

# Make space for Car-Sharing!



**Car-sharing in Sweden,  
its definition, potential and effects,  
IT-solutions for administering it,  
and strategies to further its  
development**

**July 2003**

## ***Preface to the short English version***

In May 2002 the Swedish National Road Administration published the report "Bilpooler – nyckeln till flexibelt resande" ("Car-sharing - the key to combined mobility"). Much has happened since then, the development of car-sharing in Sweden having accelerated. Yet lack of knowledge regarding car-sharing is still a major factor hindering its establishment and expansion. The present report can be seen as complementing this earlier publication through presenting new documents and describing recent developments. The major aim is to clarify the potential of car-sharing and provide support for those wishing to further its growth.

In one's enthusiasm about something, one can easily lose perspective. Thus, although car-sharing clearly has a wide variety of positive effects, it cannot achieve everything one might hope. Even if during the next 20 years, the full potential of car-sharing in terms of number of households were achieved (somewhere around a million), this could only be expected to result in a reduction in carbon dioxide emissions by road traffic of a few percent. Luckily, on the other hand, the effects of societal developments are assessed, not on the basis of a single parameter, but in a much broader sense. The greatest strength of car-sharing lies perhaps in the structural changes it can bring about – in particular through complementing the transportation system in its present form and providing more effective use of cars.

This report is primarily a concise compilation of written material commissioned from different firms. It has been referred for consideration to various authorities and organizations, and been adjusted in line with this. The report deals with following matters:

- A Swedish definition of car-sharing, together with quality requirements and practical considerations, here provided in its entirety.
- A national strategy for furthering the development of car-sharing. A summary of it is provided here.
- A nationwide investigation of the interest shown in car-sharing and of the demographic basis for car-sharing. Results of the investigation are summarized.
- What is known regarding the effect of car-sharing on carbon dioxide emissions, a summary of this being provided.
- Digital administrative systems presently available for car-sharing organizations, as summarized here.

Gothenburg, July 2003

Per Schillander

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**Frontispiece:** Parking sign located in Hammarby Sjöstad, 2003

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# **Swedish definition of car-sharing**

**Together with  
quality requirements and  
practical considerations**

## ***Preface to this section***

Since it has been shown that car-sharing can contribute markedly to reducing the burden of automobile traffic on the environment, the Swedish National Road Administration considers it important that the establishment and growth of car-sharing schemes be encouraged. There is a need of clarifying, however, just what car-sharing is and what quality requirements should be met by car-sharing groups in order for public benefits and support to be provided them.

Accordingly, the Swedish National Road Administration decided in November 2002 to commission the firm Trivector Traffic with developing a more adequate definition of car-sharing and recommending what quality requirements should be placed on car-sharing activities in Sweden, as well as how the definition of car-sharing and the quality requirements should best be applied in practice.

The following report, commissioned by Per Schillander of the Swedish National Road Administration, has been written and prepared by Christian Rydén of Trivector Traffic.

The definition of car-sharing presented here replaces the description of it contained in the Swedish National Road Administration's earlier publication "Samsas om fordon" ["Sharing of Vehicles"], Vägverket Publikation [Publications of the Swedish National Road Administration] 1998:66.

# **1 Introduction**

Car-sharing can be seen as an effective measure for reducing the burden of automobile traffic on the environment. The automobiles belonging to Swedish car-sharing organizations are often newer and have more satisfactory environmental and safety characteristics than Swedish cars in general. Studies have also shown that a member of an average car-sharing scheme drives only about two-thirds as much as earlier and that a shared car, through being used more effectively, takes the place of some five privately owned cars and as many parking spaces. Car-sharing also represents an important complement to other types of environmentally friendly forms of traffic such as pedestrian traffic, bicycle traffic and public transportation. For these reasons, the Swedish National Road Administration feels that public authorities in Sweden responsible for traffic or environmental issues should clearly encourage the establishment, growth and utilization of car-sharing.

Existing car-sharing schemes in Sweden and elsewhere have provided a norm for indicating what car-sharing, both generally and in Sweden in particular, represents. A more adequate definition, however, applying to car sharing in Sweden, appeared to be needed. Through providing such a definition, through suggesting appropriate quality requirements car-sharing should meet in order to receive public support, and through considering various questions of practical importance in this context, the Swedish National Road Administration hopes to contribute to a better understanding of car-sharing generally. Doing so also creates a more adequate basis for planning on the part of those who want to start up a car-sharing system. It can also help public authorities facilitate the development of car-sharing. A brief account of what was aimed in the present report follows.

## ***Definition***

Promoting a simple and clear definition of car-sharing was considered to improve public understanding of the concept. It was felt that such a definition should be broad enough to include all types of shared vehicle use generally regarded as car-sharing.

