

Norway's Remarkable Adoption of Electric Vehicles

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On my honor as a University Student, I have neither given nor received unauthorized aid on this assignment as defined by the Honor Guidelines for Thesis-Related Assignments

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How has the Norwegian Parliament driven Norway's wide-scale adoption of EVs?

Abstract

Norway leads the world in Electric Vehicle (EV) acceptance. The Norwegian Parliament's sweeping policy changes caused Norway's electric revolution. Electric vehicles are a key component in avoiding climate change's most severe repercussions. Government policy is necessary to drive electric vehicle adoption and transportation reform as electric vehicle implementation is not practical everywhere and is not the sole solution. Climate change requires restructuring of transportation technology and culture – that restructuring begins at the government level. Norway is a shining example of what is possible when governments rise to avert environmental disaster; the rest of the world ought to follow suit.

Introduction

Our way of life is putting the planet, the environment in jeopardy. Worldwide, vehicle emissions account for 14% of greenhouse gas emissions (EPA, n.d.). Electric vehicles pose an option for lowering transportation's carbon footprint. In Norway, electric vehicle sales have been rising exponentially since the early 1990s – they accounted for 65% of new vehicle sales in 2021 (Hurdle et al., 2022). Yet elsewhere, electric vehicles are struggling to gain traction or legitimacy in consumers' eyes.

Electric vehicles produce fewer greenhouse gas emissions than internal combustion engine vehicles and they are more simple and cheaper to operate as they have fewer moving parts. Despite their benefits, electric vehicles have a low take rate in the developed world. Range anxiety, steep prices, lacking infrastructure, etc. are hindrances to the widespread acceptance of electric vehicles. The Norwegian Parliament's success story in electric vehicle adoption is one involving cultural shifts and socioeconomic incentives – it can serve as a template for the rest of the world. Norway's adoption of electric vehicles proves the notion that government intervention is necessary to push green transportation to consumers and avoid the most severe effects of climate change. Allowing the shift to green transportation to occur naturally through social networks and peer effects would take too long.

Still, the key to a less carbon intensive future in transport involves more than just electric vehicles. Norway's success is a result of Norway's distinctive circumstances – Norway's abundance of clean domestic energy, Norwegian's collective wealth from the nationalized oil industry – Norway's methods are not necessarily applicable everywhere. Adopting simpler, greener transportation options is possible everywhere though. Options such as bicycling or clean mass transit are vital as electric vehicles are prohibitively expensive for many, require sweeping

infrastructure development and produce emissions during production, disposal, and material sourcing.

Norway's story is imperfect in that electric vehicles are an imperfect solution to the transportation problem, but Norway's story still exemplifies successful, if incomplete, transportation reform for tomorrow. The world's developed nations ought to follow a modified version of Norway's example, emphasizing overall low carbon transportation, through incentives and reformation of social norms.

Methods

Participants

Participants include Norway's electric vehicle drivers and internal combustion engine vehicle drivers – the Parliament's main targets (Egbue & Long, 2012; Haugneland & Kvisle, 2015). Government agencies in Norway such as the Energy Administration which is composed of both the Ministry of Petroleum and Energy (MPE, 2016) and the Ministry of Climate Environment (MCE, n.d.) among others, are other players responsible for the development and implementation of the incentives and programs encouraging electric vehicles. Trade associations and interest groups such as the Norwegian Electric Vehicle Association (NEVA, 2021), the Bellona Foundation (Bellona, n.d.), and the Norwegian Automobile Federation (NAF, n.d.) are also participants officially supporting Norway's driver subgroups' interests.

Sources of Research

Past researchers' findings, Norwegian Parliamentary agencies and groups, Norwegian social interest groups and agencies, interviews conducted by past researchers, and groups in conflict with the push for electric vehicle adoption in Norway were cited. Statistics on electric

vehicle adoption rates around the world highlighted Norway's success. Issues with electric vehicles and stories of green transport implementation outside of Norway also contributed.

Motivation for Research

The sources demonstrate the impact of social factors, government incentives and actions, people's responses, and the actions of organizations. The statistics underscore Norway's unique situation, drawing comparisons to other countries. Electric vehicles' downsides and accomplishments made by other nations present necessary green transport innovations not seen in Norway.

Results

The incentives and social efforts employed by the Norwegian Parliament, beginning in the 1990s, drove the widespread adoption of electric vehicles. The incentives have made electric vehicles cheaper than comparable internal combustion engine vehicles; because of them, Norway is nearing their goal for all new vehicle sales to be electric by 2025.

