THE ECOPASS MODEL
IN THE CITY OF MILAN

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MILAN

Area: 181.76 km²
Population: 1,308,000
Population density: 6,988 people/km²
City capital of
Lombardy Region
MILAN ISOCHRONE 1 HOUR FROM CITY CENTER - 2008

AREA: km²
16,000

POPULATION:
9,000,000
MILAN TRAFFIC MODAL SPLIT (FREIGHT EXCLUDED)

Trips between Milan and the Metropolitan Area
- 50.3%
- 49.7%

Trips within Milan
- 66%
- 32%
- 2%
- 0%

4.061.000 daily trips

Trips between Milan and the Metropolitan Area
- PUBLIC TRANSPORT 32%
- CARS AND MOTORBIKES 66%
- BYCICLES 0%
- OTHER 2%

Trips within Milan
- PUBLIC TRANSPORT 47%
- CARS AND MOTORBIKES 1%
- BYCICLES 5%
- OTHER 1%
### MILAN TRANSPORT SYSTEM – NETWORK 2008

<table>
<thead>
<tr>
<th>Mode</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Railway:</strong></td>
<td>MAIN REGIONAL NETWORK</td>
</tr>
<tr>
<td></td>
<td>8 lines (&quot;S&quot; lines) Length: 282 km</td>
</tr>
<tr>
<td></td>
<td>(Surface railroad length: 185.5 km)</td>
</tr>
<tr>
<td></td>
<td>(&quot;Passante&quot; underground railroad length: 11.5 km)</td>
</tr>
<tr>
<td><strong>Metro:</strong></td>
<td>MAIN URBAN &amp; SUBURBAN NETWORK</td>
</tr>
<tr>
<td></td>
<td>3 lines (M1 – M3 – M3) Length: 75.5 km</td>
</tr>
<tr>
<td><strong>Tramway:</strong></td>
<td>MAIN URBAN &amp; SUBURBAN NETWORK</td>
</tr>
<tr>
<td></td>
<td>19 urban lines Length: 187 km</td>
</tr>
<tr>
<td></td>
<td>2 suburban lines Length: 24.4 km</td>
</tr>
<tr>
<td><strong>Trolley bus:</strong></td>
<td>URBAN CIRCLE LINES NETWORK</td>
</tr>
<tr>
<td></td>
<td>4 urban lines Length: 40.8 km</td>
</tr>
<tr>
<td><strong>Bus:</strong></td>
<td>LOCAL NETWORK</td>
</tr>
<tr>
<td></td>
<td>58 urban lines Length: 464 km</td>
</tr>
<tr>
<td></td>
<td>46 suburban lines Length: 492 km</td>
</tr>
</tbody>
</table>

**Total:** 140 lines 1565.7 km
One of the main goals of Milan environmental policy is to fight air pollution and more specifically fine particulate concentration.

Milan has adopted a strategy for sustainable mobility, health and environment with the aim of taking effective action in improving environmental conditions, health and quality of life for people living and working in the Milan area.
The City of Milan is located in an area with poor conditions for the natural dispersion of pollutants, favoring a high recurrence of exceedances in air pollutants.

PM 10 Air quality EU limits:

- 50 µg/m³, not to be exceeded more than 35 times a year as 24-hour limit value
- 40 µg/m³ as mean annual limit value.

In Milan from 2005 to 2007:

- this limit was exceeded more than 120 times in a year
- annual mean values ranged between 51 µg/m³ and 54 µg/m³
LIFE EXPECTANCY LOSS (N. OF MONTHS) ATTRIBUTABLE TO PM 2.5 EXCEEDANCES

Image source: Vainio M. (2004), Fine particles in the framework of the CAFE Programme
MILAN PM 10 EMISSION INVENTORY

The strategic areas of intervention identified by the administration involve:

1. Increasing the use of Public Transport
2. Development of on-demand public transport systems
3. Fare integration and electronic ticketing
4. Rationalisation of urban traffic
5. Extension of parking regulations
6. Development of bicycle mobility
7. Increasing interchange parking lots
8. Rationalisation of urban goods distribution
9. Improvement of road safety
10. Increasing car sharing services
11. Development of info-mobility
12. Encouraging use of vehicles with zero or low environmental impact
13. Introduction of a Pollution Charge - ECOPASS -
ECOPASS is a daily entrance charge (7.30 am – 7.30 pm working days) to access the city center by passenger and freight vehicles. The charge is commisurated to PM 10 tail emissions.

Ecopass aims at reducing congestion, concentrating reduction on most polluting vehicles.
Italian Laws allow **Municipalities to limit circulation to determined areas and to apply fees to access these areas.**

**ECOPASS** is based on the polluter pays” principle”. 
ECOPASS AREA

8.2 km² (4.5% of city territory)
43 toll entrance gates
ECOPASS CLASSIFICATION CRITERIA