## ***Quality requirements***

Since car-sharing is beneficial to society in a variety of ways, it is felt that public authorities should provide those engaged in cars-sharing with certain benefits. At the same time, a number of quality requirements are clearly needed in order to ensure that the benefits have the desired effect without this being misused, and that car-sharing contribute in a genuine way to the goals of society. The quality requirements also provide criteria for establishing car-sharing in a company or other organization in a way in which the principles considered should apply to car-sharing are followed.

## ***Practical considerations***

In addition to clarifying what is meant by car-sharing and the requirements involved, various practical considerations are discussed, in particular how the quality requirements can best be met in practical terms, what departures from them can be made under certain circumstances, and how additional standards of quality can be arrived at.

## 2 Definition

Use of a simple but informative definition of the concepts of car-sharing and of a car-sharing organization can increase public understanding of what they involve. Such definitions should be broad so as to basically encompass all forms of shared vehicle use referred to as car-sharing. The definition should also be general in character, adequate for use internationally and be able to stand the test of time.

### Definition

Car-sharing means that a number of persons share the use of one or more cars. Use of a car is booked beforehand, the user paying a fee based on the distance driven and the length of time the car was made use of.

Although this is similar in some ways to traditional car rental, it differs in the possibility it provides of booking a car for short periods of time and in the rental agreement being made for an extended period of time, rather than each time a car is used. In addition, each household has its own set of keys, and cars are placed in the vicinity of where members live. In the case of company car-sharing, the keys and the cars are being readily available at the place of work. "Key" is here equal to smartcard or similarties.

There can be many different variations in how car-sharing is organized. This depends in part on who is in charge or bears responsibility (a cooperative, a private firm, a municipal government, or whatever). In addition, car-sharing organizations can be classified as being either open or closed. A closed car-sharing organization has a set of vehicles used by a limited group of persons, such as the employees of a firm or of a municipal authority. An open car-sharing organization, in contrast, is one that in principle anyone can belong to. This is the case in the majority of Sweden's car-sharing cooperatives. Many different combinations of the forms of car-sharing organizations just described are possible.

Although the definition given above covers basically all forms of car-sharing presently found in Sweden, it is important that the concept be distinguished from traditional car rental.

### 3 *Quality requirements*

The car-sharing concept as just described is very broad. It includes basically all forms of shared vehicle use regarded as car-sharing. If those engaged in car-sharing are to be provided special benefits, however, society should be able to demand that certain quality requirements be met. These requirements amount to expecting a car-sharing organization to act in accordance with the best interests of society. The exploitation of car-sharing simply to take advantage of potential benefits should not occur. Having quality requirements should involve the possibility of these being revised as the scope and quality of car-sharing develops. The requirements should not be too strict initially, although the basic quality level expected should be made clear. A high degree of environmental sustainability and traffic safety should be aimed at.

#### Quality requirements that are recommended

- 1) **An administrator.** Responsibility for a car-sharing scheme is to be borne by an administrator, understood as being a legal entity (a corporation, a cooperative, a municipal authority, or the like).
- 2) **A sufficient number of drivers.** There should on the average be at least 6 drivers who make use of each vehicle belonging to a car-sharing organization. A general exemption from this requirement is made during the first year.
- 3) **Adequate accounting practices.** The administrator should use an accounting system which makes it possible to compile, for each user, a list indicating each use of a vehicle, the length of time it was used and the distance it was driven. It should also be possible to compile a list for each of the vehicles of the total distance it was driven in the course of a year.
- 4) **Ownership of the vehicles.** Each vehicle used in a car-sharing scheme is to be registered in the name of a legal entity (not necessarily the same as the administrator mentioned above).
- 5) **Requirements placed on the vehicles**
  - None of the vehicles should be more than 4 years old.
  - All of them should have at least a four-star Euro NCAP rating.

#### *Comments on the quality requirements*

The quality requirements aim at ensuring that advantage can be taken of the benefits to society that car-sharing provides, allowing the potential societal gains to be optimized. How this can best be achieved is discussed below.

The major aim of presenting a definition of car-sharing presented here together with the quality requirements referred to is to encourage car-sharing. It is important that the cars involved be high in environmental sustainability and traffic safety, but the requirements should not be so stiff that large numbers of the presently existing car-sharing schemes would

be unable to meet them. The requirement that the cars not be more than 4 years old means the environmental and traffic-safety performance of the cars clearly being better than that of cars in Sweden generally, a requirement that the cars of most car-sharing schemes in Sweden already meet.<sup>1</sup> The requirement that all vehicles have at least a four-star Euro NCAP rating means car-sharing organizations' ensuring a very high level of traffic safety in their vehicles.

The requirements are also needed for clearly distinguishing car-sharing from "fictive car-sharing" such as might be established for the sole purpose of taking advantage of special benefits that genuine car-sharing schemes should be eligible for. The requirement of the administrator of a car-sharing scheme being a legal entity (requirement 1) and of each vehicle being registered in the name of a legal entity (requirement 4) reduces the risk of misuse. Requirement 2 also reduces the possibilities of registering car-sharing schemes that fail to live up to the goals implicit in the definition of them presented here.

