

A close-up photograph of a person's hand in a beige sweater plugging a black charging cable into a charging station. The station has a glowing green light. The background shows a dark car and a bright sky.

# Global Charging Infrastructure Market Report

An analysis of investment in  
the electric vehicle charging  
infrastructure market



# Foreword

As global warming increasingly affects billions of people around the world, many countries are looking to accelerate the transition to cleaner modes of transportation to meet mobility needs. However, this transition, which is largely toward battery electric vehicles, needs to be associated with electric vehicle charging infrastructure (EVCI) that requires a lot of investment.

**The *Global Charging Infrastructure Market Report* is an analysis of investment readiness in regions across the world, including the UK and Ireland, continental Europe, North America, Latin America, and Asia Pacific. The investment readiness of these markets was analyzed against five parameters to examine key challenges and opportunities. The index is a snapshot in time and is expected to evolve as new information becomes available and the market readiness of the regions change.**

Go to the [Charging Infrastructure Investment Comparison Tool](#) →

We have been helping government authorities around the globe develop EV strategies to enable their communities, including those in more rural areas, make the transition.

We do this by supporting the electrification of critical fleets of government vehicles, providing EVCI planning and implementation, and creating EVCI assets that are aligned with the environmental and business needs of both public and private organizations.

Implementing these project helped us identify three key catalysts for mass EV transition: government leadership and incentives, EV market maturity and EV charging infrastructure. This led to the publication of Arcadis' *Global Electric Vehicle Catalyst Index 2021*. However, our engagement in the mobility decarbonization initiative of World Business Council for Sustainable Development made us recognize that investment is critical to the success of this transition. That is why we expanded the parameters from the 2021 index to include ease of doing business and potential returns from investment to create the *Global Charging Infrastructure Market Report* and an online comparison tool with the aim of creating a global road map to help accelerate investment in EVCI.



**Simon Swan**  
Global New Mobility  
Solutions Director



# Executive summary

Current global market volatility related to the pandemic and continued political unrest is having an impact on the manufacture of electric vehicles (EVs) and chargers due to supply chain issues, including microchip shortages. This will impact the demand for charge points and energy requirements in different locations. Providing a clear strategy for charging infrastructure is therefore needed at a national level, and most countries do have one in place, but the strategies need to be in line with demand at a local level.

However, infrastructure development is and has largely been market led, but it needs public funding to overcome challenges, such as investing in charging infrastructure with few EVs on the roads. In respect to this, most countries do have grants and incentives available for the purchase of EVs, but many are behind in terms of available government funding for charging infrastructure.

With investments made mainly by private entities, the return on investment is critical to the decision-making process. De-risking these investments is made possible by governments providing clear road maps and supporting public-private partnership. Arcadis' *Global Electric Vehicle Catalyst Index 2021* was published to help identify key challenges and opportunities to accelerate the transition to EVs. The purpose of this report is to help businesses, governments and financiers understand how to unlock capital for infrastructure installations.

The transportation industry needs bespoke strategies that consider regional progress and the readiness of the energy sector to transition from fossil fuels to low-carbon and zero-emission technologies. This, however, is a multidimensional challenge because of differences in technology and regulation maturity across geographies and the multitude of market and demand segments to address.

This report is intended to provide first insights on global market readiness and calls business, governments, financiers and other partners for a collective action on creating a reference global road map that can further inform strategies

# Parameters

## Accelerating mobility decarbonization

As the world advances toward mobility decarbonization and countries accelerate their transition to enabling electric vehicles (EVs), Arcadis identified five parameters that are crucial for measuring the maturity of a country's EV charging infrastructure (EVCI) market:

- Government leadership and incentives
- EV market maturity
- Returns potential
- Charging infrastructure
- Ease of doing business within the country.

In compiling this report, we consulted with World Business Council for Sustainable Development and its members through workshops, surveys and interviews. During this process, we explored and agreed the parameters, metrics and scoring methodology included in the Charging Infrastructure Investment Comparison Tool.



Government leadership and incentives



EV market maturity



Returns potential



Charging infrastructure



Ease of doing business





## Government leadership and incentives



## EV market maturity



With societies adapting to the need for clean energy, some countries have planned to ban internal combustion engine (ICE) vehicles as soon as 2025 while others have already transitioned some of their fleets of government vehicles to electric vehicles (EVs) as part of their commitment to a net-zero carbon future.

Governments have provided incentives, such as reduced tax on EVs and grants to encourage people into transitioning. EV infrastructure strategies and associated implementation plans are being prepared at local and national levels to assure consumers that there will be enough charge points available. Given the importance of this parameter, we measured:

- EV incentives
- Regulations to support EVs
- Ban on ICE vehicles
- Net-Zero declaration.

Regulations to support an EV transition, such as national-or state-level policies and legislations, are also very important. Perhaps the most important factor is the ban on the sale of new ICE vehicles or if a region plans to do so or not. Over the last few years, we have seen countries announce their commitment to net-zero. This is another important metric to consider because without a solid commitment to Net-Zero, it is unlikely that any related government policy would materialize. Having adequate funding is necessary to create an equitable national rollout of charging infrastructure, so this is the last metric we included under this parameter.

This parameter was used to determine the maturity of each country's EV market to understand the demand for charging infrastructure.

In this report, EV market maturity was determined by assessing:

- EV registrations per capita
- EV market share
- EV models available
- Ev forecast registrations per capita.

There are several ways to measure EV market maturity, and we agreed that the most important metric to include are: EV registration per capita, ie. the number of registered EVs per 1,000 people; EV market share, ie. the market share of battery electric vehicles (BEVs) and plug-in hybrid electric vehicles (PHEVs) versus ICE vehicles; the number of available EV models; the growth of EV forecast per capita, ie. the ratio of EVs per 1,000 people.





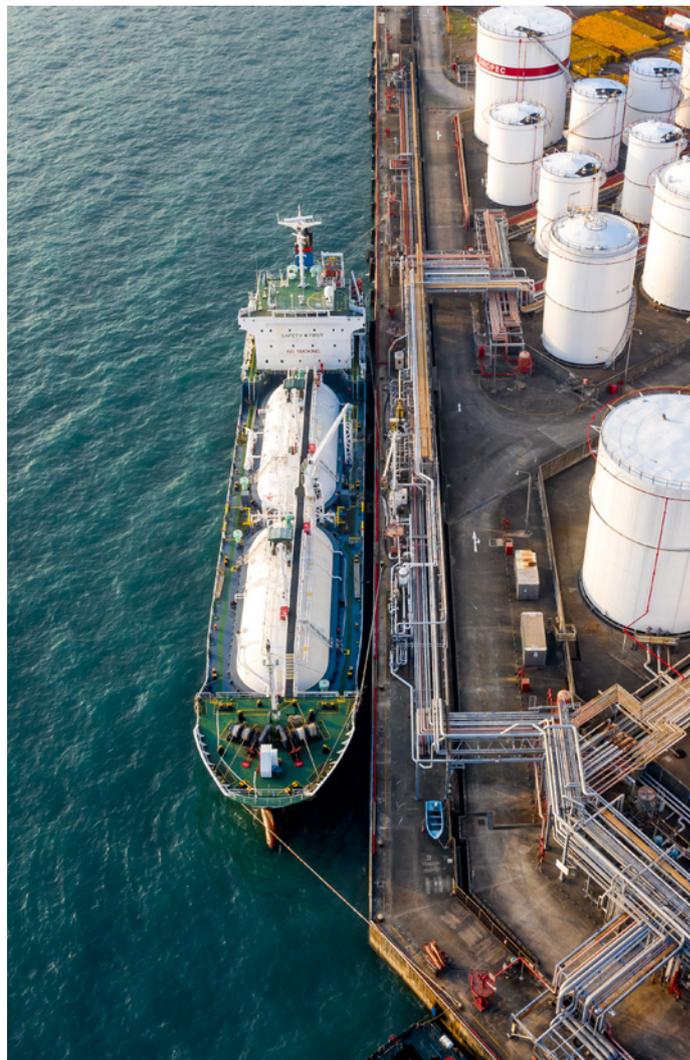
## Returns potential

The pace at which charging infrastructure is rolled out needs to be optimized. Already we have seen chargers in existing rapid charging networks needing complete replacement and infrastructure that were installed in inappropriate areas, not maintained or never used due to wrong specifications.

There is a plethora of external factors that affect the public utilization of EVCI, such as price to use the chargers, available locations and facilities, oil price fluctuations, and electrical energy supply costs, among many others. We used a simple formula to better gauge the rate at which EVCI is used: *daily average distance (in miles) driven using EVs x number of registered EVs / number of available chargers*.

Using the formula above helped us better quantify the utilization rate of EVCI, as it defines the average distance between each charger in a given area, ie. the greater the distance between each charger, the higher — in theory — the utilization rate is.

The returns potential from infrastructure is also affected by other variables, such as price of electricity and fossil fuels, capital expenditure (capex) needed for the charging infrastructure, and flexibility of services to monetize, eg. vehicle-to-grid (V2G) initiative. Therefore, we included several metrics, including a view of what the future charge point utilization rate could be built on an outlook for average journey lengths, number of EVs and installed base of chargers.



The energy price is important because it determines how much drivers will need to pay to recharge their cars at home, and it will also affect the fees imposed by a CPO, which is measured as the energy price (€) of a country per kWh. We included the average gasoline price in a country as a key metric because the price of fuel will become increasingly volatile, as we reach peak demand globally.

Another important factor when looking at the returns potential is the cost of infrastructure. We focused on the charging infrastructure capex, specifically the construction cost. The cost of grid connections is also important, but we did not include it in the charging infrastructure capex because it differs significantly across locations, depending on existing local distribution infrastructure and capacity at local substations. We used data from our recently launched International Construction Costs 2022 index to asset the cost of constructing a charging infrastructure in a given country.

The final metric we looked at is flexibility services able to monetize. This refers to any mechanism/distribution system that allows for additional revenue, such as V2G.



## Charging infrastructure

A country's charging infrastructure is closely linked to plans for supporting the adoption of EVs, and consumers will always consider the accessibility of charge points in their decision to transition to EVs. These charge points will either be available where people park their cars (eg. street, garage or driveway), on the road and their destinations.

We included metrics such as:

- Public charge points available
- EV charging strategy in place
- Forecasted public charge points by 2030
- Existing infrastructure standards.

In case a country has no infrastructure standards for EV, we checked if its government has plans to implement one in the future. We also included forecast public charge points by 2030 based on in-house models or public resources by country as one of the metrics under this parameter. EVCI developers will need to take advantage of technology improvements as the user experience of the charging infrastructure will increasingly matter and we see uptime of the chargers critical just like with the mobile phone networks and therefore there's a close relationship between chargers and the transmission and distribution network. With this in mind we have included as a metric the Transmission / Distribution network reliability using international reliability indices for the electricity networks for the duration and quantity of system down time.

EVCI developers will need to take advantage of technology improvements, as the user experience of the charging infrastructure will increasingly matter. The uptime of chargers will be critical similar to how important mobile phone networks are. Given the close relationship between chargers and the transmission and distribution network, we included transmission/distribution network reliability as a metric in this assessment. This was gauged using international reliability indices on the duration and quantity of system down time for electricity networks.



## Ease of doing business

The effectiveness of a country's venture capital and private equity is a huge factor in determining the country's readiness to do business with investors.

In this parameter, we measured:

- GDP
- Venture capital and private equity attractiveness
- Credit rating
- Government stability.

The rollout of EV charging networks will be highly dependent on the economic and government stability of the country and its business environment. The World Bank developed an in-depth analysis on the assessment of risks of doing business across different countries which we used to form a basis of this metric.





## Government leadership and incentives

As the problem with carbon emissions arise, countries across the globe have developed new policies and rigorous environmental regulations. These implementations by the government will serve as a strong catalyst for a global EV transition.



