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Towards Sustainable, Low-Carbon Road Transport: Implications from Norway's EV Deployment

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SYNOPSIS

The widespread adoption of electric vehicles (EVs) depends on interactions between government policy, technological development, infrastructure, and consumer acceptance. Norway provides a useful case for this interaction, having transformed from a country with negligible EV adoption in the early 2000s to a global leader, with more than 95% of new passenger car registrations in 2025. This Policy Brief examines Norway's EV deployment experience, from the early stages of market creation to rapid expansion and recent policy recalibration. Then, it draws implications for Singapore's transition towards a sustainable, low-carbon road transport sector.

KEY POINTS

- In Norway, a combination of technological improvements, strong financial advantages, and extensive charging infrastructure enabled rapid market expansion.
- The scale-down of government support does not necessarily result in an EV adoption reversal in mature EV markets, but such incentive reductions may need careful timing and planning.
- To ensure a sustainable road transport sector, EV adoption should go with Singapore's existing car-lite strategy and cleaner electricity expansion.

INTRODUCTION

Electric vehicles (EVs) have been considered a crucial component of road transport decarbonisation strategies, as they replace conventional internal combustion engine vehicles (ICEVs). Since the Zero Emission Vehicle Pledge at COP26 in 2021, many governments have announced plans to phase out new ICEV sales by 2035–2050 and promoted EV deployment. Singapore also set targets to have all vehicles run on cleaner energy by 2040 and deploy 60,000 EV charging points nationwide by 2030, as part of its Green Plan 2030. Supported by financial incentives and expanded charging infrastructure, EVs (45%) overtook petrol-electric hybrids (38.8%) and petrol cars (14.5%) in new passenger car registrations in 2025 for the first time. However, EVs still represent only 7.4% of total passenger cars, and the pace of growth may slow as government financial incentives are progressively scaled back.

Against this background, this Policy Brief examines Norway's EV transition and its implications for Singapore. Although the two countries differ substantially in geography, energy systems, and transport patterns, their similar policy approaches allow Norway's experience, from early market creation and rapid expansion to incentive withdrawal and market maturity, to provide lessons on how policy can evolve alongside technological progress and changing consumer behaviour, as well as the broader challenges that emerge once EV adoption becomes widespread.

ANALYSIS

Low EV Adoption Until 2010: Policies for Market Creation, But Immature Technology

Norway's EV journey began in the early 1990s, motivated by environmental objectives and efforts to foster domestic technological innovation. The government provided an EV manufacturer, PIVCO (later rebranded as TH!NK), with funding for developing prototype

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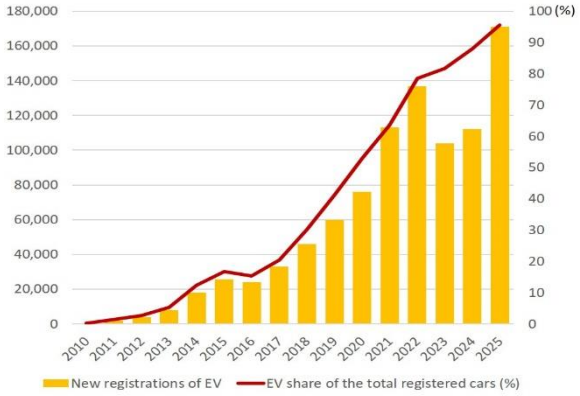
EV models, and rolled out a series of fiscal incentives for EV owners, such as exemptions from and discounts on vehicle purchase tax (1990), annual road tax (1996), and road tolls (1997). Nevertheless, EV adoption remained negligible. In 2010, only 355 EVs (0.3% of new passenger car registrations) were sold (Figure 1). The principal barrier was not a lack of policy support, but technological immaturity, including very short driving ranges, long charging times, and high battery costs. Moreover, the anticipated mass production of Norwegian EVs did not materialise due to the bankruptcy of TH!NK. Hence, EVs remained expensive and impractical for most consumers. Overall, Norway's early experience demonstrates that financial incentives alone are insufficient to stimulate widespread EV adoption in the absence of viable, mature technology.

Figure 1. Norway's EV deployment



Source: Authors' illustration based on Norwegian Public Roads Administration (2026).

