

Last month at [COP 27](#) in Egypt, CLEE partnered with the [Transport Decarbonisation Alliance \(TDA\)](#) to release a brief with six case studies of jurisdictions supporting the zero-emission vehicle market and installation of charging infrastructure. We at CLEE (including my co-authors [Shruti Sarode](#) and [Ethan Elkind](#)) worked with leading practitioners from around the globe to learn about how strategic policies, investments, and private-public partnerships are accelerating zero-emission vehicle deployment. The result of our research is captured in the Case Study brief [Deploying Zero-Emission Vehicle Infrastructure Innovations to Accelerate Transport Decarbonisation](#), which highlights innovations of local and national governments at different points in their transportation decarbonization journey. The California Air Resources Board (CARB) is chair of TDA for a two-year term through 2023 and contracted with CLEE to support education, research, and outreach efforts that expand TDA's global impact.

Why transportation? Cars, buses, and trucks produce approximately one-fifth of global greenhouse gas emissions. Transitioning the transportation sector to zero-emission vehicles (ZEVs) is essential to combat climate change. ZEVs also offer significant co-benefits beyond decarbonization—decreased air pollution, improved public health, fuel and maintenance savings, and energy resiliency— drawing unprecedented attention from policymakers, manufacturers, and consumers.

Although global sales of ZEVs for passenger cars have increased an average of 50 percent per year since 2015, they still make up only a small fraction of overall vehicles on roads today and are not evenly distributed around the globe. Many consumers and fleet owners are still hesitant or unable to purchase ZEVs, due to the lack of available electric charging or hydrogen refueling infrastructure. Installing reliable, affordable, and easily accessible charging and refueling for ZEVs either requires significant demand from ZEV drivers or targeted and sustained government investments. Governments face other challenges to widespread ZEV adoption, including a lack of familiarity with the technology, higher up-front costs compared to traditional vehicles (despite long-term savings), and range anxiety.

The case studies in this brief, summarized below, illustrate a variety of approaches to overcoming these challenges, with a particular focus on supporting the deployment of ZEV infrastructure.

California: Providing Market Certainty to Drive Private Investment

The Golden State has a decades-long history of ambitious targets to tackle climate change and decarbonize transportation. Most recently in 2020, Governor Newsom issued [an executive order](#) setting clear deadlines for the transition to 100% zero-emission vehicle sales in California: 2045 for commercial trucks and 2035 for light-duty vehicles, where

feasible. Strong targets have given state agencies (namely the [California Air Resources Board](#)) the mandate to develop a portfolio of vehicle manufacturer regulations and targeted incentives that have established market certainty for ZEV supply chain stakeholders and stimulated demand among consumers and businesses. As of [October 2022](#), 17.7% of [all new cars sold](#) in California are ZEVs, supported by more than 80,000 total public and shared chargers. The state accounts for about 42% of the entire country's ZEV sales, now surpassing 1.3 million cumulative sales. Going forward, California is applying lessons from its light-duty ZEV framework to tackle decarbonizing trucks and other heavy-duty vehicles.

Rotterdam, Netherlands: Deploying Fast Charging for Logistics

The Netherlands has the [largest number](#) of EV charging stations in Europe, with more than 75,000 public charging stations and 200,000 residential chargers. The Municipality of Rotterdam has taken the lead in installing electric charging infrastructure for trucks and delivery vans, adopting a [Roadmap for Zero Emission City Logistics](#) and a subsequent [Joint Covenant for Zero Emission City Logistics](#) between the government and more than 50 companies. Rotterdam has committed to become a Zero Emission Zone for City Logistics. In addition to public fast-charging plazas, the municipality is jumpstarting private charging installations by providing technical assistance. Government officials provide companies with free trials of electric delivery vans and cargo bikes, favorable financing for ZEVs, resources to understand charging installation, and dedicated staff to support grid interconnection and reliability.

British Columbia, Canada: Charging for Multi-Family Rental Buildings

As much as 85% of charging for personal EVs occurs at home. However, residents of multi-unit residential buildings do not usually have access to their own charger. Normally, it is the property owner who must decide to install charging infrastructure for the tenants. Deploying charging infrastructure in these multi-unit buildings is essential to help reach decarbonization goals. In the Province of British Columbia, the federal and provincial governments are helping with affordable deployment of charging infrastructure for homes, businesses, and municipalities through both rebate and [fleet funding](#) opportunities. The rebate provides [property owners](#) with up to 75% of the purchase and installation costs for an EV charging station. British Columbia has provided additional funds on top of existing program funds to [Indigenous communities and businesses](#), understanding that historically disadvantaged communities will need further assistance to finance ZEVs and the needed charging.

Portugal: Designing a National E-Mobility Hub to Support Charging Infrastructure

EV drivers need a seamless charging experience. For much of the past decade, Portugal has been working on building a digital platform that allows drivers to pay for electricity at any

charging station, regardless of owner or operator. Launched in 2015, [MOBI.E](#) is a state-owned entity in Portugal that assumes responsibility for all transactions in the public charging network. The user-centric platform eliminates the inconvenience of competing charging operators, allowing EV drivers to use one card or their mobile app to access any public charger. [MOBI.E](#) allows users to [find a charging station](#), determine what speed of charging is available, and compare the price of charging stations. The platform has been successful at catalyzing private investment through an open regulatory regime that supports infrastructure buildout. Portugal is now the fourth country in Europe to have [at least one charger](#) per 100 km of road.

Costa Rica: Scaling Electric Bus Charging Infrastructure

In 2019, Costa Rica became one of the first countries to craft a [national decarbonization plan](#) which aims to reach net-zero carbon emissions by 2050. Because the country's electrical grid is already powered almost entirely by hydropower and wind energy, EVs are fueled largely by carbon-free resources. The country also [mandated baseline installation](#) of charging stations at least every 80 and 120 kilometers on national and county roads, respectively. Costa Rica also set a goal of 70 percent ZEV public buses by 2035. These binding public bus fleet goals have helped to spur EV infrastructure investments. Electrifying buses has allowed electric utilities to enhance grid capacity and reliability to meet increasing demand for private ZEVs. Thus far, successful bus pilots have [traveled more than 75,000 kilometers](#) and carried more than 150,000 people, displacing more than 60,000 liters of diesel and utilizing more than 30,000 kilowatt hours of clean electricity.

Ghana: National Drive Electric Initiative Spurs Private Charging Investments

Expanded hydropower and solar energy installations in Ghana has led to significant periods of excess zero-carbon electricity. As a result, electricity regulators and grid operators are looking to ZEVs to help absorb excess electricity generation capacity. To create sustainable electricity demand and reduce emissions, Ghana's government embarked on the [Drive Electric Initiative](#) to [introduce EVs](#) to Ghanaian consumers and businesses as well as attract outside ZEV related investment. Ghana's Energy Commission took the lead in organizing Ghana's first ever [e-mobility conference and exhibition in September 2021](#), which convened stakeholders to discuss the opportunities and offered EV test drives to educate fleet owners and the general public. As a next step, the national initiative is undertaking a baseline study for EV deployment, which will develop standards and regulations to ensure conformity with international standards and regulations in the EV market.

Conclusion

As more countries, states, regions, and cities adopt policies and plans to accelerate zero-emission transportation solutions, sharing [best practices](#) such as through these case studies

will lead to faster implementation and improved outcomes. In just four years, TDA has grown from an idea to a unique collaboration with more than two dozen members that spearheaded a number of [activities](#) at COP 27. Follow [TDA](#) and [CLEE](#) for more ways to learn about getting involved in supporting transportation decarbonization.