The Incentives

Since 2019, local municipalities and county governments have not been able to charge electric vehicle drivers more than 50% of the internal combustion engine vehicle cost for local ferries, parking, and tolls (Norsk elbilforening, 2021). The Parliament implemented a minimum of two fast charging stations every 50 km on all public roads beginning in 2017 to support those fearing lackluster infrastructure (Norsk elbilforening, 2021). Factoring in vehicle weight, carbon dioxide and nitrogen oxide emissions, Norway's 'The Polluter Pays Principle,' a measure with multi-party support, has made taxes higher for polluting vehicles than for zero emission vehicles. The progressive tax factors many vehicle aspects but has more recently emphasized emissions (Norsk elbilforening, 2021).

Other Norwegian electric vehicle incentives include: no purchase/import taxes (1990-); exemption from 25% VAT (Value Added Tax) on purchase (2001-); no annual road tax from 1996-2021, reduced annual road tax from 2021, and full annual road tax from 2022; and access to bus lanes for electric vehicle drivers (2005-). The government has also implemented a 50% reduction in company car tax (2000-2018), down to 40% from 2018 to 2022 and a 20% reduction from 2022 on. There is also a 25% VAT exemption on leasing (2015) and a fiscal compensation for the scrapping of fossil-fueled vans when converting to a zero-emission van, implemented in 2018.

How It Has Worked

Norway was able to successfully steer the course of the state of electric vehicles in the country from being a niche transportation option to being the norm. Through polls in 2013 and 2015, Ingeborgrud and Ryghaug (2019), found “...practical as well as symbolic dimensions...important for BEV (Battery Electric Vehicle) adoption.” Both the incentives and the advantages of electric vehicles (lower operating costs and environmental benefits) constituted the practical dimensions driving electric vehicle adoption. Publicity stunts and changing social norms hypostatized the symbolic dimensions.

The Norwegian rock band A-ha, with the Bellona foundation, coordinated an EV-centric publicity stunt in 1989. They drove an electric-converted car around Oslo, parked illegally, drove in bus lanes, and neglected tolls. The press covered their antics extensively and their message – that electric vehicles should be exempt from public usage costs – sparked an electric vehicle revolution.

Social networks, also called ‘peer effects,’ play a role in technology adoption (Wee et al., 2017). For electric vehicles, it begins with one owner. That person having an electric vehicle

piques others' curiosity and purchasing decisions. A '...willingness to take a chance...significantly increase[d] the likelihood of owning an EV" found Orlov and Kallbekken (2019). Electric vehicles have become a lifestyle norm in Norway.

Norway adapted and developed policy around distinct driver subgroups. A vast charging network, incentives and changing social norms mitigate anxiety about electric vehicle range, affordability, or unfamiliarity. Reduced travel times, taxes, and fees benefit "Utilitarian Savers," seeking savings (Burs et al., 2020). The instant torque and quick acceleration delivered by electric vehicles serve "Performance Seekers," desiring driving pleasure (Burs et al., 2020). The zero emissions produced by EVs and Norway's 98% renewable energy grid (MPE, 2016) comfort "Green Technologists," who value environmental prosperity (Burs et al, 2020).

Issues

Electric vehicles in Norway may be appealing to all; still, opposition the Parliament's decisions and facilitation of electric vehicle adoption exists. Financial incentives diminish the income normally used from tolls, taxes, etc. to fund governments and infrastructure, convenience incentives can increase congestion and public transit travel times especially during rush hour times. Aasness and Odeck (2015) argue that such losses are unacceptable. They are, however, necessary – reducing GHG emissions is vastly more important than profit.

Yet, Norway's Oil and Gas Industry generates Norwegians' collective wealth. A major oil exporter, Norway uses dirty wealth to support green ambitions. The Parliament overall strives for cleaner Norwegian air but the Oil and Gas Industry, a Parliament subsidiary, supports further development of fossil fuel technology abroad.

Other skeptics may contend that electric vehicles present no tangible environmental benefit over internal combustion engine vehicles. A vehicle's lifecycle emissions incorporate

production, operation, and supply emissions. Electric vehicle's production emissions are greater than that of a gas vehicle. However, electric vehicles produce zero operation emissions while internal combustion engine vehicles in operation pollute constantly. Supply emissions – from electricity production – are the only emissions electric vehicles can claim during operation. Even in dirty grids, the average electric vehicle is cleaner (DOE, n.d.) and Norway's grid being 98% renewable weakens skeptics' arguments further.

