



CIVITAS

Cleaner and better transport in cities

MIMOSA

CASE STUDY



CLEAN VEHICLES FOR A CLEANER CITY

CLEAN FUELS AND VEHICLES



Sustainable mobility contributes to improved air quality. In addition to measures designed to encourage modal shift, a comprehensive strategy should also consider activities aimed at increasing the use of alternative fuels and cleaner, more energy-efficient vehicles. Within CIVITAS Plus, Bologna has tested innovative strategies and equipment to demonstrate the advantages offered by cleaner vehicles. Results relating to public transport and the private vehicle fleet have been very positive. These measures could represent an effective case for transfer to other cities.

Municipal context

Bologna is the capital of the Emilia Romagna region in Italy. The town, 140.85 km² in size and with 380,000 inhabitants, is located in the centre of the country. Surrounded by plains, hills, woods and the Apennines Mountains, the city has developed around a historic centre dating from the Middle Ages. The city centre is characterised by very narrow streets with their famous arcades, or porticoes. Even though this layout makes road space particularly cramped, the centre is still the focus of much public, commercial and cultural life.

The high demand for transport in the city and surrounding areas results in a high level of pollutant emissions with a low diffusion rate. As such, Bologna experiences high levels of air pollution, particularly fine particulate matter. The city centre's narrow streets further complicate the matter.

In June 2007, Bologna approved its Urban Traffic Master Plan. This outlines a strategy to address *inter alia* transport-generated pollution. This was further developed within CIVITAS.

MUNICIPAL PROFILE

LOCATION

Bologna, Italy

POPULATION

380,000

LAND AREA

140.85 km²

CIVITAS BUDGET

Five partners are involved in the implementation of CIVITAS MIMOSA measures in Bologna. The total cost of the 19 measures was 6,596,648.12 € (with the requested EC contribution: EUR 4,071,283.59 €)



BOLOGNA IN CIVITAS

Bologna (Italy) participated in CIVITAS MIMOSA, an innovative collaboration between the cities of Bologna (Italy), Funchal (Portugal), Gdansk (Poland), Tallinn (Estonia), and Utrecht (Netherlands). The motto of the project is “Making Innovation in MObility and Sustainable Actions.”

CIVITAS MIMOSA

With cities drawn from a range of geographical and economic situations, MIMOSA cities implemented a range of 69 activities, aimed at guaranteeing mobility to all citizens without burdening the environment or weakening the cities’ economy. Shaping a new mentality where conscientious behaviour is perceived as rewarding rather than a sacrifice was at its heart. This effort was reinforced by a host of technical and physical measures. It ran from 2008-2012.

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Introduction

Bologna is committed to reducing traffic-induced pollutants and greenhouse gas emissions by improving its public transport (PT) services and reducing car use. The city intends to reduce the environmental impact of its PT fleet through cost-effective vehicle replacement. Traditionally, the local public authority has always showed a strong interest in alternative fuel/ engine technology. When CIVITAS commenced in the city, Bologna had already implemented a plan for the PT fleet to shift to natural gas, thanks to regional co-funding.

The observation has also been made that, some citizens cannot or will not leave their cars at home in favour of public transport. The attitude of “I can’t survive without my car” stems from either physical or personal challenges, specific job needs, inability to reach their destinations by PT or simply a result of the fact that they belong to the “unconvertible car addicted driver” species. The city, for its part, is committed to giving such people the opportunity to contribute to lowering pollution and support the shift to cleaner fuels for private vehicles.

In this context, the participation in the CIVITAS Initiative has offered the city of Bologna two major opportunities. Firstly, it has benefitted from valuable experience exchanges with other European cities facing similar problems.

Secondly, it has allowed for the ‘on the ground’ testing of targeted innovative mobility policy, related measures and subsequent evaluation.

Taking a closer look

The first step towards clean PT fleet implementation was to carry out a feasibility study based on life cycle assessment (LCA), life cycle cost (LCC) and well-to-wheel (WTW) analysis. The study focused on different low emission bus technologies, to identify the cleanest and most cost-effective choice for Bologna. The conclusions demonstrated that

hybrid buses were the best solution. This finding was backed up by the transport company, TPer, which had already invested in alternative fuel other than diesel, i.e. trolley buses, natural gas powered buses, and reached the CNG infrastructure saturation point.

TPer then launched a call for tender in 2011 for two hybrid buses. In May, the contract was awarded and in April 2012 the buses started to circulate in the Bologna urban area.

From Monday to Friday, the hybrid buses run on a number of urban lines to test their suitability,



Hybrid buses



while at weekends the vehicles operate on two new shuttle bus lines travelling around the city centre. The vehicles are provided with an electricity generator, powered by an endothermic diesel engine, and an electric drive engine. The buses are equipped with innovative super capacitors, instead of conventional electric batteries. This helps reduce fuel consumption and cut maintenance costs, as there is no need for the deployment of battery charging stations or periodical battery substitution.

The generated energy is stored by the super capacitors and released to the electric drive engine during the acceleration phases. During the braking and decelerating phases the energy produced by the generator is stored by the super capacitor. This can very rapidly give back electrical energy in great quantities.

In order to promote private vehicle shifts to more environmental friendly fuels, such as compressed natural gas (CNG) and liquid petroleum gas (LPG), Bologna distributed specific funds, provided by the Emilia-Romagna region and the national government, to reduce intervention costs. Within CIVITAS, a specific team was allocated the task of managing the very complex procedure for granting incentives.

