



Demand Side Measures in Practice for Environmentally Friendly Vehicles

Final Report to the Transform Project
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Management Summary (1)

- This report provides a review of demand side measures as applied by cities to deliver environmental benefits via Environmentally Friendly Vehicles (EFVs). The report was commissioned for the Transform project and aims to provide a list of examples of demand side measures, with illustrative case study examples. As a UK consultancy, UK case study examples predominate but other European examples are included in what is an illustrative rather than an exhaustive study.
- In line with the European Commission's Lead Markets Initiative, the context for city strategy (Action Plans) can be seen as being derived from a range of tactical actions including;
 - Procurement
 - Local policy measures, including leveraging tools available via legislation, as well as standardisation, labelling and certification
 - Other complementary actions
- The foundation for action plans lies in the facilitating the market to respond with sustainable transport solutions.



Management Summary (2)

- Procurement measures include;
 - Green Public Procurement – for existing products and services
 - Innovation Procurement – which helps stimulate the market to provide solutions to satisfy an unmet need
 - For vehicles, city initiated Innovation Procurement works best where the public sector is a major purchaser and the products are more bespoke (e.g. Refuse Collection Vehicles, Buses)
 - Both Green Public Procurement and Innovation Procurement can be conducted as a joint procurement activity with other cities (e.g. ZEUS and the LCVPPP Projects)
- Local Policy Measures include;
 - Certification schemes for regulated vehicle types (taxis, freight logistics, city buses)
 - Zones – either Environmental or Congestion management zones
 - Other regulation, as for parking and new developments
 - These measures typically leverage standards and labelling to express demand in terms of preferences (for vehicles of a given environmental performance) and require extensive consultation prior to set up and implementation needs to include policing measures
- Other complementary actions include;
 - Partnerships with suppliers within the market, including leveraging innovation support
- City strategies
 - Strategies based on demand-side measures can be assembled using selected actions from those illustrated in this report, ideally backed by a supporting evidence base and a political commitment from elected officials, senior managers and managers involved in implementation

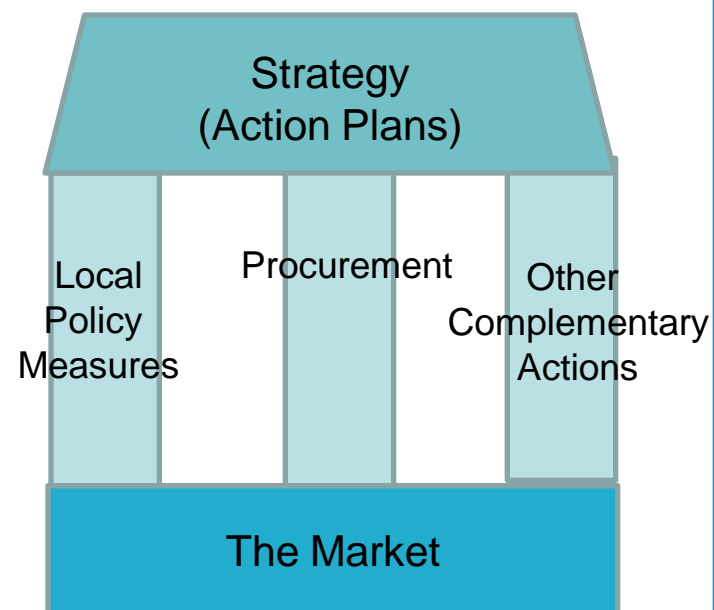
- Background to this Report
 - The following report was commissioned by Optimat on behalf of the Transform FP7 project consortium.
 - The report is based on desk research undertaken by Cenex, a consultancy and research organisation specialising in low carbon vehicle and infrastructure projects. Cenex clients include national, regional, local governments and government innovation agencies.
 - This report provides a review of demand side measures applied in cities with the aim of increasing the uptake of Environmentally Friendly Vehicles (EFVs).
 - The report focuses on EFV use as a key feature within sustainable transport initiatives. Cities have been selected as the focus of the report (rather than commercial businesses) because cities;
 - share common issues related to environmental protection (air and water pollution), public health (health effects of vehicle exhaust emissions) and sustainability,
 - provide sources of case study material that are more accessible (visible, understandable and accountable) than private business CSR activities
 - provide best practice measures that can be adopted by other cities

Demand side measures introduced

- In the context of this report, demand-side measures are activities a city takes to articulate what it wants in terms of environmentally friendly vehicle (EFV) operation (its demand) and how it goes about securing what it wants (the measures it takes)
- The European Commission has recognised the role of demand-side measures in its Lead Market Initiative (LMI) which identifies the important role played by the following policy instruments;
 - Legislation
 - Public Procurement
 - Standardization, Labelling and Certification (role in agglomerating demand)
 - Other complementary actions (including Innovation via Framework Programmes)
- For the purposes of this report, given that the unit of study is a city, local policy measures can be conveniently considered as the means by which the city applies the tools offered by legislation, along with those of standardization, Labelling and Certification. This gives rise to three types of demand-side measures, as follows;
 - Procurement
 - Local policy measures (typically the active use of available legislation, as well as standardization, labelling and Certification)
 - Other complementary actions (notably innovation support and partnership activities)

Demand Side Measures and Strategy

- Actions plans for cities can be derived from the three types of measure identified, as illustrated.
- Cities seeking to implement demand side measures do so by developing either a strategy or a series of action plans that have high level buy in from;
 - senior city managers
 - elected officials
 - city stakeholders (internal and external to the organisation) who will assist with implementation support.
- The foundation for demand-led strategy lies in facilitating interest from the market to respond to demand signals
- The report will review examples of the different actions (measures) in operation via city case studies



What is meant by Environmentally Friendly Vehicles?

- The focus of this report is on demand-side measures adopted by cities to increase the uptake of environmentally friendly vehicles (EFV).
- The report refers to examples of activities over a wide time-span, dating back to the 1990s. During this time period what constitutes an EFV has changed in nature and, in the context of this report, the actual choices made are not important in themselves. Rather, they are illustrative of different demand-side measures (as a system input) leading to a vehicle supply response (as an output), which can be assumed to have provided a satisfactory (maybe best available) outcome, without necessarily fully meeting the original need(s).