### Scoring metrics: government leadership and incentives

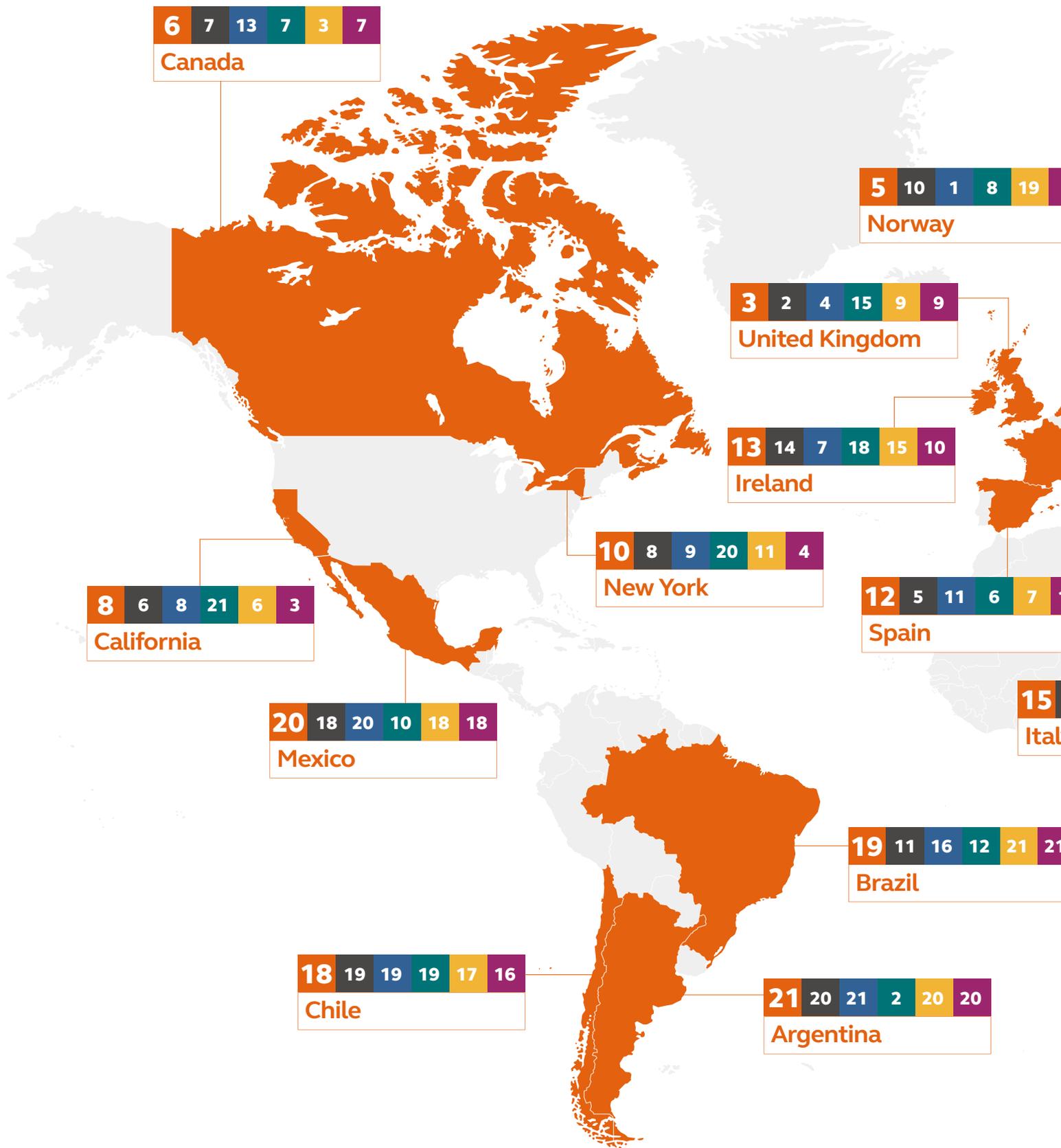
Metrics	EV incentives	Regulations to support EV	Ban on ICE vehicles	Net-zero declaration	Charging infrastructure public funding
<b>Excellent (4)</b>	2 or more incentives AND grants	2 or more EV regulations AND tax exemption for EVs	Existing ban on ICE vehicles AND penalties on low-emission zone	Declared net-zero before 2050	>0.08% of GDP
<b>Good (3)</b>	1 grant and 1 incentive OR 2 grants OR 2 incentives	1 EV regulation OR has tax exemptions and deductions	Plans to ban ICE vehicles but has approved penalty/congestion charging	Will declare net-zero by 2050 AND has an emission reduction target of 50% or more by 2030	0.04% to 0.08% of GDP
<b>Fair (2)</b>	1 grant OR 1 incentive	Pending EV regulations OR has state-level regulations and tax discounts	Plans to ban ICE vehicles OR plans to approve penalty/congestion charging	Aims to achieve net-zero on conditional basis OR reduce emissions by <50%	>0.001% to <0.04% of GDP
<b>Low (1)</b>	No incentive or grant	No EV regulation or tax deduction	No existing ban on ICE vehicles or penalties	Did not declare net-zero targets	No public funding

### Scoring results: government leadership and incentives

	EV incentives	Regulations to support EV	Ban on ICE vehicles	Net-zero declaration	Charging infrastructure public funding	Average total
<b>UK</b>	4	4	4	3	4	<b>3.8</b>
<b>Germany</b>	4	4	2	4	4	<b>3.6</b>
<b>Spain</b>	4	3	3	3	4	<b>3.4</b>
<b>Norway</b>	4	4	4	2	2	<b>3.2</b>
<b>France</b>	4	3	4	3	2	<b>3.2</b>
<b>Netherlands</b>	4	3	4	2	2	<b>3</b>
<b>Ireland</b>	4	3	2	3	2	<b>2.8</b>
<b>Italy</b>	3	3	3	2	2	<b>2.6</b>
<b>Turkey</b>	1	3	No data	2	2	<b>2</b>
<b>New York</b>	4	4	3	3	2	<b>3.2</b>
<b>California</b>	4	3	3	4	2	<b>3.2</b>
<b>Canada</b>	4	3	4	3	2	<b>3.2</b>
<b>Hong Kong</b>	4	4	4	4	4	<b>4</b>
<b>China</b>	3	4	4	4	2	<b>3.4</b>
<b>Singapore</b>	3	3	4	2	2	<b>2.8</b>
<b>Thailand</b>	2	3	4	2	1	<b>2.4</b>
<b>Australia</b>	4	2	1	2	2	<b>2.2</b>
<b>Brazil</b>	4	4	3	3	1	<b>3</b>
<b>Mexico</b>	3	2	3	2	1	<b>2.2</b>
<b>Argentina</b>	1	3	3	3	1	<b>2.2</b>
<b>Chile</b>	3	3	2	2	1	<b>2.2</b>

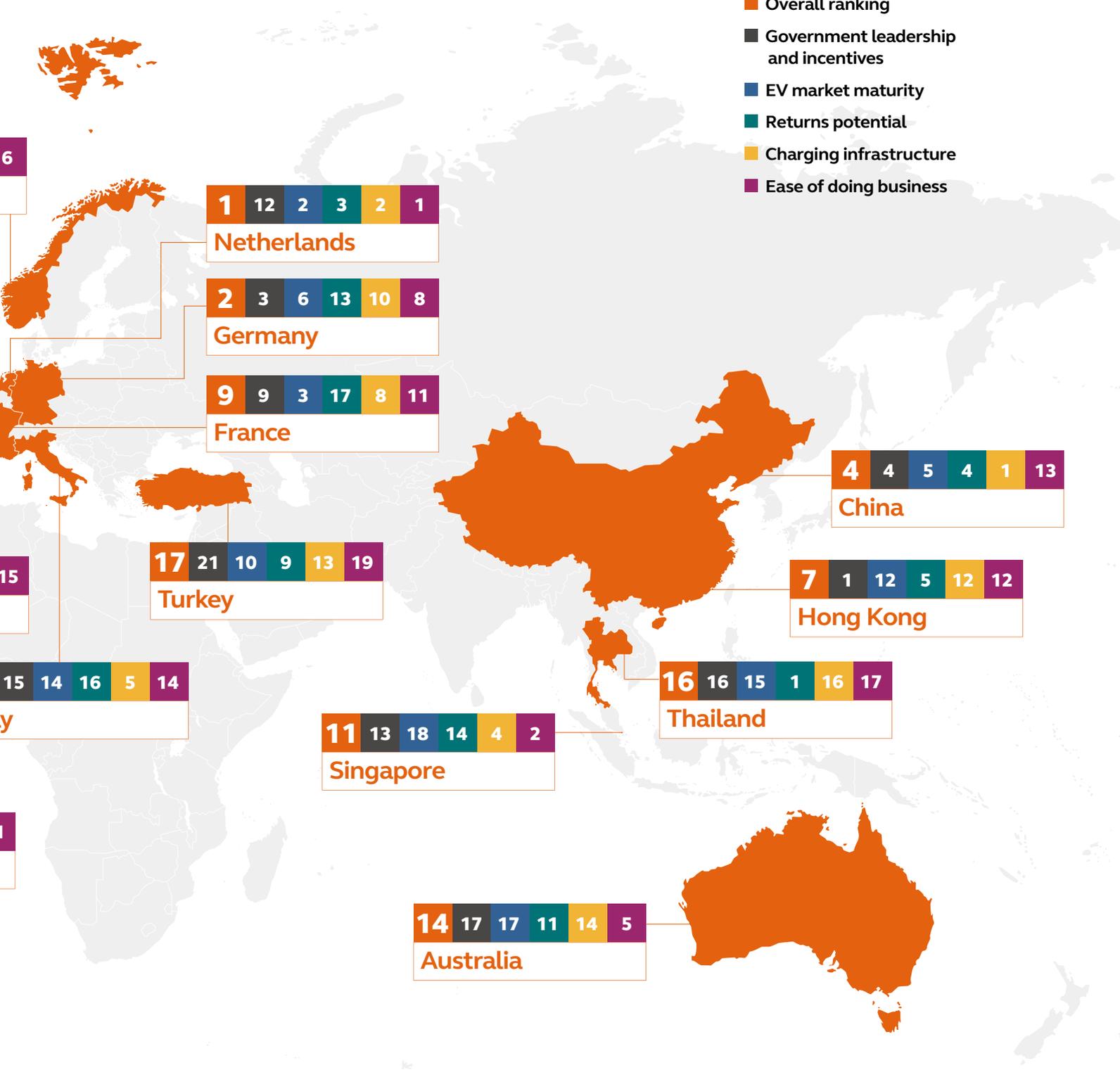
# Global Charging Infrastructure Market Report

## Overall index



Key:

- Overall ranking
- Government leadership and incentives
- EV market maturity
- Returns potential
- Charging infrastructure
- Ease of doing business



# Global Charging Infrastructure Market Report

## Regional spotlights



### Europe

In terms of overall investment readiness, the top 5 is dominated by European countries with the Netherlands, the UK, Germany, Norway and China rounding up the top 5. Germany has one of the stronger strategies to incentivize the development of the EVCI market, as it is backed by a EUR3.9 billion government fund and has new legislative tax incentives favoring EVs.

However, unlike other European countries, Germany is yet to declare a ban on the sale of ICE vehicles.

With 41 charge points per 100km, the Netherlands will not have problems in having people transition to EVs and easing consumer's 'range anxiety'. The country's high cost of energy, however, may limit future development of infrastructure or somewhat slow down the transition to EVs.

The UK has a clear strategy and incentives to promote the adoption of EVs, as well as the rollout of EVCI. When it comes to the volume of public charge points available, it is still behind other European countries and needs to scale up the charging infrastructure.

