Survey of Global Activity to Phase Out Internal Combustion Engine Vehicles

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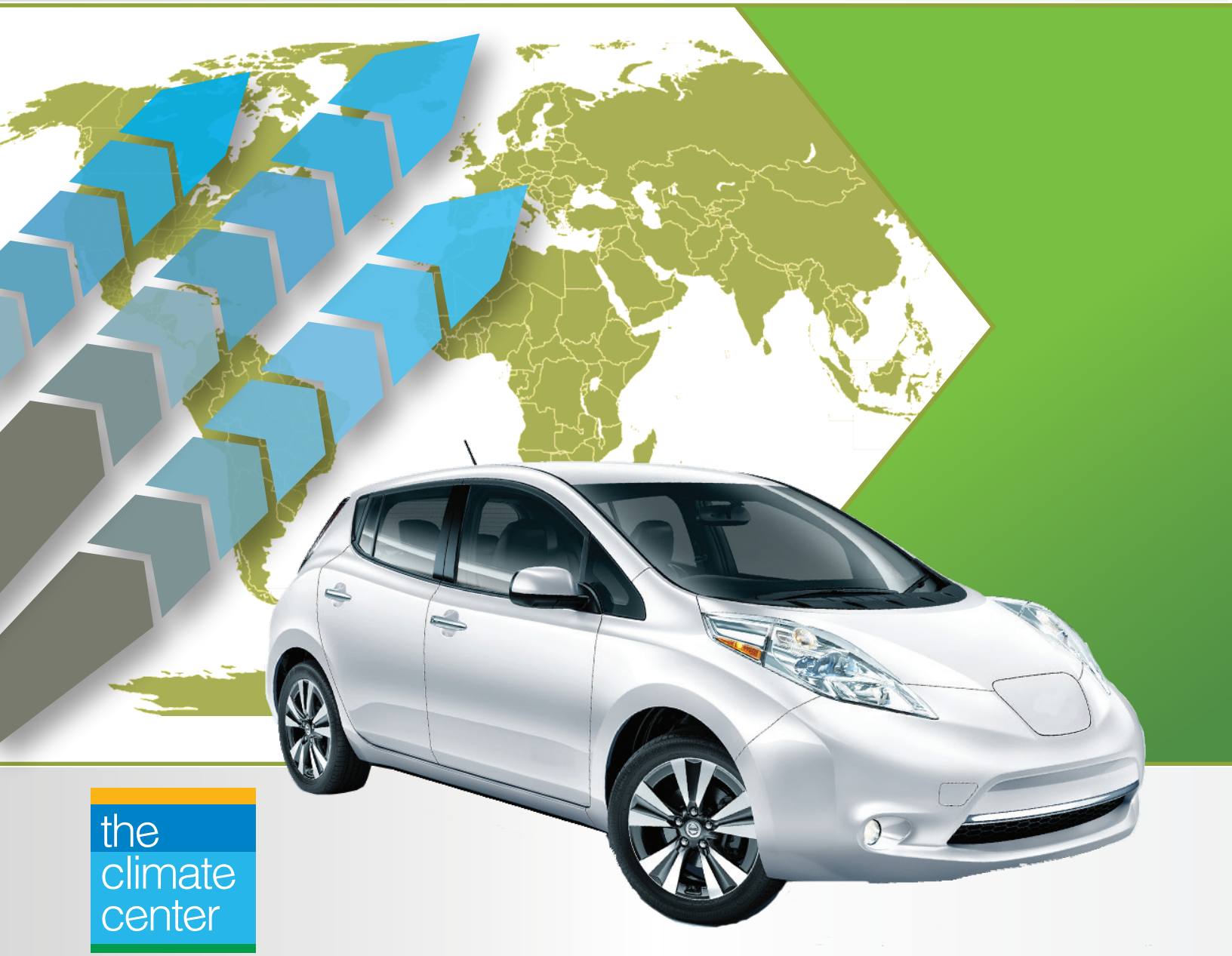

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Foreword

The Climate Center's "Survey on Global Activities to Phase out ICE Vehicles" was born as an effort to support State Assemblymember Phil Ting's Clean Cars 2040 policy effort. As part of a coalition of non-profits working to support the bill, we observed two phenomena. First, critics claimed that the political will to ban internal combustion engine (ICE) vehicles did not exist. Second, a database compiling the actions of national, state, municipal governments, as well as private industry efforts, to electrify vehicles did not exist. We produced the first version of the survey in the spring of 2018, which was met by enthusiasm from our partners in reducing greenhouse gas emissions in the non-profit and political spheres, in particular.

