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# Electric Vehicle Tourism in Queensland\*

Kaiying Wu; Yushi Lin, Luyao Luo, Qing Liu, Zemin Jia,  
Ruihao Zhang, Xi Tan, Jo'Anne Langham<sup>1</sup>

## Introduction

Tourism is one of the most significant industries in Australia. The total tourism output (including tourism consumption with taxes) reached AU\$210 billion since 2017 (Tourism Research Australia, 2018). Queensland, with its breathtaking natural resources and temperate climate, has attracted AU\$30.6 billion from worldwide travelers and is 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 impact of climate change. How to remain sustainable whilst minimize the impact of the increasing hazards created by climate change, is becoming a key issue for Queensland tourism. One of the major causes of 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). Fossil fuels are a key factor in global warming due to the production of carbon dioxide, carbon monoxide and sulfides as well as the burning of fossil fuels. The ongoing use of fossil fuels continue to damage the ecosystem and reduce resource sustainability for tourism businesses (Turkenburg, 1997). Tourism Multiplier Effect Theory (Rusu, 2011) foretells the damage to the environment and the consequential loss of billions of dollars in reduced tourism revenue. Diminished tourism revenue will create high unemployment, reduce the quality of life and create further social security issues. These issues may result in a destructive cycle for the local economy (Ke, Pan, Pan, Zheng, & Zhang, 2011). Therefore, tourism businesses must consider transformative strategies with innovative technology such as EVs to protect the natural environment and enhance the long-term sustainability of resource-based tourism businesses (Todorut & Cîrnu, 2012).

The tourism division of the Queensland Department of Innovation, Tourism, Industry Development and the Commonwealth Games (DITID), engaged the University of Queensland, Business School to investigate the potential use of Electric Vehicles (EVs) in local tourism. One of the signature programs highlighted by DITID was the Queensland Electric Superhighway, 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 participate in 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 required a realistic and feasible plan to cultivate EV use. Our project reviewed

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international research into EV use, policies, and strategies to provide recommendations for DITID to encourage increased use of EVs in Queensland tourism.

Our project focused on the following research questions:

- i) what factors motivate tourists to use EVs?
- ii) what factors deter tourists from using EVs on holiday?
- iii) where have EVs been successfully deployed?
- iv) what strategies can governments use to increase EV use by tourists?

## Literature

### Electric-mobility in tourism

Electric-mobility (e-mobility) is defined as a vehicle powered by electricity as an alternative to the combustion engine (Franke & Krems, 2012). The model includes hybrid EVs (HEVs), plug-in hybrid EVs (PHEVs), and pure or battery EVs (BEVs). 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."*

The first implementation of the idea of e-mobility is the 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).

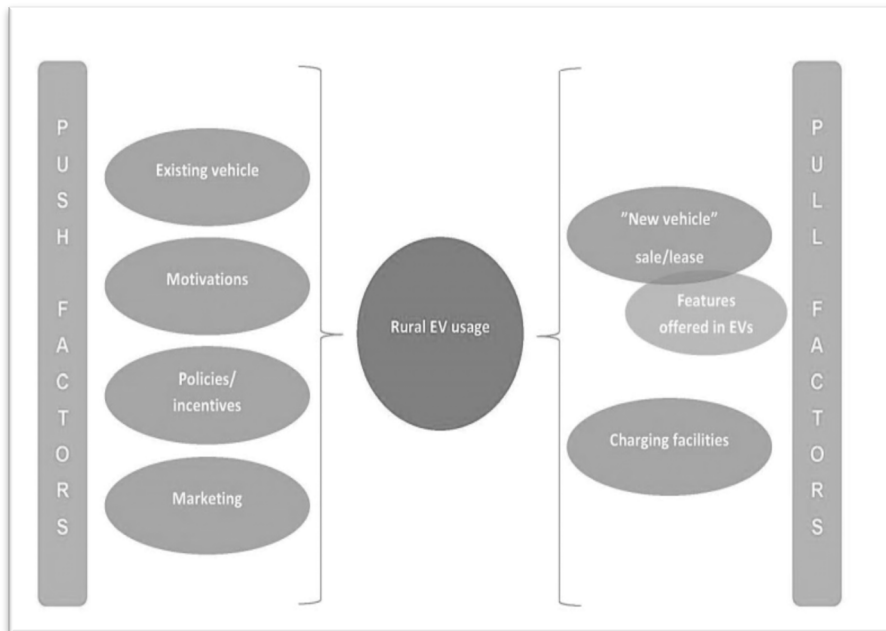
In recent years, EVs have been introduced to address greenhouse gas emission and reduce pollution in tourism due to carbon emissions (Galus *et al.*, 2012, *op. cit.*). One of the fundamental concepts of green tourism is encouraging the usage of non-fossil fuel transportation systems between, as well as within, destinations (Ioannides & Wall-Reinius, 2015). Adoption of EVs in tourism have many economic, social and environmental benefits (Miller, 2014).