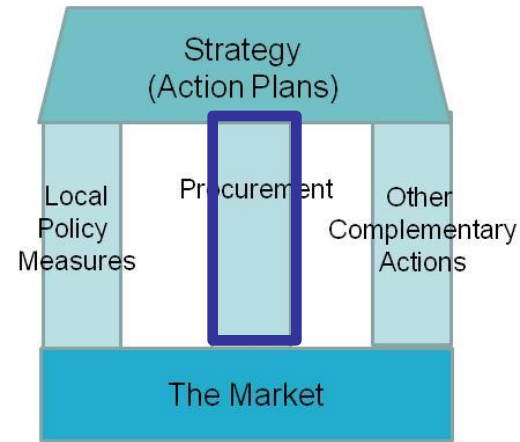
Role of the Market

- Demand-side measures require a positive supply-side (business) response, in terms of ;
 - a technological offer in line with performance requirements
 - a commercially acceptable price for the offer
 - motor industry investment in vehicle development and demonstration, service and maintenance support, as well as associated fuelling if an alternative fuel is required.
- To make an appropriate technologically advanced and commercially viable EFV offering the supplier needs;
 - Confidence in the offer based on development, test and validation
 - Commitment from its supply chain to invest to support manufacturing
 - The prospect of markets for the product of sufficient size
- As noted in the Commissions Lead Market Initiative, both supply and demand will in turn be strongly influenced by legislation and by prevailing standardisation, labelling and certification.
 - As an example, different European countries have different availability for alternative fuels

Transform Project

Procurement

- In the context of this report, procurement refers to;
 - vehicles are purchased by the city authority for its own in-house operations,
 - vehicle-delivered services purchased by the city (e.g. city bus operation, refuse collection, postal delivery services, etc).
- Procurement follows a common approach, as follows;
 - Preparation phase (needs analysis, market sounding, etc)
 - Advertisement, deadlines, invitation to tender
 - Qualification and tender examination (control of tenderers, exclusion tenderers)
 - The purchasing close (allocation of tender, negotiation, contracting)
 - Re-examination (the Alcatel period)
 - Follow up implementation (on contract and contracting company delivered the purchased product or service)



• Green Procurement

- Refers to the process whereby public authorities seek to procure goods, services and works with a reduced environmental impact throughout their life cycle when compared to goods, services and works with the same primary function that would otherwise be procured.

• Innovation Procurement

- Typically requires greater dialogue with suppliers to flush out innovative solutions best aligned to the needs analysis (which may themselves be refined for final ITT)

• Joint Procurement

- Cities can collaborate formally on joint procurement from the commencement of the procurement process, or one city can allow others to 'piggy back' from its procurement through a common framework.

- In the area of EFVs, technology development has led to categories as follows;
 - 1) differentiation in vehicle performance whereby vehicle manufacturers have greener (more environmentally friendly) offerings that outperform standard models (lower exhaust emissions)
 - 2) niche vehicle offerings made to selected markets and customers
 - 3) vehicle-retrofit products to enhance the performance of old and new vehicles
 - 4) prototype vehicles transitioning from R&D through to early market introduction

- Green Public Procurement
 - This approach is typically used to source category 1 (above) vehicles, of proven performance, based on environmental ranking criteria
 - Categories 2 and 3 can typically be handled by green public procurement once a first precedent within the business\market has been established

- Innovation Procurement
 - Innovation Procurement refers to procurement activities that seek to stimulate innovative solutions from suppliers that satisfy the articulated demand
 - Innovation Procurement typically involves process steps, including market sounding, supplier information days and competitive dialogue, to help refine the procurement specification
 - Innovation procurement exercises may result in procurement to category 2, 3 or 4 outputs (see above) or no procurement proceeding if the offers are not aligned to meeting the demand-side need (typically an unmet need that requires an innovative solution)

- The public sector in the EU25 countries are estimated to purchase the following vehicle numbers;
 - Cars – 110,000 vehicles, representing 1 % of all new vehicle purchases
 - Vans – 110,000 light duty vehicles and 35,000 trucks representing 6% of new vehicle purchases
 - City buses – 17,000 buses representing 30% of all new vehicle purchases
 - Refuse Collection Vehicles are considered as being almost exclusively for the public sector
- Directive 2009/33/EC (Clean Vehicle Directive) requires that lifetime energy consumption and environmental impacts be included in all public procurement of road vehicles
 - This means it would be illegal not to include energy and environmental considerations in the assessment criteria for bids received
 - Emissions that need to be considered include g/km CO₂, oxides of nitrogen (NO_x), Non Methane Hydrocarbons (NMHC) and particulate matter (PM)
 - The EU has set vehicle manufacturers fleet average targets for CO₂ emissions and regulates pollutant emissions via Euro standards and these can be used by cities
 - The Directive allows cities to apply minimum environmental standards for a given vehicle type. They have additionally proposed a methodology for monetising energy performance and vehicle emissions, applicable to cars and vans. This monetising of energy and emissions aids comparison of different options.
 - An approach for buses and trucks is not yet defined as EU emissions standards for these vehicles apply to engine emissions (g/kWh) as opposed to vehicles (g/km). For these vehicle types, regulation is followed in spirit rather than to a defined standardised process.

Green City Bus Procurement

- It is commonplace for cities to apply environmental criteria to city centre bus operations with the aim of minimising exhaust emissions. In some cities this is self-regulation (internal policy) for bus operations owned and operated by the city themselves. However, many European cities tender bus routes to private operators and set environmental criteria within the tender specifications.
- Examples include;
 - Self regulation
 - Paris (RATP)
 - Barcelona (TMB)
 - Tendering regulation
 - London (Transport for London)



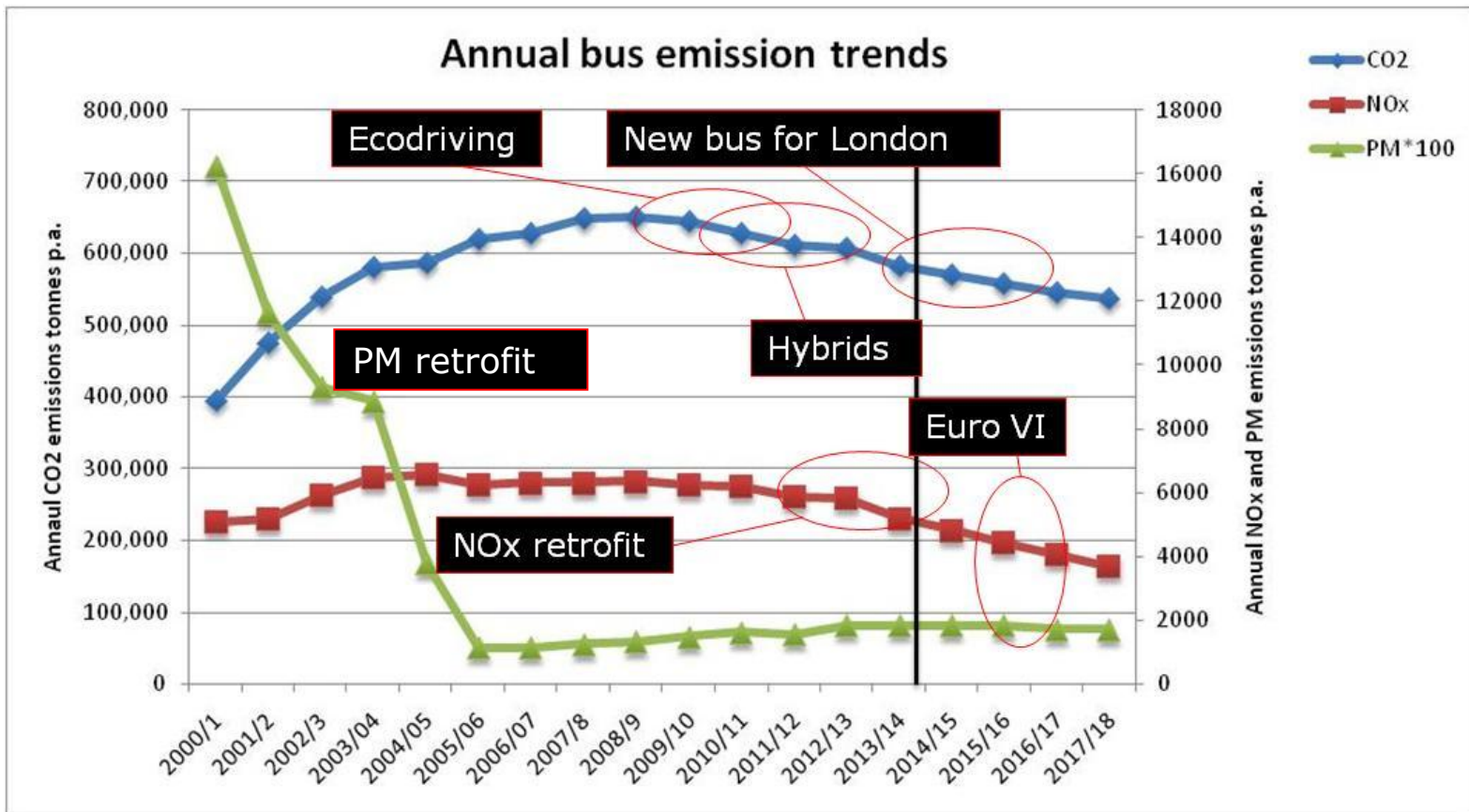
City Bus Procurement (Case Study)

