team used a number of techniques to gather data and to analyse the information. Our project gathered information according to three main areas: academic and grey literature; government information of tourism programs and case studies in the media.

### LITERATURE

The project team used secondary data to discover research on EVs. We reviewed peer-reviewed publications focusing on e-mobility, in particular Electric Vehicles (EV) in tourism business. We accessed a number of academic databases including ISI Web of Knowledge, Springer and ProQuest. We also searched other international literature via the university databases which included other industry reports, popular media, Australian Bureau of Statistics databases, Google Scholar, and Government websites. Keyword combinations for searches included: electric vehicle, EV and tourism, e-mobility, drive tourism, EV charging infrastructure, Electric Super Highway, green cars, cleaner vehicle, EV rental company, EV benefits, consumer/tourism adoption, attitude, intention, behaviour, EV opportunities and constraints in tourism, green tourism, EV tourism program, EV incentives, and policy.

Most articles were published between 2010-2019. We found Electric Vehicle use in tourism remains an under researched area. Therefore we expanded our research to sustainable tourism. Most articles we examined reported literature from countries such as Norway, Denmark, Netherlands, United States and the middle east. We used snowball sampling to extend our research to related recommended articles.

We then examined consumer motivations in regards to "push and pull" factors. Push and pull considers factors to attract and repel consumers in regards to the product or destination. Further analysis was also conducted using the PEST<sup>1</sup> model.

## TOURISM PROGRAMS

We examined tourism programs in multiple jurisdictions to understand how government policy and specific strategies impact the uptake of EVs in tourism. We narrowed our research to focus mainly on the United States and Australia. We did this because most research referred to the US and its major focus on EV tourism. In the US we selected three programs: Charge NY-New York State, California's Zero Emission Vehicles as well as Drive Electric Orlando. In Australia we examined Green Travel in Adelaide, as South Australia is a leader in eco-friendly product adoption.

### CASE STUDIES

The case studies explored how other countries and tourism destinations adopt EV for tourism. The case study selection criteria related to EV adoption in the tourism and destinations. The case studies address five countries and seven cities. They include the United Arab Emirates, Oman in the Middle East, Sydney in Australia, Amsterdam in Norway, Ishigaki in Japan, Shenzhen in China, and Okinawa in Japan.

We adopted thematic analysis for categorisation of our results. We classified the cases according to six different themes;

Car-sharing;

Public transportation;

Adoption of EV for attractions,

Cooperation (using a traditional vineyard)

Hospitality sector and special events

Conferences

We have drawn practical ideas from the cases and for further discussions based on current Queensland situations.

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<sup>1</sup> PEST – Political, social, environmental, and economic perspectives.

# CURRENT EV USE IN TOURISM



## BENEFITS OF EVS

There are multiple ways to use EV for tourism purposes, such as rented EVs or electric tour buses. Increasing the uptake of EV in tourism could solve problems generated by tourism activities as well as benefit tourists, communities and the environment.

### ELECTRIC-MOBILITY IN TOURISM

Electric-mobility (e-mobility) is defined as a vehicle powered by electricity as an alternative to the combustion's engine. The model includes hybrid EVs (HEVs), plug-in hybrid EVs (PHEVs), and pure or battery EVs (BEVs) (Frank & Krems, 2012). The connection of multiple corporations and organizations such as automotive industries, mobility service, information technology, energy suppliers, and the government is one of the characteristics of e-mobility (Galus et al., 2012).

Scheurenbrand, Engel, Peters, and Kuehl (2015) provided an holistic definition of e-mobility as *"highly connective industries which focus on serving mobility needs under the aspect of sustainability with a vehicle using a portable energy source and an electric drive that can vary in the degree of electrifications."*

E-mobility leads to low carbon mobility transitions due to carbon reductions or zero-emission footprint and employs renewable energy through storage systems such as wind and solar power. The first implementation of the idea of e-mobility is an electric car, which appeared in the early 19th century. At the end of the 19th century, internal combustion engines began to dominate the automotive market due to the advantage of sizes and the driving range provided by fossil fuels (Leurent & Windisch, 2011). Hence, conventional cars became mainstream in private transportation, ensuring people could visit various destinations and remote areas. Nowadays, use of electric vehicles (EV) is a practical way to remain sustainable and also lower oil dependency. The EV market is growing fast due to advanced technology development; model availability; charging station implementation; and increased customer demand. As a result, EV sales and production has experienced tremendous growth in the last few years. Many countries such as the US, Norway, and China have predicted EVs will overtake the current vehicle market in the next decade (MarketWatch, 2019). The development of self-driving technology will further stimulate the market and lead to a new era of e-mobility (H. Pereira, 2019).

The market growth of EVs has a significant impact on tourism. EVs have been introduced to address greenhouse gas emission and reduce pollution. One of the fundamental concepts of green tourism is encouraging the usage of non-fossil fuel transportation systems to and from as well as within destinations (Ioannides & Sandra, 2015).

Oron (2015) argues that predictions of pollution reduction due to EV are misleading as there are additional issues with recycling lithium-ion battery and using fossil fuels to generate electricity, which will ultimately continue to threaten the environment. Governments and industry must provide sustainable methods for electricity generation to overcome such problems.

### BOOST INDUSTRY AND INFRASTRUCTURE

According to the Electric Vehicle Council (2018b), high EV uptake in Australia will increase GDP by AU\$2.9 billion, requiring AU\$3.2 billion investment in charging infrastructure from 2018 to 2030. The growing use of EVs may enhance related industries and technologies such as EV batteries, motors, and charging infrastructure (Guo & Liu, 2010).

High adoption of EVs will also benefit the tourism industry. For example, there is a rising number of hotels installing charging stations to attract tourists who drive EVs. Other EV drivers (who are not hotel guests) can also make use of a hotel's bar or restaurant during the time it takes to charge an EV. According to the Queensland Government (2017), the value of state domestic tourism based on EVs in could be as high as AU\$234 million (excluding international tourists) in the next decade. The high utilization of EVs will require partnerships between car rental companies and hotels, as well as other businesses in the tourism sector (Ruder et al., 2015).

### INCREASED CONSUMER SAVINGS

Although the purchase price of EVs is higher than ICEVs, refuelling and maintenance costs of EVs are lower. The cost of recharging an EV is 60% to 90% less than refuelling costs of an ICEV. The price of refuelling is further reduced if charged from domestic solar (Electric Vehicle Council, 2018b; Queensland Government, 2017). Tourism spending may be increased by lower costs of transportation (Miller, 2014).

EVs also cost less in maintenance due to fewer components in BEVs or PHEVs than conventional petrol or diesel vehicles. There are only three moving parts in an e-motor while there are over 100 parts in a combustion engine. According to research, Australian customers will spend AU\$380 per year on EV maintenance costs compared to AU\$750 per year for ICEVs (Electric Vehicle Council, 2018b). In urban areas where cars frequently stop and start, EVs are more cost-efficient than ICEVs due to regenerative braking. The energy generated from braking can be stored back into the electric battery and used to drive the vehicle longer (Yoong et al., 2010).

## REDUCED AIR POLLUTION

Transportation emissions have become a crucial environmental issue in connection with global warming and acid rain. Some emissions are specifically related to tourist activities. For example, tour buses retain air-conditioning whilst the vehicle is stopped in during hot weather to make guests feel comfortable. However, conventional vehicles emit polluting exhaust while drivers need to keep the engine idling (Carrico, Padgett, Vandenberg, Gilligan, & Wallston, 2009). E-Buses will provide comfort without pollution.

EVs could significantly reduce on-road vehicle emissions, as EVs generate fewer greenhouse gases than ICEVs. In regions where fossil fuels are used to produce electricity, the CO<sub>2</sub> emitted by electric buses is 25% less than diesel buses (Adheesh, Shravanth, & Ramasesha, 2016).

The air quality in urban areas will also be improved as previously “tailpipe” emissions will be moved to remote power plants. According to Bloomberg New Energy Finance (2018), 50% of the world’s electricity will be generated by wind and solar in 2050. However, EVs add around 3461TWh additional electricity demands. Increasing the uptake of EVs could accelerate the utilization of renewable energy.

## REDUCED NOISE POLLUTION

Noise pollution from motor vehicles is a growing problem in tourism destinations. For example, when tourists travel to natural setting such as wildlife parks and forests, the cars create noise which also causes distress for wild animals. Noise may impact wildlife and upset their natural behaviours (Shannon et al., 2016).

Increasing adoption of EVs tourism will reduce noise pollution in both urban and rural areas. EVs have no internal combustion engine and they are almost entirely silent at low speeds. According to research, the overall noise emission in cities would be reduced by 3 dB when EVs completely replace ICEVs. The maximum reduction of noise by using hybrid buses is 12 dB when compared with conventional buses with diesel engines (Iversen, Marbjerg, & Bendtsen, 2013; Jabben, Verheijen, & Potma, 2012). In general, the utilization of EVs in tourism will reduce noise pollution and benefit humans and wild animals.

## OPPORTUNITIES FOR EVS IN TOURISM

Many countries are trying to encourage local businesses to add EVs to their fleets. Companies in the UK can receive a 35% reduction in cost when buying an electric car and a 25% price reduction for an electric van (Government of the United Kingdom, 2019). Tax incentives and discounts on vehicle registration duty are common incentives provided by governments to increase uptake of EVs (Coffman, Bernstein, & Wee, 2017; NSW Parliamentary Research Service, 2018). In 2016, the Shanghai local government set a target for car sharing to achieve 6,000 service spots, a fleet of 20,000 EVs and 30,000 charging stations by 2020 (Ibold, 2018). Free parking spaces were provided to car-sharing companies at government sites and airports. Subsidies are also granted for operations and car-sharing platform development in the UK. From 2017, Shanghai government's subsidies covers 30% of the cost of parking spaces, charging infrastructure and electricity, with an upper limit of 3 million RMB per year (Song, Schmitz, Schlosser, & Li, 2017). It's an excellent opportunity for car-sharing businesses to introduce EVs into their fleet with less money.

### GROWING DEMANDS FROM ENVIRONMENTALLY CONSCIOUS TOURISTS

The growing number of "green" customers is another opportunity for tourism businesses to increase adoption of EVs. Research shows that 81% of global customers strongly agree that companies should help to improve the environment ("Global consumers seek companies that care about environmental issues", 2018). Global Industry Analysts, Inc. (2014) reports that the car rental market is shifting towards environmentally friendly vehicles such as hybrid and electric cars.

Become more environmentally minded is a global trend for tourism businesses. More tourism businesses are trying to stand out from their competitors as 'green'. A tour operator in Cairns, Tropic Wings Cairns Tours & Charters, will start to operate 100 percent fully electric buses for their tours between Cairns and Kuranda in July 2019 to support eco-tourism and sustainability (Cluff, 2019).

Hotels and attractions installing EV charging stations could attract and impress customers who share a concern for the environment, while also promoting a hotel's green credentials. Car rental and airport transfer companies can also add EVs to their fleets to attract "green" customers.

### NEW VEHICLE MODELS FOR TOURISM ARE AVAILABLE:

As technology improves, different types of EVs like electric buses and minibus are evolving. Car rental companies and tour operators could benefit from these new vehicles. A tour company in Canada, Westcoast Sightseeing, ordered battery-electric buses from BYD Canada, as well as committed to having a 100% clean-energy fleet by 2023 (Investorideas.com, 2018). While most car rental companies have introduced electric cars into their fleet, electric campervans and RVs have been launched by several car manufacturers like Nissan. The incorporation of EVs is an excellent opportunity for car rental companies to use RVs and campervans to attract those potential customers who want to have a "guilt-free" holiday.

### EV CHARGING INSTALLATION IS GETTING CHEAPER AND EASIER

It costs AU\$21,000 to instal electric circuits and the associated charging station into a premises (Miller, 2014). However, some vehicle manufacturers have launched different programs to increase market share through the installation of charging stations. For example, Tesla offers to install charging stations in hotels at a minimal cost or completely free in exchange for free or discounted charging for Tesla customers (Jones Lang LaSalle, Inc., 2017). Tourism businesses could also add their EV charging station locations to favourite Apps like PlugShare for promotion.