Since we published the first version in early 2018, countries, cities, and companies have joined the growing list of entities committing to an electrified vehicle fleet. This topic was a major focus of the 2018 Global Climate Action Summit in San Francisco, California, where we shared the first update to the survey.

As the technology behind electric vehicle batteries improves and becomes more affordable, and as the need to reduce transportation sector emissions becomes more dire, the demand for this body of evidence has grown. We will continue to release periodic updates to the survey, especially as implementation strategies for electrifying vehicle fleets become a reality.

The "Survey on Global Activities to Phase out ICE Vehicles" represents a piece of The Climate Center's Climate-safe California - rapid decarbonization campaign. The Climate Center's mission is to deliver speed and scale solutions to the climate crisis, starting in California. Our goal is to achieve an 80% emission reduction below 1990 levels, net zero emissions by 2030, and net negative emissions by 2035. To reach these urgent, science-based goals, we must:

1. Create 100% GHG-free, clean, distributed, resilient energy & storage by 2030
2. Achieve 80% sustainable mobility by 2030, including phasing out fossil fuel-powered vehicles starting in 2025
3. Sequester 100+ MMT of additional CO2e per year through healthy soils and vegetation management by 2030
4. Fund implementation of resilience measures by 2025 including clean energy community microgrids with EV storage in every community starting in 2021
5. Enact multiple green financing mechanisms to generate the funding required to pay for these urgent efforts by 2025

The push to electrify transportation will continue as we work together to transition our economy, our personal practices, and our politics. We welcome your questions and updates as we strive to support speed and scale solutions with the best information available. Future updates to the "Survey on Global Activities to Phase out ICE Vehicles" will be shared at theclimatecenter.org.

Introduction

In light of the Paris Climate Agreement, pollution-related deaths and illness, and magnified devastation from extreme weather, global leaders are pushing to phase out fossil fuel-powered vehicles, which are major contributors to air pollution and climate change. China, Britain, France, India, and other nations have announced plans to phase out vehicles with internal combustion engines (ICE vehicles) and incentivize electric vehicle (EV) use at the national level. Meanwhile, some cities have passed measures to eliminate ICE vehicles within their boundaries by the end of this decade.

Analysts at the World Bank note that such policy moves are an important step toward pollution reduction: "While new technology adoption is traditionally viewed as a matter of private individual choice or consumer preference, today new technology and innovation are increasingly adopted in public policy agendas by governments to actively address sustainable development challenges."[1]

At the beginning of January 2018, California Assemblymember Phil Ting introduced Assembly Bill 1745, the Clean Cars 2040 Act, to ban the registration of new ICE passenger vehicles in the state of California starting in 2040. His bill joins the ranks of initiatives taking off in states including Washington and Hawaii. This survey offers an examination of international policy and market-based momentum to phase out ICE vehicles in light of these developments.

Actions by Countries

Sixteen countries have taken varying types of action to phase out ICE vehicles and increase the number of EVs, as illustrated in the following table.