Rapid Growth until the Early-2020s: Removing Financial and Psychological Barriers

Norway's EV market changed dramatically in the early 2010s. Lithium-ion battery prices, which constitute a substantial share of an EV's price, dropped dramatically between 2009 and 2012, from 1,324 USD/kWh to 589 USD/kWh, while new models such as the Nissan Leaf and Tesla Model S resolved many of the shortcomings of earlier vehicles by offering longer ranges and improved performance and reliability. These technological developments made EVs increasingly viable for mainstream consumers. Norway reinforced these improvements with policies that made EVs financially attractive relative to ICEVs. While ICEVs in Norway were subject to substantial purchase taxes based on emissions, weight, and engine power, EVs were exempt from purchase tax, 25% value-added tax (VAT), and registration tax. EV owners also received user benefits including exemptions from road tolls and ferry charges, free parking in municipal parking spaces, and permission to use priority bus lanes. Combined with relatively low electricity prices and high fuel taxes on fossil fuels, these measures substantially reduced the total cost of ownership (TCO) of EVs, which covers purchase, fuel, and maintenance costs, as well as the value of user advantage incentives. By 2012, EV TCO had fallen below that of both new and three-year-old ICEVs. Besides, Norway began subsidising public chargers in 2009 and launched a nationwide campaign in 2015 to ensure that all major roads and highways have fast chargers every 50 km. The number of public charging stations reached around 3,000 in 2011 and around 24,000 in 2022, with more than 9,000 fast chargers. Home charging was also encouraged with support for chargers in apartment buildings and legal rights for tenants to install charging points. These measures alleviated range anxiety and made EV ownership more practical by creating a dense, reliable charging network across the country.

The combination of technological maturity, economic competitiveness, and accessible charging transformed consumer behaviour. Annual EV registrations increased from 3,925 in 2012 to 136,885 in 2022, raising EVs' share of new passenger car registrations from 2.8% to 78.5% (Figure 1). Norway therefore illustrates that rapid adoption occurs when policies address both economic and psychological barriers, rather than relying solely on purchase incentives.

Slower Pace But Continued Growth in the 2020s: Policy Rollback and Market Maturity

As EV adoption accelerated, generous incentives made fiscal and transport-related trade-offs. A surge in EV sales, coupled with declining ICEV sales, eroded revenue from vehicle purchase taxes and fuel excise duties, which had traditionally been important sources of the government's revenue. Meanwhile, some EV usage benefits, such as unrestricted bus lane access and free tolls and parking, made EV ownership more attractive than public transport for commuters. To

address these unintended consequences, Norway began recalibrating its policies. Since 2017, local authorities have reduced parking and bus-lane privileges. Full ferry and road-toll exemptions were replaced by discounts: 50% in 2018 and 30% in 2023. Furthermore, EV purchase tax advantages have gradually been withdrawn. In 2023, Norway introduced the 25% VAT on EVs priced above 500,000 NOK (approximately 52,400 USD) and a weight-based purchase tax of 12.5 NOK/kg (1.3 USD/kg) on EVs over 500 kg. The VAT-free threshold fell to 300,000 NOK (31,500 USD) in 2026 and is scheduled to disappear in 2027. Also, EVs became subject to the full annual Road Traffic Insurance Tax, set at 3,270 NOK/year (343 USD/year). In brief, EVs are gradually integrated into the standard vehicle taxation system rather than being treated as a significantly subsidised technology.

Importantly, this rollback of policy support has not reversed the transition. Although annual registrations fluctuated, EVs' share of new passenger car registrations continued to increase from 78.5% in 2022 to 95.5% in 2025 (Figure 1). A sharp fall in registrations in January 2026 (2,071 cars) followed exceptionally high purchases in December 2025 (33,964 cars) ahead of changes to VAT incentives, but registrations recovered in March 2026 and remained above the corresponding monthly levels recorded in 2024 and 2025. This resilience reflects market maturity. First, EVs became increasingly affordable even without full financial incentive packages. Between 2012 and 2022, EV battery costs dropped by nearly 75%, while petroleum and diesel prices in Norway increased by 36-56%. Second, Technological improvements also diminished concerns over range and charging. Third, the government's consistent long-term policy commitment, including its target for all new cars sold from 2025 to be zero-emission, provided consumers with a credible signal that ICEVs would become obsolete and helped them make purchasing decisions based not only on current costs but also on future market and policy expectations.