Shanghai

6000 Service Points  
20,000 EVs  
30,000 Charging Stations  
by 2030





## CONSTRAINTS

EV tourism is an eco-friendly approach to achieve Queensland's sustainable tourism development strategy. However, the increasingly use of EVs will potentially put pressure the state's electricity supply. Queensland is a fossil fuel generating region and the Department of Natural Resources, Mines and Energy is aiming to reduce the consumption of coal and gas electricity ("Electricity generation," 2019; "Tips for saving energy in your business," 2019). As a result, increasing EV adoption may also raise fossil fuel consumption.

### CHARGING NETWORK

Insufficient EV charging stations is the primary constraint for EV adoption for tourism. The International Energy Agency intends to deploy between 14 and 30 million public chargers worldwide to serve electric passenger cars. The global electric-vehicle fleet reached 5 million last year, supported by 632,000 public charging points around the world. However, the charging infrastructure isn't deployed equally. China has about half of the world's EV charging stations (Figure 1). Figure 1 shows that most European countries have over 50% of charging infrastructure are level 1 or 2 charging stations, which increases charging time (Eckhouse, Stringer, & Hodges, 2019).

Charging stations owned by Tesla only charge Tesla electric vehicles, which may be inconvenient for tourists when driving EVs with other plug types. There are also limited charging stations in remote tourism destinations such as national parks (Miller, 2014). Often tourists wanting to travel to these destinations will not consider renting an EV due to such constraints.

### RANGE ANXIETY

Range anxiety is a crucial problem for EVs. Driving range for an electric vehicles can be affected by elevation, temperature, speed, use of climate control, and various other features. Research shows that the driving range is the major non-financial limitation for adoption of EVs (Coffman, Bernstein, & Wee, 2015). As there is no internal combustion engine to rely on, the driving range of electric vehicles depends on the energy storage capacity of batteries.

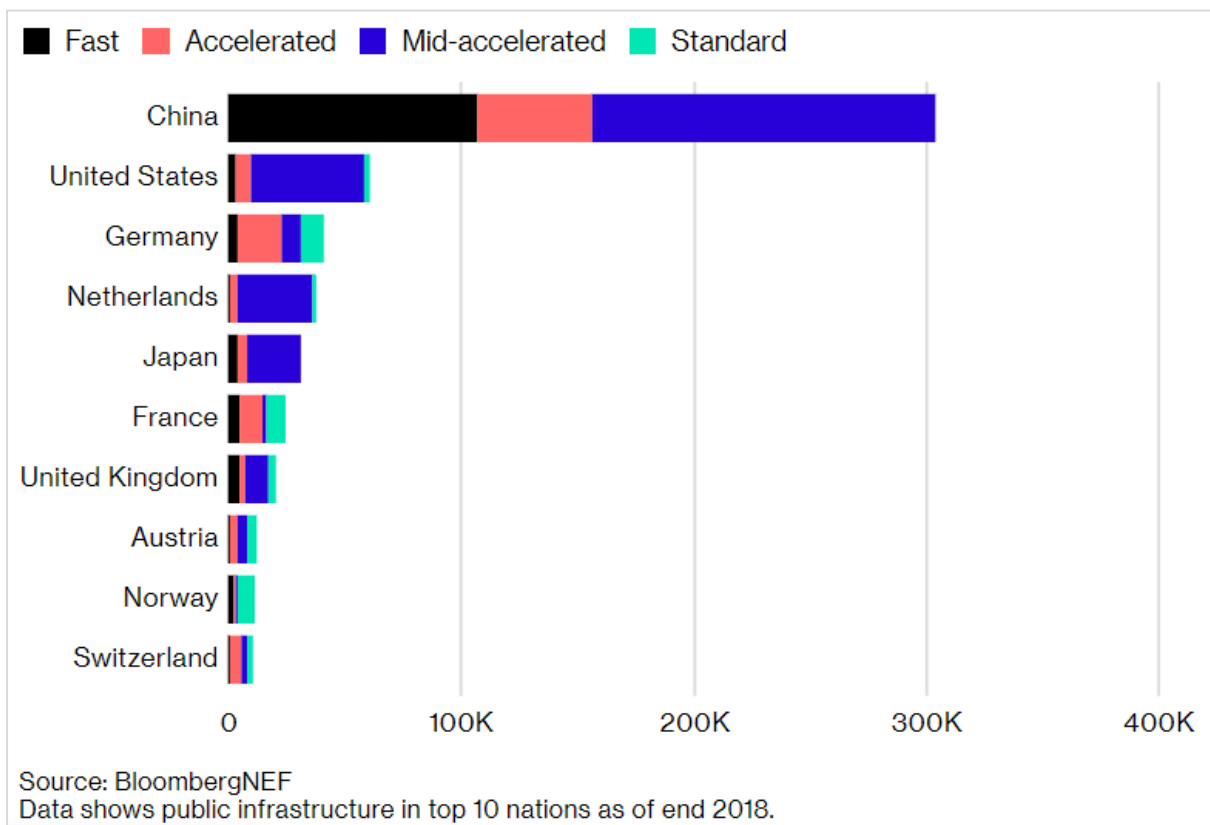


Figure 1 Public charging infrastructure in the top 10 countries

Car rental companies may be afraid that the short driving range of EVs will not satisfy customers and therefore decide to wait for new EV models with extended driving ranges. The average driving range of a fully electric minibus is 250km. This distance may not be suitable for long distance tours, especially when the destination doesn't have an EV charging station. Such restrictions mean that tour operators can only use electric minibuses in city tours or for shorter distance tours.

## HIGH PURCHASE COSTS

The high purchase price is one of the main reasons for low EVs adoption in tourism. Although the EV has more economical running costs when comparing to petrol vehicles, the purchase costs of an EV is a lot higher than comparable conventional cars. A survey of consumers in 21 major cities in the US found that the purchase price of EVs was the significant primary barrier for purchase (Carley, Krause, Lane, & Graham, 2013). When it comes to some countries like Australia with high car taxes and large distances, the high purchase price will make EVs less attractive than petrol and diesel vehicles for tourism.

## HIGH DEPRECIATION RATES

Research shows that while the average depreciation rate for a ICEV is approximately 50% (Blackly, 2019). However, EV owners face a higher depreciation rate at 60% over five years. Some popular models such as the Nissan Leaf loses over 70% of its value after five years (Blackley, 2019). Depreciation may be a significant barrier for car rental companies for EV introduction. Used EVs are also less popular than used petrol vehicles in the market because of the rapid development of technology and the lifespan of electric batteries.

## LACK OF EDUCATION

One of the key barriers to EV adoption is the lack of education about EVs. A study in the UK shows that 18% of respondents have a very low awareness of EVs, but 59% of these respondents also wanted to know more. Only 11% of all respondents claimed to be happy to pay upwards of approximately equivalent to AU\$64,000 for an EV, while 20% of respondents were not aware of tax benefits available to those buying electric cars (Fortuna, 2019).



## EVS AND DRIVE TOURISM

Drive tourism refers to mechanically-powered passenger-carrying road transportation. It includes automobiles, motorcycles, four-wheel drive vehicles, recreational vehicle travel, and caravanning (Prideaux & Carson, 2011).

Understanding how and why tourists select particular vehicles when travelling is an essential part of exploring EV use in tourism. Fjelstul and Fyall (2015) created a sustainable drive-tourism framework and identified travellers' motivations from push and pull perspectives to analyse decisions about sustainable transport for tourism (see Figure 2).

Later, Ioannides and Sandra (2015) created a model for EV usage in the countryside in the US based on drive-tourism model and emphasized the push and pull factors' roles in adoptions of EV in countryside. In particular, it stated the numbers of charging infrastructures positively stimulate the numbers of EV users.

Research shows consumers' attitudes towards EV use changes after driving EVs and experiencing fast charging technology. The deployment of fast-operating direct current (DC) system in public makes EVs more attractive in comparison to slower-operating, alternating current (AC) system (Gebauer, Vilimek, Keinath, & Carbon, 2016).

Push and pull factors are a useful tool to examine consumer behaviour and attitudes for tourist decisions about vehicle choice when on holiday.

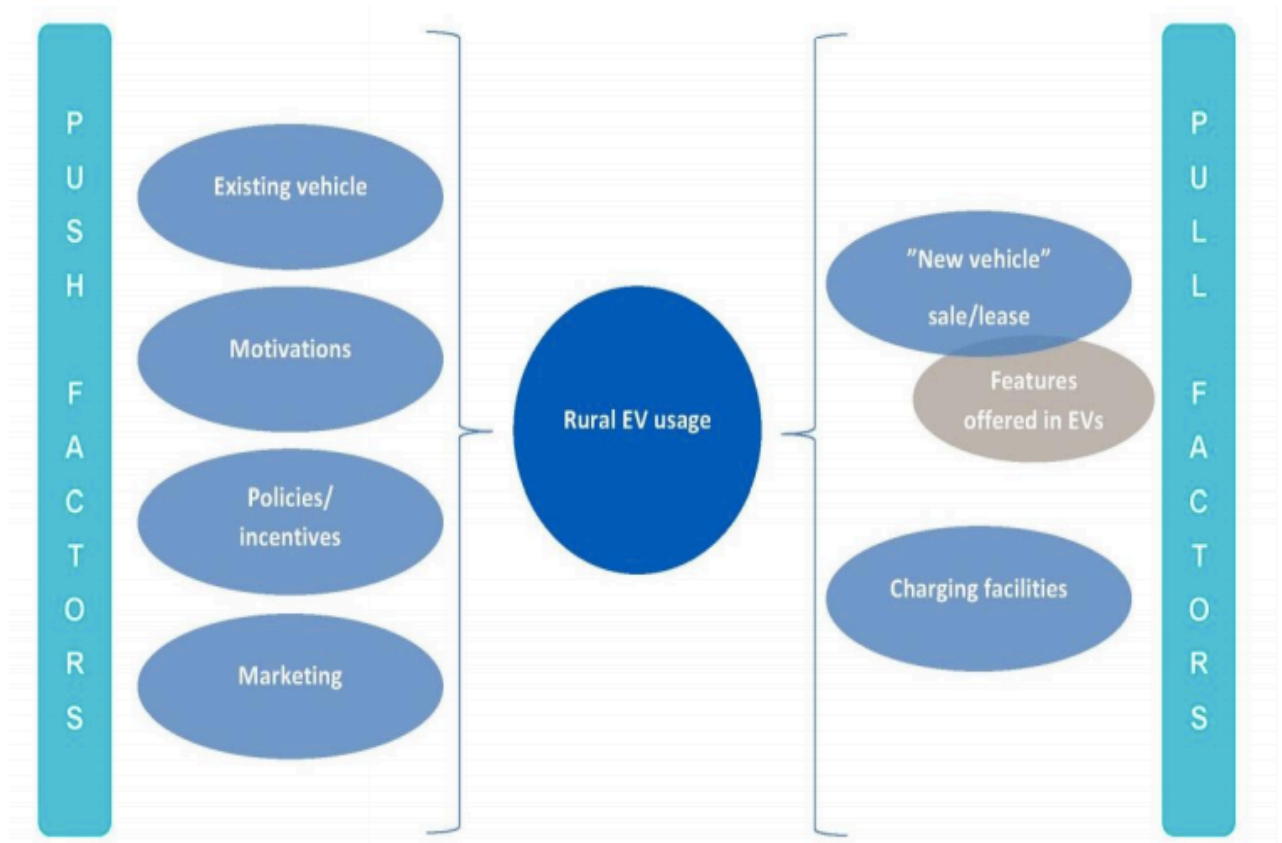


Figure 2 EV Drive Tourism Model (Ioannides & Sandra, 2015)

## PUSH FACTORS

Existing vehicle ownership, motivation, incentives, insurance and marketing are the main push factors for EV adoption. According to Fjelstul and Fyall (2015), vehicle type is a push factor. They argue that clean energy vehicles such as EV, lead the way for sustainable impact on the environment and driving an ICEV may become unacceptable social behaviour. They also claim that people with green attitudes have started questioning the necessity to own a car, especially younger generations in urban areas. Such people are possible EV rental customers and may be open to EV sharing during vacations.