Norway leads in terms of EV market maturity. Its market share and growth can be accredited to its car tax system which makes EV models cheaper to buy compared to their petrol counterparts. Norway also targets to be net-zero by 2025 which means it has a clear strategy and incentives to accelerate its transition to EVs.

### Latin America

Infrastructure development is largely market led, but it needs public funding to overcome the initial 'chicken-and-egg' situation of investing in charging infrastructure with few EVs on the roads. Despite most countries having grants available for the development of their charging infrastructure, Latin American countries are behind in terms of government funding support for such initiative. However, these countries do have incentives and grants in place to support the rollout of EVs.

In Mexico, the national EV association, *Asociación Nacional de Vehículos Eléctricos y Sustentables (ANVES)* is working with the public and private sectors and the national government to establish an official standard for the conversion of ICE vehicles to 100% EVs. Mexico also needs to accelerate the development and implementation of its *National Strategy for Electric Mobility Vision 2030*, to eliminate decision barriers related to EV acquisition. The long-term vision of the strategy proposes that the Ciudad de México achieves zero-emission mobility based on electricity as the main source of energy, generated from renewable sources.

Argentina's government proposed a new bill on subsidies and reduced taxes for EVs and introduced low-emission zones where owners of ICE vehicles will need to pay fees whereas EV owners will not. These incentives can help the public switch to EVs, but one of the biggest barriers to this transition is the country's charging infrastructure. The lack of charging points for EVs in Argentina is both a concern and an opportunity. Consumers are concerned about not having access to charging infrastructure which will affect their decision to buy EVs. But with a low market share and second highest score in returns potential, the Argentinian market presents a great opportunity for investors to build charging points in the country's busiest areas, which can further accelerate the country's EV transition.

Brazil has very limited public charge points, with an average of 3 public charge points per 100km. Most of these charge points were developed by private investors. Chile, on the other hand, has made notable progress on the electrification of its public transportation supported by the government. However, both countries will need to develop a robust EV strategy and implementation plan that is supported by public funding, subsidies and grants to smoothly transition to EVs and improve their EV market shares, which are currently at 0.3% and 0.1%, respectively.



### North America

With a huge land area to cover, Canada finds it challenging to improve its charging infrastructure. The number of charge points in the country is notably low which negatively impact's EV adoption among its citizens. Its high score in ease of doing business, healthy GDP rate and available private equity can all contribute to accelerate its EVCI development. Having adequate charge points will help convince consumers to switch to EVs and increase the share of EVs in the market.

Despite its size and population density, California has been leading the EV transition in the US in terms of vehicle annual sales and other zero-emission vehicle metrics, such as funding, market share and charging infrastructure coverage. As gas prices increase, more and more people will consider purchasing an EV which can be an opportunity to speed up improvements in the state's EVCI.

In New York, they have rolled out the EVolve NY plan of the state government in adapting to electric vehicles across the state. The program creates private-sector partnerships to expand fast-charging infrastructure and make EVs more user-friendly for all New Yorkers. With good incentives in place, New York scored fairly for market maturity and their EV market share is significantly low. With a ban on all ICE vehicles by 2035, more needs to be done on implementation of charging infrastructure as well as incentives to encourage the transition to EVs.

### Asia Pacific

China and Hong Kong are the only ones from Asia Pacific to enter the overall top 10. China is one of the first countries to enter the EV industry, but its market share is still considerably low at 5.9%. With a robust charging infrastructure already in place, China should provide more grants and subsidies to encourage wider adoption of EVs in the country.

Singapore's EV market share is currently at 0.2%. The country is already taking steps to improve its charging infrastructure, but its available subsidies and grants to encourage EV adoption could be further improved. Singapore should also consider providing a wider range of EV models for people to choose from.

In Australia, the government has made public funds available to build EVCI, but the country lacks national policies and regulations to support the EV market. Moreover, the government has not announced a ban on the sale of ICE vehicles which contributes to the low EV market share in the country.

Hong Kong has a great opportunity to accelerate the transition of its taxi fleets which operate 22 hours a day. It can follow the examples of Norway with its wireless charging for taxis or the UK which incorporate EV chargers into lamp posts. Expanding EVCI will not only help fleet operators but also encourage owners of private-use vehicles to adopt battery EVs.

With a ban on ICE vehicles by 2035, Thailand's government is relying on private investments to fund public charge points. This bodes well for private investors, as Thailand scored the highest in terms of returns potential. The government will need to create a strategy to improve its public charging network, whether using private or public funds, to ensure a smooth transition to EVs.



## EV market maturity

For investments in EVCI to work, a country needs to have a maturing EV market. Countries must have enough EVs on the road needing to be charged at public charging infrastructure for the infrastructure to generate profit for the investors.



## Scoring metrics: EV market maturity

Metrics	EV registrations (Ratio*)	EV market share	EV models available	EV forecast per capita (Ratio*)
<b>Excellent (4)</b>	>100 EVs per 1,000 people	25% and above	200 or more models	More than 10
<b>Good (3)</b>	>16 EVs per 1,000 people	20% to <25%	100 to 199 models	Between 5 and 10
<b>Fair (2)</b>	>11 EVs per 1,000 people	10% to <20%	51 to 99 models	Between 1 and 5
<b>Low (1)</b>	<1 EV per 1,000 people	<10%	<50 models	Less than 1

Ratio refers to number of EVs per 1,000 people.

For countries with only 2025 data, parameters were adjusted accordingly. For countries with only 2030 data and countries with both 2025 and 2030 data, ONLY the 2030 data will be measured. Parameters were adjusted accordingly based on available data

## Scoring results: EV market maturity

	EV registrations	EV market share	EV models available	EV forecast per capita	Average total
Netherlands	3	4	3	4	3.5
Norway	4	4	2	4	3.5
France	2	3	3	4	3
UK	2	2	3	4	2.8
Ireland	2	2	3	4	2.8
Germany	2	3	2	4	2.8
Spain	1	1	No data	4	2
Italy	1	1	2	4	2
Turkey	No data	1	2	3	2
California	2	2	2	4	2.5
New York	2	1	2	4	2.3
Canada	1	1	2	4	2
China	2	1	4	4	2.8
Hong Kong	2	1	3	No data	2
Thailand	2	1	1	4	2
Australia	1	1	1	4	1.8
Singapore	1	1	1	4	1.8
Brazil	1	1	1	4	1.8
Chile	1	1	1	3	1.5
Mexico	1	1	1	2	1.3
Argentina	1	1	1	No data	1
Singapore	1	1	1	4	1.8



# Returns potential

**As the EV market grows across the globe, investor capital that is focused on securing long term stable revenue from the EVCI is required in greater volumes.**

Therefore, it is essential to get the balance right between too much infrastructure and low utilization and under-provided infrastructure versus too-high utilization, potentially creating 'queues at the plug'. It is also important that we remember that technology changes, and countries do not want to find themselves with an outdated infrastructure network.

### Scoring metrics: Returns potential

Metrics	Charge point utilization rate	Energy price	Fossil price	Charging infrastructure capex costs	Flexibility services able to monetize
<b>Excellent (4)</b>	Higher than 20,000	Below €0.10 per kWh	Above €2.0 per litre	EV index between 85 and below	National and/or city/state government, has invested or is investing in the promotion and/or roll out of V2G charging
<b>Good (3)</b>	Between 10,000 and 20,000	Between €0.10 and €0.15 per kWh	Between €1.50 - €2.0 per litre	EV index between 86 and 100	National and/or city/state government has strategies and/or plans to promote and/or V2G charging
<b>Fair (2)</b>	Between 1,000 and 10,000	Between €0.15 and €0.19 per kWh	Between €1.10 - €1.50 per litre	EV index between 101 and 115	National and/or city/state government is exploring the V2G charging concept through research and/or study
<b>Low (1)</b>	Lower than 1,000	Above €0.19 per kWh	Below €1.10 per litre	EV index between 116 and above	No government regulations, incentives or other initiatives, but V2G chargers exist because of private sectors

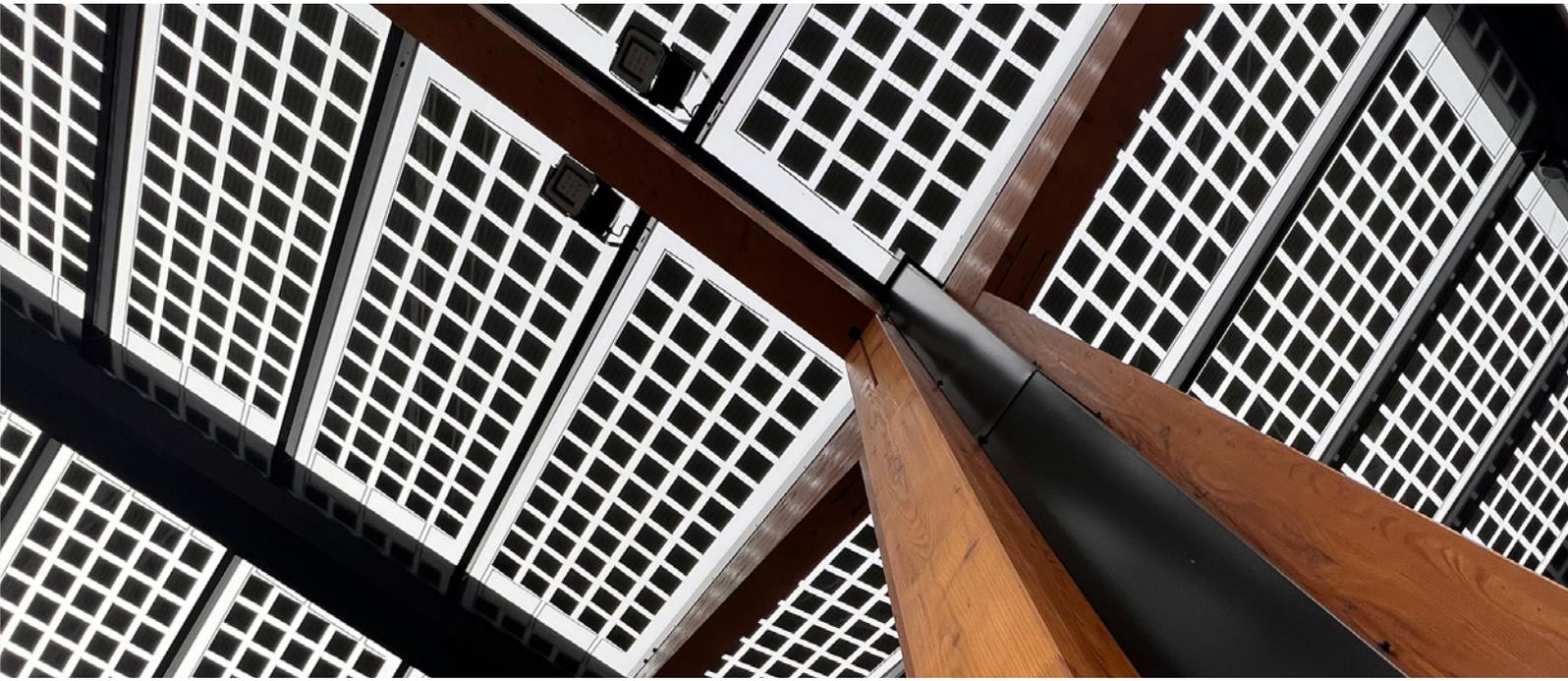
### Scoring results: Returns potential

	Charge point utilization rate	Energy price	Fossil price	Charging infrastructure capex costs	Flexibility services able to monetize	Average total
Netherlands	2	3	4	3	4	3.2
Spain	2	3	3	3	4	3
Norway	4	4	4	1	2	3
Turkey	No data	4	2	4	1	2.75
France	4	3	3	2	1	2.6
UK	3	1	3	1	4	2.4
Italy	2	1	3	3	3	2.4
Germany	2	1	3	2	4	2.4
Ireland	3	1	3	1	3	2.2
Canada	2	4	2	2	4	2.8
New York	2	3	1	2	2	2
California	3	3	1	1	2	2
China	4	4	2	4	3	3.4
Thailand	4	4	2	4	3	3.4
Australia	2	2	2	3	4	2.6
Singapore	No data	3	3	2	2	2.5
Hong Kong	1	3	4	1	No data	2.25
Argentina	No data	4	1	4	No data	3
Brazil	4	3	2	3	1	2.6
Mexico	No data	2	1	4	No data	2.33
Chile	1	3	2	3	1	2



## Charging infrastructure

The availability and accessibility of charge points will always be a major factor in the transition to EVs. EVCI grows at different rates across the world and is affected by EV market and government incentives and leadership on offer.