Country[2]	Status of ICE Vehicle Phase-Out	Date of Action
Austria	Official target: No new ICE vehicles sold after 2020[3] [4]	April 2016
Britain	Official target: No new ICE vehicles sold after 2035[5]	February 2020
China	No official target stated[6]	September 2017
Costa Rica	70% of buses and 25% of cars electric by 2035[7]	Since 2019
Denmark	Official target: No new ICE vehicles sold after 2030[8]	Since 2019[9]
Egypt	Official target: No new ICE vehicles sold after 2040[10]	November 2018
France	Official target: No new ICE vehicles sold after 2040[11]	July 2017
Germany	No registration of ICE vehicles by 2030 (passed by two Legislative chambers); cities can ban diesel cars;[12] Federal court ruling supports law[13]	October 2016
Iceland	Official target: No ICE vehicles registered after 2030[14]	September 2018
India	Official target: No new ICE vehicles sold after 2030 (will likely hit 30% by 2030)[15] [16]	April 2017
Ireland	Official target: No new ICE vehicles sold after 2030[17], incentive program in place for EV sales[18]	July 2017
Israel	Official target: No new ICE vehicle imports after 2030[19]	February 2018
Japan	Incentive program in place for EV sales[20]	Since 1996[21]
Netherlands	Official target: No new ICE vehicles sold after 2030, phase-out begins 2025[22]	October 2017
Norway	Official target: No new ICE vehicles sold after 2025[23]	Since 2016
Portugal	Official target and incentive in place for EV sales[24]	Since 2010[25]
Scotland	Official target: No new ICE vehicles sold after 2032[26]	September 2017
Slovenia	Official target: Ban the registration of ICE vehicles after 2030[27]	October 2017
South Korea	Official target: EVs account for 30% of auto sales by 2020[28]	June 2016
Spain	Official target: Ban sale of ICE vehicles after 2040[29]	November 2018

Sri Lanka	Replace all state-owned vehicles with electric or hybrid models by 2025, a move that will be extended to private vehicles by 2040[30]	November 2017
Sweden	Official Target: Phase out ICE vehicles after 2030[31]	Since 2019
Taiwan	Official target: Phase out fossil fuel-powered motorcycles by 2035 and fossil fuel-powered vehicles by 2040.[32] Additionally, the replacement of all government vehicles and public buses with electric versions by 2030.[33]	December 2017

Very few countries have taken legislative action regarding incentive programs or ending ICE vehicle sales, and the legislative action that has passed is non-binding. In most countries, agency ministers announce targets and pledges. As noted in The Economist, "Despite talk about national bans – this year Britain and France have said that by 2040 new cars completely reliant on petrol or diesel will be illegal – no country has passed concrete legislation to implement a ban."[34] The government of India may be using the vagueness of their proposal to back out of their target, arguing that 30 percent EVs on the road by 2030 is more realistic. This shift was met with dismay from government consultants, who responded by saying that moving targets make it harder to signal to consumers that EVs should be the future. According to Deepesh Rathore, the director of Emerging Markets Automotive Advisors, "You are not actually telling people to buy EVs [only], you are saying that you may also buy EVs. Why would someone take that [EV] option when that technology is not completely proved, [as against] the technology which is 100 years old and running very well across the world?"[35] Additionally, governments undermine their signals to the market about making EVs affordable and accessible when they backtrack on targets.

Generally, experts argue that governments focus too heavily on the short term. According to Dustin Benton, the policy director at Green Alliance, "...if we keep building and buying dirty

cars we'll miss the growth opportunity of the century."[36] Benton also points to a report arguing that governments are going to miss international climate commitments if they do not significantly expedite their requirements for emission reductions in the transportation sector.[37]

A certain degree of caution on the part of governments makes sense. Policymakers are proceeding with care because they recognize the political cost of requiring adoption of a new technology (EVs), even if that technology is superior to the old one (ICE vehicles). They also recognize that car companies need time to prepare for the demand required to replace ICE vehicles. Still, international momentum to curb the pollution from ICE vehicles signals that governments are preparing to take more significant action. When they do take action, the results are impressive. Following Germany's Federal Court ruling, which supported the banning of diesel fuel-powered vehicles by city governments, sales of diesel-powered vehicles fell 19.5 percent over the course of a year.[38]

Actions by Cities

Cities around the world are implementing registration and zoning policies that promote clean transportation, including designating car-free city centers in major metropolitan areas. Even in cities where cars are still allowed in city centers, such as Oslo, street parking has been significantly reduced and pedestrian access has become the priority in city planning.[39] The movement toward clean cars at a city level has been in the international spotlight since twelve mayors signed the C40 Fossil-Fuel-Free Streets Declaration in October 2017, committing their cities to all-electric buses by 2025 and zero emissions in designated areas by 2030.[40]

