



### **Background for Cluster 6: clean vehicles**

The global vehicle fleet continues to be dominated by internal combustion engines; even under progressive scenarios this is likely to remain the case over the short to medium term due to the slow vehicle fleet turnover rate, and yet-to-be-solved technological problems in making alternative powertrains fully competitive with internal combustion engines.

The suitability of different clean-vehicle technologies depends not only on local circumstances, but also on the national framework. The measures analysed in this cluster include a wide range of technology options and vehicle categories in order to offer appropriate clean-vehicle solutions to the variety of cities in SOLUTIONS's regions.

#### **Solution 6.1: registration restrictions/number plate auctions**

This measure aims to limit a city's vehicle fleet by linking car-ownership to possession of some form of permit. The measure limits vehicle ownership in a city, while permit fees create an additional disincentive for vehicle ownership, which, if differentiated by vehicle emissions, may also encourage the adoption of cleaner vehicles. As such schemes make car ownership less attractive in general, they may also increase the use of more sustainable modes such as public transport and non-motorised modes.

#### **Solution 6.2: management of electric two-wheelers**

Electric two-wheelers have many positive characteristics compared to petrol equivalents (more so over cars), including less local air pollution and noise, lower CO<sub>2</sub> emissions, improved safety and increased mobility for low-income citizens. This measure aims to replace fossil-fuelled two-wheelers with electric two-wheelers.

#### **Solution 6.3: fuel economy/CO<sub>2</sub> standards**

Vehicle standards aim to improve the fuel economy of the new vehicle fleet and to reduce the emissions per vehicle-kilometre. It is an effective approach to accelerate technology innovation, as adopting advanced technologies is prerequisite to achieving stringent targets.

The setting of long-term targets offers certainty to vehicle manufacturers; crucial to them in order to make investments in new technologies (Schipper, 2007). For policy-makers, the key benefit of vehicle standards compared to other mechanisms is the need to deal with only a relatively small number of car manufacturers, whereas other policies usually target a vast number of individuals.

#### **Solution 6.4: fuel switch in taxi fleets: EVs**

Electric vehicles are very suitable to be used as taxis and tricycles. Motorised tricycles play a major role in Asia as cheap alternative to taxis for shorter distances. The distances that taxis and tricycles cover are usually within the driving range of regular electric vehicles.

Furthermore, charging can be easily provided during waiting times at major taxi stands. Substitution of fossil-fuelled taxis and tricycles with electric vehicles can reduce local air pollution and noise, and depending on the electricity mix, it can also contribute to greenhouse gas mitigation.

A city can encourage adoption of electric taxis or tricycles by providing financial incentives (e.g. subsidies, loans) for these vehicles, by providing necessary infrastructure or by tightening local emission standards. Sometimes it is also necessary to adapt local regulations to facilitate the use of electric vehicles.

#### **Solution 6.5: fuel switch in taxi fleets: CNG/LPG**

In a number of cities, the use of taxis fuelled by CNG (Compressed Natural Gas) or LPG (Liquefied Petroleum Gas) has been implemented primarily to reduce local air



pollution. CNG and LPG are advantageous compared to other conventional fuels as they cause less tailpipe air pollutants and produce less noise. CNG vehicles emit 20% less nitrogen oxide than petrol vehicles. However, the CO<sub>2</sub> benefits vary greatly and may be even higher than an efficient diesel powered vehicle.

**Solution 6.6: emissions-based vehicle taxation (annual & purchase/registration tax)**

Emissions-based vehicle taxation aims to create disincentives for the acquisition and use of heavily polluting vehicles, while creating incentives for less polluting vehicles. Larger, more polluting and fuel-consuming vehicles are charged higher tax rates than less polluting vehicles. For example, acquisition taxes can be levied through a feebate system where cleaner vehicles benefit from a rebate, financed by higher taxes on more polluting vehicles. Tax exemptions can also be allowed for specific technologies.

**Solution 6.7: clean vehicles in the municipal fleet**

Municipalities can encourage the use of cleaner vehicles through the way they manage their own fleets, specifically by introducing clean vehicles in the fleets of the municipality and municipal enterprises. This requires energy efficiency and environmental performance to be considered for vehicle purchases.

**Solution 6.8: information and promotion of clean vehicles among the general public and private companies**

Information on clean vehicles is provided to the public, e.g. in form of a campaign. In addition, advantages for the use of clean vehicles are created, for example through reduced public parking fees or reduced road tolls.

Such measures aim to increase the share of clean vehicles in private and commercial fleets. The public's knowledge of clean vehicles is improved and advantages are created. This can lead to wider use of clean

vehicles.

**Solution 6.9: infrastructure for clean vehicles**

When new fuels are to be introduced or their deployment is to be increased, often additional infrastructure such as CNG refuelling stations or EV charging facilities are needed.

By providing support for the installation of refuelling/charging stations, the city can reduce the barriers for clean vehicle adoption. The city can install its own charging facilities or provide the necessary land. Close cooperation with electricity suppliers or car dealers can speed up the installation of recharging/refuelling facilities.

**Solution 6.10: fleet renewal schemes**

The measure deals with the provision of monetary incentives for citizens to exchange their old, petrol fuelled car/motorcycle with a new, clean one (electric/hybrid etc. Especially electric vehicles, which have very high initial investment costs compared to conventional vehicles, benefit from monetary incentives.

The measure aims at increasing the adoption rate of clean private vehicles. The impact of the measure is twofold.

Firstly, it will increase the number of clean vehicles on the roads, thus reducing the overall environmental impact, and on the other hand it will boost the car/motorcycle market; suffering significant losses during the economic crisis. At best the measure should be implemented at national level or linked to national policies.