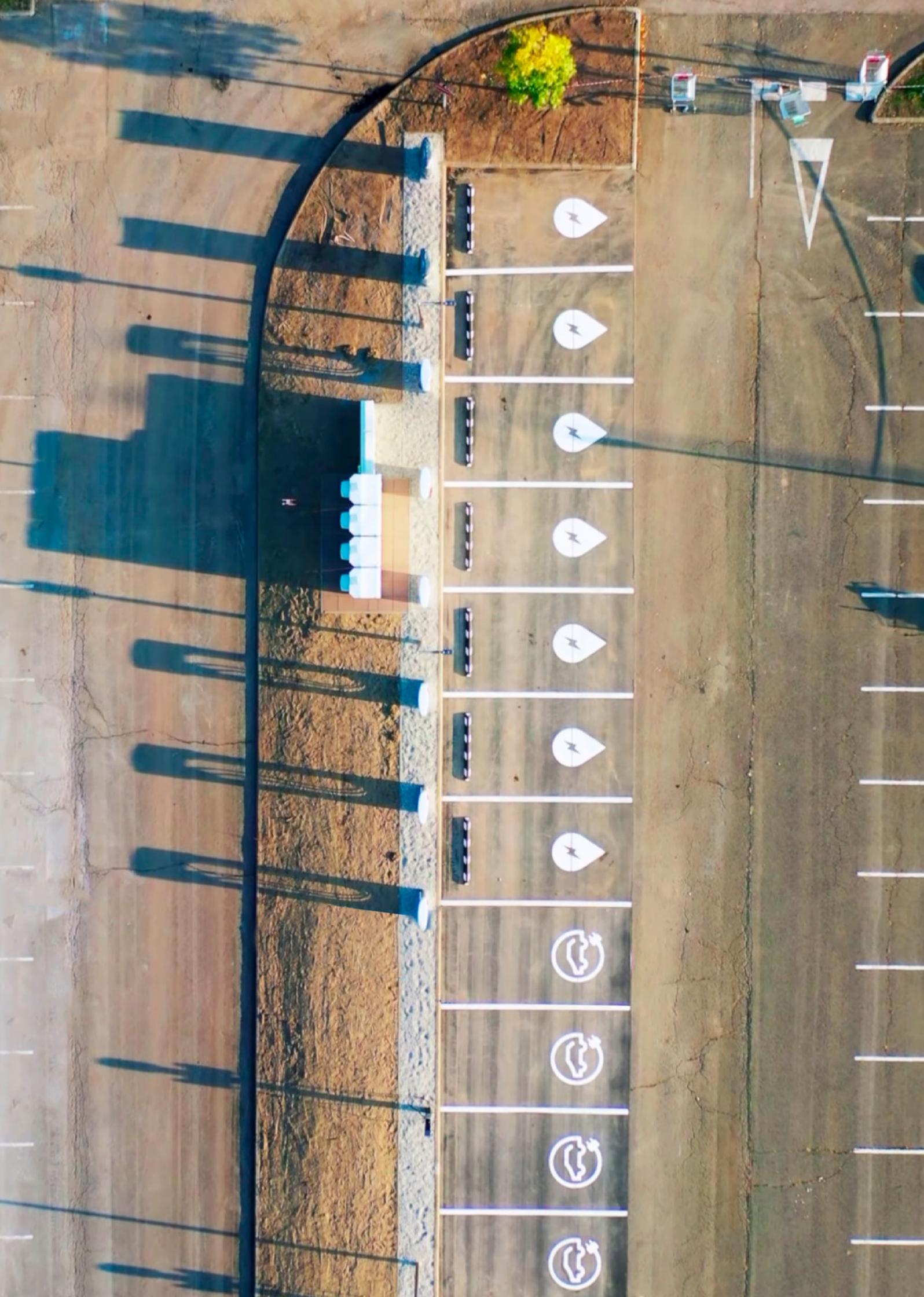
### Scoring metrics: EV charging infrastructure

Metrics	Public charge points available (*Ratio)	EV charging strategy	Existing infrastructure standards for EV	Forecast public charge points by 2030 (*Ratio)	Transmission/Distribution network reliability
<b>Excellent (4)</b>	1-5	Has national strategy backed by city/state government strategy, including the country's capital city	>2 approved standard	1-5	<p><b>No exceptional events included:</b>  <math>0 \leq \text{SAIDI} \leq 40</math> minutes/year  <math>0 \leq \text{SAIFI} \leq 1</math> interruptions/year</p> <p><b>Exceptional events included:</b>  <math>0 \leq \text{SAIDI} \leq 60</math> minutes/year  <math>0 \leq \text{SAIFI} \leq 1.5</math> interruptions/year</p>
<b>Good (3)</b>	6-10	Has country-wide strategy and some cities have their own strategy	1 to 2 approved minimum standard	6-10	<p><b>No exceptional events included:</b>  <math>40 &lt; \text{SAIDI} \leq 80</math> minutes/year  <math>1 &lt; \text{SAIFI} \leq 2</math> interruptions/year</p> <p><b>Exceptional events included:</b>  <math>60 &lt; \text{SAIDI} \leq 120</math> minutes/year  <math>1.5 &lt; \text{SAIFI} \leq 3</math> interruptions/year</p>
<b>Fair (2)</b>	11-15	Has no country-wide strategy yet but key cities/states have their own strategy OR has country-wide strategy but key cities/states do not have their own strategy	With pending standards for approval OR with grant/incentives in place	11-15	<p><b>No exceptional events included:</b>  <math>80 &lt; \text{SAIDI} \leq 120</math> minutes/year  <math>2 &lt; \text{SAIFI} \leq 3</math> interruptions/year</p> <p><b>Exceptional events included:</b>  <math>120 &lt; \text{SAIDI} \leq 180</math> minutes/year  <math>3 &lt; \text{SAIFI} \leq 4.5</math> interruptions/year</p>
<b>Low (1)</b>	16 or more	Does not have national strategy set by the government	No pending standard for approval and no grants	16 or more	<p><b>No exceptional events included:</b>  <math>120</math> minutes/year <math>&lt; \text{SAIDI}</math>  <math>3</math> interruptions/year <math>&lt; \text{SAIFI}</math></p> <p><b>Exceptional events included:</b>  <math>180</math> minutes/year <math>&lt; \text{SAIDI}</math>  <math>4.5</math> interruptions/year <math>&lt; \text{SAIFI}</math></p>

Note: Ratio of vehicles to charge points

## Scoring results: Charging infrastructure

	Public charge points available	EV charging strategy	Existing infrastructure standards for EV	Forecast public charge points	Transmission/Distribution network reliability	Average total
Netherlands	3	4	4	3	3.5	3.5
Italy	4	4	4	1	4	3.4
UK	1	4	3	3	4	3
Spain	4	3	No data	1	4	3
France	1	2	4	4	4	3
Germany	3	2	4	2	4	3
Turkey	No data	1	4	4	1	2.5
Ireland	1	3	3	1	3.5	2.3
Norway	1	2	3	1	2.5	1.9
California	2	4	4	3	4	3.4
Canada	3	4	2	4	4	3.4
New York	2	4	4	1	4	3
China	3	4	3	4	3.5	3.5
Singapore	4	2	3	4	4	3.4
Hong Kong	3	2	2	No data	4	2.75
Australia	3	2	1	No data	3.5	2.38
Thailand	2	1	2	No data	4	2.25
Chile	3	2	1	No data	2.5	2.13
Mexico	1	2	1	No data	4	2
Argentina	1	2	1	No data	1	1.25
Brazil	1	2	1	No data	1	1.25





## EV ease of doing business

The combination of strong government leadership, robust legal system and regulatory policies, and strong GDP per capita demonstrates a country's potential and attractiveness for EVCI market investment.



## Scoring metrics: ease of doing business

Metrics	Government stability	GDP <i>GDP per capita</i>	Venture capital and private equity country attractiveness	Credit rating
Excellent (4)	Ranks 90-100	€50,001 and above	Ranks 1-10	AAA
Good (3)	Ranks 75-89	€30,001 to €50,000	Ranks 11-20	+/- AA to +/- A
Fair (2)	Ranks 50-74	€10,001 to €30,000	Ranks 21-40	+/- BBB to +/- BB
Low (1)	Ranks 1-49	€10,000 and below	Ranks 41 and above	CCC

World Bank Index  
Voice and accountability:

- Political stability and absence of violence/terrorism
- Regulatory quality
- Rule of law
- Control of corruption.

Formula:  
=GDP/Population

Entrepreneurial culture and deal opportunities, including indicators of innovation, corporate R&D, and the ease of starting, running and closing a business

Forward-looking opinions on the relative ability of an entity or obligation to meet financial commitments

## Scoring results: ease of doing business

	Government stability	GDP per capita	Venture capital and private equity country attractiveness	Credit rating	Average total
Netherlands	4	3	4	4	3.75
Norway	4	4	3	4	3.75
Germany	3	3	4	4	3.5
UK	3	3	4	3	3.25
Ireland	4	4	2	3	3.25
France	3	3	3	3	3
Spain	2	2	2	3	2.25
Italy	2	3	2	2	2.25
Turkey	1	1	1	2	1.25
New York	4	4	3	3	3.75
California	4	3	3	4	3.75
Canada	4	3	4	3	3.5
Australia	4	2	1	2	3.75
Singapore	3	3	4	2	3.75
Hongkong	4	4	4	4	3
China	3	4	4	4	2.5
Thailand	2	3	4	2	1.5
Chile	3	2	1	3	2.25
Mexico	1	1	2	2	1.5
Argentina	1	2	1	1	1.25
Brazil	1	1	1	2	1.25

An aerial photograph of a bus depot. In the foreground, several blue buses are parked in a row. In the background, a larger number of white buses are parked in neat rows. A yellow bus is visible on the right side. The depot is situated on a paved area with some greenery and buildings in the distance.

## Case study

# Converting fleet to electric vehicles to help meet zero-emission goals by 2035

### Helping reduce greenhouse gas emissions

Transportation accounts for more than 50% of California Greenhouse Gas Emissions (GHG). A September 2020 Executive Order requires that, all new cars and passenger trucks sold in California be zero emission vehicles by 2035. The Executive Order would ban the sale of new vehicles that are powered by an internal combustion engine, which includes gasoline, diesel, and hybrid electric vehicles.

To facilitate an effective conversion of its fleet of internal combustion engine (ICE) vehicles to EVs fleet to meet its sustainability objectives and California targets, Arcadis was retained to develop a fleet electrification plan for a large California utility that provides water service. This study was developed to support the utility's inaugural Sustainability Plan, a roadmap for the utility's forward-looking sustainability efforts.

The water utility currently operates a mixed-use fleet of approximately 225 vehicles. Vehicles are based at one of the utility's four facilities where charging infrastructure needs to be developed.

### Developing a fleet sustainability plan

Our fleet electrification plan investigated conversions from every angle and provided a baseline assessment of vehicle use, issues, operational constraints and facility needs that can impact EV adoption.