People who believe in sustainability are more likely to view EVs positively (Daziano & Bolduc, 2013). According to a survey conducted by Ngeborgrud & Ryghaug (2017), 63.3% of respondents claimed EVs should be purchased because they are environmentally sound. Research demonstrates that uptake of EVs will also change people's attitudes towards sustainability.

People who purchase EVs without environmental concerns become aware of climate change and carbon emissions after driving EVs (Thronsen, Skjølvold, Ryghaug, & Christensen, 2017). Fjelstul and Fyall (2015) also discovered that income, vacation time and household compositions also impact on tourists vehicle selections during holidays.

Fjelstul and Fyall (2015) determined that an effective marketing strategy positively impacts market demand for EVs. Many people may not be aware of model options for EVs and do not know about functions and performance. Incentives from government to encourage purchase of EVs will influence people's decisions to buy and use EVs. When insurance for EVs are lower than renting a conventional vehicle, EV uptake will also increase (Ioannides & Sandra, 2015).

## PULL FACTORS

Pull factors include new vehicles, attractions, destinations, and charging infrastructure which attract consumers to use EVs in their vacations. When enough vehicle models are available for hire, such as hybrid EVs (HEVs), plug-in hybrid EVs (PHEVs), and pure or battery EVs (BEVs), more consumers will use EVs (Fjelstul & Fyall, 2015). Ioannides & Sandra (2015) believe EV features such as drive distance or range and the ability to drive in adverse weather conditions currently affect consumer's decisions to use EVs during holidays. Global infrastructure such as charging facilities in popular destinations will increase EV adoption.

Ramos, Dionísio and P. Pereira (2018) believe a network of sustainable tourism options connected to natural resources will allow clean tourism and improve EV demand. Similarly, if the hospitality sector, such as hotels and restaurants implement charging stations they believe it will attract travellers to charge their vehicle while resting and relaxing (Fjelstul & Fyall, 2015).

# EXISTING

TOURISM PROGRAMS



# ZERO EMISSION VEHICLE PLAN

## BACKGROUND INFORMATION

The Zero Emission Vehicle (ZEV) Action Plan (2013), is a sustainable long-term transportation strategy which aims to reduce greenhouse gases in 9 US states (California, Connecticut, Maryland, New Jersey, New York, Oregon, Rhode Island, Vermont and Massachusetts). The purpose of this action plan is to reach 5 million EVs by 2030 and install 250,000 EV charging stations by 2025. The US government has provided \$2.5 billion in financial support for rebates (Northeast States for Coordinated Air Use Management [NESCAUM], 2018).

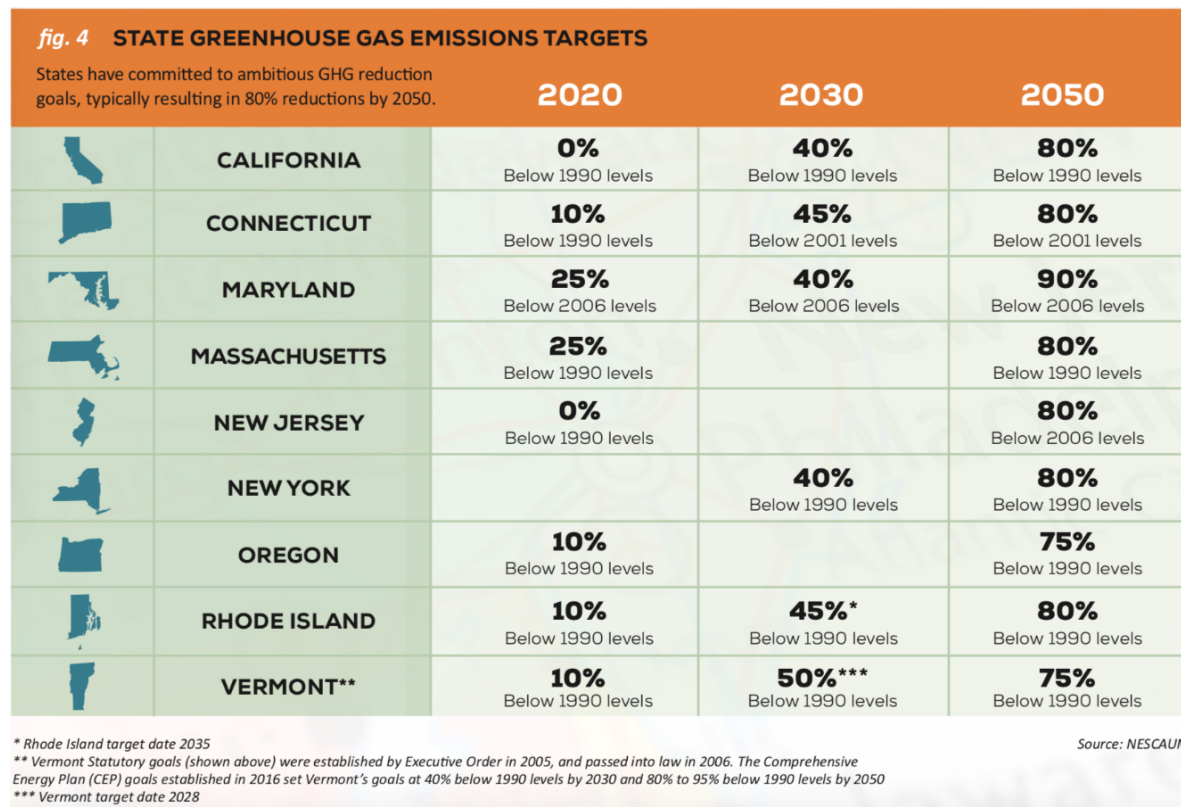


Figure 3 Greenhouse gas emissions targets of different states in the U.S

The ZEV action plan emphasizes the importance of cross-state cooperation. It reduces and eliminates barriers for EV travellers crossing state boundaries. Potential barriers may occur when each state introduces its EV strategy separately. For example, if two states adopt different types of chargers, it would increase the difficulty for interstate travellers. The ZEV action plan improves accessibility to charging stations during long-haul EV tours and also benefit cross-state tourism. Multi-departmental cooperation contributes to aligning further sustainable development at the state level.

The ZEV plan includes:

- incentives for EV customers
- support for EV fleet development,
- cooperation with local government
- reduction in greenhouse gas emissions from regional transportation sector
- consumer education and outreach on EV use
- shared standards for EV facilities in different states

## CHARGE NY PROGRAM IN NEW YORK STATE

### CHARGE NY STRATEGY

New York State's EV tourism program is part of Charge NY Strategy which is initiative to get more electric cars and trucks on the roads around the state, responsible by NYSERDA. The program aims to emerge EV-based tourism in Hudson Valley and Catskills regions of lower New York State because in these regions, tourism provides significant economic benefits and job opportunities (Ruder et al., 2015).

#### Government policy:

Financial support for EV purchase

Max\$2000 subsidy/ Max\$7500 debate

Limited Rebate

Discount of tunnels fee

Cross-state cooperation

### FINANCIAL INCENTIVES

In order to reduce the cost of EV purchase, Charge NY provides multiple incentives and various support for EV adoption. Several policies offer rebates and subsidies to EV buyers, dealers and fleet operators (New York State Energy Research and Development Authority [NYSERDA], 2019a). Up to US\$2000 is available in rebates for new car purchases as well as up to US\$7500 in federal tax credits. The rebate depends on the charging or "all-electric" range of the car, which means hybrid cars are also included for rebates.

### DRIVE CLEAN REBATE FOR ELECTRIC CARS

The Drive Clean Rebate amount depends on the EPA all-electric range for that car model

Greater than 120 miles

**\$2,000 OFF**

40 to 119 miles

**\$1,700 OFF**

20 to 39 miles

**\$1,100 OFF**

Less than 20 miles

**\$500 OFF**

Electric cars with MSRP >\$60,000  
(MSRP is the manufacturer's suggested retail price)

**\$500 OFF**

Figure 4 Drive Clean Rebate for Electric Cars in New York State

## LIMITED REBATE

Although the state government offers subsidies for purchasing EVs, these rebates from the government are limited. (NYSERDA, 2019b). However, for those governments who have a limited budget, providing a funding strategy may help forecasting government costs and also increase the purchase potential for EVs, thus increasing revenue through car taxes and other indirect car costs.

### Available Funding

Open to New York State residents, the Drive Clean Rebate offers a point-of-sale rebate of up to \$2,000 toward the purchase of a new electric car. The chart on the left displays how much rebate funding is still available. Please make sure to check this page before purchasing an eligible electric car. Data is updated regularly as Drive Clean rebates are fulfilled at dealerships.

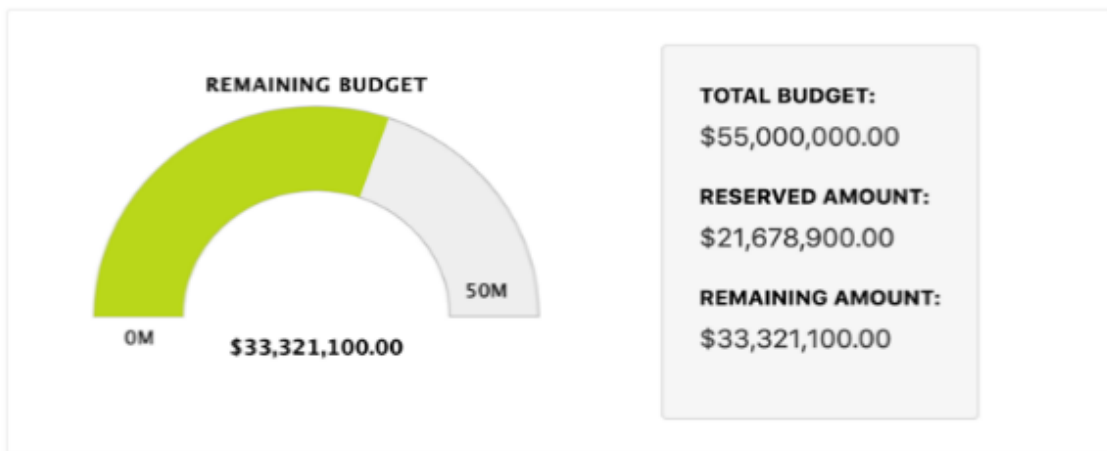


Figure 5 Drive Clean Rebate for Electric Cars in New York State



## GREEN PASS PROGRAM

The NY state government designed a subprogram named Green Pass which allows EVs to drive over all bridges and tunnels in the state with a 10% discount (Figure 6). Also plug-in EVs are allowed to use high occupancy lanes ( New York State Department of Transportation [NYSDOT], 2019). Early adoptors of EV will have the added advantage of reduced delays in traffic.

## CROSS-STATE COOPERATION

The ZEV plan is an opportunity for New York state to develop EV tourism. The multiple strategies will boost inter-state EV travel to the Hudson Valley and Catskills regions. Transportation represented 21% of traveller spending in Catskills which means they have a considerable market opportunity with EVs. Cross-state cooperation will also help to reduce conflicting rules and standards between different jurisdictions.



Figure 6 New York State Green Pass Vehicle sticker

## BATTERY RECYCLING

Technically, EVs are not a zero pollution product as the battery remains and has little recycling value. Battery disposal is still a technical barrier for overall pollution (Farhan, 2016). The New York State government requires EV manufacturers to collect their rechargeable batteries for recycling or proper management at the end of their useful life. EV consumers must return their batteries to the manufacturer for disposal (New York State Department of Environmental Conservation [NYSDEC], 2019). Some private companies, such as Tesla, has a focus on battery recycling as part of the ongoing research for sustainability (Kely, 2011).