Remaining Challenges

Despite its success, Norway has not completed the electrification of its road transport. EVs dominate new registrations but represented 32.1% of the passenger car stock in December 2025, compared with 32.4% for diesel vehicles and 23.8% for petrol vehicles. Therefore, fleet turnover remains important, particularly as EV tax incentives are withdrawn. The challenge is even greater for heavy-duty vehicles. In 2025, EVs accounted for only 9.1% of registered buses, trucks, and vans, compared with 86.7% for diesel vehicles. As these heavy-duty vehicles often require larger batteries, longer driving ranges, and higher charging capacities, achieving deeper decarbonisation of the transport sector may require new targeted policies, technological innovation, and increased investments.

More fundamentally, Norway has been less successful in reducing private-car dependence. Rather, earlier incentives made private EV ownership increasingly attractive, and some suburban residents switched their mode of commuting from public transport to private vehicles. The increase in the number of registered passenger cars from 2.5 million in 2012 to 2.9 million in 2025 suggests that new vehicle purchases outpace the retirement of older vehicles. As long as the new cars are EVs, this expansion may not be a major problem for Norway's emissions, since nearly 99% of its electricity comes from renewable sources. Indeed, Norway's emissions from the transport and electricity/heat generation sectors were reduced by 2.3 $MtCO_2e$ and 1.3 $MtCO_2e$, respectively, between 2012 and 2023. However, EVs do not eliminate congestion, land requirements for roads and parking, or resource use associated with vehicle production. Thus, to build a more sustainable transport system, Norway's future transport policy will need to strike a balance between promoting EVs and encouraging behavioural change to greater use of public transport, cycling, and walking.

Implications for Singapore

Since Norway and Singapore differ significantly in geography, energy systems, and regulatory arrangements, replication of Norway's policies is not an appropriate approach. Nevertheless, given their similar policy trajectories, Norway's experience could offer several implications for Singapore. Like Norway, Singapore is moving towards a model in which EV adoption is expected to rely progressively less on financial incentives. Singapore has implemented various support

measures for EVs while expanding charging infrastructure, and recently is gradually reducing EV subsidies. Between 2023 and 2025, Singapore's EV Early Adoption Incentive lowered the rebate cap on the Additional Registration Fee from 20,000 SGD to 15,000 SGD. The cap fell to 7,500 SGD in 2026, with the scheme scheduled to end in 2027. The Vehicular Emissions Scheme is also being restructured so that only pure battery EVs qualify for rebates from 2026.

Norway's experience suggests that such policy recalibration does not undermine EV adoption once the market has reached sufficient maturity. However, it also highlights that the incentive withdrawal should be accompanied by continued efforts to address underlying barriers to adoption. EY's 2025 Mobility Consumer Index implies that Singapore's EV market may not yet have reached the same level of consumer confidence as Norway. 32% of 300 surveyed Singapore consumers intending to purchase a vehicle within two years planned to choose an ICEV, up from 26% in 2024. Respondents expressed concerns over charging availability and interoperability, battery replacement costs, and other hidden costs. In this sense, with a decline in financial support, policy attention should increasingly focus on addressing these concerns by improving the availability and reliability of charging infrastructure and battery durability with a credible policy signal favouring zero-emission vehicles.

Norway also shows that EV adoption should not be treated as synonymous with sustainable mobility. This distinction is particularly important for Singapore given its land constraints and heavy reliance on gas-fired power generation. Simply replacing ICEVs with EVs would not significantly reduce land-use pressures and national emissions, since EVs still require space for charging and parking and their lifecycle emissions are tied to the carbon intensity of power generation. Thus, EV policy should be embedded within Singapore's broader car-lite and energy transition strategies. Existing measures, such as a vehicle quota system via the Certificate of Entitlement, road pricing, an extensive public transport system, and the promotion of active mobility, provide important mechanisms for pursuing transport decarbonisation without encouraging growth in private vehicle dependence. In addition, continued grid decarbonisation is essential, as the climate benefits of EVs are amplified when EVs are charged with clean power.

CONCLUSION

Norway's EV transition demonstrates that successful market transformation requires policies to evolve alongside technological and market maturity. At the same time, its experience also reveals the limitations of focusing primarily on vehicle electrification. For Singapore, the central lesson is therefore not to replicate Norway's individual policies, but to adopt a similarly adaptive approach. Financial incentives can be progressively recalibrated as the market matures, while continued investment in charging infrastructure, consumer confidence, car-lite mobility, and power-sector decarbonisation will remain important for achieving broader transport sustainability.

WHAT TO LOOK OUT FOR

- EV sales and shares in the two countries after phasing out financial benefits
- Changes in consumer perception of EVs in the next Mobility Consumer Index report
- Correlation between emissions from transport and power generation in Singapore

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