### EVs and drive tourism

Understanding how tourists select 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 attraction ("push") and repulsion ("pull") factors for travelers' motivations to evaluate decisions about sustainable transport for tourism. Later, Ioannides and Wall-Reinius (2015) created a model for EV usage in the US countryside based on the drive-tourism model emphasizing the push and pull factors in EV adoption. Ioannides and Wall-Reinius (2015) claimed the number of charging infrastructure sites positively impacts the number of EV users. Meanwhile, other research shows consumers' attitude towards EV use changes after driving EVs and experiencing fast charging technology (Lebeau, Van Mierlo, Lebeau, Mairesse & Macharis, 2013). The deployment of fast-operating direct current (DC) public

systems makes EVs more attractive compared to the slower-operating, alternating current (AC) system (Gebauer, Vilimek, Keinath, & Carbon, 2016). Push and pull factors aid in examining consumer behaviour and attitudes for tourist decisions about holiday vehicle choice (see Figure 1).

### Push factors



**Figure 1 EV Drive Tourism Model** (Ioannides & Wall-Reinius, 2015, *op. cit.*)

Existing vehicle ownership, motivation, incentives, insurance and marketing are the main push factors for EV adoption. According to Fjellstul 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 Internal Combustion Engine Vehicles (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. Daziano & Bolduc (2013) also state that people who believe in sustainability are more likely to view EVs positively. According to a survey conducted by Ingeborgrud and Ryghaug (2017), 63.3% of respondents claimed EVs should be purchased because they are environmentally sound. Research demonstrates that people who purchase EVs without environmental concerns become aware of climate change and carbon emissions after driving EVs (Throndsen, Skjølsvold, Ryghaug, & Christensen, 2017). Fjellstul and Fyall (2015) discovered that income, vacation time and household compositions also impact on tourist's vehicle selections during holidays. They also determined that an effective marketing strategy positively impacts market demand for EVs. Ioannides & Wall-Reinius (2015) claimed incentives from government influence purchasing decisions and encourage the use of EVs. When insurance for EVs are lower than renting a conventional vehicle, EV use also increases (Ioannides & Wall-Reinius, 2015, *op. cit.*). The Economic and Social Commission for Asia and the Pacific (ESCAP) identified many push factors to deter consumers from traditional automobile ownership (United Nations, 2013). These factors include time, cost, travel charges, parking fees, parking availability, emission concerns, transport regulations and longing for greener lifestyles (United Nations, 2013). ESCAP believe that governments have a role to play in community choices for transportation and these can be changed by controlling factors such as travel regulations, time and fees.



## Pull factors

Pull factors identified by Fjelstul & Fyall (2015) 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, *op. cit.*). Ioannides & Wall-Reinius (2015) also believe variety in vehicle models, features such as drive distance or range and the ability to drive in adverse weather conditions, currently affect consumers' decisions to use EVs during holidays. Ramos, Dionísio and Pereira (2018) suggest 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, *op. cit.*).