## DESTINATION CLUSTERS

The government customizes EV routes and its' supporting facilities through creating destination clusters and analysing market characteristics (Ruder et al., 2015). The government mapped two different types of potential EV tourism destination, natural attractions and humanities, and proposed charging points and potential EV tourism routes (Figure 7). By collecting features in these clusters to choose suitable EV tourism development methods. For example, in natural attractions, the range anxiety is the main barrier for developing EV tourism, to spread charging network should be the priority. Meanwhile, hospitality businesses in humanities and city areas are important to tourists, as a result, they should consider to install charging points in accomendations, restaurants and café.



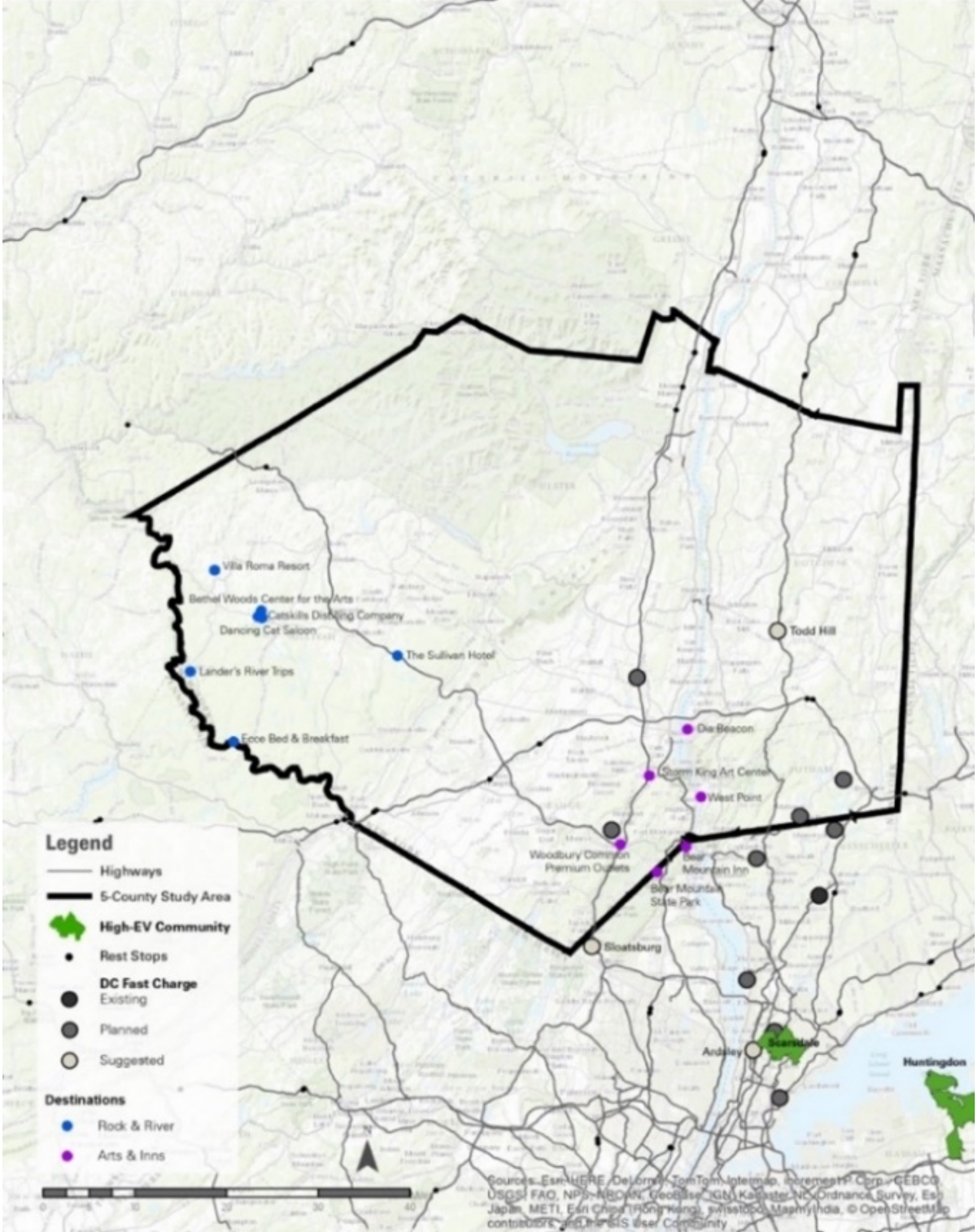


Figure 7 New York State Destination Cluster Map

## ALL-IN-ONE EV TOURISM APP

As the tourism industry significantly grows with EV use, there is a potential market base for the development of apps (Ruder et al., 2015). Millennials are potential customers as they are interested in new technologies and have a relatively high adoption of EVs (Ruder et al., 2015). The New York State developed an all-in-one EV tourism app (Figure 8), to build an EV-friendly environment to increase millennial EV adoption. Online applications improve opportunities for companies and organizations to create car sharing or rental platforms.

## DISCUSSION

Overall, New York State EV tourism program is based on an integrated strategy. To achieve their goals, the government assembled a complete EV ecosystem to increase EV use and enhance tourism. This has been successful regardless of the type of EV, due to consistency in policies regarding charging stations; the creation of an online app; route customisation based on destination with charger stations; the creation of EV car rental and car sharing businesses; cross-state cooperation; and EV tourism target market segmentation. The multi-approach strategy has improved EV tourism development.

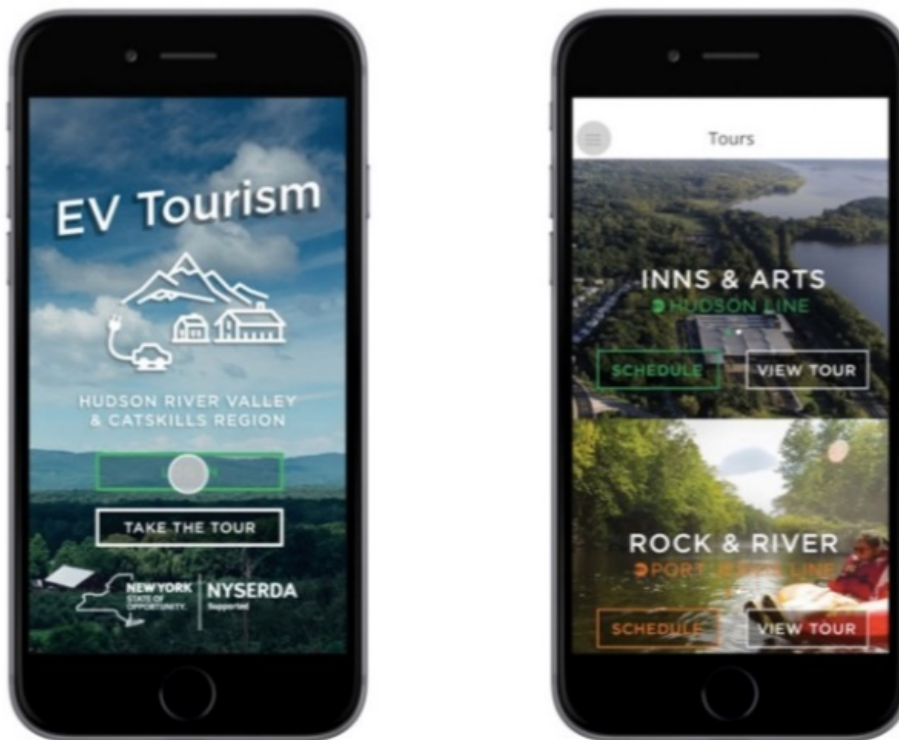


Figure 8 All-in-one tourism app

## GREEN TRAVEL TOURISM IN ADELAIDE

### Green Travel in Adelaide

Green travel project leads Adelaide's EV tourism, which focusing on car share business and EV infrastructures and incentives (City of Adelaide, 2019). As the city government aims to be the world first Carbon Neutral City, encouraging more sustainable move models and EV have been part of their objectives.

### Government policies :

Rebates to install charging station.

### Actions:

Smart Parking System matches EV drivers' parking demand.

Carbon Neutral Strategy leads cooperation between government and private sectors.

## FINANCIAL INCENTIVES

The Adelaide government offers a series of rebates for installing charging points or stations. Compared to the New York state, Adelaide does not have any subsidies for EV purchasing. From a social perspective, Adelaide residents are motivated to purchase EVs with only 20% or less identified as budget conscious. Many residents are motivated by the environmental benefits of driving EVs. This general sentiment means that Adelaide has an environment for potential EV adoption.

## CARBON NEUTRAL STRATEGY

The SA government's Carbon Neutral Strategy has allocated more budget into "Green Travel". "Green

Travel" is a part of the Carbon Neutral Strategy 2015-2025. The strategy funds many business partners in order to collaborate with the private sector. One program is the Ecocaddy (Figure 9), which has been operating a Zero-emission short trip transport service to increase EV use when travelling in the city. The car-sharing company, Goget, is also collaborating with the government to encourage low-carbon travel. Therefore, cooperation between government and private companies benefit EV tourism.



Figure 9 ECOCADDY short trip transport

## SMART PARKING SYSTEM

An impressive action by the Adelaide city council is the Smart Parking System which can monitor and match the EV parking availability to actual demand (Adelaide City Council, 2016). The EV parking system (Figure 10) flexibly adjusts availability of car parks in peak times. Car parks have overhead indicator lights,

indicate whether space is occupied, only available for EV or it is available for all cars. As a result, the system maximizes EV parking resources.

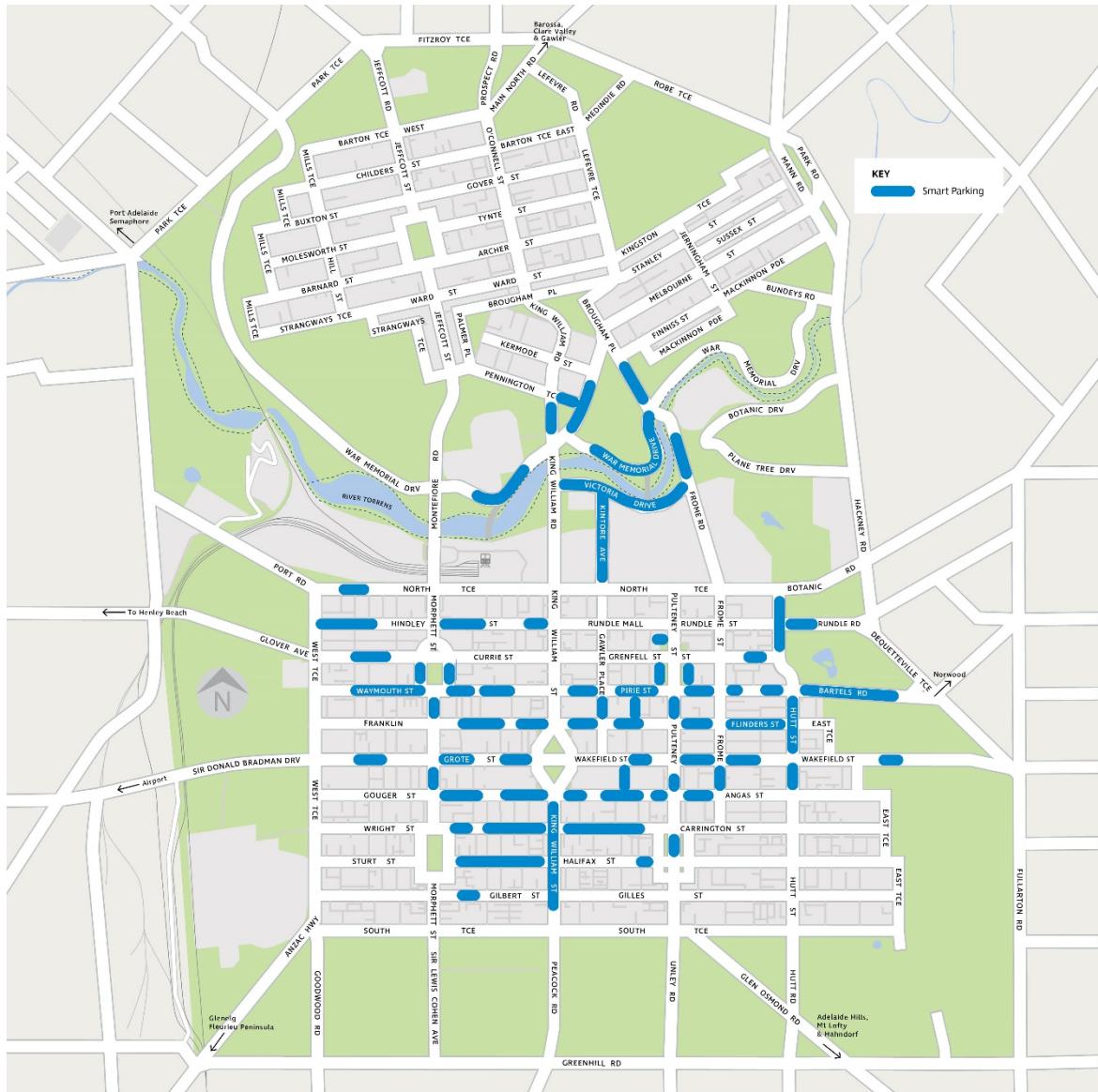


Figure 10 Adelaide Smart Parking Network (Blue Line)