- Transport for London
 - In 1995, using London Emissions Inventory data Transport for London (TfL) identified city buses as contributing more than 10% of London's particulate matter (PM10) emissions and therefore initiated a study exercise to determine which technical approaches would best suit emissions reduction across the London-wide fleet to help develop tender documentation for routes. TfL operated only a limited number of the then 6,500 London city buses, so envisaged an approach whereby it used the procurement opportunities associated with the tendering of routes (typically conducted every 3 years). At that time London had 5 main suppliers bidding to provide bus services from depot locations across the city.
 - A technology review was undertaken looking at natural gas, liquid petroleum gas and options to clean up diesel vehicles. The large numbers of double decker buses (limited roof height for addition of gas cylinders) and the space constrained locations of many depots (no room for gas stations) within residential areas made gaseous fuel use problematic for many sites. This required TfL to seek innovations in diesel offerings.
 - Suppliers proposed the use of low sulphur fuel and either catalysts or diesel particulate filters (DPF), with the latter capable of removing 99% of particulate matter emissions
 - In 1999 TfL commenced a DPF trial to test and validate the technology, showing it to the bus operators bidding on route services.
 - Once validated TfL wrote clean diesel provisions into tenders as TfL policy, providing operators with the option to supply new buses or retrofit older buses to deploy on routes won.
 - By December 2005, all 8,000 buses in London were fitted with DPF technology

City Bus Procurement (Case Study)



- Having used procurement to drive forward PM retrofit, TfL switched attention to cutting other emissions
 - First to CO₂ reduction via piloting and then specifying hybrid buses
 - Second to NOx reduction by piloting and then specifying NOx retrofit and latterly NOx reduction via Euro VI.



Green Procurement of Waste Collection services

- Historically, cities managed their own waste collection and therefore ran their own in-house fleet of refuse collection vehicles (RCVs). However, the increasingly complex requirements placed on waste recycling has led to the emergence of large companies specialising in offering vertically integrated recycling services (e.g. from wheelie bin to dedicated recycling and disposal pathways).
- Many city authorities now tender for waste collection services, offering these contractors long contract lengths (typically not less than 5 and sometimes extending beyond 10 years). The long contract lengths are consistent with the extended payback and asset lifetimes expected for infrastructure items required to ensure appropriate service provision (e.g. depots, processing plant, waste-to-energy facilities, etc).
- Where certain assets exist (e.g. landfill gas collection and anaerobic digestion, etc) these assets may provide a strategic (asset utilisation) driver for the choice and fuelling of vehicles used. For example, the presence of certain types of 'waste-to-energy' facilities offers a means of establishing 'closed loop' operations whereby gas generated from waste can in turn be used to fuel the refuse collection vehicles.
- RCVs have high fuel costs (per km travelled) and typically operate in densely populated areas, making sustainability issues a key evaluation criteria within the tender documents developed by a city authority. The specialist companies active in this area compete to provide services to many cities and this in turn has led to positive trend toward the cities and companies jointly prioritising EFVs.

Refuse Collection Vehicles in Madrid (Case Study)

- Madrid – articulating its demands
 - The districts of Madrid city have a population of c3.3 million, with more than 1.25 million workers entering the city daily and 7 million tourists visiting each year. This generates a waste collection requirement of 4,300 tonnes per day
 - The City of Madrid articulated its ‘demand priorities’ for waste collection as follows;
 - Comfort and minimal disruption to the public
 - Daily door-to-door collection, recycling points across the city
 - Source separation and separate collection
 - Maximise energy from waste and reduce waste to landfill.
 - High efficiency and quality of service
 - 24 hour operation, communication with citizens, businesses and emergency services.
 - Minimal environmental impact.
 - Environmentally friendly vehicles
 - For the city centre, the City of Madrid articulated its interest in (demand for) a quiet RCV that could operate during the evening and/or early morning, collecting waste from restaurants, hotels and businesses, without disturbing residents and visitors staying in city centre hotels. The vehicle also needed to be small enough to be capable of manoeuvring in narrow city centre streets.
- Procurement
 - The procurement process commenced more than a year in advance of the award of the contract, offering the contract for a 9 year duration

- Background

- Waste and energy specialist FCC Medioambiente won the contract for Madrid with a bid value (cost to the City of Madrid) of € 448 m
- To provide a competitive environmental offering to Madrid, FCC was able to offer natural gas powered RCVs, with additional support vehicles running on bioethanol.
- To address the need for an RCV suited to city centre operation, FCC Medioambiente needed to enhance its offering. In the period leading up to its bid submission FCC Medioambiente established a small consortium of experienced and technically advanced firms to help develop a new vehicle. The consortium received EU funding from the Eureka project (3697) with the project running between September 2005 and May 2006.
- The project led to the development of a hybrid electric RCV with a short wheel base for higher manoeuvrability, an enhanced load carrying capacity (4-5 tonnes) and 50-60 kWh of battery capacity as an aid to efficient and low (part zero) emission operation
- FCC offered 15 of these vehicles as part of its successful bid to the City of Madrid



Large gas RCV



Compact Hybrid Electric RCV

Green Public Procurement for Japanese Cities (Case Study)