## Methodology

The research team used secondary data to address the research questions. Data were derived from government databases, publications, journals, and reports which were issued between 2010 and 2019. We classified the data into two categories: policies and business models. In the policy group, we examined four tourism programs in other jurisdictions to understand how government strategies impact the uptake of EVs in tourism. We narrowed our search to focus on the United States (US) and Australia as most academic research referred to these two countries. One such example in the US, the Zero Emission Vehicle (ZEV) Action Plan (2013), was a sustainable long-term transportation strategy which aims to reduce greenhouse gases in nine US states (California, Connecticut, Maryland, New Jersey, New York, Oregon, Rhode Island, Vermont, and Massachusetts). The purpose of this action plan is to reach five million EVs by 2030 and install 250,000 EV charging stations by 2025. The US government provided US\$2.5 billion in financial support for rebates (Northeast States for Coordinated Air Use Management [NESCAUM], 2018). Due to this commitment, some cities such as New York and Orlando developed their own EV charging ecosystems and promotion policies to increase EV users. Meanwhile, in Adelaide South Australia, the local government aims to be the world first Carbon Neutral City which was a pioneer idea in the territory. We selected four programs from the US and Australia: Charge NY New York State, California's Zero Emission Vehicles, Drive Electric Orlando and Green Travel program in Adelaide. We selected these cases because these were representative of a range of ways that EVs had been deployed and showed different potential options. In terms of business practices, we explored how companies and tourism destinations develop EV tourism. We used three regions: The United Arab Emirates; Oman and Japan due to their business innovations resulting in positive social and economic change. Our examples, include: the oil rich country Oman, which has the first public charging station installed after the EV festival "EVRT Middle East 2018"; in Ishigaki, Japan, island tourism became more sustainable after the government established a pure electric transportation network near the largest island lagoon; and in Okinawa, a local car rental company recovered from service failure with government assistance. We sought

variety in service delivery and successful uptake of EVs in our case studies to determine which factors have the greatest influence on EV use. Thematic analysis was used for identification and factor categorization. We classified items according to three different themes; car-sharing, customer-centric design and special events. We drew ideas for practical strategies from cases and built on these through brainstorming discussions within the team based on similarities in Queensland's infrastructure, events and environment.

## **Government program cases**

To Understand where destinations had successfully incorporated EV use in tourism, the research team investigated a number of programs including: 1) California's government multiple practices on adopting EV. 2) New York State's Charge NY program in supporting the Hudson Valley local tourism. 3) Adelaide's Green Travel program to increase the convenience of inner-city EV experience. 4) Orlando's DEO program for improving theme park tourism through EV car rental services.

### **California - Financial incentives**

To stimulate the increased use of EVs, California adopted policies and rebates for middle-lower income buyers (with the gross annual income limitation is US\$35,640 for individuals and US\$72,900 for households). The California Clean Vehicle Rebate Project (CVRP) provide US\$1,500 rebates for all types of light-duty vehicles combined with the US\$7500 federal tax credited. In addition, the rebates are flexible to support more in middle-lower income buyers. Higher income buyers (where gross annual income exceeds US\$250,000 for individuals, US\$340,000 for households, and US\$500,000 for joint filers), are not eligible for the CVRP rebates (Dow, 2017).

### **California - Rules for auto manufactures**

For achieving the goals of ZEV action plan, the US government regulates and encourages auto manufacturers to sell more EVs though assigning ZEV credits. Manufacturers gain credits based on the number and types of EVs sold. ZEV credits are expected to reach 22% of production is ZEV in 2025. Manufacturers need to balance ZEV credits and sales of traditional cars. Otherwise, they must pay US\$5,000 per car as a penalty (Alternative Fuels Data Center, 2019). As the regulations only apply to traditional manufactures, Tesla is not eligible for the ZEV credits. However, Tesla can earn EV credits for sales to traditional auto manufacturers. This example shows how governments can influence the EV market, through market regulation such as compulsory plans and policies for carmakers to increase EV sales.

### **California - West coast electric highway**

The "West Coast Green Highway" is an example of electric vehicle promotion to reduce the negative impacts of transport on the environment and increase sustainable tourism. The Green Highway is about 1,350 miles long and stretches from the U.S. border with Mexico to California (Los Angeles to San Francisco), Oregon, Washington, and to the border with Canada (Washington State Department of Transportation, 2013). DC fast-charging stations

are situated every 25-50 miles and situated with cafes, restaurants, and retail shops. The DC fast-charger stations allow travelers to charge their cars within 30 minutes. The West Coast Green Highway has many conveniently located fast chargers. The charging locations enable EV drivers to have zero-emission road trips with high-technology and a 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.

### New York State - Charge NY Financial incentives

To reduce the cost of EVs, Charge NY provides multiple incentives and 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], 2019). 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 charging requirements or "electric" range of the car. This criterion means hybrid cars are also included in rebates.

### New York State - Limited rebate

Although the state government offers subsidies for purchasing EVs, these rebates from government are limited. (NYSERDA, 2019). However, for governments with limited budgets, funding strategies may help estimating government costs and increase purchase potential for EVs. The indirect effect is increased revenue through car taxes and other car costs.