## DISCUSSION

Adelaide has a unique advantage to promote EV tourism to the public because its residents share a positive attitude towards renewable technologies, and the people of Adelaide have relative high awareness of EVs.

A survey conducted by Evenergi (2019) shows South Australia has world-leading penetration of rooftop solar, over 55% respondents have solar panels and another 40% having either considered or in the process of considering solar power. Based on these results, residents in Adelaide have a positive attitude on transferring from ICE to EV.

However, a number of respondents indicated that solar power was a prior factor to buying an EV as solar power was required for both housing and EVs in order to achieve total zero-emission lifestyle. Although EVs are a zero-emission product, the electricity requirement will not reduce the overall emission level because traditional electricity generation produces high levels of greenhouse gases. This view was also shown in a survey conducted by Evenergi in which an amount of responders noted that they would consider installing solar panels as a pre-require to purchasing EVs (Evenergi, 2019). As a result, taking EVs as sustainable

tourism traffic may need to consider its' energies' sustainability.

In addition, Adelaide has a wealth of vineyards for tourism, which attract many road trip tourists. Wine tours can create opportunities for EV tourism. Adelaide also own many renewable energy resources, and green energy production is 73% of total energy supply until 2021. One of these types of supply is solar power. Solar power helps ease range anxiety of EV drivers (City of Adelaide, 2018). Tesla has an ongoing electric battery program for storage of renewable energies in South Australia, which will help electricity supply in rural regions. These batteries will also benefit both private and public EV chargers in the future (Parkinson, 2019).

Green Travel Adelaide is aligned with the Carbon Neutral Strategy. The main objectives are reducing car emissions by using EVs and encouraging low carbon movement. The government has created innovative projects to increase the convenience of EV use, such as smart parking; integrated application of EV related services; and flexible on-street/off-street charging points to support tourism destinations. The government's effort for investing in renewable energy, means that it is able to spread the charging network to rural areas with truly green energy supply of electricity to EVs.

## ZERO EMISSION PLAN IN CALIFORNIA

### California ZEV Plan

The California ZEV action plan is to reach the adoption of 5 million electric vehicles by 2030 and install 250,000 EV charging stations by 2025, with US\$2.5 billion initiative financial support for rebates ("ZEV Action Plan," 2019). California leads the nation in EV adoption. The website: Ars Technica, states that California as the biggest market of vehicles in the U.S., is still leading in the EV field-- with 49% of EV sales in the nationwide (Geuss, 2018).

### Government policies

- Rebates to EV buyers according to their income levels and car engine type

### Actions

- Regulate auto manufacturers to sell a certain number of EVs
- Cross-state cooperation
- West Coast Highway

## FINANCIAL INCENTIVES

In order to stimulate the application and dissemination of EVs, California has adopted policies and rebates for the EV market and local residents. Due to the high price of electric vehicles compared with traditional cars, high-income buyers are usually not price-sensitive. But for middle-lower income buyers, the high price is one of the obstacles for EV purchase. The California Clean Vehicle Rebate Project (CVRP) provides rebates to EV buyers according to income levels, the type of electric battery, and vehicle type (see Table 1).

For middle-lower income buyers (with the gross annual income limitation is \$35,640 for individual, and \$72,900 for household) the CVRP provide \$1,500 rebates for all types of light-duty vehicles, combine with the \$7,500 federal tax credited. Now, the rebates increased \$500, the savings are up to \$11,500. (see Table 2)

Higher income buyers (with the gross annual income exceeds US\$250,000 for individual, US\$340,000 for household, and US\$500,000 for joint filers), are not eligible for the CVRP rebates (Dow, 2017).

Table 1 Rebates based on personal income

	March 29, 2016 – October 31, 2016	November 1, 2016 – Present
<b>Consumer Income Cap*</b>		
Single filers	\$250,000	\$150,000
Head-of-household filers	\$340,000	\$204,000
Joint filers	\$500,000	\$300,000
<b>Increased Rebate for Low-to-Moderate Income Consumers**</b>		
Standard rebate amount increased by	\$1,500	\$2,000
* Income cap is deferred for consumers of fuel-cell electric vehicles (although receipt of a rebate above the income cap precludes receipt of a high-occupancy-vehicle-lane sticker, per Assembly Bill 544 of 2017).		
** For consumers in households with income ≤ 300% of the federal poverty level.		

Table 2 Rebates based on vehicle types

Vehicle Types	Effective Dates					
	3/1/2010	6/18/2011	7/4/2013	6/1/2014	3/29/2016	11/1/2016
<b>Plug-in Hybrid Electric (PHEV)</b>	\$3,000	\$1,500	\$1,500	\$1,500	\$1,500– \$3,000*	\$1,500– \$3,500**
<b>Battery Electric (BEV)</b>	\$3,000– \$5,000***	\$1,500– \$2,500***	\$2,500	\$2,500	\$2,500– \$4,000*	\$2,500– \$4,500**
<b>Fuel Cell Electric (FCEV)</b>	\$3,000– \$5,000***	\$1,500– \$2,500***	\$2,500	\$5,000	\$5,000– \$6,500*	\$5,000– \$7,000**
<b>Zero-Emission Motorcycle (ZEM)</b>	\$1,500	\$900	\$900	\$900	\$900	\$900
<b>Neighborhood Electric Vehicle (NEV)</b>	\$1,500	\$900	\$900	\$900	\$900	\$900
<b>Commercial Zero-Emission Vehicle (CZEV)</b>	\$20,000	\$0	\$0	\$0	\$0	\$0

\* Lower-income consumers eligible for an additional \$1,500.  
 \*\* Lower-income consumers eligible for an additional \$2,000.  
 \*\*\* Amounts varied by ZEV type. For definitions, see CCR 1962.1.

## RULES FOR AUTO MANUFACTURERS

For achieving the goals of ZEV action plan, the government regulates and encourages auto manufacturers to sell more EVs, though assigning the ZEV credits. Manufacturers gain credits based on the number of EV sold and types of EVs. The ZEV credits are expected to reach 22% in 2025, which means that 8% of EVs need to be sold. Manufacturers need to balance ZEV credits and sales of traditional cars.

Otherwise, they have to pay US\$5,000 per car as a penalty (Alternative Fuels Data Center, 2019). As the regulations are only suitable to traditional manufactures Tesla is not included. However, Tesla but can earn EV credits for sales to traditional auto manufacturers.

The government has the ability to influence the EV market, through promotion and stable growth, as well as regulating the market by promulgating the relevant compulsory plans and policies for carmakers to increase EV sales.



## THE CALIFORNIA EV TOURISM: WEST COAST ELECTRIC HIGHWAY

The “West Coast Green Highway” is an application of electric vehicles in the tourism industry, which aims to reduce the negative impact of transport on the environment and to promote sustainable tourism. The green highway is about 1,350 miles long and contains five states: the border between U.S. and Mexico, California (Los Angeles to San Francisco), Oregon, Washington, and the border connects the U.S. with Canada (Washington State Department of Transportation, 2013). DC fast charging stations are situated every 25—50 miles along the road with cafes, restaurants and shops. The DC fast charger allows travellers to charge their cars within 30 minutes.

The West Coast Green Highway (Figure 14) has many fast chargers in convenient places. The charging locations provide EV users with opportunities to have zero-emission road trips with high-technology and consistent experience. The West Coast Green Highway also assists the development of the EV industry with employment opportunities, promoting EV use and reducing the negative impact on the environment.

### DISCUSSION

Although California has developed various policies and actions to increase the uptake of EVs, potential rises in EVs may negatively impact traditional revenue from ICEVs. Since the development of the EV industry, more people are willing to give up traditional vehicles and move to the new EV technology. The government has supported this through developing regulations and providing incentives to expand EV utilization. People with EVs do not need to pay the gasoline tax. With the decreasing number of traditional gasoline vehicles, the government will lose revenue from gasoline tax which will also reduce funding road maintenance. (Alex, 2019) (Figure 11). As a result, government may need to consider the decline of traditional fuel’s revenue and develop alternative revenue strategies.

Therefore, the lack of EV adoption in Queensland, should prompt government to adopt similar incentive policies based on poverty level of residents, and provide support to assist middle-lower income residents to purchase EVs.



Figure 11 California electric highway

## DRIVE ELECTRIC PROGRAM IN ORLANDO

### Drive Electric Orlando

Orlando has the world biggest airport car rental (Jonathan, 2012) with about 4 million cars rented annually and 57 million visitors attracted by Disney, Universal, and Sea World (Bilbao, 2018). In order to increase adoption of EVs, Orlando has launched the Drive Electric Orlando (DEO) program in 2013. This program has 15 Nissan Leaf cars which provides EVs for a large number of annual visitors. This program also promotes education and demonstration of the benefits of EVs for mass groups (Combs,2016) .

#### Government policies:

- Consistent EV rental price

#### Actions:

- Public - private partnerships (car rental companies, theme parks and hotels)
- Create appropriate communication channels

## FINANCIAL INCENTIVES

The Orlando government offers various incentives on EV utilization to improve EV adoption. These incentives are also focused on car rental companies, theme park partners and hotels. In order to ensure EVs rent at a comparable price, the government works with rental companies to keep EVs' price the same as the average price of petrol vehicles. In addition, the government connects enterprises to auto manufacturers to increase EV fleet diversity. The government works with theme parks to offer incentives on parking for visitors in order to contribute to positive EV rental experience. Similar actions are provided by the government when working with hotels to encourage the use of EVs.

## APPROPRIATE COMMUNICATION CHANNELS

The government created social media accounts to engage DEO's partners, consumers, specialists and other stakeholders. Social media allows both government and the public to communicate information about EV tourism. For example, when visitors want to inquire oabout EV relevant information, they can directly ask others on social media questions about the information that they need. In addition, public comments on social media enable the government to understand public expectations about EV tourism and adjust their actions to improve theme park EV road trips. As a result, appropriate communication channels (Figure 12) can help connect public and private companies to understand

the community use of EVs and develop appropriate EV strategies.



Figure 12 DEO Facebook Logo

## PUBLIC-PRIVATE PARTNERSHIP

The DEO program involves cooperation between the government and industry. Based on theme park tourism in Orlando, the government mainly focusses on car rental partners and theme park partners to improve the EV drive travel experience.