Integrated with the financial incentive distribution, was the exemption of CNG/LPG

and electric vehicles from the access restrictions planned between October 2011 to March 2012. Furthermore, on-street parking charges for CNG/LPG vehicles were halved, while these were completely free for electric vehicles. To promote the measure, the city carried out awareness-raising and information campaigns.

Supported by Emilia-Romagna's innovative electromobility programme, Bologna also promoted the spread of electric vehicles. Incentives were made available to residents that bought an electric bike. A network of on-street battery charging points was developed. Two on-street electric charging points for electric vehicles were deployed near the headquarters of the Emilia-Romagna Region and Bologna's city offices.

The programme is based on the unprecedented agreements signed by Emilia-Romagna Region, the national electricity company Enel and the multiregional utility Hera, which foresee e-company interoperability and plug-in device standardisation. In this way, electric vehicle drivers are allowed to charge their batteries wherever they need to in the regional territory, independent of their home electricity provider. The companies share hardware, software and plug-in standards and the charging costs incurred are debited as part of the home electricity bill.

Results

The activities carried out in Bologna were certainly successful. The cost of the two special hybrid buses was approximately the same as for conventional hybrid vehicles, except for the fact that conventional ones need battery replacement every three years, resulting in additional costs. Compared to conventional hybrid buses, the data collected under real service conditions in the summer of 2012, a period characterised by an intensive air conditioning use, show a fuel consumption reduction by approximately 26 percent, with the average consumption being 2.52 km/l (equivalent to 39.68 litres/100 km). The resulting estimated emission are as follows: Nitrogen Oxides: 6,67 gm / Km; Carbon Monoxide: 0,09 gm / Km; HC: 0,04 gm / Km; PT: 0,22 gm / Km.

In 2011, the number of LPG and CNG-powered vehicles circulating in the city reached 16 percent, exceeding the national average of 6 percent. In particular, cleaner vehicles now make up over 10 percent of the total fleet, fulfilling the European Union White Paper "Roadmap to a Single European Transport Area" recommendation. Compared to 2007, when the measure started, in 2011 the number of CNG and LPG vehicles in Bologna increased by 87 percent. This resulted in a reduction by 25 percent of carbon monoxide emissions, accompanied by a general emission decrease.

Cost-benefit analysis shows that the break-even point on the investment will be reached in 12 years. This means that the improvement of Bologna's air quality was not too expensive in relation to the specific time span.

With reference to the incentives for electric vehicles, after only one year all the available fund was allocated and approximately 900 electric bikes were purchased. Considering that electric bicycles are often chosen instead of more polluting motorbikes, the environmental benefits of this measure are clear. As a direct result of the action being so popular, new funds were allocated in September 2012 to be distributed in the same manner.

Bologna's efforts to improve its transport system and mobility policies have already been recognised in 2011, when the city won the European Mobility Week award, being judged



The TPer bus in operation



to have done the best job in promoting clean alternatives to using cars and involving citizens in activities to support sustainable urban mobility.

Lessons learned

Efforts to improve air quality in the city through actions on urban mobility should be addressed to make both the public and private fleets less polluting. A good strategy must take into account specific scenarios and background information, and the right technology must be chosen for the city's individual context.

The success of the measure to promote the a shift in fuel preferences from petrol to LPG and CNG does not exclusively depend on the incentives for vehicle owners to reduce the intervention costs. A key factor is a shared interest in environmental issues that can help persuade private car drivers to adopt cleaner vehicles and/or fuels. For this to happen, it is important that proper communication campaigns are carried out. Furthermore, the combination of incentives and other benefits arising from being able to move better around the city has proven to be a successful tool to achieve positive results.

Focusing on limited access and innovative parking policies as incentives to boost the purchase of clean cars can also influence the availability of clean fuel providers. These are an essential factor to make it possible for citizens to shift to lower impact fuels. Bologna, for instance, is one of the few Italian cities where the methane and LPG filling station network has increased significantly.

The choice of running a clean car represents a valuable and attractive alternative for city's residents.

Upscaling and transferability

Given the positive results to date, TPer's next investment plan will foresee the procurement of other hybrid vehicles. With no need for a dedicated infrastructure, hybrid bus technology is a highly transferable and adoptable solution.

The measure dealing with fuel shift to LPG or CNG can also be replicated in cities facing the challenge of stimulating car fleet replacement. Due to lack of funding, this measure will not be continued. Nevertheless, less polluting vehicles will be favoured where possible.

Following Bologna's example, similar campaigns to explore the potential of cleaner fuels have been already implemented in Italy at regional and national level. These are based on various schemes, which are adapted to specific local situations.

Following research, a new project was launched in September 2011 to create a methane-fuelled car sharing fleet.

The electromobility programme, carried out by the Municipality of Bologna, in cooperation with the Emilia-Romagna region, foresees the installation of new charging points.

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References or sources

CIVITAS webpages:
<http://www.civitas.eu/content/bologna>



Acknowledgements

Measures have been implemented by the Municipality of Bologna, the Emilia-Romagna region and ATC/Tper (public transport company at regional level), with the support of ClickUtility (a team of professionals experts in the field of local public services) and TeMA (consulting agency for mobility and local public transport services).

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Publisher

ICLEI – Local Governments for Sustainability,
Freiburg, Germany
Executive Director: Wolfgang Teubner

Date written

26 October 2012

Series editors

Ciara Leonard
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Layout

Stephan Köhler (ICLEI)



Alternative fueling station

