Milan, Italy

The Ecopass pollution charge and Area C congestion charge - comparing experiences with cordon pricing over time.

The city of Milan introduced the Ecopass, a selective pollution charge for the most polluting vehicles in January 2008 with the aim to reduce traffic pollution and congestion in the city center. In January 2012, the pollution charge was replaced by Area C, a congestion charge for all vehicles with the aim to expand on the effectiveness of the Ecopass.

157 ICLEI Case Studies July 2013

Abstract

In 2008, Milan introduced a cordon pricing scheme in the city center, by which vehicles entering the area had to pay a pollution charge, proportional to their emission class. The scheme, called Ecopass, was in force until January 2012 when it was replaced by a congestion charge scheme, Area C.

Milan's Ecopass and Area C schemes have reduced the traffic, increased public transport speed and ridership, improved air quality and led to public revenues collection for the city. This case study compares and analyzes the results obtained by the two schemes, and aims to highlight some helpful aspects for road pricing implementation in different contexts.

Population / Land area
1.25 million (2012) / 181.76 km²

Municipal budget
4,325,000,000 Euro [4]

Cordon pricing and congestion charging worldwide

Mobility in urban areas is often related to issues such as air pollution and congestion. These problems are more evident in areas with high car ownership, ineffective mobility networks and a lack of public transport services.

Local governments have since the beginning of the 21st century addressed such problems with several types of pricing schemes, of which cordon pricing is by now a well-known practice. Cordon pricing refers to a fee related to the use of roadways within an area defined by a cordon.

One type of cordon pricing schemes is congestion charges. For many years, the only example of congestion charging was Singapore, but today there are significantly more experiences to draw from, as well as several detailed plans that have made considerable progress towards political approval. Other examples of cordon pricing schemes are found in London, Oslo, Stockholm and Milan.

Although no easy generalization is possible, since final results of the implemented policies depend on how they are tailored to the specific characteristics of the city, the case of Milan is a useful example, as two different cordon pricing schemes were tested within a short time period. The analysis of this case thus supports a comparison between pollution charges and congestion charges.

Milan in context

Milan is the capital of Lombardy in northern Italy, and is the second largest city in the country. The city has a population of about 1.3 million, while its greater metropolitan area is the largest in Italy with an estimated population of about 5.2 million. The population density is 7200 habitants/km^2, double to that of Rome 's metropolitan area, and in the European region's top-ten population densities.

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Figure 1. Duomo di Milano

The Duomo di Milano is placed inside the cordon "Cerchia dei Bastioni" , that defines the tolled area of both *Ecopass* and *Area C.* This area covers 4,5% of Milan Municipality.

Although Milan is served by a considerable public transport network, car ownership is 0.6 cars per inhabitant [3], which ranks Milan among the cities with the highest car concentration in the world. This high car ownership along with the city´s geo-climatic conditions that are adverse to particulate dispersion, lead to high pollution levels.

In 2008 the local government launched a vehicle pollution charge "Ecopass", aiming to reduce PM10 concentrations, as stipulated by European legislation. That was the starting point of cordon pricing policies in Milan, as summarized in table 1 below.

Date	Important events in Milan's road pricing policies
Jan. 2008	Implementation of the pollution charge Ecopass
2008	First year trial of Ecopass
2009	Ecopass trial period year extension
2010	Ecopass pollution charge
June 2011	Ecopass Referendum
16 Jan. 2012	Implementation of the congestion charge Area C
25 July 2012	Area C trial period suspended due to a ruling by the Council State
17 Sept. 2012	Area C trial reintroduction
April 2013	Area C trial end, enters into force definitively

Table 1. Timeline

Timeline of important events in Milan´s road pricing policies in 2008-2013.

From Ecopass to Area C: A dynamic approach to road pricing

In 2006, the local government of Milan established a working group comprising academics and city officials in order to evaluate all the possible options for cordon pricing in Milan. The working group analyzed previous examples of cordon pricing as done in Singapore, London and Stockholm. The local government agreed to a trial period for a pollution charge (*Ecopass*) with tarifs proportional to vehicles' PM10 tail emissions (table 2), with a long-term prospective to gradually implement a congestion charge that would be equal for all vehicles.

In the Ecopass scheme, the charges were not set in order to eliminate all externalities of road traffic, but simply to meet a realistic target of reducing PM10 emission from vehicles. Focusing on air pollution abatement indicates the interest of the local authorities in environmental issues, but was also a strategy of theirs to overcome the tax payers' initial reluctance to the introduction of yet another charge.