### New York State - Green pass program

The NY state government designed a subprogram named Green Pass which allows EVs to drive over all toll bridges and tunnels in the state with a 10% discount. Also, EVs drivers can use high occupancy lanes (New York State Department of Transportation [NYSDOT], 2019a). Which means early EV adopters have less delays in traffic.

### New York State - Cross-state cooperation

The ZEV plan is an opportunity for New York state to develop EV tourism. The multiple advantages for EV drivers based on state policy is an opportunity to also increase inter-state travel to the Hudson Valley and Catskills regions. Transportation represented 21% of travelers spending in Catskills, indicating a considerable market opportunity with EVs (Ruder et al., 2015). Cross state cooperation will also help to reduce conflicting rules and standards between different jurisdictions.

### New York State - Destination clusters

The state government customizes EV routes and supporting facilities through creating destination clusters based on market characteristics (Ruder et al., 2015, *op. cit.*). They mapped two different types of potential EV tourism destinations based on natural attractions and cultural & arts attractions, and consequently proposed charging points and potential EV tourism routes. By identifying specific features in these clusters, the government can choose

suitable EV tourism development methods. For example, in natural attractions, range anxiety is the main barrier for the development of EV tourism. Therefore, increasing the range of the charging network should be a government priority. In supporting such government strategies, hospitality businesses in both urban and rural areas should consider installing charging points in tourist accommodation, cafes, bars, and restaurants.

#### Adelaide - Green travel tourism - Carbon neutral strategy

The South Australian (SA) government's Carbon Neutral Strategy has allocated significant budget for "Green Travel". "Green Travel" is a part of the Carbon Neutral Strategy 2015-2025 (Adelaide City Council, 2019). The strategy funds business partners for collaboration to reduce carbon emissions. One program is the EcoCaddy: a Zero-emission short trip transport service focused on increasing hybrid pedicab use when travelling in the city. The car-sharing company, Goget, collaborates with the SA government to encourage low-carbon road trip. Such cooperation between government and private companies benefits EV tourism.

Sydney also applied a similar program for tourism businesses. The government collaborated with public transportation service provider-NRMA to invest US\$10 million in building a fast-charging network in the south of the New South Wales state, where more than 95% of road trips were within the service area. The collaboration also supports local destinations to develop EV self-driving tours. EV manufacturer Tesla has installed six supercharging stations in Cassegrain Vineyards where more green drivers are anticipated.

#### Adelaide -Smart parking system

The Adelaide City Council Smart Parking System can monitor and match EV parking availability to actual demand (Adelaide City Council, 2016, *op. cit.*). The EV parking system flexibly adjusts cues to denote availability of car parks in peak times. Car parks have overhead indicator lights, indicating whether space is occupied, available for only EV use or available for all cars. As a result, the system maximizes EV parking resources.

In Amsterdam, EV box, the prime supplier of recharging stations in the city, has successfully served approximately 19,000 EV drivers among 1,500 charging station via a smart charging system that optimize power distribution between every single EV user. The system makes recharging more economic for all EV drivers.

#### Orlando: Drive Electric Orlando (DEO) - Public-private partnership

The DEO program involves cooperation between government and industry. In Orlando, the state government focused on car rental and theme park partners to improve the EV travel experience (Combos, 2016). The state government ensures that sufficient EV equipment is accessible at rental locations in to support the EV car rental fleet (Combos, 2016, *op. cit.*). Training is also supplied by the state government and includes short videos, PowerPoint presentations, factsheets, and sample maps of the chargers' network in Orlando to increase public knowledge and reduce range anxiety. The government also works with theme parks, inviting 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 installation of

charging stations as well as provide appropriate training for hotel staff to support EV commuters.

## **Tourism business cases**

We collected data on the implementation of EV tourism in cases from Japan and United Arab Emirates. A key finding is that collaboration between government and tourism industries is a major contributor to program success. We selected this sector to demonstrate the benefits of car-sharing, customer-centric design and event marketing for EV tourism.