Notwithstanding, electric vehicles in Norway and elsewhere have other, less apparent problems. Electric vehicle batteries require rare earth, heavy metals for their production. Sourcing these metals often comes with negative impacts to local communities, peoples, and land. Cobalt (a vital metal in EV batteries) extraction, for instance, is a major business in the Democratic Republic of Congo where there are enormous mines filled with men, women, and children digging through the ground with their hands. Battery, electric vehicle, and other technology companies profit from the cheap, almost indentured, labor, and availability of land (Tsurukawa, et. al, 2011). Similarly, Lithium mining in Chile's salt flats affects the purity and availability of groundwater around the extraction sites and spreads outwards to the neighboring communities. These communities are vulnerable to long-term impacts caused by "...mismatched evolution of aquifer and social dynamics." (Liu & Agusdinata, 2021). As the electric vehicle industry grows, the world's extractive industries will follow, accompanied by widespread environmental and socio-economic damage to the mining regions.

EV batteries pose another issue at the end of their lifecycle. Battery duty cycles cause degradation, causing the vehicle's range to diminish. Once the range becomes unacceptable, batteries need replacement. Batteries discarded in landfills can release toxins and heavy metals yet currently, recycling is not a significant motivation in battery design and current Lithium-ion

battery recycling technologies produce extensive waste and greenhouse gas emissions (Morse, 2021). Advances in battery recycling, repurposing, or remanufacturing are necessary to avoid discarded batteries and/or the overproduction of batteries and the resulting pollution, environmental, and societal damage.

Analysis

Why It Has Worked

The incentives had the most significant impact on electric vehicle adoption in Norway. Bjerkan et al. (2016) determined that financial incentives were most significant. Norway's population is 83% urban (Worldbank, n.d.) and for city drivers, convenience incentives (bus lane access, toll exemptions, etc.) were decisive. Despite its high urbanization, Norway's population centers are unattached, and their overall population density is just 14.73 people per square kilometer (Kansas – 13.9 people/sq. km, Utah – 15.4 people/sq. km) making adequate charging infrastructure vital (Worldbank, n.d.).

Norway's situation is unique: it is one of the largest exporters of oil per capita (EIA, n.d.) and its oil industry is state-run yielding Norway the world's sixth highest GDP per capita (PPP) (Wikipedia, 2022). Because of the state control, Norwegian's have a collective wealth that has allowed people the financial ability to purchase new electric vehicles and the Parliament to spend and even lose money on incentives and programs aiding electric vehicle adoption.

Also unique is Norway's geography; the prevalence of fjords (long, deep inlets of the sea between high cliffs) has sustained Norway's energy grid through hydroelectric power making Norway's energy 98% renewable. Electric vehicles are more environmentally friendly in Norway as, even in dirty electricity grids, they are cleaner than internal combustion engine vehicles (DOE, n.d.).

The Role of Norwegian Organizations

Norwegian people and their representative interest organizations steered Norway's electric vehicle revolution, lobbying the Parliament for climate-first policy, and giving the people a voice. The Norwegian Electric Vehicle Association (NEVA), lobbies for electric friendly infrastructure and policy (Norsk elbilforening, 2021). Bellona works for and with the people, for green energy and against those in opposition and the Norwegian Automobile Federation, an association of Norwegian drivers, works in their interests (Bellona, n.d.; NAF, n.d.).

Why It Has Not Worked Elsewhere

The combination of wealth and abundance of clean energy found in Norway is rare currently. Norway's Parliament and the people they govern have aggressively championed electric transport for three decades while countries less privileged are just now entering the industrial age that 'the West' entered in the 18th century.

The United States surpasses Norway in population density (Norway: 14.73 people/sq. km, U.S.A.: 36.02 people/sq. km (Worldbank, n.d.)) and is similar in urbanization though electric vehicles makeup just 3% of the new vehicle market (Kane, 2021). The reason is culture. The transportation infrastructure and culture in the United States is car-friendly and pedestrian-hostile, it favors individualized transportation options over less-carbon intensive shared transportation options. Zoning in the U.S. also favors cars over buses, trains, walking, bicycling or anything else which is something that needs to change. Individual freedom is paramount in, and exploration is a fabric of American culture. Americans' rigid, conservative-leaning political views, the slow-moving bureaucratic government, and the gas-guzzling American vehicle lobby's strength paint the picture of failure in the U.S. – one common in the developed world.