Exhaust PM 10 emission factors are taken from EMEP/CORINA IR Emission Inventory Guidebook that makes reference to the COPERT4 methodology for road transport.
<table>
<thead>
<tr>
<th>Class</th>
<th>Main vehicle category</th>
<th>PM10 (mg/km)</th>
<th>Charge</th>
</tr>
</thead>
<tbody>
<tr>
<td>Class 1</td>
<td>Low Emission Vehicles</td>
<td>=</td>
<td>0 euro</td>
</tr>
<tr>
<td>Class 2</td>
<td>- petrol Euro 3 and Euro 4</td>
<td>&lt;= 10 mg/km</td>
<td>0 euro</td>
</tr>
<tr>
<td></td>
<td>- diesel Euro 4 with particulate filter</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Class 3</td>
<td>- petrol Euro 2 and Euro 1</td>
<td>&lt;= 10 mg/km</td>
<td>2 euro</td>
</tr>
<tr>
<td>Class 4</td>
<td>- petrol Euro 0</td>
<td>&lt;= 100 mg/km</td>
<td>5 euro</td>
</tr>
<tr>
<td></td>
<td>- diesel cars Euro 4 without particulate filter, Euro 3,</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Euro 2 and Euro 1</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>- diesel commercial vehicles Euro 4 without particulate</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>filter and Euro 3</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>- diesel commercial vehicles Euro 2, Euro 1 and Euro 0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Class 5</td>
<td>- diesel cars Euro 0</td>
<td>&gt; 100 mg/km</td>
<td>10 euro</td>
</tr>
</tbody>
</table>
Tariffs have not been determined in order to eliminate externalities, but in coherence with a realistic target of traffic reduction and of PM 10 tail emission reduction.

Elasticity of renounce to use car to tariff has been estimated through a stated preferences analysis based on 2000 interviews to car drivers.
## Proposed Alternatives for Each Fee

<table>
<thead>
<tr>
<th>Car Pooling</th>
<th>Switch to Local Public Transport</th>
<th>Park &amp; Ride</th>
<th>LPT</th>
<th>Two Wheelers (Motorcycle and Bicycle)</th>
<th>Renounce to Journey</th>
</tr>
</thead>
<tbody>
<tr>
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<td></td>
<td></td>
</tr>
<tr>
<td>6%</td>
<td>74%</td>
<td></td>
<td></td>
<td>7%</td>
<td>13%</td>
</tr>
</tbody>
</table>
The area guaranteed a high level of infrastructure and service with **28 “surface” lines**, including buses, trams and trolleybuses and **three subways lines**.

39 urban and suburban lines have been potentiated anyway since the time of Ecopass start.

**Modal split in Ecopass area already showed a prevalence of public transport** (nearly 70%).
The Ecopass system is entirely based on an access control system composed of 43 electronic gateways. The electronic gateways have built-in cameras that take pictures of the license plates of all incoming vehicles. Plates are identified through an OCR (Optical Character Recognition) system, for a vehicle classification, resulting in eventual fines for unauthorized vehicles.
You can pay the charge the same day or the following one.
You can pay via internet, phone, ATM, bank remittance, or cash.
You can buy a single daily pass, multiple access pass, area resident discount pass.
Failure to pay determine a fine of about 70 euros.
Free access is granted to public transport vehicles, taxis, emergency vehicles, modeps, scooters, motorbikes, vehicles carrying disabled passengers and/or bearing a disabled passenger badge.
ECOPASS PUBLIC COMMUNICATION

- Information on the website of the City of Milan
- Radio TV and press campaign
- Street advertising
- Leaflets
- Letter from the Mayor to all citizens
- Variable message signs

Monitored results are communicated to the population on a monthly base.

A public consultation will be performed at the end of the first year experimental period.
Effects of Ecopass are evaluated through the monitoring of:

A. **environmental effects** (changes in characteristics of circulating vehicles, traffic emissions, pollutant concentrations, mainly PM10)
B. **traffic effects** (traffic flows, with their vehicles composition, congestion levels on the road network, average speeds and times for trips)
C. **public transport effects** (monitoring the number of daily passengers, monitoring quality standards, commercial speed);
D. **on-road safety effects** (accidents indicators, injuries indicators);
E. **socio-economical effects** (general economic indicators, specific retail indicators, average estate values);
F. **level of acceptance and consensus**
G. **economic figures** (Operating costs, Income from ticketing, income from fines, Income reinvestments, Traffic externalities)

Monitoring has the aim to provide a general framework for Ecopass assessment and can help in the development of a Decision Support System to guide the evolutions of Ecopass System. Ecopass is conceived as a dynamic system. Because of natural rate of substitution of cars, in order to keep results on congestion, the scheme needs to be periodically updated.
The deterrent effect resulted higher than expected. Renounce to private car use rates were close to the ones obtained with the Stated Preferences survey, but it is also possible to observe a renounce among heavy duty vehicles.
There is a decrease in road traffic in the Ecopass area of 14.2%, accompanied by a road traffic reduction out of the area of approximately 3%.
The total number of vehicles subject to fee payment (Classes 3, 4, 5) that enter the Ecopass area each day decreased by 60%, which equals 26,000 vehicles/day; of which:

35% change of itinerary (avoiding Ecopass area),
17% access with non-pollutant vehicles (vehicle substitution)
48% modal shift (renounce to use car.)
RESULTS

-20, 7% reduction of accidents

-19.4% reduction of accidents with injured
The estimated mean reduction of exhaust particulate emissions within the period during which Ecopass is imposed is about 23%, and the reduction of ammonia emissions (the second pollutant chosen as Ecopass classification criterion) is almost 50%.

But for other main pollutants the obtained results positive too: emission reductions are estimated between 15% and 20% for total primary PM10, nitrogen oxides and carbon.
In Milan, between January 1st and September 30th 2008:

- Number of 50 ug/m³ exceedances was 52 vs the 2005-2007 average of 82 exceedances.
- Mean urban PM10 concentrations was 38 ug/m³ vs the 2005-2007 average of 47 ug/m³.

- Meteo conditions affect the result.
Revenues are estimated to amount to 12-15 million euro for year 2008.
All revenues have already been reinvested in public transportation increase.
Less than 10% of users are “heavy users” (entering the area more than twice a week).
Management costs amount to 6-8 million euro.
Infrastructure costs depend on sunk costs for the traffic control system of Milan,
Performing a rich variety of functions.
Benefits in terms of the reduction of social costs will be calculated.
THANK YOU

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www.comune.milano/ecopass