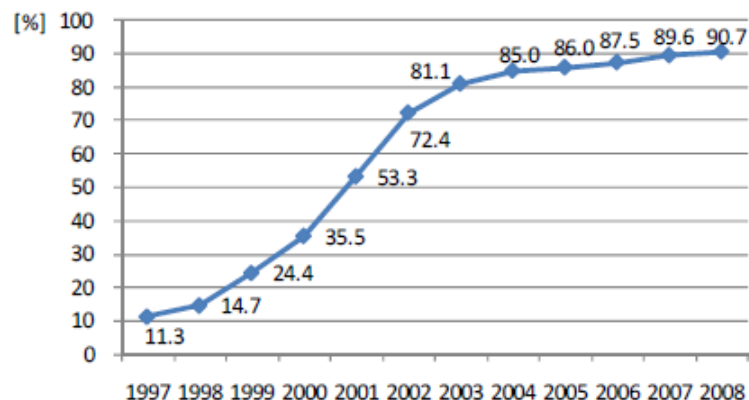


- In contrast to the European situation, in Japan there is a structure for energy assessment defined by the Japanese Top Runner Programme
 - In Japan, city authorities (> 0.25m population) are encouraged to sign up to the Top Runner programme, which operates via a league table assessment of the energy efficiency of a range of products that the authority will be purchasing, from cars and trucks, through to air conditioners, photocopiers and on to fridges and cookers
- The scheme is underpinned by national regulation but aims to foster green (energy efficient) public procurement by providing guidance, as follows
 - A standard set for a category which takes into account the anticipated improvement in energy efficiency for the product category (e.g. forward facing).
 - A league table of the top 10 products in the product category and their relative performance against the standard

Example of results

- For passenger cars the programme delivered a rapid increase in penetration of Top Runner Standard Compliant cars leading to a 23% reduction in fuel economy of cars purchased between FY1995 and FY2010

Penetration of 2010 Top Runner Standard compliant Passenger Cars



Source: SERC Discussion Paper SERC09035
www.denken.or.jp/en/serc/research_re/download/09035dp.pdf

Innovation Procurement (Case Study)

- Zero Emission Vehicles in Urban Society (ZEUS) Project
 - Stockholm was the project lead for a collaborative technology procurement project also involving Athens and Amaroussian (Greece), Copenhagen (DK), Coventry (UK), London Boroughs of Camden, Southwark and Sutton (UK) and Palermo (Italy). The project ran between 1994 and 1999. In combination, the cities identified an interest to acquire 174 zero emission passenger cars and 37 vans.
 - The consortium put an expression of interest in the Official Journal of the European Union in 1997, as well as opening up the procurement for third party buyers to join their consortia.
 - 7 suppliers were down selected from 20 bidders but only 3 (Fiat, Peugeot and Citroen) could provide both left hand drive vehicles for the European partners and right hand drive vehicles for the UK market.
 - In total 278 electric vehicles were eventually sourced by the partners and an additional 150 purchased by third parties.
 - The joint procurement helped achieve price reductions of 25-50% as well as full service and maintenance provisions.



Fiat Elettra, Palermo

Innovation Procurement (Case Study)

- Low Carbon Vehicle Public Procurement Programme (LCVPPP)
 - Launched in 2008, the LCVPPP was a collaborative procurement programme initiated and funded by the UK Department for Transport
 - The aim of the programme was to use public sector procurement to help stimulate the uptake of low carbon vehicles
 - 26 public sector organisations joined a consortium of buyers
 - A two stage approach was adopted whereby after initial purchase and trial activities (Stage 1) successful suppliers would be able to sell vehicles to the wider public sector with grant funding support (Stage 2) from the same procurement framework agreement
 - The project commenced with the procurement of a low carbon van and an all electric van
 - 24 supplier bids were received with 3 electric vans selected and 1 hybrid electric van
 - A total of 200 vans were ordered and entered trial operation with a minimum of 1 year 's operation required to prove out performance
 - Of the suppliers, only 1 (the hybrid electric van supplier) was selected for Stage 2. The battery electric vans were found to be too expensive due to high battery costs.
 - The Stage 2 procurement generated 500 orders in total
 - The hybrid electric van supplier is now offering a van product that is considered commercially viable with no grant funding.



Ashwoods hybrid electric van received 130 orders in Stage 1 and 500 in Stage 2

Innovation Procurement (Case Study)

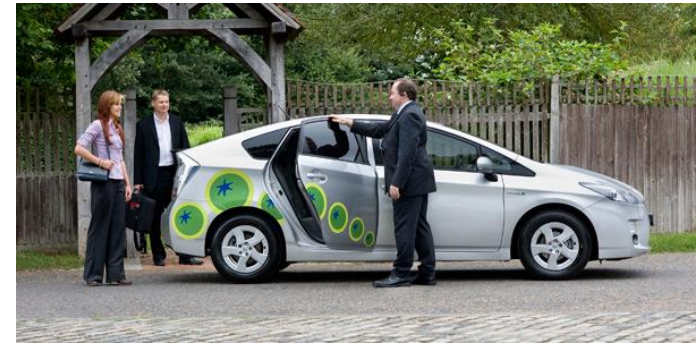
- Electric Vehicles in Stockholm
 - In October 2010, the City of Stockholm initiated a joint procurement , with state-owned utility company Vattenfall, to demonstrate Sweden's purchasing potential to manufacturers of Electric Vehicles (EVs) and Plug-in Hybrid Electric Vehicles (PHEVs).
 - A joint procurement approach was adopted to;
 - Reduce administrative costs for the participating organisations
 - To achieve price reductions for all buyers (big and small)
 - To send a strong demand signal to the market
 - In total 260 public sector organisations and 36 private bodies have been recruited to the buying consortium. The consortium anticipates purchasing up to 1,250 vehicles a year over the 4 year duration of the supply agreement.
 - The City of Stockholm engaged with 20 suppliers during its market sounding exercise. A 2 phase process was used with 12 of 14 suppliers passing the pre-qualification stage and 10 submitting full bids.
 - By the end of 2012, 174 vehicles had been purchased from the framework agreement.



Procurement of Services

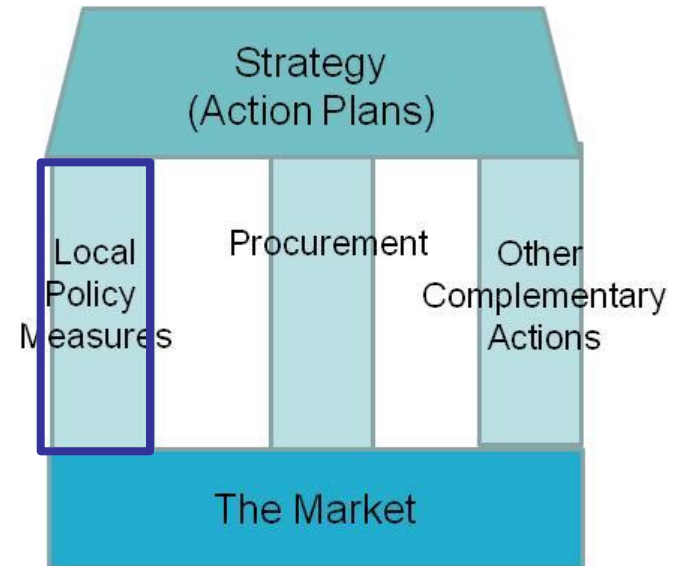
In cities across the world, services are being procured from companies who are seeking to use environmental performance as a differentiator.

