

In view of the adverse health effects of NO_x and particulate matter in the air we breathe, these and many other compounds are subject to air quality standards. In the European Union, *air quality standards* have been established by the *European Commission* to be enshrined in national law by the Member States. Air quality standards are usually expressed in hourly average, daily average and yearly average limits. Enforcing air quality standards thus requires an extensive monitoring effort on a national scale.

California

California was the first, in 1990, to install [Zero-Emission Vehicle \(ZEV\) regulations](#) and it is still expanding that effort in order to meet its air quality and greenhouse gas emission *reduction goals*. By 2050, 87% of cars on the roads of California must be Zero-Emission-Vehicles. The California Air Resources Board (CARB) targets the car manufacturing industry as well as the demand side of the market. New motorized vehicles and engines must be certified by the CARB for *emission compliance* before they are legal for sale, use, or registration in California. Moreover the CARB has installed a *zero-emission vehicle mandate*. This entails that car manufacturers are obliged to sell a certain percentage of zero emission vehicles of their entire fleet. This percentage is increased on a yearly basis.

On the demand side of the market, consumers are stimulated in different ways to buy plug-in hybrid and zero-emission vehicles: they are entitled to rebates on the buying price of qualifying clean cars, and given permission to use dedicated High Occupancy Vehicle lanes even if driving their cars without passengers. The state of California is furthermore co-funding the roll-out of hydrogen infrastructure for



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hydrogen fuel cell electric vehicles and hydrogen internal combustion engine cars as well as recharging infrastructure for battery electric vehicles. By the end of 2017, [50 hydrogen fuelling stations](#) were expected to be operational. Approximately 1000 public charging stations are already available for plug-in EVs.

Local government

However, electric vehicles and other zero-emission vehicles are not the only solution to improve the liveability of the urban environment. Municipal governments have many options to combine in *smart mobility strategies*:

- They are keen to reduce the number of cars on the road in order to reduce congestion by offering attractive, zero- or low-emission public transport options. Many big cities rely on mass rapid transit systems, mostly train, metro and light-rail systems, but also bus rapid transit systems such as in the [Brazilian city of Curitiba](#). Many cities are replacing their conventional bus fleets or converting them to low or zero-emission fleets, based on natural gas or hydrogen, if not electric.
- Many municipal governments are also actively stimulating their residents to walk and cycle, by allocating more public space to pedestrians in car-free areas and providing green corridors with dedicated walkways and cycling infrastructure. To clear the space they can stimulate electric car sharing schemes, which reduce the need for parking spaces on the longer term.
- Many cities worldwide have established environmental zones where the most polluting cars are forbidden access.
- On top of national stimulation measures, cities are also developing their own initiatives to encourage zero-emission vehicles, such as EVs through subsidies,



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provision of free parking permits and aggressive expansion of new public charging stations. The [city of Amsterdam](#) expects to expand the current number of 2200 public charging stations in the city to 4000 in 2018.

Many national, state and municipal governments act as launching customers and role models by turning their own vehicle fleets into zero- or low-emission vehicle fleets.

Emission Trading System

When it comes to reducing CO₂ and other greenhouse gas emissions, we see policy measures being developed at a different level, in a *concerted effort* between nation states. In Europe, approximately 50% of greenhouse emission sources are covered by the European Emission Trading System, a market in which emissions from a variety of sources are traded under a cap which is *gradually lowered*.

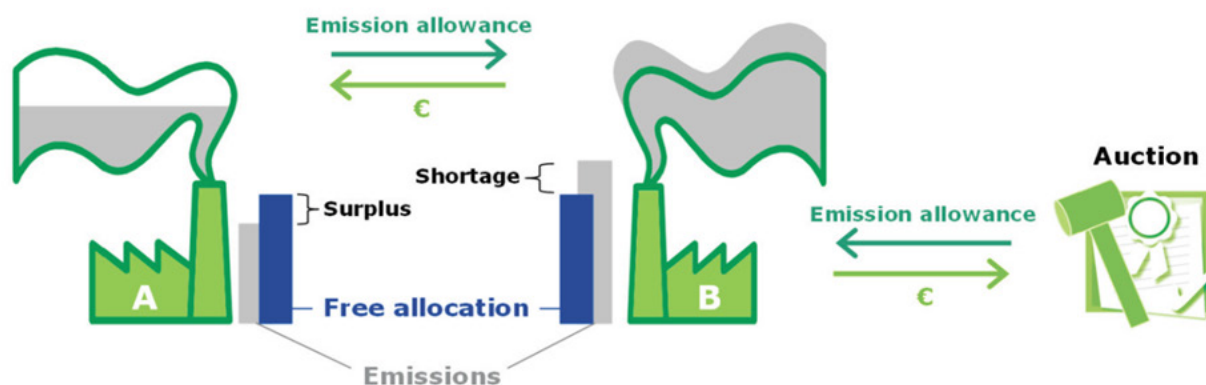


Figure: Systematic overview of the Emissions Trading System



Many states and countries outside Europe are experimenting with or have already established their own emission trading systems, such as China. Emissions by vehicles on the road, however, are not covered by the European ETS. They are subject to emission reduction targets that are defined by the European Commission, per member state, and per sector that is not covered by the ETS.

Renewable energy sources

Together with the electrification of vehicles, governments are also promoting renewable energy sources. The fluctuating supply of these sources, which are often employed at a local – decentralized scale, can go hand in hand with electric vehicles. Electric vehicle batteries provide the *storage capacity* needed to ensure the *stability of the power grid*. Their potential can be exploited by *demand response schemes*. However, the complexity of power grid operations will strongly increase if electric mobility becomes an essential component of the future renewable energy system. To engage electric car owners in demand response schemes, a retail market has to be designed in which car owners are *providers of flexibility services* to the power system. Such schemes will not only require a lot of ICT-support, but will also require governments to adapt the current regulatory framework of the electricity market. Many governments are experimenting now with so-called ‘smart charging’ strategies or Vehicle-2-Grid technologies. Pro-active thinking on regulatory change and new incentive schemes is needed to pave the way for advanced EV-business models.



European Clean Mobility Package

With the so-called Clean Mobility Package , launched in November 2017, the European Commission commits to very ambitious targets of EU fleet-wide CO₂ emissions of new passenger cars and vans to help *accelerate* the transition to low- and zero-emission vehicles. Both for new cars and vans, the average CO₂ emissions will have to be 30% lower in 2030, compared to 2021. Even if the Clean Mobility Package is largely driven by the Paris Climate Agreement, it will certainly *accelerate the adoption* of plug-in electric vehicles and hydrogen fuel cell electric vehicles, besides other zero-emission cars, such as hydrogen-fuelled internal combustion engine vehicles. Moreover, the package addresses the *need for better efficiency* in all modes for transport of goods, requiring new technologies as well as a better organization of transport processes, with new business models. The Clean Mobility Package fits into the wider European policy to make European industry *stronger and more competitive*, striving for world leadership in innovation, digitalisation and decarbonisation.

With the *latest* EU-package of energy policy measures: [Clean Energy for all Europeans](#) (30 Nov. 2016) “The Commission wants the EU to lead the clean energy transition, not only adapt to it. Today's proposals have three main goals: putting energy efficiency first, achieving global leadership in renewable energies and providing a fair deal for consumers.”

While the package does not specifically refer to electric vehicles, it does contain measures to ensure the roll-out of infrastructure for electric mobility at all buildings, including non-residential buildings.



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