



# **SOLUTIONS Training Kit**

## **Cluster 6: Clean vehicles**

[www.urban-mobility-solutions.eu](http://www.urban-mobility-solutions.eu)



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## About SOLUTIONS

SOLUTIONS aims to foster knowledge exchange and boost the uptake of innovative sustainable urban mobility solutions through the further exploitation of existing knowledge.

The main focus of the SOLUTIONS project is on the exchange between cities from Europe, Latin America and the Mediterranean.

The project looks at the following thematic areas:

- public transport
- transport infrastructure
- city logistics
- integrated planning / sustainable urban mobility plans
- network and mobility management
- clean vehicles



## Introduction to Cluster 6: Clean vehicles

**Clean vehicles:** hybrid electric vehicles (HEVs), plug-in hybrid electric vehicles (PHEVs), battery electric vehicles (BEVs)

**Issues:** electric vehicles' well-to-tank emissions (i.e. from electricity generation)

**Main focus:** ten innovative transport solutions from around the world

SOLUTIONS for	Type of impact
Registration restrictions/number plate auctions	Shift (Improve)
Management of electric two-wheelers	Shift (Improve)
Fuel economy/CO2 standards	Improve
Fuel switch in taxi fleets: EVs	Improve
Fuel switch in taxi fleets: LPG/CNG	Improve
Emission-based vehicle taxation	Improve (Shift)
Clean vehicles in municipal fleets	Improve
Information and promotion of clean vehicles	Improve
Infrastructure for clean vehicles	Improve
Fleet renewal schemes	Improve (Shift)

## Solution 6.1: registration restrictions/number plate auctions



Number plates in Beijing



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

### **Objectives and implementation**

- Aims to limit a city's vehicle fleet by linking car-ownership to possession of some form of permit
- May increase the use of more sustainable modes such as public transport and non-motorised modes



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

### **Barriers**

- Permit distribution by auction might favour wealthy vehicle owners, but a lottery system can be used
- Strong opposition from the public



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

### **Examples**

- Singapore
- Shanghai (CN)
- Beijing (CN)



## Solution 6.2: management of electric two-wheelers



Electric two-wheeler in Foshan

## Solution 6.2: management of electric two-wheelers

### Objectives and implementation

- Aims to replace fossil-fuelled two-wheelers (or passenger cars) with electric two-wheelers
- Electric two-wheeler plan can be written, based on an examination of the role and implications of electric two-wheelers in the transport system
- **Possible measures:**
  - banning non-electric PTWs,
  - dedicated parking and charging areas for electric two-wheelers,
  - separate lanes for (electric) two-wheelers,
  - special waiting areas at intersections for motorcycles,
  - excluding (electric) two-wheelers from city tolls

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

### **Drivers**

- Less local air pollution and noise
- Lower CO2 emissions
- Improved safety and increased mobility for low-income citizens

### **Barriers**

- Insufficient regulations and enforcement
- Deficient integration into the transport system
- Lack of knowledge about how to manage two-wheeler traffic
- Motorised two-wheelers are often not sufficiently included in transport planning and regulations

## Solution 6.2: management of electric two-wheelers

### Examples

- Many Chinese cities (however, ninety Chinese cities have banned electric motorcycles)
- Motorcycle lanes and waiting boxes in Kuala Lumpur (Malaysia) and Taipei (Taiwan)
- Electric charging station in Murcia (Spain)
- Electric scooter programmes in Rome (Italy), Rotterdam (NL) and Barcelona (Spain)
- Naples (Italy)
- MOLECULES project (<http://www.molecules-project.eu/>)

## Solution 6.3: fuel economy/CO2 standards



Fuel station in Cologne

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

### Objectives and implementation

- Aims to improve the fuel economy of the new vehicle fleet and to reduce the emissions per vehicle-kilometre
- Effective approach to accelerate technology innovation
- Different implementation approaches:
  - based on fuel consumption per distance travelled
  - based on CO<sub>2</sub> emissions per kilometer travelled
  - based on all GHG emissions
  - based on the energy intensity (MJ/km) of the vehicle