Coordination with EV manufacturers allowed the team to develop a list of currently available and soon to be available electric vehicles that could potentially replace the utility ICE equivalents. Insights from manufacturers also formed the basis of cost of ownership analyses for major vehicle classes in each of their four facilities.

The collection of findings allowed us to assess the infrastructure needs and energy requirements to support the transition, including charging station infrastructure concept plans that show charger locations, layouts and power supply improvements. Then an alternative energy sources study was performed with a solar power feasibility assessment for rooftop, canopy and ground mount systems that can support the fleet's electrification power needs.

Budgetary cost estimates for a pilot program and future implementation were developed to provide a detailed road map, schedule and financial plan to transition to EVs. Costs covered the planning study, design and engineering work, construction, implementation, and additional operational costs not covered in current operations.

### Meeting 100% zero-emission target

With this complete road map, the utility developed its foundation to electrify its vehicles. The road map will also help the utility to transition to EVs and meet its 100% fleet electrification target before 2035, which will reduce GHG and improve residents health in California.

# Insights from around the world





## France

### EVs by the numbers



Market share of EVs: **24.3%**



France is aiming to ban new sales of petrol and diesel vehicles by 2040.



Gas price per liter: **€1.752**

Energy price per kWh: **€0.125**  
(Average 9.2 liters consumed per 100km: 15kWh consumed per 100km)



Gas price consumption per 100km: **€16.2**

Energy price consumption per 100km **€1.87**

### Achievements

The French government has established wide-ranging incentives and policies to improve the EV market growth. The government incentives cover used and new private BEVs and PHEVs. On top of this, grants allow people from low-income households or with employment issues to access long-term rental and rent-to-purchase agreements on low-emission vehicles.

Government regulations will increase the tax on diesel and petrol fuels and ban the sale of ICE vehicles by 2040. On the infrastructure side, there are firm standards in place to make new and existing buildings EV ready. France's progressive incentives and policies is reflected on its market share. In February 2021, BEVs and PHEVs had a combined market share of 24.3% – higher than the UK's. France is poised to be one of the most progressive EV markets in the world.

### Opportunities

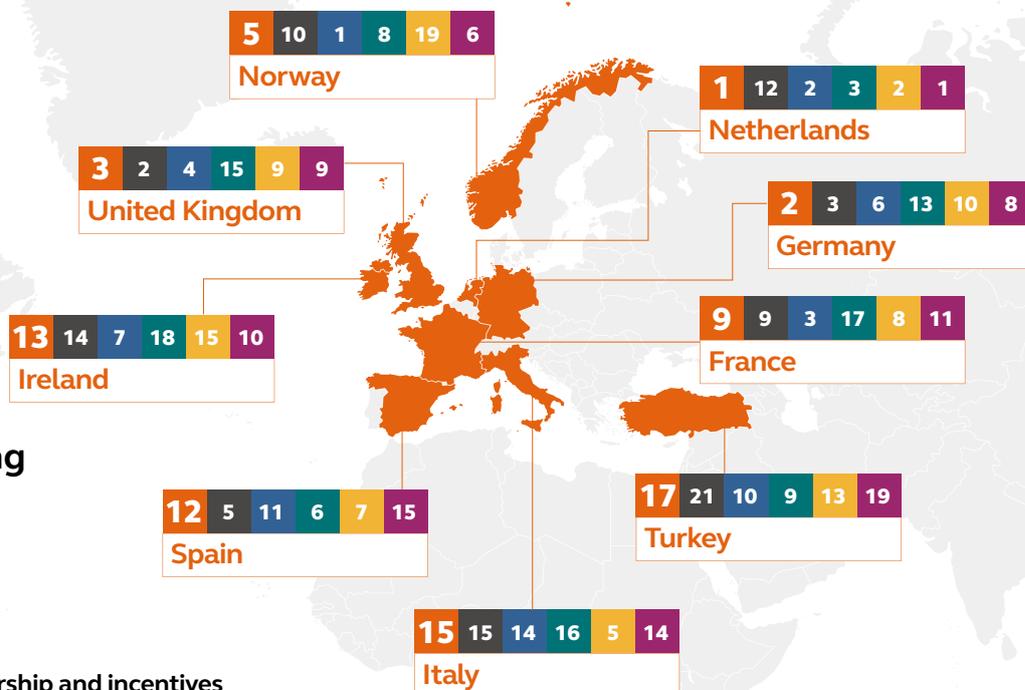
France is planning to install at least 7 million charge points. As of this reporting, however, it only has 31,206 public charge points in Metropolitan France and 1,780 fast chargers. To meet its goal, it needs to ramp up public charge point availability, especially fast charger availability. It also needs to consider the possibility of chip shortages in the manufacturing of EVs and for charging infrastructure. Ongoing events in China may also impact manufacturing which may lead to a linear increase in the number of EVs moving forward.

With its incentives and policies, France is doing its best to encourage individuals and businesses to equitably transition to EV. Eventually, however, it may need to speed up its public charging infrastructure plans to ease the transition and meet the growing EV sales. Rural France, in particular, will need strategically located hubs to cater for those traveling long distances across the country.

## Global charging infrastructure Europe

Key:

- Overall ranking
- Government leadership and incentives
- EV market maturity
- Returns potential
- Charging infrastructure
- Ease of doing business



## Germany

### Spotlight market insight:

Strong early government engagement in the transition kick started the market, but lack of clarity is beginning to cause worries over long-term development.

### EVs by the numbers

Market share of EVs: **22.5%**

Germany has not yet announced a plan to ban ICE vehicles but has a net-zero target date of 2045.

Gas price per liter: **€1.978**

Energy price per kWh: **€0.247**

Gas price consumption per 100km: **€18.2**

Energy price consumption per 100km **€3.7**

### Achievements

Germany has one of the stronger strategies to incentivize the development of the EVCI market, as it is backed by €3.9 billion worth of funds from the government. The German Charging Station Regulation (Ladesäulenverordnung) also stipulates that all petrol stations in Germany are required to accommodate EV charging stations. The country also has new legislative tax incentives favoring EVs. With these plans being implemented by the government, Germany emerged as one of the leading markets that act proactively to ease the transition to EVs.

### Opportunities

Germany has 81 models available compared to the other European countries like the Netherlands, the UK, France and Ireland which have more than 100 models for people to choose from.



A complicated political landscape is one of the challenges Germany faces. While some lawmakers support the transition to EVs, others are opposed to a ban on ICE vehicles in the country. Due to recent political events, their net-zero target date was moved from 2050 to 2045, and this upheaval within the government may create uncertainty in the automotive industry and affect those wishing to transition to EVs and investors looking to secure sound financial EVCI opportunities.

## Ireland

### EVs by the numbers



Market share of EVs:  
**5.87%**



Ireland has not yet declared a ban on ICE vehicles, but it has a net-zero target date of 2050.



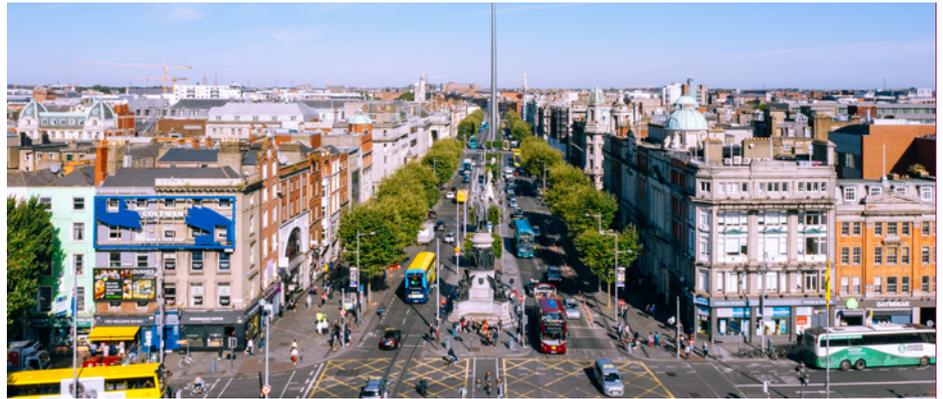
Gas price per liter:  
**€1.80**

Energy price per kWh: **€0.19**



Gas price consumption per 100km: **€16.56**

Energy price consumption per 100km **€2.85**



### Achievements

Ireland's expanding EV market is nascent but gaining in strength due to targeted government regulations and charging infrastructure standards. Key policies include the need for future buildings, major renovations and existing properties with certain volumes of parking space to have EV charge points. The government offers incentives to encourage EV adoption in the country, such as residential and public charge points, relief on vehicle registration tax, and grants for the taxi/hackney and limousine sector.

### Opportunities

Ireland will need to focus on some areas, such as increasing the number of public charge points and setting ultra-low emission zones. The country has not yet declared a ban on ICE vehicles, but it aims to finish its transition to EVs by 2030. The government also announced recently that there will be reduction in the incentives for transitioning to EV. This will pose a problem, as it is one of the most powerful mechanisms that can be used by the government to convince people to transition to EVs.

## Italy

### EVs by the numbers



Market share of EVs:  
**4.4%**



No plans to ban ICE vehicles but is planning to cut 60% of carbon emissions by 2030.



Gas price per liter:  
**€1.76**

Energy price per kWh: **€0.19**



Gas price consumption per 100km: **€16.56**

Energy price consumption per 100km **€2.85**

### Achievements

Italy's EV market is still in the early stages, but the government is committed to support its growth. Back in 2016 the Italian Ministry of Transport and Infrastructure regulated the possibility to convert conventional vehicles into EVs. After the regulation, Italy set a target to replace 25% of government fleets with EVs, hybrid and natural gas vehicles. It also set policies for new and renovated properties to include EV charge points. Italy made strong progress in transitioning to EV back in 2020 due to the increase of government incentives. The transition of transportation also gained support from cities like Milan and Rome, with plans including banning ICE vehicles and Florence having granted 70% of new taxi licenses to EV fleets.

### Opportunities

There is no official announcement yet in their net-zero emission target date and there is also no plan for banning vehicles with exhaust fumes. Their policies can also improve by having more EV specific rules and regulations. A low BEV and PHEV market share is possibly linked with them having low volume of public charging points i.e. due to lack of visible EVCI people are discouraged to buy an EV. With limited charging points available for the country it could affect the future of their EV market.

# Netherlands

## EVs by the numbers

Market share of EVs: **25%**

By 2030 Netherlands plans to have no carbon emissions, but it has not yet released a zero target date.

Gas price per liter: **€1.76**  
Energy price per kWh: **€0.19**

Gas price consumption per 100km: **€16.19**  
Energy price consumption per 100km **€2.85**

### Spotlight market insight:

A leader in EV development in Europe based on a wealthy driver base, but energy affordability issues may limit future development



## Achievements

The Netherlands ranked at the top of our metrics, as it is the most advanced country when it comes to EV transition as per the parameters set. The government provided an ample amount of tax incentives for EV sales, and it has a plan to ban ICE vehicles by 2030 which is many years ahead of some other countries. The Netherlands scored highly in the returns potential, as the data shows that it has 41 charge points per 100km and will, therefore, not have a problem in transitioning to EV.

## Opportunities

While it has a leading EV market, the Netherlands could improve its regulations on fuel retailers and existing infrastructure. It also does not have a net-zero target date, but it has a 49% target for reduced greenhouse gas emissions by 2030. These areas provide great opportunities for a progressive EV market.

# Spain

## EVs by the numbers

Market share of EVs: **4.8%**

Spain has declared a ban on ICEs by 2040 and a net-zero target date of 2050

Gas price per liter: **€1.80**  
Energy price per kWh: **€0.11**

Gas price consumption per 100km: **€16.56**  
Energy price consumption per 100km **€1.65**

## Achievements

Spain has supported the EV market by creating new regulations and providing about €800 million worth of incentives. It plans to invest €4.3 billion in its EV market for production and batteries and €1 billion will be allotted in boosting its public charging stations. Spain also has a reliable and stable distribution network, averaging only 30minutes of SAIDI/SAIFI, which is a good building block for EVCI.