In some countries, city governments can quickly enact and develop bans on ICE vehicles because they have jurisdiction over land use, zoning, and local law enforcement. For example, in addition to the commitments under the Fossil-Fuel-Free Streets Declaration, drivers in Paris and Barcelona must register their cars to receive a sticker indicating whether or not the vehicle is zero emission. If the car does not meet a certain standard, the sticker indicates that the vehicle is not allowed in designated areas of the city on weekdays.[41] [42] Similarly, in London and Oxford, a car that is not identifiable as zero emission will be charged for driving in defined city centers.[43] Diesel cars that are ten years or older in Delhi are deregistered and cannot be driven at all.[44] Fortunately, programs in one city have been shown to inspire actions in others. Paris' mayor Anne Hidalgo said of their policy, "Our ambition is clear, and we have started to roll it out: we want to ban diesel from our city, following the model of Tokyo, which has already done the same."[45]

City	Status of ICE Vehicle Removal	Date of Action
Antwerp[46] [47] Brussels[48] Gent[49] Mechelen[50]	Low Emissions Zone (LEZ) Enforced or Planned in Belgium *For complete list of cities with LEZs outside of Belgium visit http://urbanaccessregulations.eu/overview-of-lezs	-
Amsterdam[51]	C40 signatory plus additional commitments: Electric buses by 2022; buses, taxis, and delivery trucks within A10 ring road emissions free by 2025; ICE vehicles banned by 2030	May 2019
Athens Auckland Barcelona Berlin Birmingham Cape Town Copenhagen Heidelberg Honolulu Jakarta Liverpool London	Signed the C40 Fossil-Fuel-Free Streets Declaration: Electric buses by 2025, ICE vehicles banned by 2030	Initial 12 signatories in October 2017; more have joined since

Los Angeles Greater Manchester Medellin Milan Mexico City Paris Quito Rio de Janeiro Rotterdam Santiago Santa Monica Seattle Seoul Vancouver Warsaw West Hollywood		
Bogotá	Vehicles banned on 76 miles of city streets from 7am to 2pm every Sunday and holiday (Ciclovía);[52] alternating vehicle restrictions during rush hour based on license plate number (Pico y Plata)[53]	1974; 2014
Bristol[54]	Ban of privately owned diesel cars in city center between 7am and 3pm starting in 2021	November 2019
British Columbia[55]	10 percent of all vehicles sold by 2025 to be zero emissions vehicles; sale of ICE vehicles banned by 2040	May 2019
Delhi	Deregistration of diesel cars older than 10 years; progressively restrictive emission standards	November 2014
Hamburg	Ban on diesel cars not meeting Euro 6 standards on two major roads[56]	May 2018
Madrid[57]	C40 signatory plus additional commitments: restricted use of gas-powered vehicles made before 2000; restricted use of diesel-powered vehicles made before 2006; complete ban by 2020 on gas- and diesel-powered vehicles made before these dates; complete ban on diesel vehicles of all ages by 2024; electric buses by 2025; ICE vehicles banned by 2030	2017-2018
New York City[58]	Cars banned in Central Park	April 2018
Oslo	Removal of parking spots from city center by 2017; gradual closure of city streets to private traffic by 2019[59]	June 2016
Oxford	Expand "Zero Emission Zone" from 2020-2035; no cars can enter city center without sticker identification[60]	October 2017
Paris	C40 signatory plus additional commitments: Weekday ban on cars made prior to 1997; select streets open to zero emissions vehicles by 2020; cars banned in city center from 10am to	2017-2018

	6pm on first Sunday of each month;[61] electric buses by 2025, ICE vehicles banned by 2030	
Rome	C40 signatory plus additional commitments: diesel vehicles banned from city center in 2024[62]	2017-2018
Tokyo	Began "Say No to Diesel Vehicles" campaign; phase-out of diesel vehicles by prefecture began in 2003[63]	December 2000

Auto Manufacturer Commitments & Corporate Responsibility

To meet future demand for EVs, auto manufacturers need to plan and gear up for the relevant changes to design and manufacturing processes. Normally, government calls for reduced vehicle emissions are met with resistance from the private sector. According to Winfried Hermann, transport minister for Stuttgart, "We say, clean up your technology, they say it is impossible."[64] Nevertheless, many automakers are now planning to sell most of their vehicle fleet in electric versions.

