Car Sharing as an Environmental and Pedestrian-Friendly Mobility Measure: the Rome Case Study



Summary

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Introduction The CS service in Rome facts and figures assessing the operations profiling the users environmental benefits livability improvements Conclusions

Introduction



Introduction



The CS service in Rome: facts and figures



Currently: 111 vehicles (same make, different models) 61 locations 1,500 CS registered members

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Points of strength:

affordability

(low rates and small membership fees, special discounts for transit pass-holders, no extra charges for gas)

circulation bonuses

(no parking fees, free ride on taxi/bus lanes and access to LTZs)

good area coverage at district level

(the number of locations, each of them calculated as a circumference with a radius= 500m, compared to the whole neighborhood area, is about 1)

The CS service in Rome: facts and figures



The CS service in Rome: facts and figures

Development of the service

Some performance indicators have been estimated to describe how the service progressed from the operative point of view in the last thirty months. Such a performance analysis was developed comparing four different scenarios of the service:

SCENARIOS		Memberships	Vehicles	Locations	
	January – March 2008	783	35	22	
	November 2008 – January 2009	1, 04 0	41	24	0
	November 2009 – January 2010	1,370	106	61	
	March 2010 – May 2010	1,500	111	61	

During the third scenario **37 new locations** were introduced in areas where no service was available before

The CS service in Rome: assessing the operations

Development of the service

Operational indicators have shown that to a general increase of the service in terms of number of trips and amount of hours the CS vehicles are reserved, did not correspond an equal increase in the average number of km travelled per trip (from 43 to 34 km/trip); such a discrepancy seems to suggest that car sharers use the service more frequently and for shorter trips.



The CS service in Rome: assessing the operations

Differences at urban level

To different districts and even locations may correspond very different indicators values, due to several factors as the quality of the built environment where each parking area is located; closeness to other locations which may play the role of "equally-preferred option"; car models available at each location, etc.



The CS service in Rome: assessing the operations

Best and worst locations according to operational performances indicators (monthly)



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The CS service in Rome: profiling the users

With about 20 trips/user per year, the Rome CS member:

- is an adult (age: 35-60),
- makes in average 34 km per trip in about 5 hours,
- picks up the car usually at 3 different locations

.....but merging results from an O/D matrix with a GIS-based analysis of typical home - CS location distances



The CS service in Rome: profiling the users

... it came out that, for each location, there are three kinds of CS members

- a) Those <u>who live in the district</u> and hopefully walk to the chosen CS parking (home-cs parking distance < 2 km)
- b) Those <u>who do not live in the district</u> and drive to the chosen CS parking (home-cs parking trip < 40 min., up to 40 km)
- c) Those <u>who do not live</u> in the district and walk or drive more

Walkers are the majority (70 %)

some locations are used by walkers, only

as a result, the importance of "closeness" is very relevant as: The average distance by walking members = 530 m The average distance by driving members = 5 km (or 16 min)

The CS service in Rome: profiling the users



The CS service in Rome: assessing the locations

The success of a location depends (mainly) on land use:



(Cervero, Sasheen, Littmann)

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The CS service in Rome: assessing the locations



The CS service in Rome: assessing the locations

Quality parameters of the road network: 3 recurring patterns

Built Environment

PARKING AREA: MASSI	MINA
N° of NODES	72
N° of LINKS	119
N° of BLOCKS	32
AVERAGE SIZE PER BLOCK	6.28 ha

suburban location



3

PARKING AREA: LEC	CE
N° of NODES	150
N° of LINKS	271
N° of BLOCKS	111
AVERAGE SIZE PER BLOCK	1.81 ha

central location



PARKING AREA: ARGENTINAN° of NODES312N° of LINKS530N° of BLOCKS161AVERAGE SIZE PER BLOCK1.25 ha

historic area location



The higher number of blocks, the best network connections!

The CS fleet is composed by conventional gas-fuelled, EURO 4 and 5compliant vehicles; moreover the CS vehicles are newer (2 years old) than most private vehicles (the average age of the private cars fleet registered in Rome is about 8 years old) and with:

better engine technology

improved fuel efficiency

lower emission levels

vehicle type	units	average age (years)	EURO requirements
CINQUECENTO	6	1.3	EURO V
PANDA	68	1.4	EURO IV
GRANDE PUNTO	28	1.7	EURO IV
MULTIPLA	2	3	EURO IV
DOBLO'	5	1.4	EURO IV
FIORINO	1	1	EURO IV

The private cars fleet registered in Rome (1,923,397 vehicles) is compliant with Euro requirements as follows:

✓ 12.12 % Euro 0
✓ 8.58% Euro 1

✓ 18.91% Euro 2

✓ 20.77% Euro3

✓ 39.52% Euro 4

(ACI - 31/12/2008)



The calculation of the environmental effects due to the circulation of the CS fleet and its relevance at urban level have been elaborated, starting from the number of trips and km travelled for each type of vehicle available in the CS fleet in 2009



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The emission package due to the CS fleet and the registered private cars fleet have been estimated according to the COPERT methodology:

$$\mathbf{E}_{\mathbf{p}} = f e_{pjk} \ x \ N_j \ x \ perc_{jk}$$

 fe_{pjk} emission factor per p-pollutan, j-class of vehicles and k-driving cycle (g/km*veh)

N_i number of j-class vehicles (units)

perc_{ik} travel lenght for the j-class of vehicles and k-driving cycle (km)

For each pollutant an average emission factor has been estimated taking into account the composition of the registered fleet circulating in Rome in terms of:

- EURO requirements;
- type of fuel used (gasoline/diesel);
- vehicle category

CARBON DIOXIDE

The local operator provided the specific CO_2 emission factor per each type of CS vehicle

vehicle type	CO₂ g/km		
CINQUECENTO	119.00		
PANDA	119.00		
GRANDE PUNTO	139.00		
MULTIPLA	204.00		
DOBLO'	168.00		
FIORINO	204.00		

The difference between the CO_2 emissions of the CS fleet in comparison to the private cars fleet regarding the same mileage travelled in 2009 is about - 46%



The comparison results in terms of CO, NO_x , PM and NMVOC emissions



The CS service in Rome: livability improvements

CS has a not negligible effect on traffic, in terms of reduction of circulating passenger cars



(*) = Area required by a 10-km, home-to-work trip (two ways) in a given working day – UITP standards 2001

The CS service in Rome: livability improvements



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The lesson learned from Rome so far proved that even minor measures as CS can contribute far beyond expectations to improve environment and livability, even though a strong impact on travel patterns in Rome is currently beyond reach

However, more important is to assess such a service in terms of achievable environmental benefits and livability:

For all the citizens:

Less pollution

Improved urban environment at an affordable cost (theoretical cost of the service per inhabitant:0.34€)

For the most frequent users:

- Increase walking (annual average number of steps per user: 53,000= 42.4km)
- Increase health (annual average energy expenditure: 2,200 kcal)