The government assists car rental companies to ensure that EV equipment is properly installed at rental locations in sufficient numbers to support the EV fleet. Training includes short videos, PowerPoint presentations, factsheets and sample maps of

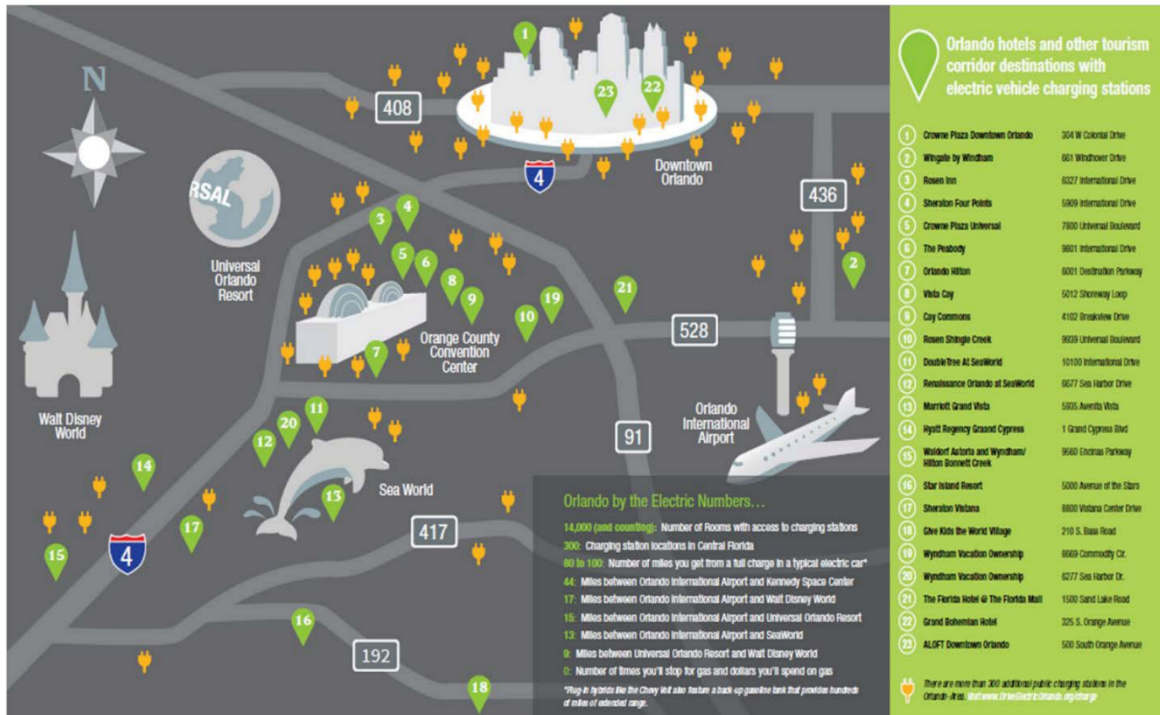


Figure 13 EV charging stations in Orlando tourism destinations

chargers' network (Figure 17) in Orlando which is used to increase public knowledge and reduce range anxiety.

The government works with theme parks, inviting them to discussions to expedite the build of charging infrastructure and explore collaborative marketing. In order to improve the overall experience for theme parks, the government collaborates with the hotels around destinations to recommend the installation of charging stations as well as provide appropriate training for hotel staff which also supports EV commuters.

## DISCUSSION

Orlando combines the advantage of its theme parks and car rental companies to develop the DEO program. This requires government and industry to cooperate to enhance the EV driving experience. The strategy applied in Orlando provides an example that can be applied in other regions, particularly for those with similar destinations such as amusement attractions. Social media is also a suitable platform to promote EV tourism and understand target market expectations.

# CASE STUDIES



## CHARGING STATIONS

**SYDNEY** is transforming road transport to be more sustainable by accelerating the transition to a low emission vehicle market (Meixner, 2018). NRMA, as one of the Australian largest member organizations, works with all levels of government and company members to improve road and transportation infrastructures. In 2017, NRMA set up a network of 40 fast-charging stations at the cost of AU\$10 million. It aims to translate tight roads, public transport system, and better facilities in Australia.

Mainly, NRMA's charging network is a connection between government, charging companies, and local business. In Dec 2017, Tesla partnered with Cassegrain Wines. Tesla installed six superchargers in Cassegrain Wines. In return Tesla owners can enjoy a 20% discount on Cellar Door purchases in Cassegrain Winery (Cassegrain Wines, 2019)

Cassegrain Vineyards, as one of the first vineyards to grow and produce Chambourcin grape commercially in Australia. The Cassegrain family has a long history in winemaking since 1643 in France. After setting in Australia, the traditional France winemaking methods combined with modern Australian technique and technology, which has been received many awards and accolades

### KEY FINDINGS

Third-party companies are useful to encourage EV operators and local businesses to establish an EV network.

NRMA, as the public transport network assistant company, has invested in a big charging network in NSW. NRMA supports road facilities and technology car companies, car-sharing companies as well as charging companies. These efforts by a third-party has given the EV market greater media exposure through newspapers and the internet.

Cooperation between local wineries and charging companies creates sustainable branding image.

Tesla, as the low fuel emission car producer, creates an image of sustainable development. The Cassegrain Vineyard can build a new sustainable brand image through installing and providing EV charging services. Cassegrain may attract new market segments such as those with middle to high level income, higher education as well as fans of high-quality wine (Thomas, 2018).

Good opportunity for charging company's business.

Industry collaboration with famous tourism destinations to build and manage charging stations will support EV car owner's expectations for convenient access to charging stations during road trips. Such partnerships give confidence for customers to purchase or rent EVs.



Figure 14 EV Chargers for Hyatt Airport Hotel in Amsterdam, the Netherlands

## DESTINATION HOTEL COOPERATION

**The EV-Box** is a company which provides charging station service. Today, the EV-Box of Amsterdam is home to almost 19,000 electric drivers and offers about 400 full-electric taxis and 300 fully-electric car-sharing vehicles (Amsterdam, 2019). This company has helped Amsterdam to install over 1,500 charging stations and use the Smart Charging system. The company's business plan focuses on cooperation with different hotels to enhance the number of EV adopters through installing recharging stations ("Hospitality Charging", 2018). Based on E-box research, 94% of EV drivers prefer visiting establishments that are equipped with charging stations (E-Box, 2018). Collaboration between hospitality businesses and charging station companies increased the coverage of the EV infrastructures, generates direct income from charging products, and promotes EV tourism. As a result, the EV Box strategy has been highly successful.

## KEY FINDINGS

### Improve competitiveness through collaboration

For private hotel business, they are a step ahead of competitors because the charging stations they offer are a new service option for EV customers (Teng, Lu, & Huang, 2018).

### New demographic relating to consumer attraction of EVs.

EV facilities may attract new guests who are environmentally conscious and prefer to choose EVs as their primary transportation.

### Showcases hotel's Corporate Social Responsibility.

The new charging strategy highlights a hotel's social responsibility to reduce carbon emissions when more people choose clean energy cars as their primary transportation option.



## CAR-SHARING

The Ishigaki Island boasts regarded as the largest blue coral community in the Northern Hemisphere as well as Sekisei Lagoon, one of Japan's largest lagoons. Its beautiful landscapes are drawn 1.24 million tourists annually (2016 figure; 2017 estimate: 1.35 million). Since the thriving tourism industry constitutes the economic pillar of the Ishigaki Islands, it is essential for local government to retain sustainable tourism while protecting nature and social society.

The Go Share plan (E-SHARE Ishigaki Co, 2018) launched by GOGORO car-sharing company, is supporting by the government of Ishigaki Island. The company offers electric motorcycle rides in order to enhance tourist's travel experiences while makes the tour eco-friendly. A swappable battery system is a unique advanced technology which can save time during recharging. Moreover, The Gogoro driving fee calculates by the using hour, consumers can enjoy early bird discount if they book online. The GOGORO designed an online app which link to user's mobile devices so that tourists can quickly know the layout of motor stations start their journey easily. Furthermore, the E-SHARE Ishigaki, safety and secure plan is a necessary guideline to protect resident and tourist. In case traffic accidents, the company also set a service centre to help tourists get familiar with the riding instructions, conditions as well as traffic rules when they pick up the electric motorcycle. In addition. A swappable battery system which can save time in recharging process was applied in the plan to create a smooth trave experience. Specially, consumers do not need to pay for battery replacement. Similarly, The Gogoro built a successful business in Taiwan; it displaced 4.1 million litres of gasoline and reduced CO2 emissions by 26 million kilograms.



Figure 17 GOGORO e-motorcycle



Figure 17 Go Share Map in Ishigaki



Figure 17 GO SHARE electric vehicle battery switch and free pick up service area

## KEY FINDINGS

The E-share model contributes to the growth and development of the local community.

For the Go Share plan, it is increasing the destination attractions and tourists' numbers. Moreover, it is increasing employment opportunities and incomes for local community.

The Go Share plan contributes to environmental value.

The Go Share program helps to introduction and consumption of renewable energy. It provides a chance for zero-emissions mobility. Also, reduce pollution when recycle EVs and battery.

The Go Share plan has potentials in stimulating EV tourism which could be a new source of revenue for local economics.

Regarding of car rental companies, sharing economy was a cost-efficient model for distributing services and products due to the relate lower cost for service providers. Finally, apart from building networks for EV charging station, there is an alternative business model for EV development, namely car-sharing system. The system has been first discussed in Europe since 1980's. To date, there are various EV producer and programs in different countries, like Uber, Zipcar and Car2Go. As for Japan, the local government inputs GOGORO plan in the Ishigaki Island as a new car-sharing style in order to practice its long-term EV strategies.





## ELECTRIC VEHICLES AS PUBLIC TRANSPORT

In the past, diesel and gas vehicles have been part of a traditional open vehicle. However, with the EV developing in the global area, public transport services are transferring to a low- or zero-emission systems.

Shenzhen is seen as a “first level city” in terms city readiness for electric vehicle adoption, with numbers of local programs implemented and significant advancements in charging infrastructure (Shenzhen Municipal People’s Government, 2015). China selected Shenzhen as the first of 13 pilot cities for demonstrating and promoting the new energy vehicles model from 2009. Between 2009 and 2015, the Shenzhen government provided 500 million yuan (nearly \$74 million) per year of financial incentives for electric vehicle purchasing, the government granted benefits and subsidies for tolls, car insurance and charging infrastructure (Liu, 2005). By the end of 2017, a total of 16,359 electric buses had been implemented, making the city’s entire bus fleet completely electronic. These public transport policies and incentives provide an opportunity to Shenzhen as the first zero-emission city worldwide.

Compared with the former diesel buses, Shenzhen’s e-buses have significantly reduced dependence on fossil fuels and lessened environmental pollution. Also, the public transportation department partnered with BYD to create e-quality abuse for time-control, high-quality buses for citizens to choose. Shenzhen is the headquarters of BYD, the manufacturer with the second-highest 2015 worldwide electric vehicle sales (Ogan & Chen, 2016). Base on the data, there are 9000 people/times from 47000 p/t adapt to self-driving electric vehicle. Besides, Fuel consumption in the public transport industry has been reduced by more than 95%.

Based on the operating mileage in Shenzhen in 2016, electric buses consumed less 72.9% energy than the diesel buses, with a daily average running distance of 174.4 km, and energy consumption was 106.3 kWh/100 km. According to the Shenzhen Municipal Transportation Commission, the resulting energy savings amount to 366,000 tons of coal saved annually, substituted by 345,000 tons of alternative fuel.

### KEY FINDINGS:

Reduce carbon emission in the inner city.

Because of the zero-emission transport network, the resulting energy savings amount to 366,000 tons of coal saved which can reduce carbon emissions.

Financial incentive support is important.

The incentives and policies for encouraging electric vehicle purchases provides an opportunity to improve citizen awareness of electric vehicles.