### **Car-sharing**

The Ishigaki Island boasts the largest blue coral community in the Northern Hemisphere as well as Sekisei Lagoon, one of Japan's largest lagoons. Its landscape attracts 1.24 million tourists annually (E-SHARE Ishigaki Co, 2018). The tourism industry constitutes an important economic pillar for the Ishigaki Islands and local government must build sustainable tourism while protecting the environment and local community. The government of Ishigaki Island supports the Go Share plan (E-SHARE Ishigaki Co, 2018) launched by GOGORO, a car-sharing company. The company offers electric motorcycle rides that are eco-friendly and enhance tourist's travel experiences. Motorcycle drivers access a unique advanced swappable battery system which can save time during recharging. Furthermore, consumers do not need to pay for battery replacements. Gogoro has also successfully established their business in Taiwan at displaced 4.1 million liters of gasoline and reduced CO<sub>2</sub> emissions by 26 million kilograms with their vehicles.

This case study shows that the E-share model contributes to the growth and development of the local community, provides environmental value and has potential in stimulating EV tourism which could be a new source of revenue for local business.

### **Customer-centric design**

The Okinawa government established a car-rental model and corporation with three rental service companies: Nippon Rent-a-car Okinawa; Nissan Rent-a-Car Okinawa; and ORIX Rent-a-car Okinawa. It was one of the first EV projects in the world to use electric cars to support tourism business and provide sustainability of tourism. The design for the service began in 2009 and opened in 2011. However, initial rental services failed to meet service expectations in 2013. Two main reasons for failure in the uptake of EVs are poor service performance and a lack of understanding of the customer experience.

EV technology is still new in the consumer marketplace 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 (Weiller & Neely, 2015).

To support the fledgling industry, the Okinawa government shifted focused attention on understanding issues from a customer-centric perspective and consequently created a new

car rental model based on customer suggestions. As a result, the government improved the value of the rental services aiding the business and the industry to recover (Weiller & Neely, 2015).

### Marketing and special events.

January 2018, Global Electric Vehicle Road Trips (EVRT's) (Hanley & Hanley, 2018) company launched a marketing campaign to accelerate the adoption of EVs for the creation of smart and sustainable societies. This road travel campaign provided trial EV tours for road trips. The trial was an eight-day electric vehicle road trip, across two countries (United Arab Emirates and Oman) with 60 road participants who travel 2,000km. During the road trip there were more than 200 charging points available and 250 test drives. The EVRT kicked off at Masdar's World Future Energy Summit, travelling to Dhabi via Oman.

The road trip companion brings awareness of EVs for tourism purposes and has achieved eight broadcast clips, 99 print articles, 5554-page visits, and more than 30 million impressions through social media (Fortuna, 2018). Global EVRT also partnered with an electricity company in Oman and installed the first public charging station. This facility attracted significant government and the media attention. After the event ended, the supreme council of energy in United Arab Emirates announced that EV owners could enjoy free charging, car registration, sales registration, and parking in assigned areas until the end of 2019. It is expected that EV adoption in the gulf region will accelerate in the future due to these strategies.

The EV road trip campaign was beneficial to the development of EV tourism industry as it increased public awareness and encouraged government sponsorship of the EV and led to new or improved EV facilities. All these factors help both the local community and tourists as well as encourage further EV adoption (Sharma, 2018).

## Findings

In the cases of federal or local government, tools to enhance EV use within the relative jurisdiction can be allocated into three main selections: financial, policy and investment.

### Financials

Government financial supports include subsidies, tax refund, reduce the cost of public facilities as well as penalties. The case studies suggest that the government plays a significant role in creating consumer confidence which subsequently influences EV adoption by local families, travelers and tourism businesses.

As electric vehicles are more expensive than traditional internal combustion cars, many governments have taken reducing the purchase price as a fiscal incentive to raise the competitiveness of EVs in the auto market (Barton & Schütte, 2017, Mock & Yang, 2014). For example, California state government offers rebates based on residents' income, supporting middle to low-income householders' adoption of EV. In New York state, the government set tax-reductions for EV purchases. However, directly reducing the purchase price of EVs would



not necessarily eliminate consumers' concerns about the use of EVs, EV's have high battery replacement requirements, recharging time is longer than traditional car refuelling and they have high depreciation. All of these elements still impact consumer decision making as they considers the long term disadvantages of EV and what happens after purchasing (Lebeau, *et al.*, 2013, *op. cit.*). As a result, incentives placed on the early stage of EV use is worth exploring (Barton & Schütte, 2017, *op. cit.*).

In the New York state, discounted toll rates for EVs may improve the convenience EV use but it would not be a strong trigger to empower EV purchases because the toll is not the main consideration for consumers purchasing decisions.