- Postal Services and local delivery
 - Postal and delivery service providers including TNT, DHL and Royal Mail report increased customer interest in the environmental performance of their operations. All confirm to ISO 14001 Environment and all conduct environmental reporting.
- Private hire Limousine services
 - Green Tomato Cars established a London-based limousine service using Toyota Prius cars. The company promotes the environmental credentials of its vehicle fleet, which is exempted from congestion charge due to low emissions.
 - Chinese automaker BYD has recently agreed to partner with Green Tomato Cars to introduce 50 BYD electric minivans for trial in the London market
- Street cleaning
 - Amey reports having won street cleaning contracts with London boroughs by investing in service provision using electric vehicles (Modex van).



Local Policy Measures

- This section of the report addresses policies cities adopt by means of leveraging tools available via legislation, as well as standardisation, labelling and certification.
- Examples considered in this report include;
 - Vehicle licensing (certification) arrangements
 - Taxis and Freight
 - Road use regulation
 - Environmental zones
 - Congestion charge schemes
 - Freight regulation (night time delivery, consolidation centres)
 - Parking regulation
 - City centre and residential
 - Regulation of new developments
 - Low Emission Strategies



Taxi Licensing Arrangements

- Taxis operating within city boundaries are typically subject to licensing arrangements. These arrangements provide licensed operators with specified privileges in terms of access to clients and particular locations where client-business is available including railway stations and airports. Licensed taxis can also be provided with further benefits including access to bus lanes and dedicated parking ranks, all of which aid them in their business operations. In return for these privileges, licensed taxis have to meet vehicle performance and vehicle service and maintenance requirements set out within the terms of the license.
- Licensed taxis are often liveried to help the customer and other stakeholders (police, traffic wardens, etc) identify them from unlicensed 'private hire' operators. In some cases the performance requirements encourage the use of dedicated vehicle types (London taxi shape based on turning circle requirements) and in some cities regulation extends to cover vehicle emissions standards, with environmental measures implemented including regulation of the fuel used, as well as retrofit technology requirements to cut the emissions from older vehicles.
- **Examples include;**
 - London (licensed operational restrictions)
 - UK: London (Transport for London and British Airports Authority) restrict older polluting vehicles from operation (option to retrofit)

Taxi Licensing Arrangements (Case Study)

- London
 - Taxis in London are regulated by the Public Carriage Office (PCO), a department within Transport for London (TfL)
 - There are around 22,000 licensed taxis and 50,000 private hire vehicles (minicabs) in London. They contribute around 20% of harmful emissions from ground transport in Central London
 - In 2012, the PCO applied a 15 year age limit for taxis and a 10 year age limit for private hire vehicles
 - All newly licensed taxis must meet, as a minimum, the Euro V emissions standard
 - For older diesels the PCO has previously required operators to retrofit vehicle emissions control in order to be able to extend the taxis' operational lives in the capital
 - TfL and the London Mayor are working with taxi and vehicle manufacturers to develop a low emission (zero emissions capable) taxi by 2018



Fleet Certification Schemes

- Environmental performance measurement schemes
 - Environmental certification schemes provide a useful tool for cities when it comes to differentiating between the environmental credentials of different fleet operators when they bid for the supply of services.
- One of the better established environmental certification schemes is the ECO Stars Fleet Recognition scheme, developed in South Yorkshire but now has schemes operating across Europe, including in Rotterdam



- The key features of the ECO Stars scheme include;
 - Open to all fleets based or operating in the city area covered
 - Free advice to the fleet, followed by the award of an environmental star rating
 - Emphasis on fleet operations as well as the vehicles' environmental performance commercial vehicles and buses

ECOSTARS - Rotterdam (Case Study)

- Use of ECOSTARS Scheme
 - Rotterdam was one of 7 cities to join the ECO Stars scheme in 2012
 - The scheme is being applied by Rotterdam for its own fleet operations, as well as being promoted to private businesses operating commercial vehicles within the city limits
 - Local businesses, haulage companies and the refuse collection company for Rotterdam, have been assessed as part of the scheme.
 - Two consultancies are contracted by the municipality to carry out audits
 - ECOSTARS Rotterdam currently includes > 500 vehicles with a target to cover c5,000 vehicles
- Stakeholder organisations EVO (Employers' Organisation for logistics and transport) and TLN (Transport and Logistics Netherlands) have been sympathetic to the rating system on the basis that the terms of methodology is in line with national actions in this field.
- Rotterdam is investigating whether privileges can be extended to ECO Star operators, such as widening the time window for loading and unloading.



Schmidt Seafood received a 4 star rating for its truck fleet
Source: www.ecostars-europe.eu



Roteb's hybrid electric RCV achieved a 5 star rating
Source: www.volvetrucks.com

Environmental Zones

- Environmental zones (E-Zones) restrict vehicle access only to vehicles meeting defined environmental performance. These zones are typically designed either to keep out older gross emitters or are more restrictive and only allow access to the most EFVs. The former approach suits the regulation of larger areas whereas the latter approach is typically best suited to city centres including the 'old town' areas.
- The regulatory (implementation) approach for E-Zones is based on legal powers related to traffic restriction. Within national legislation cities have the right to restrict traffic flows to a particular area for reasons of public safety (a traffic management order in UK law). For E-Zones this definition has been extended to include safety related to public health and the desire to protect the general public from the harmful effects of air pollution.
- The E-Zones have defined guidelines as to which categories of vehicle and vehicle operator they apply restrictions to, when these restrictions apply (only at specified times or 24/7), guidance as to how the zones are policed and defined penalties for non conforming vehicles.
- The set up and operation of an E-Zone requires extensive planning and consultation ahead of its implementation, as well as setting up the licensing and policing arrangements, which typically involve vehicle permitting, as well as camera and traffic warden based policing.
- Examples include Tokyo (Japan), Gothenburg, Stockholm and Malmo (Sweden) and London (UK)

Environmental Zones – Case Study

- London Low Emission Zone
 - The London Low Emission Zone was introduced in 2008.
 - Covering an area of 1,580 sq km, the Zone operates 24/7, 365 days a year
 - The purpose of the Zone is to keep out older polluting vehicles. This is achieved by setting an environmental performance requirement on vehicles entering the zone.
 - Those vehicles entering the LEZ that don't comply with the required standard receive a hefty fine (currently £200-300 per day)
 - The Zone was originally introduced with a Euro 3 requirement for lorries > 12t in weight, with this standard being extended to cover lorries > 3.5t, buses, coaches and mini-buses,
 - Environmental exemptions apply for vehicles retrofitted with emissions control or operating on alternative fuels
 - The LEZ standard was further tightened to Euro 4 for lorries in 2012
 - The zone is monitored using Automatic Number Plate Reading Cameras with registration plates matched with vehicle owners using UK Government records (DVLA)