Class	Main vehicle category	PM10 (mg/Km)	Charge (Euro)
Class 1	Low emission vehicles	0	0
Class 2	Petrol Euro 3 and euro 4 Diesel Euro 4 with particulate filter	≤ 10 mg/km	0
Class 3	Petrol Euro 2 and Euro 1	≤ 10 mg/km	2
Class 4	Petrol Euro 0 Diesel cars Euro 4 without particulate filter, Euro 3, Euro 2 and Euro 1 Diesel commercial vehicles Euro 4 without particulate filter and Euro 3	≤ 100 mg/km	5
Class 5	Diesel cars Euro 0 Diesel commercial vehicles Euro 2, Euro 1 and Euro 0	> 100 mg/km	10

Table 2. Ecopass pricing scheme. Toll classes based on Euro V vehicle emission standards during the *Ecopass* pricing scheme [1]

The system entered into force on 1 January 2008 for a one-year trial period and was later extended for the years 2009 and 2010.The Ecopass was a "cordon toll" within a defined area of 8 km^2 covering 4,5% of Milan Municipality.

The population within the area is 77,000 habitants, 6% of Milan`s municipal population. The location and dimension of the tolled area covers the historic urban district Cerchia dei bastioni. The 43 toll entrance gates were controlled by an electronic system of cameras, reading the license plates of the vehicles accessing the area.

In 2009 and 2010, PM10 concentration dropped to under the value of 40 µg/m^3 established by European legislation. In 2011, however, this continued reduction in PM10 concentration reversed, and the average PM10 concentration for the year once again surpassed the limit as it reached 49 µg/m^3. Indeed, the Ecopass led to two different results. The first was a modal shift from private cars to public transport. The second, however, was vehicles fleet renewal, that ended up increasing the number of un-tolled vehicles entering the area, which in turn increased the related friction emissions.

The Ecopass scheme was no longer able to accomplish the main objective of reducing PM10 below European legislation limits, and in the city a heated debate on the possible evolution of the road pricing policy began. In the same year an organizing committee, *MilanosiMuove*, promoted a referendum with five questions of which one regarded the future development of Ecopass.

The question stated:

> *"Would you like to extend the charged zone to the whole city and to all vehicle categories to fund policies for sustainable mobility?"*

The voter turnout was 49% and the result was clearly in favor of changing the cordon pricing: 80% positive answers and 20% negative answers.

As a result, *Area C* has now replaced the Ecopass and is based on the same designated traffic restricted zone corresponding to the central Cerchia dei Bastioni area. A trial period entered into force on 16 January 2012, and ended in April 2013. In March 2013, the municipal council decided to definitively adopt the Area C congestion charge that will be one of the most important measures in the future PUMS (Urban plan for sustainable mobility). All vehicles entering the area between 7:30 and 19:30 are now subject pay a five-euro charge. The payment allows traveling the whole day in the charged area.

Unlike Ecopass the Area C toll is equal for every vehicle. In fact older and most polluting vehicles were not circulating in the city center anymore so that most of the emissions now derived from friction sources.

For the residents of the tolled area, while under Ecopass there was the possibility to a discounted tariff with yearly permits, under Area C they have 40 free entrances per year after which any additional entrance will cost two Euro.

Results

Results of the Ecopass and Area C schemes are found in traffic reduction, public transport speed increase, air quality improvement and revenue collection.

Traffic results

Although the main Ecopass objective was to reduce air pollution emissions, the scheme also lead to significant results in traffic reduction and traffic composition, reported in the monitoring documents [1]:

- Traffic inside the tolled area as of 30 June 2011 was reduced by 16,2% with respect to 2007, before the Ecopass was implemented;