Non-financial incentives provide a convenient way to use electric vehicles.

Based on the Shenzhen Municipal People’s Government policy, Shenzhen provides one hour of free parking each day for electric vehicles.

## CUSTOMER-CENTRIC DESIGN

The government established the car-rental model and corporation with three rental service companies includes Nippon Rent-a-car Okinawa, Nissan Rent-a-Car Okinawa, and ORIX Rent-a-car Okinawa in Okinawa State. It is one of the first EV projects in the world, which is the use of electric cars to support tourism business and sustainability of tourism on the island of Okinawa, Japan. In the first three-year, the service was designed in 2009 and operated in 2011. However, these Okinawa EV rental services have failed to meet initial expectations in 2013. The reasons for failure in the EV market can be separated in two parts: poor service performance and customer experience. Besides, lacking of incentives and awareness for marketing promotion also contributes to business model failure. To be more specific:

### POOR SERVICE

- Low utilization rate of EVs - 10.6% in 2012 (target:20%)
- Low public willingness to pay for EVs in rental companies-1.5M yen (\$15,000) per car (target 2M)

### POOR CUSTOMER EXPERIENCE

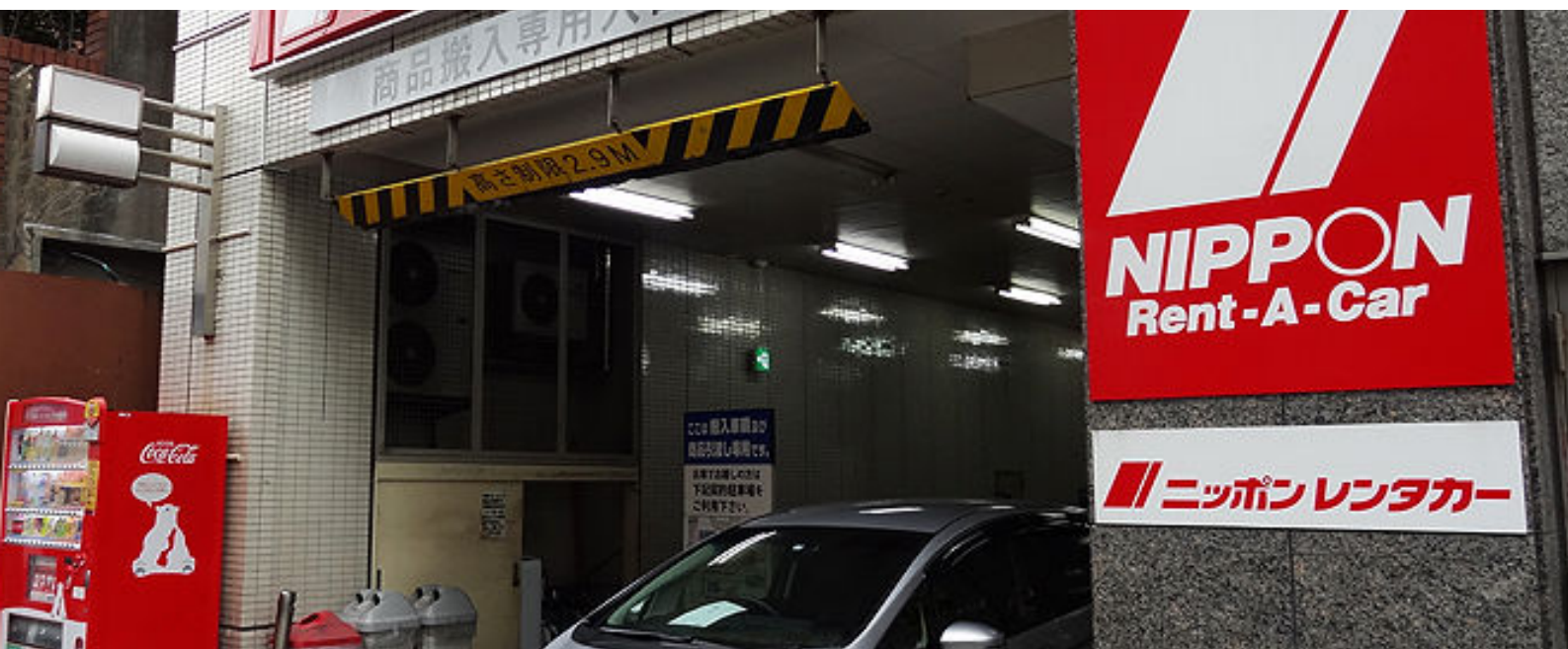
- 'Range anxiety' reduced confidence for renting EVs
- Customer feedback showed concerns about the lack of fast charging stations.
- Customer and tourists tend to recharge two to three times a day rather than once, as estimated in the AEC's original business plan.
- Travel agents had limited incentives and awareness to promote EV tours.

EV technology is still new in the mass market and travel agents are unfamiliar with EVs as a product. Uncertainty and unstable performance of EVs create issues that tourism companies must consider, such as vehicle safety, recharging cost, and driving range.

Therefore, the government shifted its attention from product-centricity to customer-centricity and created a new car rental model based on the University of Tokyo group's suggestions. As a result, the government has increased customer satisfaction in the experience and improved the value of the rental services.

### RECOMMENDATIONS

- Rebuild the business model to meet customer expectations.
- Work through the value chain to ensure the program delivers service value.
- Use smart sharing of data so all companies in the value chain can improve their to business model and enhance the customer experience.



## MARKETING AND SPECIAL EVENTS

Global EVRT's (Electric Vehicle Road Trip) (Hanley & Hanley, 2018) company launched a marketing campaign to accelerate the adoption of EV for the creation of smart and sustainable societies. Held on 18th January 2018 (Global EVRT, 2018). This road travel campaign provides trial EV tour for road trippers. It is 8 days electric vehicle trip, cross 2 countries (United Arab Emirates and Oman) with 60 road participants to travelled 2,000 Km. There are more than 200 Charging points launched and 250 Test drives and experiences given. The Electric Vehicle Road Trip (EVRT) kicked off at Masdar's World Future Energy Summit. The journey was departure from Abu Dhabi via Oman and finally ended in Dubai.

Apart from the road trip, the Global EVRT also held EV related events such as conference and exhibition in the closing day. These events brought industry professionals together to showcase EV technologies, discussed the future of EV industry. Some activities such as workshops and free test-driving spots were provided to build more engaging experiences.

### KEY FINDINGS:

- The EV road trip campaign is beneficial to the development of EV tourism industry, it promotes the growth of public awareness.
- The success of EV events push forward relevant Government department to continue supporting EV market via releasing incentives and policies.
- Events lead to a new or improved EV facilities, which will also help to both local community and tourists, encourage further EV adoption as well (Sharma, 2018).

### CONCLUSIONS

This road trip companion (Fortuna, 2018) brings awareness of EVs for tourism purposes and has achieved 8 broadcast clippings, 99 print articles, 5554 instance of online coverage, and more than 30 million impressions through social media. Global EVRT gained support and partnerships from electricity company in Oman. It installed the first public charging station in Oman, which also attracted

the Oman government and the media's attention. Additionally, after this road trip ended, the supreme council of energy in United Arab Emirates have announced that EV owners can enjoy free charging, free car registration fee, free sale registration fee, and free parking in assigned areas until the end of 2019. These strategies increase the awareness of EV tourism. It is expected that EV adoption in the gulf region will accelerate in the future.

Intensive marketing strategies play a vital role in promoting EV tourism. Special events like exhibitions and conferences also stimulate EV adoption. Similarly, the government of Fukui created a charity event in order to increase public education of EVs In Japan. Junior high-school students got involved in the program to design the cars' outfits. Also, Fukui government cooperated with travel agencies to hold EV tours. The graffiti activities engage the next generation and enhances environmental consciousness.

## CONCLUSIONS

Electric Vehicles have become a future transport model in the tourism sector. Australia is behind many countries due to the customer's lack of knowledge of EV, insufficient policy support and an evolving charging infrastructure. Our research investigated the uptake of EVs for tourism in Queensland. The study shows EVs play a vital role in tourism as its positively impacts the environment and increases sustainability for economic and social development. Increased numbers of charging stations and infrastructure as well as new vehicle models, such as electric buses, bring opportunities for tourism. However, several constraints exist due to the immaturity of EV technology. As a consequence, customers are reluctant to invest in EVs due to range anxiety, the high depreciation rate of cars and purchase cost. However, advances in technology will overcome many of the constraints longer-term.

The research examined six case studies in several locations including Japan, China, Netherland, Australia, and the middle east. These case studies demonstrated many ideas for EVs adoption in tourism. Government-private business partnerships in China and business to business corporations in Netherland showcased the transformation in transportation services. A comprehensive EV charging network was built by hotels to appeal to more consumers. Charging stations installed in traditional wineries was shown to increase customer's length of stay. Global EVRT illustrated the importance of marketing strategies such provide green itinerary and road trip marketing campaign, hence increasing numbers of EV adopter and bring the awareness of EV for tourism purpose. One failure of EV application in Okinawa has been discussed. The research showed that the car rental model eventually achieved success after changing business strategies to consumer-centric approaches. Additionally, the Go Share plan as a creative car-sharing model has also identified as the practical ideas to promote EV tourism.

Our research examined four programs: Charge NY in the New York State, ZEV Action Plan California, Green travel Adelaide as well as Drive Electric Orlando. The study has emphasised the importance of the Government role in uptake of EV in tourism. For example, financial and non-financial incentives. However, specific incentives related to tourism business has not clearly stated. Moreover, cross-state corporations improve development of EV adoption. While Drive Electric Orlando program provides a practical business plan such us partnership between government, theme parks and hotel to promote EV tourism. Many challenges still exist such as compulsory regulation requiring auto companies to sell a minimum number of EVs.



# FINDINGS



## FINDINGS

### FINDING 1 :

The government should provide policy support in line with local conditions to effectively increase EV adoption.

The study found that the government plays a key role in giving confidence to consumers and tourism businesses to uptake EV. The government allocates funds to support EV adoptions, including financial and non-financial incentives. In Orlando's program, the government invests in electric charging infrastructures in tourist business such as hotels, theme parks as well as help the car rental companies to install charging points. Similarly, Adelaide government supports the installation of EV charging stations in city areas to conveniences EV adopter's charging. Apart from that, the government has also offered rebates for EV purchaser including such as

tax-reductions and discounted toll rates in New York state. Further, in California, the rebates based on residents' incomes as lower income could get more subsidies for purchasing EV. Because of middle to low-income householder account for the largest segments of the population and reducing the upfront cost of EV for them will increase EV uptake rates in California. Moreover, compulsory regulation requires automobile companies to make specific numbers of EV in a certain period. Therefore, government subsidies are vital to EV uptake in tourism and local conditions must be considered when conducting related policies or regulations.

### Finding 2:

City planning must account for destination type and EV use .

We found that governments from different jurisdictions enhance EV tourism based on destination types. To address EV user 's range anxiety issue, New York State specified two destination clusters, namely "rock & river" and "arts & inns" , in Hudson Valley based on mapping likely destinations for tourists and proposing charging stations. These two clusters repurpose themselves as EV destinations to attract the early adopter market. Adelaide city council focuses on a low-carbon footprint for inner-city travel to increase the convenience of EV travel in the city area. The City Council also try to encourage more people to use EV

through setting on-street charging points and smart parking system. As having many famous theme parks, Orlando 's EV tourism strategy aims to enhance the driving experience of theme parks' related EV routes. Specific actions including collaborating with rental car companies, hotels, and theme parks to provide EV education for the employees of these tourism businesses to deliver better EV services to customers and mitigate consumer' s range anxiety. Therefore, the government should create an EV action plan based on destination types.

### Finding 3:

Appropriate communication channels can raise public awareness of EV tourism.