Freight Certification and Consolidation Centres

- A number of European cities have linked consolidation centres and environmental zones. Logistics companies deliver to a consolidation centre where deliveries are bundled for collection by local logistic companies operating environmentally friendly vehicles. These vehicles are typically afforded a wider operating window (times of day) for delivery than for logistic companies operating with conventional vehicles in other parts of the town\city. The local logistic companies typically operate zero emission vehicles including small electric vans for daily deliveries, as well as electric 3-wheelers and mopeds for time critical deliveries.
- Regulatory approach
 - The same as for environmental zones
- Examples include;
 - Amsterdam (Netherlands) – Food Centre Amsterdam
 - Hasselt City (Belgium) – City Depot
 - Nuremberg (Germany) – ISOLDE



Ref: 020stadtsdistributie.nl

Congestion Charge Zones (CCZs)

- Congestion charge zones (CCZs) seek to discourage vehicle movements within an area through a daily access charge. The charge can include discounts for EFVs. This approach provides a means by which businesses that operate dedicated fleets, to service customers located within a congestion charge zone, can mitigate costs that would otherwise be incurred.
- Traffic management legislation provides the regulatory basis for a congestion charge zones, with the terms of access defined by local regulation.
- Access to the zone is typically via a ticketing scheme where tickets can be purchased through designated outlets, either ahead of, during, or shortly after access.
- Zone policing is managed through the registration plate monitoring via camera-recognition with database matching between vehicle registration number, vehicle ownership documentation and ticket purchase.

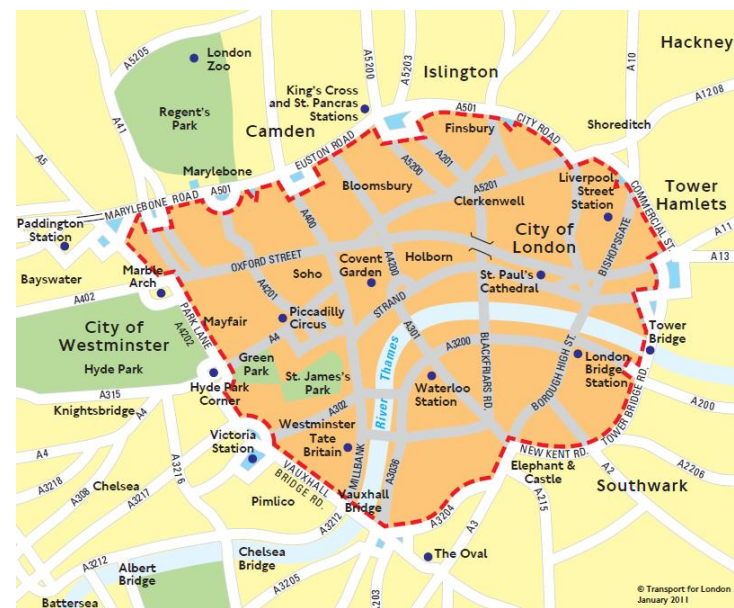


The Durham scheme includes camera recognition and requires payment on exiting the zone

Source: www.citytransportinfo.com

Congestion Charge Zones (Case Study)

- London introduced a city centre Congestion Charge Zone in 2003
- The primary purpose of the CCZ is to discourage traffic through central London to cut congestion. The cost of entry to the Zone is £10. However, the CCZ has included discounts of up to 100% on the charge for Zone entry for EFVs. Initially this was for alternatively fuelled, hybrid and electric vehicles but more recently the discounts were applied based on CO2 emissions (< 75 g/km CO₂).
- The London CCZ is credited with having helped create a niche market for Gwiz Electric Vehicles and has been cited as an important policy driver for electric vehicles in the UK by car companies.



Parking policy – public car parks and resident parking

- The majority of cities operate their own publically accessible car parks. These car parks typically only restrict access based on vehicle height and/or length (due to space constraints). However, in a few cases parking policy has been used as a means of signalling encouragement to the use of EFVs. Measures deployed include;
 - the incentive of free or reduced cost parking for EFVs
 - free electricity for electric vehicles via charge points often positioned in conveniently located parking bays
 - lower resident permit charges for EFVs.

Parking Regulation (Case studies)

- Gothenburg (Sweden)
 - To encourage EFV use the City of Gothenburg introduced dedicated parking spaces for certain types of (primarily natural gas and electric) vehicle in prime locations.
 - Owners of these vehicles registered them with the city authority and received a certificate which could then be displayed on the dashboard to aid the policing of the scheme.
 - Where it was not free, the cost of parking was also subsidised compared with other vehicle types.

Low Emission Strategies

- Low Emission Strategies refers to an area of work that has been developed by city authorities centred around the regulation applied to developments within city centre locations.
- Developments such as new housing build, new business premises, shopping, retail and leisure facilities, all give rise to air pollutant emissions arising from the additional traffic movements they bring to the site. These additional emissions can be particularly problematic if the area is already suffering exceedances and is designated an Air Quality Management Area.
- The Low Emission Strategies approach seeks to negotiate measures to ameliorate the impact of these emissions through EFV initiatives. Cities can either encourage investing businesses to pay a development levy (per sq m of development) that the city hypothecates into its' own EFV initiatives, or the business can be encouraged to invest themselves in EFV operation or facilities (e.g. fuelling stations for alternative fuelled vehicles) that help provide 'network benefits' by being accessible to a range of local businesses, as well as the city authority themselves.
- The Low Emission Strategies approach offers a flexibility to negotiate with businesses and for them to partner into local initiatives.

Low Emission Strategies (Case Studies)

- London Borough of Greenwich (Woolwich Town Centre)
 - As part of the redevelopment of Woolwich town centre, Tesco and a property developer submitted a bid for a supermarket and residential housing.
 - Aware that the development would lead to increased traffic movements and associated air pollution, the London Borough of Greenwich negotiated a Section 106 agreement with Tesco with environmental provisions including charging points for EVs in the car park, a car club and 50% of store delivery and 50% of Tesco' home delivery vehicles meeting Euro 5 emissions standards on the opening of the store.