## Opportunities

Spain will need to make improvements in their public charge points. Currently they are averaging 3 charge points per 100km which may limit the growth in people wishing to transition to EV. Providing the people and fleet operators more information on EV models, charging requirements and adding its locations may convince potential buyers to transition to EV.



## UK

### EVs by the numbers



Market share of EVs:  
**6.9%**



The UK has declared a ban on ICE vehicles by 2040 and a net-zero target date of 2050.



Gas price per liter:  
**€1.96**

Energy price per kWh: **€0.23**



Gas price consumption per 100km: **€18.03**

Energy price consumption per 100km **€3.45**

### Achievements

The UK has made great progress in its national EV strategies and city plans and legislations. The UK has been the fastest nation in G7 to decarbonize cars and other vehicles, stating that all new petrol and diesel vehicles will be phased out by 2030. The UK is committed to provide a €2.5 billion funding for its EV charging infrastructure. Its strategies will greatly increase the country's current public charging infrastructure with a ratio of 41 charge points per 100km, which is expected to increase by at least 51 charge points per 1km by 2030.

### Opportunities

Currently the UK is still behind other European countries when it comes to the volume of public charge points available across the country. To alleviate problems in transitioning to EVs the UK will need to have more available public charge points and encourage people to charge at home and work. Local governments can partner with consultants and charge point providers to map where EV chargers are needed and what support the government can offer. Another concern is the availability of suitable EVs in the marketplace, as there is often up to a year wait for some models and not all of the market is accommodated for.

#### Spotlight market insight:

The UK government has a clear strategy with milestones and a plethora of public funded schemes to incentivise infrastructure indicating a bright long-term future which has increased the index score. Physical roll out currently lagging, slowing market growth in the near term.

# Turkey

## EVs by the numbers



Market share of EVs:  
**8.7%**



Turkey does not yet have a ban on ICE vehicles but declared a net-zero target date of 2053.



Gas price per liter:  
**€1.21**

Energy price per kWh: **€0.06**



Gas price consumption per 100km: **€11.13**

Energy price consumption per 100km **€0.9**

## Achievements

Turkey's own EV brand has launched and is being promoted by its president, kicking off what could be the backbone of the Turkish EV market. Togg will go into series production in the fourth quarter of 2022. This has a potential to attract those who value homegrown brands.

In addition, Turkey has policies that will help EV charging infrastructure in parking lots, fuel stations and other suitable places to build EV chargers if they have the positive opinion of the relevant electricity authority. Turkey also has a green tariff which allows consumers to access renewable energy source for their EV chargers should charging station operators apply for it. If these policies will be utilized properly by the Turkish government, there's a possibility that this can boost buying decisions for those looking to convert to EVs.

## Opportunities

Turkey's EV market is still in its infancy, so there is still a lot of room for improvement. Firstly, setting up a more concrete net-zero goal would be a good first step and to have a clearer timeline of when they will impose policies. The government ratified Turkey's net-zero goal, moving it to 2053, three years after the target set at the Paris Agreement. Secondly, it has raised the tax on EVs which could hamper buying decisions. In addition, there is no indication yet of any diesel/petrol car sales ban target. These factors, if resolved, can further improve the current EV market share in the country which is at almost 9%. If there's no incentives, then policies and regulations are the next thing that can help promote the EV market. For now, it seems, a lot of work needs to be done before the Turkish EV market can really thrive.

### Spotlight market insight:

The market is heavily dominated by ICE vehicles with little incentive to currently invest in EV charging. However, shoots are beginning to be seen with government initiatives and with a strong standards framework, the market could be in a place to grow quickly.

# Norway

## EVs by the numbers



Market share of EVs:  
**86.5%**



Norway will ban all ICE vehicles by 2025, but it currently has not net-zero date.



Gas price per liter:  
**€2.24**

Energy price per kWh: **€0.10**



Gas price consumption per 100km: **€20.61**

Energy price consumption per 100km **€1.5**

## Achievements

Norway's EV market is ahead of its time and is impressively so. Its EV market growth can be credited to its car tax system which makes EV models cheaper to buy compared to a similar petrol model. The Norwegian parliament is confident that by 2025, all car sales will be either electric or hydrogen thanks to the country's strengthened green car tax system. Another accomplishment for Norway is its capital's wireless charging for electric taxis, making it more efficient for taxis to charge. Lastly, another important factor for its advancement could be its early net-zero goal for 2025, with its capital, Oslo, targeting net-zero as early as 2023. This gives a clearer timeline for setting up charging infrastructure and EV plans.

## Opportunities

Despite the strong green tax system in place, diesel and petrol car conservatives can continue to use their cars especially since there's no usage ban at all. In Oslo, conservatives don't agree to the ban of petrol and diesel cars. Companies in Norway are adapting their business models and offering EV charging infrastructure but there's no minimum standards yet requiring stations and new buildings to have EV chargers. The Norwegian government can take advantage of this by introducing policies/regulations to encourage more businesses to install EV chargers on their premises. Right now, data suggests there's at least 30 EVs per charge point in Norway and 75% of EV owners experience regular charging queues, highlighting the need for more chargers in the country to meet demand.

**CASE STUDY**

# Creating charging hubs for rural communities

With the UK's National Grid forecasting 11 million electric vehicles on roads by 2030 (and over 30m by 2040), there is a clear role for local government in EV infrastructure planning and installation to address ever-increasing demand.

**The challenge**

Carmarthenshire County Council (CCC) required a regional EV strategy and technical evidence base that supported the transition to zero emission vehicles, with the aim of becoming an early leader in the field.

Like many local authorities across the UK, CCC must adapt to cope with the rising demand for EVs. CCC had already begun work to accelerate this transition through the installation of fast and rapid chargers available for public use but lacked a coherent and unifying countywide strategy. Arcadis was commissioned by CCC to prepare a countywide EV Strategy that complemented local and national initiatives. The strategy aimed to promote EV uptake through proposed EV charge points and complementary measures to meet EV charging demand for residents, employees, and visitors.

**The solution**

Arcadis set out to produce a 10-year EV infrastructure strategy in collaboration with the council. Drawing upon our expertise conducting extensive EV policy reviews across the UK, we provided a holistic overview of current policies and trends to inform strategy development. In agreement with CCC, we integrated Welsh Government forecasts for electric vehicle uptake, traffic forecasts, journey purposes and journey lengths to predict demand and potential locations for charger placements.

Carmarthenshire has set out a clear vision and aim of becoming a Net-Zero municipality by 2030. With that in mind, in creating the 10-year EV Infrastructure Strategy, we identified a range of evidence-led solutions including infrastructure and complementary solutions to support uptake.

**Innovation**

We used digital mapping tools including the application of Geographic Information Systems (GIS) to visualise existing Electric Vehicle Charging Point (EVCP) infrastructure and available energy capacity across the study area.

Existing EVCPs were each illustrated with a mile buffer, enabling the identification of gaps in Carmarthenshire's network provision. In turn, this enabled us to make recommendations for potential future locations to install charge-points, with the aim of developing a stronger, well distributed EVCP network.

A 'use case scenario' was subsequently devised which assessed grid capacity. This scenario simulated the implementation of Rapid EV chargers to develop a baseline energy analysis of primary substations and the demand headroom across the Carmarthenshire area. This analysis enabled us to make assumptions on areas across the county in need of infrastructure upgrades to meet demand.



## Sustainability

By encouraging future growth in EV use, we have assisted CCC in futureproofing the transport network, which ultimately will contribute to local and global pollution reductions and improve quality of life.

In addition, accelerating the rollout of EV charging infrastructure constitutes a specific component in the roadmap to achieve Welsh Public Sector net zero greenhouse gas emissions by 2030. The deployment of efficient EV fleets and sustainable charging infrastructure will be integral to achieving this.

An emphasis was also placed on ensuring that less-populated rural areas across Carmarthenshire are not excluded from EV use by lack of infrastructure in order to create an inclusive user experience across the region

## The outcome

The Cross Hands EV Hub is a superfast charging hub that will benefit the local communities, businesses and commuters and visitors to the area.

The hub is an excellent example of collaboration between local government, Carmarthenshire County Council, and industry - SWARCO and Arcadis, which used central government funding by way of the Welsh Government's Ultra-Low Emission Vehicle Fund.

The EV hub incorporates a solar canopy linked to a battery energy storage system capable of supporting up to four 50kW rapid chargers and one 150kW charger. The site has been designed to easily accommodate faster chargers and additional chargers in the future – to expand when utilisation of chargers increases as more people switch to plug in vehicles and need to charge at this hub.

Watch this [video](#) to find out how we're working with SWARCO to deliver an electric vehicle charging hub for rural communities, helping more people switch to electric vehicles and reduce air pollution.

*“I was very proud to lead the delivery of Carmarthenshire's EV Strategy setting out a delivery plan for transition to EVs over the next ten years. We worked closely with the client to understand their needs, which helped us to meet tight timescales with deliverables right first time”*

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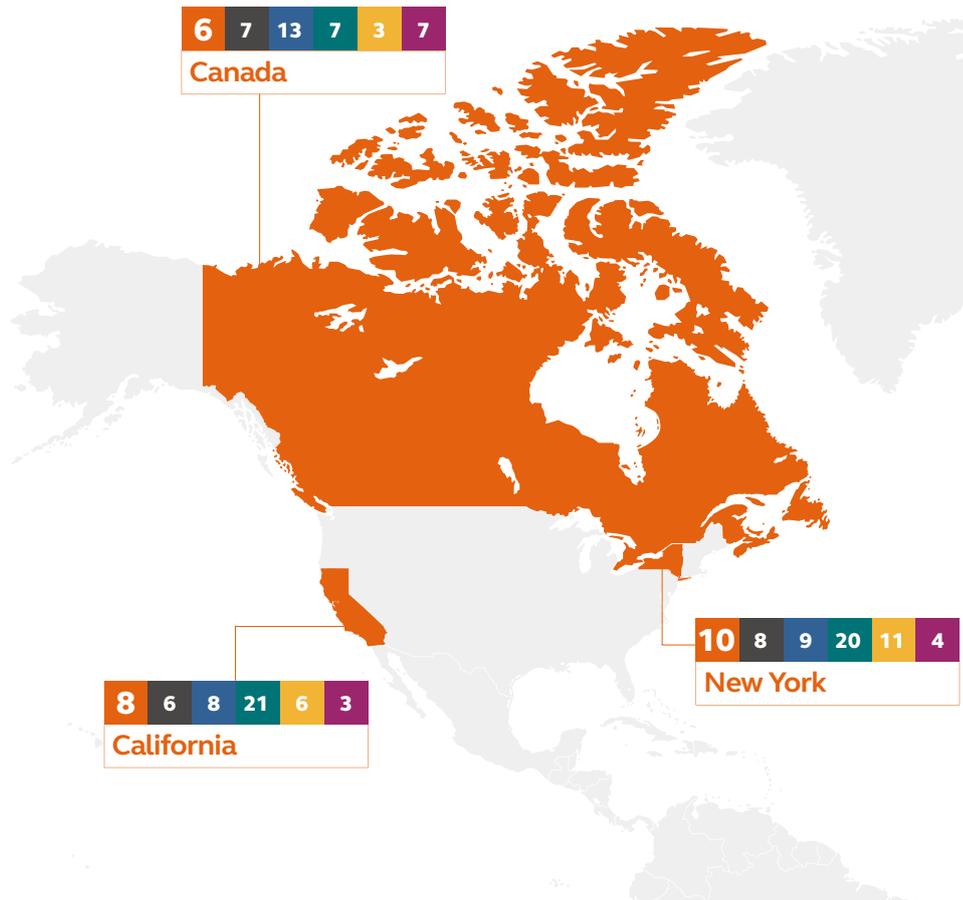
### Daniel Parr

Associate Technical Director –  
Arcadis Sustainability Mobility  
and Technologies (SM&T)

## Global charging infrastructure North America

Key:

- Overall ranking
- Government leadership and incentives
- EV market maturity
- Returns potential
- Charging infrastructure
- Ease of doing business



### EVs by the numbers



Market share of EVs: **3.52%**



Canada set to ban ICE vehicles by 2035, and it targets to be net-zero in 2050.