## **Solution 6.3: fuel economy/CO2 standards**

### **Drivers**

- Policy makers have to deal with manufacturers only, not a large number of individuals
- Significant environmental and social benefit
- Economic impact: innovation

### **Barriers**

- Rebound effects: Vehicle efficiency standards reduce the cost of driving and promote increased travel



## Solution 6.3: fuel economy/CO2 standards

### Examples

- 8 out of 15 top vehicle market regions (79% of world vehicle sales) have established fuel consumption or GHG emission standards
- United States (since 1975)
- European Union CO2 emission regulation until 2020





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

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

### Objectives and implementation

- EVs are very suitable to be used as taxis and tricycles
- Distances that taxis and tricycles cover are usually within the driving range of regular electric vehicles
- Charging can be easily provided during waiting times at major taxi stands
- City can encourage adoption by:
  - providing financial incentives
  - providing necessary infrastructure
  - tightening local emission standards.
  - adapting local regulations to facilitate use of EVs



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

### **Drivers**

- Intention to reduce local air pollution
- Tool to support wider adoption of electric vehicles

### **Barriers**

- Limited driving range
- Limited charging infrastructure
- Need for specialized maintenance workshops

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

### Examples

- Shenzhen (China) – 800 taxis
- Mexico City (MX), Kanagawa Prefecture (JP), Dublin (IE), London (UK)
- Kathmandu, Nepal – 600 electric tricycles
- Mandaluyong, Philippines – pilot project with electric tricycles

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



CNG fuel station in Delhi, India

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

### **Objectives and implementation**

- Reduce local air pollution, noise and GHG emissions compared to petrol or diesel equivalents
- Combination of different instruments:
  - Financial incentives for the vehicles/fuels
  - Provision of sufficient refueling stations (CNG)
  - Restrictions on conventional taxis
- Loans can help vehicles or fleet owners to bear the initial conversion cost of switching to LPG or CNG



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

### **Drivers**

- Reduced local air pollution
- CNG vehicles emit 20% less nitrogen oxide than petrol vehicles

### **Barriers**

- Lack of refuelling infrastructure
- Fear of conversion or replacement costs



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

### Examples

- CNG taxi and auto rickshaws in Delhi and Ahmedabad (India)
- Madrid (Spain) has installed CNG/LPG refueling stations and provided grants to taxi drivers to convert their vehicles





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



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

### **Objectives and implementation**

- Aims to create disincentives for acquisition and use of heavily polluting vehicles, while creating incentives for less polluting vehicles
- Higher tax rates for larger, more polluting and fuel-consuming vehicles
- Acquisition taxes can be levied through a “feebate” system: cleaner vehicles benefit from a rebate, financed by higher taxes on more polluting vehicles.
- Tax exemptions can be allowed for specific technologies

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

### **Drivers**

- Fuel economy of the fleet is improved
- Downsizing of vehicles and alternative-fuel vehicles are promoted
- General increase in vehicle taxation can reduce overall car ownership

### **Barriers**

- Improper design of the vehicles evaluation scheme
- Assessment criteria do not include alternative fuels
- Tax level not high enough to influence purchasing behaviour



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

### **Examples**

- Kanagawa Prefecture (Japan): tax exemption for purely electric vehicles
- Norway: electric vehicles exempted from VAT and receive other monetary and non-monetary advantages.
- France: bonus-malus system
- Other European countries: vehicle taxation is differentiated according to emissions.