In countries that lack economic and manufacturing power, there is little ability to purchase new electric vehicles or overhaul infrastructure. For emerging economies, Norway's success model loses relevance. Norway's government has been progressive in implementing policies to drive EV acceptance, but the foundation of their success is a combination of Norwegians' collective wealth and their abundance of green energy. For developing nations, EV adoption like that seen in Norway, is not possible. Green energy and transportation in developing countries is an unlikely priority – developing nations focus on economic growth through industrialization and resource extraction often without great consideration of environmental impacts. While Norway is also imperfect in this regard, their model of government intervention to drive environmentally friendly reform remains relevant, though its application differs.

Discussion

Incentives, organizational effort, and social networks are necessary to effect electric vehicle adoption. The climate emergency is too dire to allow markets and peer effects to work alone, government intervention is required and its associated policies must be suited to the region and its people. Aasness and Odeck (2015) contend that "...Norwegian incentives have led to adverse effects and should not be copied by other countries..." Such arguments originate from an unaffordable profit centric mindset. The gravity of climate change demands a common environmentalist perspective and through this, Norway's model is applicable elsewhere, with modification.

Modification is the key word; Norway's situation is unique. For electric vehicles to become legitimate, developed countries need to source the rare earth metals needed ethically – without damaging ecosystems or abusing local societies. Wealthier countries (e.g., the United States, United Kingdom, European Union, Australia, Canada, etc.) have this ability. Less

privileged nations need the economic and material support of the wealthier to succeed. However, considering the complex and political event of radical economic globalization, this presently seems unlikely.

In parts of Europe and Asia, low-carbon transportation is already the norm. In The Netherlands for example, comprehensive infrastructure favoring walking and riding over driving sustains bicycling. It has been popular in Holland since pre-WWII. Cars gained traction in the 1960s until the Middle East oil crisis in 1973 and a campaign against cars, for bicycling emerged called “Stop the Child Murder” (after a fatal motor vehicle accident involved a child) moved bicycles back to favorability. Parents encourage Dutch children to learn to cycle early on, streets have bike lanes sometimes wider than car-lanes with roundabouts for easy travel, and large bicycle parking stations are frequent. Just as Americans, Canadians, and others tie themselves to their automobiles, the Dutch are with bicycles; one said, “We aren't cyclists, we're just Dutch,” (BBC, 2013).

Holland's story is like that of Sweden, Denmark, Austria, and in Japan, China, and others' green transport in the form of high-speed rail. The commonalities are adequate mass transit and lower car-reliance making Norway's story an imperfect one – Norwegians still rely heavily on cars and fund their efforts with Oil and Gas exports. The Norwegian Parliament still deserves praise: they implemented wide-scale transportation reform, taking steps towards a greener future. The rest of the world's governments ought to follow suit and strive to reform transportation with electric vehicles *and* green mass transit, bicycling, etc. Low carbon transport is not a cultural phenomenon unique to select locales, it is possible everywhere – if the supporting infrastructure is built, people will come.

Complete decarbonization of transportation with electric vehicles alone is not feasible. It is mandatory to reform the funding behind and perception of transportation— green mass transit, cycling etc. are the simpler yet cleaner answer. Such simple transport options were commonplace in U.S. cities in the mid-20th century and are common in places like the Netherlands today; they are much easier to implement in less wealthy nations than EVs with their prohibitive cost to purchase and implement. It is unlikely that EVs will become the norm beyond wealthy, advanced nations but transportation decarbonization is possible using simpler, cheaper, already available options. Norway’s success story is one unique to Norway but the way they succeeded is applicable everywhere.

Christina Bu, the secretary general of the Norwegian Electric Vehicle Association, stated for *TIME*: “Half a million people in Norway now drive EVs. I met one...recently...he just turned 100 years old. He bought his first EV when he was 99 and uses it to take his 103-year-old sister on Sunday trips.” (Bu, 2022). If, in a sparsely populated, frigid environment, a 100-year-old man can live with an electric vehicle, others can. If a government can rise and take steps to avert the worst consequences of climate change by upheaving national infrastructure and travel culture, all developed countries can. The model of personal, carbon intensive transport is not sustainable. Norway’s electric vehicle revolution was possible because of Norway’s unique situation but every country has a unique situation presenting opportunities for green transportation revolutions. Successful decarbonization of travel will take global effort, social movements, and government action: it is possible, it just needs to happen.

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