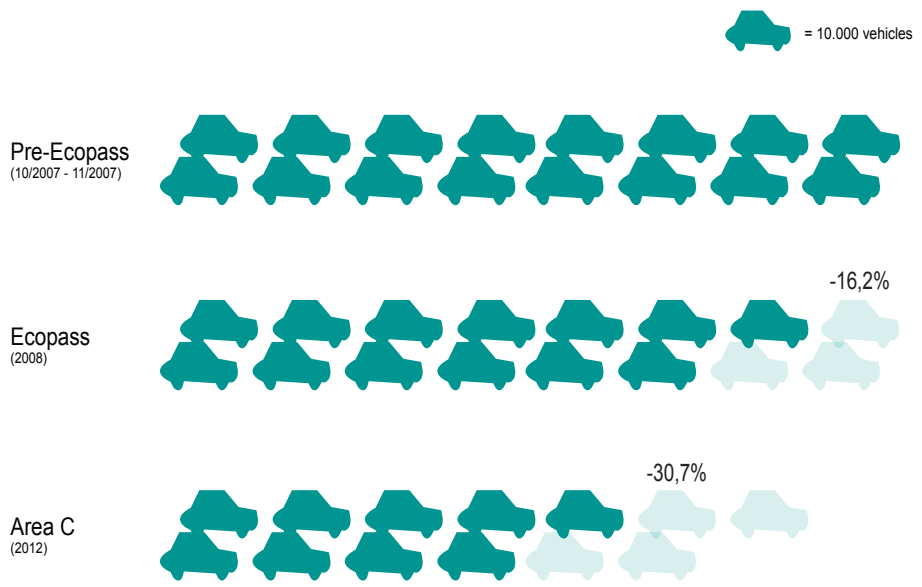

Figure 2. Traffic

Number of cars entering the tolled area before and during the implemetation of *Ecopass* and *Area C*.

- Road accidents within the tolled area were reduced by 21,3% in the same period;
- Traffic composition in the tolled area improved as the number of high polluter vehicles declined by 48,1% and number of low-emission vehicles increased by 478%.

After the launch of Area C, the traffic reduction has been even greater [(2)]:

- The daily average of vehicles entering the area during the first year of Area C was reduced by 30,7% with respect to the period of Ecopass, amounting to 41.000 vehicles less per day.
- Road accidents were further reduced by 23,8% with respect to 2011.

Public transport

During the Ecopass period public transport use, measured as the number of passengers exiting subway stations inside the tolled area, increased by 12,5% [(2)]. In addition, the average speed of public transport increased by 11,8% [(2)].

Comparing available data of public transport speed during the Area C scheme, we refer to the period January-June 2012 data with the data of the same period in 2011. This shows that busses and light train increased their velocity by 5% between 8:00 and 18:00. Outside the Area C the velocity of busses and light train increased by only 2-3% in the same period[(2)].

Air quality

It is estimated that the Ecopass scheme reduced the area's total PM10 emissions by 15% compared to the prior period without the Ecopass.[(1)] These estimated PM10 emissions were reduced by another 18% after the first year of the Area C

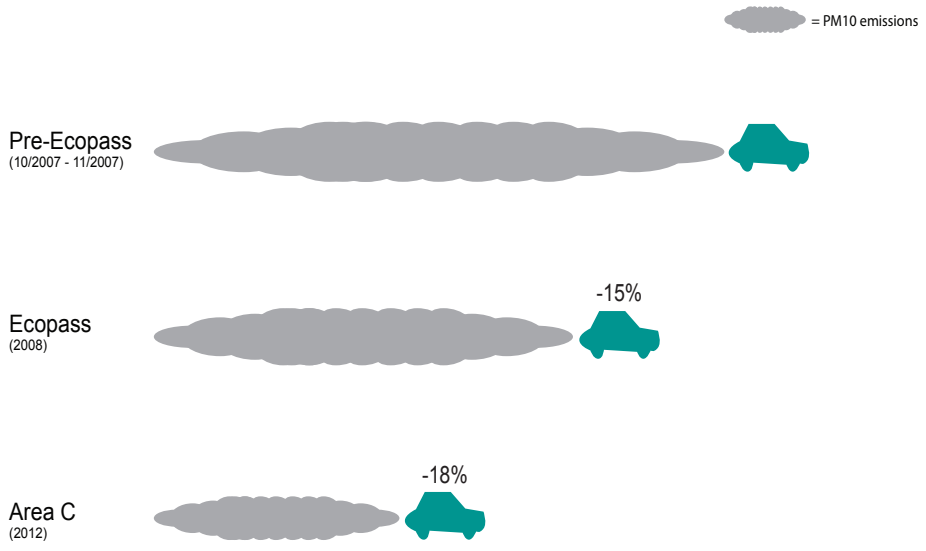

Figure 3. Pollution

Estimated PM10 emissions reduction in percentage in the tolled area thanks to the implemetation of *Ecopass* and *Area C.*

toll system in 2012 compared to 2011 levels [(2)].These estimations are based on the difference between the number of vehicles entering the charged area before and after the Ecopass' implementation.