Woolwich redevelopment



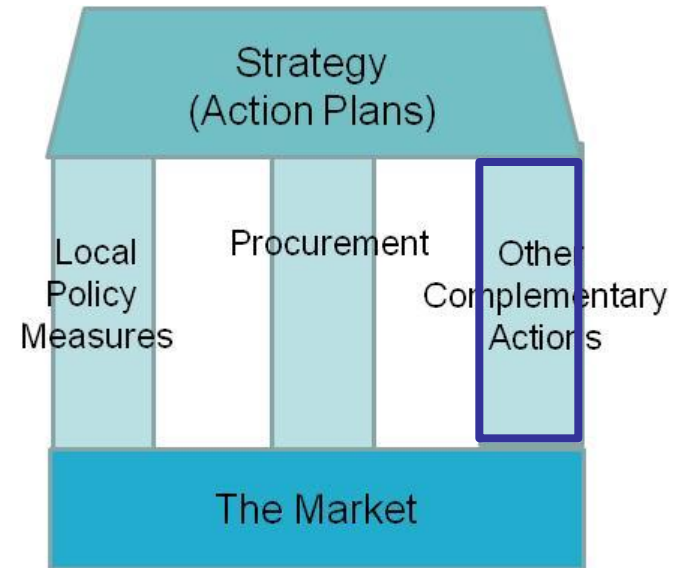
Tesco Extra Woolwich, opened in 2012



Ref: www.lowemissionstrategies.org

Other Complementary Actions

- Partnerships
 - Quality partnerships between business and local government, often for a specific sector (e.g. freight, bus, etc)
 - Support for special interest group whereby stakeholders collaborate on project based activities with a city-based focus on a technology or fuel-related opportunity
- Other innovation support
 - Participation in collaborative R&D projects
 - Government funded Infrastructure projects
 - City-managed competitions\funding



- UK Quality Bus Partnerships
 - Under the Transport Act 2000 and Local Transport Act 2008, a city\municipal authority can arrange a Partnership to ensure that the role of the authority, as the provider of high quality infrastructure, and the bus operators' role of providing high quality bus services, are effectively combined to achieve operational goals, without the need for public subsidy for bus services.
 - Quality Partnerships allow for regular (typically twice yearly) dialogue between key stakeholders on matters of common interest related to how bus services can be improved
 - At intervals the Partnership activities lead to the development of formal agreements that aid complementary investments in infrastructure, vehicles and services
 - Where Partnership operation doesn't deliver desired goals the legal framework allows the city authority to enforce a quality contract on a particular bus route
 - A number of UK cities have formed Bus Quality partnerships with suppliers (e.g. Oxford, Kent, Leicester, etc) to improve bus service provision and targeting environmental (air quality) demands through reducing congestion and negotiating EFV deployment.

Quality Bus Partnership (Case Study)

- Sheffield Bus Partnership
 - The Sheffield Bus Partnership includes bus operators First South Yorkshire, Stagecoach in Sheffield and Sheffield Community Transport, as well as Sheffield City Council and South Yorkshire Passenger Transport Executive (SYPTTE)
 - Launched in October 2012 the voluntary partnership has targeted increased bus passenger numbers, air quality improvements and route optimisation to reduce duplication, as competition between private operators was leading to bus congestion in some areas of the city
 - The Partnership has targeted EFV deployment such that more than 60% of Sheffield's buses (Nov 2013) met or exceed European environmental emissions standards, while 400 buses will be replaced to create a 50% fleet of the highest eco standard by 2017
 - The success of the first year of activities has helped the Partnership secure an exclusive Better Bus Area grant of £18.3 million to further improve Sheffield's bus offer
 - Bus operators active in the Partnership have also been successful in securing funding from the Government's Green Bus Fund
 - Stagecoach secured £1.5m for 19 new hybrid buses, now in operation



R&D Collaborations

- Cities develop collaborative working arrangements with local Universities and industry. These collaborations tend to be based on longstanding relationships that create a conducive context and platform for discrete projects when technology opportunities arise. For environmentally friendly vehicles, these projects typically reflect a shared interest in a given area and a willingness on the part of the city to trial new technology from the vehicle supplier on the basis of shared value and shared risk.
- Examples include;
 - London (UK); via the London Hydrogen Partnership
 - Berlin (Germany) and BMW; via the Mini-e trial
 - Birmingham and Coventry (UK) and Smart, Mitsubishi and Microcab; via the Cabled Project
 - Coventry (UK) and Peugeot; via the ZEUS project
 - Gothenburg (Sweden) and Volvo;
 - Yokohama (Japan) and Nissan

London Hydrogen Partnership (Case Study)

- The Greater London Authority co-funds a partnership between industry members to scope and develop projects supporting transport and stationary uses of hydrogen fuel cells in London.
- Formed in 2002, the Partnership owns the London Hydrogen Action Plan (2012-2016)
- The Action Plan has helped position fuel cell vehicles as a promising EFV technology able to assist London in meeting a range of strategic objectives via input to London's strategy policy framework which includes the Mayor's Air Quality Strategy and his Transport Strategy.
- The Partnership has helped develop several European Union funded R&D projects that have supported the demonstration of fuel cell powered buses, taxis and cars, as well as the deployment of hydrogen refuelling stations.
- The high level political support has helped put London 'on the map' for the industry interested to identify lead markets for hydrogen fuel cell vehicle deployment.

HYDROGEN
LONDON working towards a
hydrogen economy for
London and the UK



London's Deputy Mayor Kit Malthouse acts as a figurehead for the London Hydrogen Partnership

R&D Collaborations (Case Study)

- BMW Mini-E Trial (Berlin and Oxford)
 - Berlin was the first city to deploy BMW’s mini battery electric vehicle (Mini E) with testing commencing in June 2009. The vehicles were delivered to private customers and fleet users.
 - Testing in Oxford took place between December 2009 and March 2011 with 40 Mini E cars handed to private users for two consecutive six-month field trial periods.
 - The Oxford arm of the Mini-E trial had Oxford City Council and Oxfordshire County Council as partners with BMW, Scottish and Southern Energy and the South East England Development Agency (SEEDA). Data collection and research was conducted by Oxford Brookes University, with funding provided by the Technology Strategy Board and the UK Department for Transport.
 - In total 500 Mini E’s were tested with additional deployment in the US and China, as well as in Munich and Paris.
 - The trial helped establish EV charging infrastructure and high profile EV use to interest city residents. It helped cities learn about the factors influencing the attractiveness of EVs to end users and thereby the potential for EVs as a means of cutting air pollutant emissions.



Ref: www.bimmertoday.de



Ref: www.minispace.com

R&D Collaborations (Case Study)

- The CABLED Project (Birmingham and Coventry)
 - The CABLED project ran from July 2009 to June 2012. It showcased electric cars across Birmingham and Coventry, making ultra-low-carbon vehicles available to real users and collected data on everyday use.
 - 110 electric vehicles were deployed along with 36 charge points
 - Other partners in the project included Aston, Birmingham and Coventry Universities
 - Eon supported charge point deployment in public locations and for workplace and domestic installations
 - Mercedes (Smart), Mitsubishi, Tata and JLR all provided vehicles for the project
 - The Birmingham\Coventry activities made up part of a much larger international Mercedes (Smart ED) trial
 - Vehicles were tested for a minimum of 12 months operation
 - Funding was secured as part of the Ultra Low Carbon Vehicle Demonstration Project (ULCVD) co-funded by the Technology Strategy Board and the Department for Transport
 - The EV infrastructure was later integrated into the Plugged in Midlands EV infrastructure project



Mitsubishi MiEV cars being showcased in central Birmingham as part of the CABLED project

Infrastructure Projects (Case Study)

- Birmingham City Council and the Plugged in Midlands Project
 - As a founding partner in the CABLED project, Birmingham City Council, working with Coventry City Council, were keen to build on the progress made in vehicle and infrastructure roll out. The next opportunity available took the form of a national programme called Plugged in Places..
 - The Plugged in Places (PiP) programme was launched in 2009 as a pilot scheme to develop electric car cities across the UK. The plan was to use feedback from these pilot schemes to develop national charging infrastructure and inform national policy.
 - Cities and regions were invited to compete to acquire Plugged in Places status and secure 50% capital grant for EV charge points.
 - Birmingham City Council invited Cenex and Central Technology Belt to assist with the development of collaborative bid and to recruit additional cities to the consortium.
 - The Plugged in Midlands project commenced in December 2010 with its coverage extending across the East and West Midlands
 - As well as assisting with the development of the bid to win funding, Birmingham City Council served on the steering group and worked with Cenex to develop a 'Buy For Good' procurement framework for charge points to be available for use for any public sector body.