## Solution 6.7: clean vehicles in the municipal fleet



Electric fleet of Aachen's energy provider

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

### **Objectives and implementation**

- Way to encourage the use of cleaner vehicles through the way municipalities manage their own fleets
- Municipal procurement guidelines may oblige departments and municipal enterprises to purchase fuel-efficient, low-emission vehicles
- ...especially where municipal enterprises operate local public transport, waste collection or street cleaning services
- Implement an accounting system which keeps long-term savings in the investing department



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

### **Drivers**

- Share of clean vehicles in municipal fleet increases
- Municipality can serve as role model for private enterprises
- City can share its experience with new vehicle technologies
- Long-term cost savings

## Solution 6.7: clean vehicles in the municipal fleet

### Examples

- Grenoble, France: replaced around a quarter of its fleet with CNG vehicles
- European projects:
  - CIVITAS ELAN - alternative fuels were used for waste disposal vehicles in Zagreb.
  - CIVITAS TELLUS introduced clean vehicles to Rotterdam's municipal fleet.
  - TURBLOG, Utrecht tested an electric 'beer boat'.
  - Stockholm, Sweden has added 200 clean cars to its municipal fleet & introduced clean vehicles as part of EU CIVITAS TRENDSETTER





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



## **Solution 6.8: information and promotion of clean vehicles**

### **Objectives and implementation**

- Aims to increase the share of clean vehicles in private and commercial fleets
- Provide information on clean vehicles to the public, e.g. in form of a campaign
- Create advantages for the use of clean vehicles
- Local activities should be linked to nation-wide schemes, e.g. vehicle labelling systems based on CO<sub>2</sub> emissions, local air pollutants or fuel economy



## **Solution 6.8: information and promotion of clean vehicles**

### **Drivers**

- Public knowledge of clean vehicles is improved and advantages are created
- Can lead to wider use of clean vehicles
- Manufacturers or NGOs can support campaigns for cleaner vehicles

### **Barriers**

- Insufficient alterations/flexibility of national or regional regulations



## **Solution 6.8: information and promotion of clean vehicles**

### **Examples**

- Norway: Electric vehicles can drive on bus lanes, free parking, exempt from road tolls
- London, UK: Electric cars exempt from congestion charge.
- European projects:
  - CIVITAS Trendsetter – clean vehicle use in private companies,
  - NICHES – deployment of clean vehicles in the private sector and
  - ECOSTARS – clean vehicles for local fleet operators

## Solution 6.9: infrastructure for clean vehicles



CNG fuel station, Delhi, India



## **Solution 6.9: infrastructure for clean vehicles**

### **Objectives and implementation**

- Address “chicken and egg dilemma” by providing or supporting initial infrastructure development
- City can reduce the barriers for clean vehicle adoption by providing support for the installation of refuelling/charging stations
- City can install its own charging facilities or provide the necessary land
- Close cooperation with electricity suppliers or car dealers can speed up installation



## **Solution 6.9: infrastructure for clean vehicles**

### **Drivers**

- Private investors will be encouraged to develop charging/refueling infrastructure
- Adoption of clean vehicles will be made easier

## Solution 6.9: infrastructure for clean vehicles

### Examples

- Rotterdam (NL): subsidies for charging station construction; city installed charging facilities on public ground
- London (UK): CNG infrastructure for buses can be shared with private vehicles and municipal fleets under some conditions
- Other European cities: Stockholm (SE) & Lille (FR) for biogas





## **Solution 6.10: fleet renewal schemes**

## **Solution 6.10: fleet renewal schemes**

### **Objectives and implementation**

- Provision of monetary incentives for citizens to exchange old vehicles with new clean vehicles
- Should be implemented at national level or linked to national policies
- PPPs can be a means of promoting the measure.
- Can be combined with taxation measures and/or low emission zones to increase effectiveness



## Solution 6.10: fleet renewal schemes

### Drivers

- Increase the adoption rate of clean private vehicles
- Reduce overall environmental impact
- Boost car/motorcycle market



## Solution 6.10: fleet renewal schemes

### Examples

- Norway: electric vehicles exempt from high taxes on automobiles
- The UK and the Netherlands: subsidies for EV purchase

# Thank you!

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