According to **Volvo's CEO**, the manufacturer aims for 50 percent of sales to be fully electric by 2025.[65] Other companies including **BMW** and **Renault** have committed to significant increases in EV production in the next two years and plan on a full transition in the near future. The **PSA Group**, which owns **Peugeot** and **Citroen**, stated its intentions to electrify 80 percent of its fleet for production by 2023, and **Toyota** is manufacturing its first fully electrified Prius to meet California's updated vehicle standards for 2020.[66] Toyota also announced it will be adding more than 10 EV models by the early 2020s, and has partnered with **Panasonic** to develop a new EV battery.[67] Companies that have already produced fully electrified cars, such as **Nissan**, are setting the pace by providing more variety to make EVs appealing to consumers with diverse needs. **Aston Martin**, **Jaguar**, and **Land Rover**, producers of luxury cars, have also spoken publicly about their company goals to move toward electrifying vehicles.[68] German-owned makers of

Rolls-Royce and **Mini Cooper** vehicles plan to bring 25 electric models to market by 2025, in line with the goals that several European countries have targeted for the end of new ICE vehicle sales.[69] Additionally, they hope to stay ahead of shifting market demands and the impending European target goals by increasing research and development spending to 7 billion euros.[70] The largest auto manufacturer in Europe, **Volkswagen**, has pledged 20 billion euros for its electric car program, and its luxury brand **Porsche**, in collaboration with **Audi**, will release 20 electrified models by 2025.[71]

Ford Motors and **General Motors** are also taking the extra step to significantly invest in production efforts. In January 2018, the chairman of Ford announced that the company would more than double their investment in EV production, up to $11 billion, and have 40 models ready for production by 2022, addressing a wide variety of consumers' aesthetic and logistical needs.[72] Sixteen of the 40 models will function as fully electric cars. In the case of General Motors, one of the largest automotive manufacturers in the world, company leadership aims to produce 18 battery electric cars and fuel cell-powered vehicles by 2023, two of which will come out this year. The company has already opened its market for EVs in China, where General Motors reported selling more cars than it did in the United States in 2017. In the summer of 2017, "it started selling a two-seat EV there, for just $5,300."[73] Pressure from regulators in China, Europe, and California to slash carbon emissions from fossil fuels is partially responsible for the shift in attitude at these major companies.[74] Other influential forces include "**Tesla Inc.'s** success in creating electric sedans and SUVs that inspire would-be owners to line up outside showrooms and flood the company with orders."[75] **Fiat-Chrysler** claims to be "going after Tesla," producing four electrified **Maserati** models by 2022.[76]

Available EV models skew towards sedans, luxury vehicles, and smaller cars, with some compact SUVs available.[77] The market for electric SUVs and trucks has been largely untapped, but a recent growth in funding and startup activity is beginning to change that. **Ford** plans to release an all-electric version of its bestselling F-150 pickup truck, **General Motors**' Hummer will be re-released in 2021 as an electric truck, and **Tesla's** Cybertruck will enter the market soon after.[78] In addition to existing companies, several startups including **Rivian**, **Lordstown Motors, Karma**, and **Bollinger** all aim to specialize in electric pickup trucks and claim valuable space in the emerging market.[79]

Beyond the production of EVs, automakers' willingness to market them can be seen as an indicator of their commitment to EVs. EV marketing, or lack thereof, impacts public awareness. As recently as August 2018, a study found that automakers spend a negligible amount of money on EV advertising compared to conventional vehicle advertising.[80] (Notably, the study found that advertising spending and EVs sales were higher in states with zero-emission vehicle mandates, suggesting that government policies do "drive the market."[81] See below for more detail.) Since a lack of awareness of EVs is the biggest barrier to their adoption,[82] bringing them into the public eye is a critical step for their growth. In February 2020, America's most-watched television show of the year – the Super Bowl – aired with 102.1 million viewers.[83] In a first, four auto manufacturers bought advertisements to showcase their electric cars, some of which are electric versions of previous models, and some of which are entirely new. **Audi**, **General Motors**, **Porsche**, and **Ford** promoted their EVs.[84] These companies' willingness to advertise EVs during

primetime may signal an increased corporate commitment and a growing mainstream awareness and acceptance of EVs.