Gas price per liter: **€1.40**  
Energy price per kWh: **€0.09**



Gas price consumption per 100km: **€12.88**  
Energy price consumption per 100km: **€1.35**



### Achievements

Canada has invested about €570 million in its charging infrastructure to make EVs more affordable for its consumers. This investment include the establishment of fast chargers coast to coast and installment of public charge points in localized areas where people live, work and play. Canada scored highly in the ease of doing business parameter. With its healthy GDP rate and private equity, it proves that doing business with the country has low risk potential. Canada's good governance provides ample amount of incentives to encourage its citizens to transition to EVs.

### Opportunities

With a huge land area to cover, Canada finds it challenging to improve its charging infrastructure. The number of charge points in the country is notably low which negatively impact's EV adoption among its citizens. Its high score in ease of doing business, healthy GDP rate and available private equity can all contribute to accelerate its EVCI development. Having adequate charge points will help convince consumers to switch to EVs and increase the share of EVs in the market.



## The US: California

### EVs by the numbers



Market share of EVs: **-8.1%**



California is banning ICE vehicles by 2035 and has set a net-zero target date of 2045.



Gas price per liter: **€1.10**

Energy price per kWh: **€0.11**



Gas price consumption per 100km: **€10.12**

Energy price consumption per 100km **€1.65**

### Achievements

The Biden administration has allocated €4.75 billion for the development of the country's charging infrastructure. On top that, the California state government has the California electric vehicle infrastructure project (CALeVIP) which will address the regional needs of charging infrastructure throughout California while supporting state goals to improve their air quality, combat climate change and reduce the use of petrol. California provides multiple incentives relating to EVs. With its good governance and high GDP, it proves low risk it is for investors to invest in the country.

### Opportunities

California is one of the largest states in America with one of the highest density of people, it will be a great opportunity to speed up the improvement of their public charge points. The charging infrastructure is one of the main reasons to consider for the people to transition to EVs. As gas prices increase more and more people will consider in purchasing an EV. To ease the transition, they will need to mobilize more quickly the California Electric Vehicle infrastructure project.

California has been leading the transition to EV in the United States including but not limited to vehicle annual sales and all other zero emission vehicle metrics i.e., funding, market share percentage, most extensive public charging infrastructure in the country.

## The US: New York

### EVs by the numbers



Market share of EVs: **-0.67%**



New York will ban all ICE vehicles by 2035 and set a net-zero target date of 2050.



Gas price per liter: **€1.10**

Energy price per kWh: **€0.11**



Gas price consumption per 100km: **€10.12**

Energy price consumption per 100km **€1.65**

### Achievements

In Addition to the national plans of the Biden administration throughout the US in improving the public charging stations, the state of New York has also released its plans of improvement. The EVolve NY is a plan of the state government in adapting to electric vehicles across the state. The program creates private-sector partnerships to expand fast-charging infrastructure and make EVs more user-friendly for all New Yorkers. NYPA is installing fast chargers along major interstate corridors, in five major cities and at New York City airports. The state government of New York also offers huge amounts of incentives and developed policies in support of the EV Market.

### Opportunities

Even though the state of New York has good incentives, implementation plans for charging infrastructure and its market maturity is rated fair in our metrics while its EV market share is significantly low. Convincing New Yorkers to adopt EVs is crucial. With so many residents in New York City who depend on taxis, electrifying those fleets could help with the state's EV goals. The state will also need to approve more EV models to entice consumers.



## Australia

### EVs by the numbers



Market share of EVs: **0.7%**



Australia does not have a plan to ban ICE vehicles, but it has a net-zero target date of 2050.



Gas price per liter: **€1.13**

Energy price per kWh: **€0.18**



Gas price consumption per 100km: **€10.40**

Energy price consumption per 100km **€2.7**

### Achievements

The Australian government allotted AUD16.5 million for grants to pay for battery EV fast-charging stations across capital cities and key regional centers. It also provided AUD40 million to improve its charging infrastructure and is holding a two-year EV trial for a government fleet. Each province in Australia has its own plans to support the people in transitioning to EVs. The Australian government also invested in the Clean Energy Finance Corporation to accelerate the jet charge rollout of EV charging infrastructure.

As of 1 August 2022, a range of policy measures and ambitions were announced by the federal government which includes:

- Amendment to Fringe Benefits Tax Assessment Act to exempt zero or low emission vehicles, including eligible plug-in hybrid models.
- Removal of a 5% tariff for eligible electric cars with a customs value below the luxury car tax threshold for fuel efficient vehicles.
- Intention for AUD500 million investment to boost national charging infrastructure.
- Target for 75% of new Commonwealth government fleet purchases to be electric by 2025.
- National Electric Vehicle Strategy which broadly targets 89% of new car sales and 15% of all vehicles on the road to be electric and by 2030.

While the actual tax and tariff changes further incentivise EV purchases, they aren't dramatic. There remains no penalty for polluting vehicles as is the case in Europe and elsewhere. The broader intent around EVCI investment and government fleet transition is possibly more significant to the Australian EV market.

### Opportunities

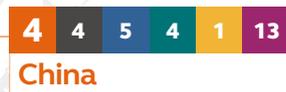
Though the government has allocated funds in support of the EV charging infrastructure and grants, Australia has yet to release any national policy and regulation in support of the EV market. This may also be one of the reasons why its EV market share is considerably low. The Australian government has not yet announced a ban on the sale of ICE vehicles which is one of the factors behind the low market share for EVs.



## Global charging infrastructure Asia Pacific

Key:

- Overall ranking
- Government leadership and incentives
- EV market maturity
- Returns potential
- Charging infrastructure
- Ease of doing business



## China

### EVs by the numbers

Market share of EVs: **5.9%**

China planned all of its public sector vehicles to be 100% EVs by 2035 and set a net-zero target date of 2060.

Gas price per liter: **€1.37**

Energy price per kWh: **€0.09**

Gas price consumption per 100km: **€12.60**

Energy price consumption per 100km **€1.35**



### Achievements

China is one of the very first countries to participate in the EV market, and it has been since the beginning. The country has spent at least \$60 billion in support of the electric car industry in the form of research and development, tax exemptions and financing for battery charging. The Chinese government allocated over \$350 million in the development of its charging infrastructure in support of the EV industry. The country also has multiple strategies in place for key cities regarding the charging infrastructure to help with the EV transition. The commitment of the government in support of the EV industry shows, as China has more than 200 fast chargers per 100km and multiple regulations in local governments around charging infrastructure for new properties and other infrastructure projects.

### Opportunities

Despite being one of the earliest to participate in the EV industry and its solid charging infrastructure, China's EV market share is still considerably. The government needs to develop new strategies to convince its people to swap their ICE vehicles for a battery EVs. As it stands, China needs to improve its grants and subsidies to help the growth of its EV market.

### Spotlight market insight:

Huge market size and need to limit pollution in cities have given both public and private stakeholders reason to invest in the market. However, the business environment for foreign companies remains difficult to navigate.

## Singapore

### EVs by the numbers



Market share of EVs: **0.1%**



Singapore plans to phase out ICE vehicles by 2040 but does not have a net-zero target date.



Gas price per liter: **€1.20**

Energy price per kWh: **€0.14**



Gas price consumption per 100km: **€11.04**

Energy price consumption per 100km **€2.1**



### Achievements

Singapore has enough charging stations to support EVs despite their small EV market share. The Singapore government has provided grants and subsidies in support of the EV market. It also set aside \$30 million for the next five years for any initiative related to EV. The country also created policies in making charging stations a mandatory aspect in parks, new buildings and other types of infrastructure. Singapore plans to roll out 60,000 EV charging stations across the country by 2030 and set to ban the sale of new ICE vehicles by 2040.

### Opportunities

Though the government is doing its part in improving the EV market, Singapore has very low market share for EVs. Having better strategies around grants and subsidies could potentially convince its people in transitioning to EVs while providing more models to choose from can be considered to spur the growth of its EV Market.

## Thailand

### EVs by the numbers



Market share of EVs: **0.1%**



Thailand is banning ICE vehicles by 2035 and but does not have net-zero target.



Gas price per liter: **€1.29**

Energy price per kWh: **€0.10**



Gas price consumption per 100km: **€11.87**

Energy price consumption per 100km **€1.5**

### Achievements

The government of Thailand has released \$164 million for PHEV and BEV projects to support the country's transition to EVs. Thailand plans to produce 1.051 million EV units by 2025 and has a long-term goal of producing 6.22 million EV units by 2030. It targets to sell only zero-emission vehicles by 2035. Thailand aims to develop a smart grid and smart EV charging system and implement a V2G electricity system to ensure more efficient power distribution to support EV usage.

### Opportunities

The government currently has no plans to fund public charge points but instead is highly dependent on private investments. The government will need to create a strategy moving forward to improve Thailand's public charging station to ensure a smooth transition to EVs. Being able to recharge vehicle on the road while traveling is one of the key things that consumers consider in switching to EVs. The lack of government initiatives regarding these aspects may hinder the country's plans for the EV industry.



## Hong Kong

### EVs by the numbers



Market share of EVs:  
**0.7%**



Hong Kong will stop new registration of fuel-propelled private cars, including plug-in hybrids and hybrids in 2035, and it has set a net zero target date of 2050.



Gas price per liter:  
**€2.66**

Energy price per kWh: **€0.14**



Gas price consumption per 100km: **€24.47**

Energy price consumption per 100km **€2.1**

### Achievements

Despite being in its early stages, Hong Kong's EV market is evidently growing thanks to the government's support. Hong Kong has a comprehensive EV road map which consists of important factors, such as funding, EV policies, innovation plans and charging infrastructure. Within the plans, Hong Kong will utilize its demographical setup where a lot of their residents stay in residential buildings. For instance, the EV-charging at Home Subsidy Scheme is a smart move to help EV owners easily charge their cars at residential parking lots. In addition, Hong Kong has set up millions in funding for electric bus fleets, so they can test them under local conditions. The country also has a \$200 million Green Tech Fund for the research and development of green technologies, including EV projects.

In the long run, Hong Kong's plan will boost its EV sales and make Hong Kong as one of the most attractive EV markets in the world.

### Opportunities

There are many factors that could improve Hong Kong's EV market which is still in the feasibility stage. These factors include requiring fuel stations to have EV charging capacity and electrifying taxi fleets. Hong Kong currently needs fast chargers or wireless chargers to support the electrification of taxi fleets that operate 22 hours a day. The government can speed up the feasibility study in this area and look at innovations in other countries like installing EV chargers on lamp posts in the UK and developing wireless charging systems that offer a quick charging solution for electric taxis in Norway. Establishing a wider EV charging network for both private and public sectors can be just what Hong Kong needs to boost its EV market even further.

## CASE STUDY

# Feasibility study for forecourt EV chargers, solar PV and battery energy storage sustainable solutions

Client:  
**Confidential**

### Background

Arcadis was engaged by a confidential client who manages Australia's largest petrol and convenience network with a history spanning over 120 years. This client, with the support of government grant funding, is taking the first step to transition their business from a traditional hydrocarbons-based transport fuels provider into renewable energy retailer to the public, representing a significant transformation of their business model. A condition of the applicable government funding was that the recipient was required to abide by a fixed delivery schedule that necessitated seamless project design and execution.