California's could also strengthen rules for auto manufacturers to regulate the supply side from fossil fuel consumption to renewable energies. However, in practice the agreement between the auto manufactures and policy makers is a barrier. Penalties for car companies who do not reach the ZEV sale goal would introduce disincentives for traditional auto companies. Policymakers need to consider that any penalties applied at the manufacturing stage could potentially be transferred to the customer. When auto companies must pay penalties, it is likely that they will increase the price of traditional cars which will mean consumers offset the costs.

### Strategy and implementation plan

Many governments have established related EV development plans to guide local EV market growth. Most of the government actions are customised according to destination and domestic situation. For example, EV user's range anxiety was addressed in New York State using specified two destination clusters: "rock & river" and "arts & inns" which provided location mapping for tourists and proposed charging stations in the Hudson Valley. These two approaches were used to attract early adopters. Orlando's plan is based on well developed theme park tourism to boost EV car rent, while Adelaide's EV strategy is part of its Carbon Neutral Strategy to lead city sustainability. Those long-term approaches demonstrate cross-department coordination, as well as government-business cooperation is necessary. Another example of this is the Japanese EV car rental company and the collaboration with UAE for the Global EVRT. Public-private partnerships provide opportunities to develop EV tourism in related industries such as hotels, restaurants and transport that directly provide goods or services to facilitate tourism business. These partners have a significant role in promoting tourism and are a necessary collaborator to improve EV use.

### Investment

Government investment is a substantial requirement for EV development. Establishing a supercharging network is a popular action by governments. Two such examples are the California west coast electric highway in the U.S. and the Queensland's electric highway in Australia. However, charging stations need to be standardized to address different the different EV models and charging requirements. In addition to the prohibitive cost of EVs, a lack of adequately located charging stations can be a barrier for purchasing. Local community collaboration improves access. This is the model in Queensland. The state's fast-

chargers are a co-investment by government and local community organisations including universities and private companies.

Adelaide government's smart parking system help adjust parking capacity in the city centre for EVs. This system is a sustainable and flexible approach that helps the city transferring to EVs as the lead auto market. In New York State, the government considers the charging station subsidiary as a new economy model because lengthy car recharging creates opportunities for people to be entertained whilst charging their EV. The feasibility of this idea requires further research.

However, government investments are not always successful, for example, the case in Okinawa, Japan, local government encouragement for car rental companies to adopt EV was a failure. It is crucial for the tourism business to understand consumer's needs and provide positive experiences to meet such expectations. Nevertheless, many companies lack awareness of customer motivations. Fjelstul and Fyall (2015) stated that factors attract or repel consumers and therefore influence behaviours and attitudes towards EV use. A focus on understanding and addressing customer concerns can improve use and ownership of EVs. Issues such as drive (distance) anxiety can be mitigated through the development of maps or location guides that indicate charging points in relation to destinations.

## **Recommendations**

### **Government's choices in policy support**

The state government can develop related policies to support EV adoption in tourism. Researchers recommend that the Queensland government develops financial and non-financial incentives to encourage tourism business to utilizes EV. The government can provide a budget for EV tourism funds to stimulate EV adoption. Such funding can be used for tax-reduction, rebates, and offer to support an increase in EV directed tourism in Queensland. Car rental companies could choose to adopt EVs in their business due to specific rebates tied to EV vehicles. Funding or grants could support innovative event organizing businesses to promote EV and EV tourism. Governments could also aid in the installation of fast-charging stations with free of charge consumers based on specific criteria.

The government can also support or arrange special events to promote EV tourism. EV exhibitions with government support will provide opportunities for consumers to drive and experience EV, therefore, improving their understanding of EV's attributes and performance. Social media such as Facebook and Twitter could be used to promote EV tourism and to interact with consumers to moderate discussion to ensure information is correct.

### **Public-private partnerships**

Hospitality industries play a significant role in promoting a progressing tourism in any sector. While theme parks attract large volumes of tourists each year in Gold Coast, installations of EV charging points on site would also encourage tourists who own an EV or who may choose to rent an EV whilst on holiday. Meanwhile, businesses should provide free



parking for EV users whilst they recharge. As a result, the government can investigate the potentials of EV applied in Gold Coast theme parks region.