Automotive manufacturers are not the only corporate presence that make a significant impact on EV adoption. Other industries that use predominantly fossil fuel-powered vehicles, such as trucking and transportation services, would send crucial market signals by demonstrating a greater willingness to use electric trucks and other emission-free technologies. A Council on Foreign Relations article describes major corporations acting as EV and green technology consumers as exhibiting "corporate responsibility." The article also draws a parallel to the success of corporate and public commitment to investment in renewables. "When large corporates [such as **Google** and **Apple** announcing their intent to run on 100 percent renewables] publicly committed to investing in renewables, states and cities competed to adopt clean energy policies to attract investment, leading corporates to invest billions in renewables across the country."

A similar opportunity exists for clean cars. Ride-hailing, an industry entirely reliant on personal car ownership, has recognized the opportunity to incentivize and encourage EV adoption. **Lyft**, for example, has announced their intention to provide one billion rides per year in EVs. **Uber**, meanwhile, is incentivizing the switch to EVs by offering to pay more to participating drivers.[85] In the logistics world, **UPS** is involved in an ongoing effort to electrify its entire London fleet (170 trucks), which includes developing a smart schedule for charging the trucks so that the grid remains stable. They are also moving to electrify 1,500 trucks in their New York fleet.[86] While industries on both the supply and demand side of EV uptake have legacies of reliance on the

fossil fuel industry to overcome, these big names have a prime opportunity to set a meaningful example for other companies as well as individuals.

Driving the Market

Constituents require encouragement and incentives to make climate-friendly lifestyle changes, especially when they are concerned with the affordability and convenience of their options. For example, in Austria, the government introduced a Model Regions program in 2008 that allowed citizens to test drive EVs, highlighted incentive programs for purchasing EVs, and gave cities financial support to transition their infrastructure toward EV use. This program developed public support behind a transition to EVs and signaled to Austrians that their government was committed to a clean-air future. According to Christopher Wolfsegger, the Model Regions program manager, government sponsorship of this effort resulted in 1,500 more electric vehicles on the road (40% of EVs in Austria) and the development of 1,600 charging stations.

Governments can incentivize manufacturers to produce more EVs and accelerate demand among consumers. For instance, the government plays an important role in ensuring that major automotive manufacturers do not backtrack on their EV targets due to lobbying and financial support from the fossil fuel industries. Additionally, clear direction from governments helps companies plan for financial success in the future. According to Ferdinand Dudenhoeffer of University of Duisburg-Essen, the director at the Center for Automotive Research, "Governments do the industry a favor by setting firm deadlines."[87]

Advocates for phasing out ICE vehicles have criticized governments for setting targets too far in the future. Greg Archer, director of clean vehicles at Transport & Environment, an advocacy group in Brussels, stated, "Since cars usually last about 15 years, France's target [of no new ICE vehicle sales after 2040] means that gasoline and diesel cars would be on the road until 2055. That is too long to meet France's own climate change goals."[88]

As evidenced by the activity of countries, cities, and automobile manufacturers, the body of clean car advocates is growing. Policy efforts like California's Clean Cars 2040 Act become more feasible as the movement expands. Phase-outs and related efforts to end the use of ICE vehicles promise to substantially improve air quality, reduce greenhouse gas emissions, and enhance the health of life on the planet.

The Climate Center inspires, aligns, and mobilizes action in response to the climate crisis. We work with business, government, youth, and the broader community to advance practical, science-based solutions for significant greenhouse gas emission reductions.
www.climateprotection.org

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