Communication channels can be used to reach consumers and to convey marketing messages to customers and prospects. We found both government and private business devoted efforts to building efficient communications channels to deliver EVs and EV tourism information to customers. To promote the Drive Electric Orlando program, the government created an official website and Facebook pages to transfer EV tourism messages and have interactions with consumers. In particular with social

media like Twitter and Facebook, they provide a platform to connect government, private companies and public, allow them to share their thoughts and voices. This would be beneficial to business or government as they have the opportunities to understand their consumer's needs and expectations. Apart from that, EV tourism online-apps that would help business or government to accelerate EV tourism due to its conveniences and easy to use for EV adopters. An example in New York State, the

government develops All-in-One mobile application that facilitates EV tourism destinations for EV drivers in which customer can search charging stations in tourism destinations as well as plan EV trips. Further, special events like conferences, exhibition and marketing campaigns can be a catalyst for the public

to understand EVs and EV tourism. In cases of the UAE road trip campaign which organized by the Global EVRT company and was supported by local government has enhanced consumers awareness of the EVs and accelerated local EV tourism.

#### Finding 4:

Tourism industries should adopt customer-centric approaches.

Customer-centric model is important for services provider in the tourism sector. It is crucial for tourism business to understand their consumer's needs and therefore, they can provide positive experiences to meet their expectations. Nevertheless, many companies lacking awareness of the matter. Fjelstul and Fyall (2015) stated that push and pull factors influence consumers' behaviors and attitudes towards EV adoptions in tourism destinations. It demonstrates that understanding consumer's motivations and concerns are vitally important for design tourism

products. For example, to replace consumer's drive anxiety to drive happy, tourism business should consider providing a specific map to indicate the locations of charging points in destinations. An example "EV car rental model" in Okinawa showed that after adopting customer-centric approaches in their business, its increase their competitive advantages and help the company achieved final success.

#### Finding 5:

Public private partnership provide opportunities to develop EV tourism.

Tourism and hospitality industries including such as hotel, restaurants, accommodations and transportations, that directly provide goods or services to facilitate business, pleasure and leisure activities away from the home environment. They are the supplier of the service for tourism. It is playing a significant role in promoting tourism in any tourist destinations. The research found that to encourage EV tourism, public-private partnerships provide opportunities to develop EV tourists. For example, the government corporates with a rental car

company and launched EV rental car project in Japan. In Drive Orlando programs that the government corporates with theme parks, hotels, car rental company to promote EV tourism. While the UAE government supported the Global EVRT company to run a road trip campaign. In Sydney, the government cooperates with NRMA and Tesla to the installation of EV charging infrastructure in wineries. The research demonstrates that the building public-private partnerships would be accelerated development of EV tourism.

# RECOMMENDATIONS





# RECOMMENDATIONS

## QUEENSLAND GOVERNMENT

### RECOMMENDATION 1

The state government should develop related policies to support EV adoption for tourism.

We recommend that the Queensland government should develop financial and non-financial incentives to encourage tourism business to utilize EV.

#### FINANCIAL

The government should allocate "EV tourism funds" for tourism business to stimulate EV adoptions. Specifically, the funds can be used for tax-reduction, rebates, and offer to tourists industry. For example, car rental companies have adopted certain numbers of EV in their business they will be eligible for applying the funds. The funds can also support the business who have creative ideas to develop EV tourism, for instances, an event organiser proposes a special event to promote EV and EV tourism, they will be able to apply for funds. Apart from that, the government can support to install fast charging stations and provide free of charge to consumers in a certain period.

#### NON-FINANCIAL

The government should organize or support special events to promote EV tourism. For example, EV exhibitions can set some pilot which will provide opportunities for drive experience to consumers therefore to enhance their understanding of EV's functions and performances. Besides, developing communication channels such as Facebook account

and Twitter to promote EV tourism to interact with consumers or prospects to ensure accurate information is delivered. Meanwhile, the government can offer opportunities to assist tourism business promotions or marketing activities, therefore, greater their business exposures and increase their reputations. For example, the company who is utilizing EV in their business will have the chances to advertise their business in Tourism and Events Queensland website (TEQ) as well as related official social media such as Facebook and Twitters.

#### REGULATION

We suggest the government should implement regulation to push tourism business to adopt EV. The government should require related departments or tour operators which located in natural-based like on an island or national parks to adopt certain numbers of EV. In particularly in a national park, we can restrict conventional car to enter the parks and provide an electric bus to transfer tourists. Further, national parks should cooperate with local restaurants and attractions to offer a certain amount of discount for the tourists who drive EV to visit the park. For example, a 10% discount entrance fees for Glow-worms Caves in Springbrook National Park. Nevertheless, regulations need further research.

### RECOMMENDATION 2

The state government should build public private partnership to develop EV tourism.

#### HOSPITALITY INDUSTRIES, AMUSEMENT PARKS

The government should support hospitality industries such as hotels, accommodations restaurants to install EV charging infrastructure in destinations. Hospitality industries play a significant role in promoting tourism in any tourist destinations as it is the supplier of the

services for tourism. While theme parks attract large volumes of tourists each year in Gold Coast, installations of EV charging points on site would encourage tourists who own an EV or who rent EV to travel to the site. Meanwhile, the business should provide free parking spot through online booking to ease tourists parking concerns. As results, it would be considered as a promotion distribution channel to deliver EV tourism messages to consumers.

## RIDESHARING COMPANY –UBER

Uber considered as the most affordable and efficient option for the citizens and tourists in city areas due to the routes and times are flexible for both the drivers and the passengers. The government should cooperate with ridesharing company like Uber to promote EV tourism in city areas because riders like residents or tourists will have opportunities to experience EV. Besides, encouraging Uber drivers transfer conventional vehicles to EV and encourage EV drivers to join Uber by offered related incentives, for example, EV drivers can pay less fare to ridesharing company compare with a conventional car. Alternatively, on the Uber app, the company can create an “EV button” to classify the car type, therefore, stimulate riders who with environmental conscious of selecting the EV. For EV riders, consumers will have \$5 rebates for their next ride.

Apart from that, the government can also design a marketing campaign that uses EV Uber to advertising EV tourism. For example, design poster or brochures to educate riders about the performance of EV.

## RACQ-ROADSIDE ASSISTANT

The government should work with Queensland RACQ roadside assistant to promote EV tourism. RACQ has a high reputation among Australia, with over 1.7 million members (RACQ,2019). This would be the best distribution channels for government to advertising EV tourism to residences because RACQ offers various benefits to their members, including discounts for restaurant or theme parks. Therefore, the consumer who drive EVs in destinations such as theme parks or national parks, they can get extra discounts. Besides, EV adopters will have discounts for membership fees.

## TOURISM BUSINESSES

### RECOMMENDATION 1

Tourism business need to develop marketing plan to raise consumers’ awareness of EV.

We recommend tourism businesses create marketing plans to increase consumers and prospects awareness of EV and positively influences of their perception on EV (Ely, 2013). For example, by adopting online and offline tools to create advertising campaigns to create a sound EV image for consumers. Specifically, using social media such as Facebook and billboards as well as instore brochures and short videos to advertising EV tourism. Besides, social media provide a platform for consumers to share their EV travelling experience and be able to interact with other EV adopters hence they will have more confidence on EV tourism. Nevertheless, greater exposure online may attract risk such as negative feedback. The related policy and procedures carefully beforehand can help manages the risks effectively.

Special events including conferences or EV exhibitions provide opportunities for drive experience to consumers therefore to enhance their

understanding of EV. Alternatively, tourism business can design a sustainable tourism itinerary to engage with costumers to convince them the services outdo the value, and they, therefore, should choose the tour that merges with EV. The EV road trip campaign in the Middle East caught public’s attention to EV tourism, moreover, stimulate government’s investment in charging infrastructure therefore accelerant EV tourism development.

Internal employees training program

We suggest tourism industries conduct EV education and training programs with specific to employees, ensure these workforces can ready to employ their expertise in emerging EV tourism. The qualified staffs would serve to provide accurate EV information to their consumers. For example, in a car rental company, the staff is required to present the functions or performance of EV to consumers in order to influences their perceptions towards EV.

### RECOMMENDATION 2

Tourist industry should adopt a customer-centric approach in their business.

Many companies have started transferring products-oriented to customer-centric, in particular for service providers in the tourism domain. A typical example, "EV car rental model" in Okinawa demonstrated that understanding customers' expectations are crucial for design tourism products. We suggest the tourism businesses create value through customer-centric approaches, for example, car rental companies apply customer-centric strategies will have a competitive advantage in market. Specifically, to delight customers, we suggest the tourism industries should offering a positive customer experience from the service awareness stages to purchasing process and finally through the post-purchase evaluations.

Industries should investigate existing tourist's data to understand consumers' needs then to build an ecosystem model in business. Further, by applying integrated marketing strategies to design packages include hotels and resorts or attraction, moreover, provide online booking and customer service. Short video, factsheets and sample maps of chargers' network provide to consumers can also help to reduce consumer's drive rang anxiety. Besides, companies can offer more EV model options to meet tourists demand. Additionally, tourism business can deploy a smart-parking app to convenience EVs parking and recharging because it shows the charging points in a tourism destination.

### RECOMMENDATION 3

Tourism and hospitality industries have opportunities to transfer to a new business model by merging with EV tourism.

## NATURE BASED ATTRACTIONS

Nature based attractions such as lakes, islands or parks we suggest tourism industries located in those areas can adopt EVs on site. This can also work alongside car-sharing approaches. Businesses may create online apps so tourists can use the app to rent electric vehicles. Business can also deploy swappable battery systems with unique advanced technology to save recharging time. Tourists can easily change their battery to a full charged battery once they arrived at a certain point. The electric motorcycle sharing mode is a cost-efficient way to distribute services and products and most importantly, it releases limited greenhouse gases.

While in national parks, we suggest using EV buses to connect attractions and provide transfer services for tourists as conventional vehicles have negative impacts on natural resources by releasing greenhouse gases (Chiladakis, L., Crowfoot, W., & Winston, R. 2013). Tourism businesses located in national parks can also adopt EV sharing models, for example, offer electric vehicles for self-driving tourists in national parks.

## HOTEL AND WINERIES

We suggest hotels and wineries install charging infrastructure onsite to attract consumers and showcase the Cooperate Social Responsibility (CSR) to stakeholders. Hotels with charging stations attract more tourists, especially EV adopters and environmentally conscious consumers (Teng, Lu, & Huang, 2018).

Installing charging stations provides opportunities for businesses to attract more tourists onsite and even

encourage them to stay longer. Wineries can create tour packages for EV drivers to fill the time whilst charging. For example, "30 minutes tour" for people who are waiting for the EV to recharge, or "special lunch with discount wine" packages. It is an ideal opportunity for traditional wineries to increase sales in cellar doors and draw attention from a new market. Such packages will place businesses ahead of their competitors and increase business.

## LIMITATIONS AND FUTURE RESEARCH

### LIMITATIONS

The findings from this project have some limitations. There is a lack of prior primary research on this topic. Although this project aims to investigate the potential of adopting EVs in the Queensland tourism industry, the attitudes of tourism businesses in Queensland towards EV are still unclear due to insufficient primary research on this topic.

As the literature review and case studies provide the main research data in this report, the findings of this project are based on the analysis of existing tourism programs and cases from different regions. Secondary data sources may be unreliable or outdated. For example, although a survey shows the residents in Adelaide hold positive attitudes towards transferring from ICE to EV, it may not be comparable to the situation in Queensland. Due to

the lack of recent data, this report used the data from 2013 to 2017 to analyze the ZEV plan in the U.S. Market approach will change based on economic and technology development, as well as consumer attitudes towards EV use. Therefore, generalizing findings based on old data may be a substantial limitation.

### FUTURE RESEARCH

Future research should address the limitations outlined in this report. Due to the project aims to investigate potential use of EVs in the Queensland tourism industry, empirical research should be conducted to understand the local EV market. Future research should also explore the tourist perspective. Further research is also required on the economic and political environment when exploring the Queensland use of EVs.

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