In addition to this, from the latest analysis the level of black carbon in the tolled area is almost half of that of black carbon outside the tolled area. This pollutant is being proposed at the European and global levels as a new metric of particulate pollution health effects.

Revenue collection

Public administration revenues are the sum of charge payments and penalty payments. The annual charge payments were 12.4 million Euro in 2008, 9.6 million Euro in 2009 and 8.9 million Euro in 2010. During the Ecopass scheme the operational costs were equal to 6.5 million Euro. Since the trend of toll free vehicles continued to grow the revenues were continuously decreasing.

During the period between January to June 2012, the revenues under the Area C scheme amounted to 11.2 million Euro [4]. On the other hand, the operational costs in 2012, including the vehicles control system and management system, remained equal to those of the Ecopass, resulting in a net gain for the municipality.

Lessons learned

In Milan´s case several aspects regarding the implementation process and the effects of cordon pricing can be helpful to better understand and implement this kind of traffic measures in other contexts.

A pollution charge (Ecopass) may encourage private vehicle fleet renewal

The pollution charge could be a measure to foster and expedite renewal of the private vehicle fleet. In Milan, the yearly growth of Class «1» vehicle registrations was higher compared to the national Italian equivalent in 2008.

Local business and property values were not influenced by cordon pricing

Analysis on business effects and property values were carried out in order to investigate possible drawbacks of cordon pricing inside the "Cerchia dei Bastioni", and no negative effects were observed.

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Figure 4. Communication campaign.
GreenGraffiti Italia champaign for Milan Municipality to advertise the Area C Congestion Charge entered into force 16 January 2012. The *Ecopass* and *Area C* were publicized by means of various different media.

Importance of communication and transparency

The importance of communication and co-ordination between relevant stakeholders and the local government has also shown itself to be a key factor in Milan's case, where this is part of the city's integrated strategy for sustainable mobility. The Ecopass and Area C were publicized by means of different media such as radio, television, web and street posters and the GreenGraffiti champaign

(Figure 4).

Transparency in the use of the revenue is another key factor. Since the introduction of Ecopass, Milan Municipality has made substantial improvements, recently publicizing the balance sheets on their website. Furthermore, it is also possible to access the bimonthly report on Area C monitoring online.

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Figure 4. BikeMi.
One of the BikeMi stations, in Milan's bike sharing system in operation since 2008

Importance of improving alternative modes of transportation

Providing valid alternatives to private car users was one measure that was integrated with both cordon pricing schemes in Milan. Since the introduction of Ecopass, economic resources were invested in sustainable mobility, supporting public transport and bike sharing. Concerning public transport, 18 million euros were invested in 2008 in order to increase the service and route frequency which resulted in 1,000 additional rides per day[(2)]. In 2012 another 10 million Euros were invested in order to increase the service and route frequency. Regarding busses and light train, in 2012 there were 288 more rides per day than in 2011. Furthermore there were 28 more metro rides per day than 2011. Since 2008 Milan´s government invested resources to implement BikeMi, the city's bike sharing service (Figure 4).

Difficulties of a gradual approach

From the beginning of Milan's road pricing with the Ecopass scheme, a gradual and progressive approach was envisaged according to which less polluting vehicles would be charged progressively over the trial years, then gradually switching from the pollution charge to a congestion charge scheme. However, this approach had significant limits and difficulties. Once the Ecopass scheme was implemented, it proved complicated to change the charge scheme, and a consultative referendum was required to foster the changes necessary to implement the Area C congestion charge.

Replication

The introduction of cordon pricing in Milan followed the introduction of similar policies in London and Stockholm. The results achieved in Milan are in line with results achieved in these former experiences.

They show that cordon pricing can be a significant tool to promote a modal shift from private vehicles to alternatives transportation modes, using the revenues to enhance public transport, cycle networks and pedestrian areas.

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Milan's model of cordon pricing can be used by local governments with restricted economic resources, using the following framework:

- Establishing a working group comprising academics and city officials that research previous experiences and develop possible alternatives;
- Develop a pricing scheme considering the difficulties of dynamic pricing implementation in the context of the case in question;
- Make the utilization of revenues clear from the outset. Milan's local government developed a revenue utilization plan for the Area C scheme that has increased the number of public transport vehicles and enhanced cycle networks;
- Include a trial period and public communication of the results achieved. Transparency is a key factor for an effective and positive involvement of stakeholders.

Budget and finances

The operational costs of the Ecopass scheme amounted to 6,5 million [4] euros per year, which were directly funded by the scheme's revenues. The Area C is based

Sources

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