### The role of Arcadis

Arcadis was responsible for developing a feasibility design study for the integration of forecourt EV chargers, solar PV and battery energy storage at the 121 sites across Australia.

### Results for our client

Arcadis developed a standardised model enabling scalable and repeatable designs to be implemented across multiple sites, minimising the requirement for bespoke solutions. Our cost estimation team developed a comprehensive model that compares site upgrade costs and assisted with investment prioritisation. To meet the tight schedule and de-risk the project, the Arcadis team developed a series of innovative methods. One such method was a GIS based solution enabling real-time reporting based on a customised reporting application that could be used by the Arcadis field and design teams. This nationwide GIS platform was used in conjunction with site inspection and a reporting platform to allow real-time reporting and quality assurance for data collection and design. This solution was shared with the client to enable effective collaboration.

### Relevance to this project

- Assisting our clients with a clear path forward – Arcadis delivered a feasibility study that set out a plan to deliver a relatively new technology
- At the forefront of sustainable solutions – This project is an example of how Arcadis is leading energy transition in the transport sector, which is the key to help achieve greener, cleaner and better environment for generations to come.
- Experience providing project-developed models to our clients – Arcadis developed modelling tools that were refined and quality assured for ongoing use.





## Mexico

### EVs by the numbers



Market share of EVs vs ICE: **4.6% vs 00%**



Mexico has declared a ban on ICE vehicles by 2040 but has yet to declare a net zero target date.



Gas price per liter: **€1.09**

Energy price per kWh: **€0.15**



Gas price consumption per 100km: **€10.03**

Energy price consumption per 100km **€2.25**

### Achievements

Even if Mexico is only a developing market for EVs, it provides several incentives to boost the rollout of EVs. Mexico's Ministry of Economy has signed an agreement to ban the sale of ICE vehicles from 2040 within the framework of the UN's COP 26 and has committed to sell only zero-emission vehicles starting 2040. In addition, Mexico also has a program called 'Hoy no circula' which targets the reduction of vehicle emission in Mexico City and State of Mexico through a penalty over a specific time. On top of this, the city also has its 'Taxi Improvement Program - Request for Support and/or Financing for Vehicle Replacement 2021' which offers financial support to those qualified vehicle owners who wish to transition their vehicles to EVs. If all these initiatives becomes effective, Mexico can attract consumers to consider acquiring EVs.

### Opportunities

In Mexico, the national EV association, *Asociación Nacional de Vehículos Eléctricos y Sustentables (ANVES)* is working with the public and private sectors and the national government to establish an official standard for the conversion of ICE vehicles to 100% EVs. To meet the country's emission targets, however, the government needs to speed the development of its official standard and implement strong EV policies that will citizens and corporations to use EVs. Mexico also needs to accelerate the development and implementation of its National Electric Mobility Strategy to eliminate decision barriers related to EV acquisition. This strategy is key to the successful rollout of EV in the country, as it will tackle investments, legal framework, infrastructure,

#### Spotlight market insight:

Mexico has little EVCI development and low certainty on return, but it has a strong underlying infrastructure which can be a strong development opportunity for investors.



## Global charging infrastructure Latin America

Key:

- Overall ranking
- Government leadership and incentives
- EV market maturity
- Returns potential
- Charging infrastructure
- Ease of doing business

### Argentina

#### EVs by the numbers



Market share of EVs: **1.7%**



Argentina has declared the ban of ICE vehicles by 2041 and a net-zero target date of 2050.



Gas price per Liter: **€0.93**

Energy price per kWh: **€0.04**



Gas price consumption per 100km: **€8.56**

Energy price consumption per 100km **€0.6**

#### Achievements

The government of Argentina is proposing a new bill in favor of EVs which will allow consumers to own EVs and their utilities with less cost and reduced tax. The government also implemented annual fees for ICE vehicles in entering the downtown areas of the country to discourage and lessen the use of ICE vehicles in busy areas and reduce emissions. There has been an increase of EV users in the country since the market for EV exploded back in 2017 when the tariff reduction on EV importation was introduced. The government of Argentina has been very supportive of EV and will have more plans for it in the coming years to meet its net zero target date of 2050.

#### Opportunities

Major cities in Argentina currently lack EV charging points which is a great opportunity for adding new charging points in busy areas of the country. The number of people using EVs in the country is also low, but with the plans of the government supporting the use of EVs the demand is expected to surge. Though its rankings in EV market maturity is low, the country's returns potential is fair..

#### Spotlight market insight:

A very nascent market that is seeing little development in EV penetration or investment infrastructure but its relatively low costs for infrastructure development means it could be a market with early investment potential.



## Brazil

### EVs by the numbers



Market share of EVs: **0.3%**



Brazil has announced a ban on the sale of ICE vehicles by 2030 and set its net zero target date to 2050.



Gas price per liter: **€1.44**

Energy price per kWh: **€0.15**



Gas price consumption per 100km: **€13.25**

Energy price consumption per 100km **€2.25**

### Spotlight market insight:

A market that is at the low end of the development and adoption curve but its strong government incentives position it for strong growth in the future.

### Achievements

Brazil's path to electrification is still developing and the number of electric cars is still low. However, the Brazilian government is set to promote the transition to EVs through its electric mobility programs, fiscal policies, research and development (R&D) initiatives, and other regulations. Among these initiatives, Brazil is focusing on its R&D programs, as its EV market is still at its early stage. The leading public institution conducting R&D projects on e-mobility is the Brazilian National Electric Energy Agency (ANEEL). A strategic program established by ANEEL called ANEEL R&D – Call 22 aims to generate business and foster solutions to the e-mobility market within a four-year period (2020-2024). This strategic call program for e-mobility has an allocated investment of approximately BRL620 million for this project. These programs help to promote the EV market in Brazil, and studies estimated that the country will have 8 million EV cars in their road by 2030.

### Opportunities

Currently, Brazil has very limited public charge points, with an average of 3 public charge points per 100km. The government has no plans at present to provide funding public for charge points, and this poses a problem for people who want to transition to EV. Most of Brazil's public charge points came from private investors. The government will need to develop a proper plan if it wants to transition smoothly to EVs.



## Chile

### EVs by the numbers



Market share of EVs:  
**0.1%**



Chile has declared a ban on ICE vehicles by 2035 and set a net zero target date of 2050.



Gas price per liter:  
**€1.30**

Energy price per kWh: **€0.11**



Gas price consumption per 100km: **€11.96**

Energy price consumption per 100km **€1.65**

### Achievements

Chile is advancing electric mobility for its public transport, with a goal to transition all its public transit fleets to zero emissions by 2040. It is one of the countries with the largest number of electric buses in the world with a total of 814 e-buses. Santiago, Chile's capital city, has a fleet of more than 700 e-buses which is still growing, the largest outside of China. By comparison, there were about 650 e-buses in the entire US in 2020, although political momentum seems to be building for an investment in the sector. Santiago is aiming for a zero-emission fleet by 2035. The country also has a good ratio of charging infrastructure when compared with the rest of the countries in Latin America. In addition to that, Chile also has government programs supporting the electrification of its fleet. The latest program is the Ministry of Energy's 2022 Public-Private Electromobility Agreement. This agreement identified 142 institutions and companies and grouped commitments under the four axes of the National Electromobility Strategy: sustainable means of transportation and financing; charging infrastructure and regulation; research and human capital; and dissemination, information and articulation.

Chile's goal to decarbonise its transportation will accelerate through this government strategy to collaborate with institutions and private companies.

### Opportunities

Chile has made notable progress on the electrification of its public transport; however, it needs to improve its strategies in promoting private EVs. Chile lacks national regulations and EV incentive schemes that will boost the attractiveness of electric cars. The Chilean government could speed up its National Electromobility Strategy especially the creation of incentives including subsidies to purchase and recharge electric cars.



# Conclusion

## Thinking about investing in EV infrastructure?

The maturity of EV markets in countries you are thinking of investing in will act as a guide but if your organization is actively thinking about investing in a particular location or real estate portfolio please get in touch with our EV Investment Advisory team to explore the opportunity in more detail where we can support with data, insights and technical due diligence.

All countries included in the report are making progress at different speeds and focus areas toward mobility decarbonization. For example, Turkey and Argentina are the only countries with no incentives or grants to support the rollout of EVs, while Australia and Mexico are lagging behind other countries in terms of regulations or tax deductions. However, there is still progress even in the slower-to-develop markets. For example, all countries/states in the index have declared a net-zero declaration. In 2017, Istanbul introduced electric taxis for the first time. Since 2019, the head of Turkey's Electric and Hybrid Vehicles Association has been calling out the government to provide incentives. Similarly in Australia, there has been increased pressure on the government to bring in new regulations supporting EV transition especially since Australia is the only country in the research with no ban on petrol and diesel cars. Research by the Australia Institute showed that over half of Australians (57%) support a ban on the sale of new fossil-fueled vehicles from 2035, and increased pressure has meant that new regulations are coming. At the time of writing a range of EV policy measures and ambitions have just been announced by the Australian Federal Government.

When it comes to actual number of EVs per capita, Norway is ahead with 118 EVs per 1,000 people, and it has an EV market share of 64.5%. The rest of Europe is catching up with a broad range of EV incentives that can push the average market share in the region to 13%. Meanwhile other regions are falling behind, such as Asia Pacific and Latin America, with less than 2% of EV market share.

Actively planning for investment in EVs now will not only align your organization with the forthcoming regulations and incentives but also provide you with a key tactic for achieving ESG objectives, improving regional air quality and meeting larger net zero goals.

We must, of course, promote active travel such as walking and cycling as an alternative to car use which will reduce congestion and CO2 emissions further and provide greater benefits to improve quality of life. Mobility decarbonization through electrification is just one way to reduce CO2 emission globally from transportations and must apply to all forms of transportations from bus and coach, LGV and HGV, to trains and the aviation and the maritime sectors. Hydrogen will have its place in many of these sectors and the business case for alternative fuels will change over time which must be assessed. We will see other new technologies provide opportunities for reducing congestion and CO2 emissions, and we must also carefully and continually assess the true impact of these just as is needed with electrification which relies on the energy sector, accelerating the transition from burning fossil fuels to renewable energy generation. We hope that you find the Charging Infrastructure Investment Comparison Tool useful to compare the progress of mobility decarbonization being made across the globe.

### Our capabilities

We help the public and private sector bring their EV visions to life with support for every phase of the journey from strategy building to executing fleet implementations and charging infrastructure construction to the supply, operation and maintenance of the infrastructure. The variety of projects that we have been involved with provides unique insight into what's hindering global EV adoption and how to get on the path to a successful EV transition.

For more on how we can help with EV and charging infrastructure strategies, fleet transitions and charging network implementations, connect with us today.



# Methodology

As the world advances toward the future of clean energy emission and countries transition to EVs, Arcadis identified four influential categories that can help measure the maturity of EV markets across the globe: government leadership and incentives, charging infrastructure, returns potential, and ease of doing business.

Following a workshop and numerous interviews and engagement with multiple members of WBCSD, the parameters were validated, a scoring matrix was developed and organized, and data available publicly from multiple sources was put together by our research team. All research was then validated by Arcadians from countries assessed in the study and other members of WBCSD.

The data gathered was used to measure the performance of each country against the scoring matrix developed. The results were studied and reviewed and developed into an assessment for each country defining their achievements in transitioning to EVs and opportunities moving forward.

Members and organizations that contributed in the workshop and in interviews included: Arcadis, Comfortdelgro, Dalooop, EATON, EBRD, IEA, ENEL, E-REDES, RAP, DIDI and in-country validation from Arcadians around the world.

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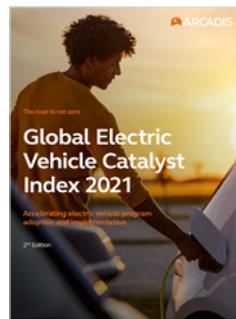
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