**Plugged-In
Midlands**

www.pluggedinmidlands.co.uk



EV Charge Point in Central Birmingham

City-based funding

- A number of cities have recognised the benefits of making available funding, at intervals, to part fund the cost of innovative environmental showcase projects. The benefit of this approach is that either customer-led or supplier-led initiatives can be encouraged.
- A competition approach is typically adopted whereby often radically different ideas can be submitted into a process with a common evaluation matrix. The most promising idea(s) can then be awarded funding, as well as being publicised to the local community and to other cities.
- This form of funding is typically discretionary and provided at intervals.
- The main benefit of this approach is that it is very flexible in terms of the initiatives it can be used to support and it can be attractive for organisations to engage with due to the publicity associated with a successful award of funding and the stakeholder interest this can generate.

City-based funding (Case Study)

- Oakland (California) and the Carl Moyer Programme
 - Air quality management issues in Oakland and the wider Bay Area are overseen by the Bay Area Air Quality Management District (BAAQMD).
 - The Carl Moyer Programme was established in the State of California in 1998 to provide grant funding for projects including retrofitting diesel trucks to cut air pollutant emissions.
 - Funding for the programme is raised through state tax on the cost of emissions testing of vehicles and on new tyre purchase fees. The scheme has recently been extended to include a levy on the new vehicle registration tax which is then redistributed for clean vehicle initiatives.
 - The funding is administered locally within the Bay Area, with small grants handled by BAAQMD.
 - In the BAAQMD funding is offered for engine replacement or engine retrofit with emissions control technologies for trucks, locomotives, construction equipment and tractors.



Ref: en.wikipedia.org/wiki/Carl_Moyer_Program

Summary (1)

- A city can deploy a range of demand side measures to articulate their needs to suppliers and road users, in terms of the environmental and/or energy performance levels the city feels it would prefer vehicles were achieving when operating within the city boundaries.
 - For cities, air quality concerns and the need to tackle climate change are drivers for a demand for EFVs.
- Demand side measures can typically be split into 3 categories, as follows;
 - Procurement
 - Local Policy Measures
 - Other Complementary Actions
- Procurement
 - Procurement is a key means by which an organisation can communicate its demands for EFVs
 - There is an obligation under EU law (Clean Vehicle Directive) to include environmental and energy performance criteria in vehicle procurement
 - Both Green Public Procurement and Innovation Procurement approaches can be applied
 - Innovation Procurement can help cities satisfy an unmet need
 - Examples include Refuse Collection Vehicles in Madrid and Low Carbon Vans for UK Local Authorities
 - Demand for EFVs can be articulated both through vehicle purchase and during the procurement of all types of service that require vehicle operation (public transport, waste collection, logistics, private hire taxis, etc)

Transform Project

Summary (2)



- Local Policy Measures
 - Local policy measures typically express demand by more restrictive practices, discouraging the operation of more polluting vehicles and favouring green vehicles
 - They leverage tools available through national legislation, as well as making use of standardisation, labelling and certification
 - Measures include certification schemes for categories of vehicle (taxis, freight logistics, etc)
 - Whole areas of a city can be regulated via Low Emission Zones and Congestion Charge Zones that then apply to large vehicle populations
 - Parking rules can also be differentiated to favour EFVs
 - The application of local policy measures typically requires extensive consultation with stakeholders
- Other Complementary Measures
 - Typically require Partnership working
 - Partnerships may be most effective when cities are actively supporting new technology development and deployment
 - Partnerships can be used to leverage innovation funding to help take forward project activities
 - Complementary measures typically work best to engage the market when seen to have strong political backing, as evidenced by inclusion of the measures in strategy documents, the availability of funding and a proposed pathway whereby EFVs supported via these complementary measures will, if successful, receive follow on support via procurement and/or other local policy measures;

Transform Project

SWOT Analysis – Procurement



Demand Side Measure	Critical Success Factors	Strengths	Weaknesses
Green Public Procurement	Benefits from an independent validated evaluation framework, particularly one taking into account future as well as current performance and linked to whole life costs	Can be adopted by many cities	Tend to have little impact on car purchasing (minimal impact on a global market) but can prove highly effective for smaller volume and more bespoke vehicle types dependent on the public sector for sales (city buses and refuse collection vehicles)
Innovation Procurement	Dialogue process and strong commitment to the demand articulated	Good means of helping introduce new technology to market, helping satisfy demand for an unmet need	Can be a slow process to implement, due to time required for the supply chain to development and deploy innovative technologies.
			Tend to only garner responses from more innovative SMEs offering unproven technologies
			Long timescales introduce the risk of loss of political support for the end procurement

Transform Project

SWOT Analysis – Local Policy Measures



Demand Side Measure	Critical Success Factors	Strengths	Weaknesses
LEZs and CCZs	Scheme set up and policing	Apply to large populations of vehicle	Expensive to set up and police
Freight and taxi regulation	Requires scheme set up and policing	Can target vehicle types that pose environmental problems.	Critics argue that freight regulation adds costs to operations already run to very tight margins and this is particularly disadvantageous to smaller operators.
Parking regulation		Can be used to promote environmental standards and/or raise funding for environmental measures.	Limited in scope to private individuals or businesses and can be politically unpopular.
Low Emission Strategies	A planning agreement and the time and inclination on the part of the city and developer to negotiate an agreement	Leverage on businesses tends to be high when associated with a new multi-million euro value development, for which time (delays) is money	Limited in scope to new developments. Therefore sporadic in nature for cities to implement and outcomes always negotiation dependent
	Need to ensure clear and transparent communications throughout for probity purposes and only request measures that are implementable.		Not effective for new innovative technologies.

Demand Side Measure	Critical Success Factors	Strengths	Weaknesses
Partnerships including R&D	Partnership working toward common shared goals, with city support for partnership forums	Effective at leveraging innovation (R&D) funding showcasing new technologies.	Not a guarantee that showcasing in small numbers will lead to post trial deployment in larger numbers



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