### Opportunities in ridesharing

Ridesharing companies are also potential partners to promote EVs. 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 drivers and passengers. The government could cooperate with ridesharing companies like Uber to promote EV tourism in city areas. Encouraging all riders (residents or tourists) will create opportunities for people to experience EV as an option. Encouraging Uber drivers to also transfer from conventional vehicles to EVs will benefit both the tourism industry as well as governments. Strategies for EV uptake may include incentives such as reduced rates for drivers of EV to pay to the ride sharing company than a conventional car. The reduced rates could be offset by government based on a target for ride sharing companies, such as a 5% reduction in tax for every 10000 ride sharing cars that are EVs. Alternatively, Uber, could also provide a ride option available through the ride sharing app that allows riders who are environmentally conscious to choose an EV. Alternatively, riders could be offered rebates for their next ride. Partnerships with rider sharing companies have many potential opportunities to encourage uptake and acceptance of EVs.

### Tourism business marketing plans

Tourism businesses can create marketing plans to increase the number of consumers and aid awareness of EVs, this will positively influence tourist's perceptions of EVs (Ely, 2013). There are many tools available for promoting EV tourism such as social and mainstream mediator advertise EV tourism. Social media provides a platform for consumers to share their EV travelling experiences and interact with other EV adopters which will enhance confidence on EV tourism. However, greater exposure online may attract negative feedback, but this can be mitigated with appropriate policy and procedures carefully determined and crafted to help manage any related issues.

Special events including conferences or EV exhibitions provide opportunities for drive experiences for consumers. Tourism business can provide sustainable tourism itineraries to engage customers and assure them of the value of EVs as part of their holiday. The EV road trip campaign in the Middle East caught public attention and stimulated government investment in charging infrastructure. The consequence was that EV tourism was viewed positively in this region.

### Customer-centric approaches in tourism business.

Many companies have started transferring from a product-oriented to customer-centric approach in their business models, particularly for service providers in tourism. The EV car rental model in Okinawa demonstrated how understanding customers' expectations are crucial for designing tourism products and services. We suggest tourism businesses create value through focusing on customer-centric approaches. Car rental companies who apply customer-centric strategies will have a competitive advantage in the market. Tourism

industries should capitalize on any positive feedback through post-purchase evaluations, these can then be used for future promotions. Industries should also investigate existing tourist data to understand consumer needs in regards to EVs.. Further, by applying integrated marketing strategies to design packages that include hotels and resorts or attractions, through online booking and other customer service channels, tourism agents can also encourage EV use. Short videos, factsheets and sample maps of charger networks reduce consumer's drive range anxiety. Rental companies should also offer more EV model options to meet tourist demands, this will also increase the potential use of EVs for tourism. Tourism business could develop a smart-parking app to ensure convenient EV parking and recharging, creating clear information for charging locations and the potential for raising additional revenue.

### **New business models by merging with EV tourism.**

For tourism businesses located in or near nature-based attractions such as lakes, islands, or parks should adopt EVs on their sites. Modelling behavior of the businesses will work alongside car-sharing approaches to demonstrate a preferred way of engaging and travelling around environmental destinations. Businesses can create apps so tourists can also rent electric vehicles. Business can provide swappable battery systems on site to save recharging time. The electric motorcycle sharing model demonstrates a cost-efficient way to distribute services and products and most importantly release limited greenhouse gases.

While in national parks, we suggest providing EV buses to connect attractions and provide transfer services for tourists. Conventional vehicles have many negative impacts on natural resources and release greenhouse gases (Chiladakis, Crowfoot, & Winston, 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.

Hotels and wineries should install charging infrastructure to attract consumers and showcase their 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 provide opportunities for businesses to attract more tourists onsite and encourage them to stay longer. Wineries can create tour packages for EV drivers to fill the time whilst charging. A 30-minute tour could be provided for people who are waiting for their EV to recharge, this could also have options for special lunches with discount wine packages. There are many opportunities for local businesses such as traditional wineries to capitalize on the use of EVs whilst also increasing sales in cellar door products. Such packages will also increase competition in the local market.

### **Limitations and Future research**

The findings from this research are limited by the insufficient empirical research available on successful EV tourism case studies.

The literature review and case studies provide the main research data in this report and therefore the results of this project are based on the analysis of existing tourism programs

and cases from different regions. Generalizability of data and recommendations may be inappropriate in some cases due to the local context including environment, social and political issues.

Future research should include empirical investigation of EV tourism case studies. Future research should also explore the tourist perspective of EV use and examine motivators for EV adoption and use in tourism. Further research is also required on the economic and political environment when exploring the Queensland use of EVs.

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