The requirement of adequate accounting practices (requirement 3) ensures its being possible to follow up the use to which a car-sharing organizations have been put, e.g. in terms of the number of users. Obtaining relevant statistics on car-sharing organizations on a regular basis also makes it possible to study their effectiveness.

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<sup>1</sup> Most Swedish car-sharing organizations have the policy of none of their cars being more than 3 years old, whereas cars in Sweden as a whole have an average age of 10 years (Source: [www.naturvardsverket.se/index.php3?main=/dokument/fororen/tatort/tatort/katalyt.html](http://www.naturvardsverket.se/index.php3?main=/dokument/fororen/tatort/tatort/katalyt.html) and the report *Bildelning i praktiken – en kartläggning av organisation och funktion hos svenska bilkooperativ* [Car-sharing in practice - a survey of the organization and functioning of Swedish car-sharing cooperatives] Vägverket publ. [Publications of the Swedish National Road Administration] 2002:90).

## **4 Practical considerations**

A number of practical items of advice are presented here aimed at making it easier to apply the definition of car-sharing provided and to adhere to the quality requirements associated with it. The advice concerns how one can best satisfy the requirements, take exception to them when it appears called for, and arrive at additional principles one may feel should apply. A general discussion of these matters follows. Thereafter, advice on creating or procuring car-sharing services is given. Matters of the allotment of public support to car-sharing organizations are also discussed.

### ***Adopting still higher quality standards and requirements***

The quality requirements recommended in this report are of such an elementary character that most present-day car-sharing organizations in Sweden already conform with them. One could also employ more stringent quality requirements. This could be done in connection with the establishment of new car-sharing organizations, with the procurement of car-sharing services from organizations providing them, or as a condition to be met by car-sharing organizations for public support to be provided it. The individual car-sharing organization could also introduce principles on its own in order to raise its environmental and traffic-safety standards. The following standards or requirements for each car could be introduced, either generally or by the individual car-sharing organization:

- that the car meet the European 2005 emission requirements (or whatever emission requirements are regarded as being best at the time)
- that the car be included in the list published by the organization "Gröna bilister" (Swedish Association of Green Motorists) of the most environmentally friendly cars or meet the SNRA travel policy requirements
- that the car be no more than 3 years old

Standards and requirements of this sort would be of relevance for the purchase of new cars or the replacement of cars already owned. Although it is quite possible that the quality requirements recommended in this report will be superceded by more stringent ones in the future so as to achieve a still higher level of environmental sustainability and traffic safety, car-sharing organizations might very well consider it advantageous even now to employ standards of the sort just described.

A group of persons or an organization that wishes to start up car-sharing, either on its own or by procuring the service from some external provider, may also decide to include various quality standards of its own in addition to those just referred to, such as the following.

- that all vehicles be "clean" vehicles as defined, for example, by the city governments of Gothenburg, Malmo and Stockholm
- that the consumption of gas not exceed some particular level
- that the weight of the vehicles be between some upper and lower limit

There are of course many other types of standards which those bargaining with a provider of car-sharing services might want introduced, such as standards of price or service or of the booking system or the accounting practices employed, of how the organization is administered, of other characteristics of the vehicles, etc.

### ***Possible departures from the quality requirements advocated***

Although the quality requirements advocated in this report are of a very basic character, situations may arise in which it can appear best to depart from these in some way, a matter which is up to each organization who want to put requirements on car-sharing to decide. Since the Swedish National Road Administration aims at a minimum quality standard being maintained, it is recommended that a car-sharing organization adhere insofar as possible to these requirements and that, if it departs from some one of them in a particular instance, it document the reason for doing so in some way.

One way of creating certain flexibility in adherence to the quality requirements named, without departing from them under other than special conditions, would be to introduce the possibility for a car-sharing organization to apply for temporary exemption from a particular requirement, for example for a year at a time. Reasonable appearing wishes of this sort could thus be approved for specified periods of time.

### ***Providing public support for car-sharing schemes***

Society can contribute to the establishment and growth of car-sharing by supporting it in various ways. This in turn can benefit society by reducing the negative effects of car traffic on the environment and by improving urban environments generally. The support provided should not be of economic character, since most car-sharing organizations today are on firm economic footing, having achieved this on their own.

The Swedish National Road Administration's responsibilities concerning the expanded use of car-sharing involve primarily spreading information about car-sharing and removing hindrances to its growth. The major responsibility for providing support for individual car-sharing organizations lies at the local level, in the separate municipalities, although regional authorities, such as the different regional governments in Sweden, public transport authorities, and the like have certain responsibilities in this respect. The following are examples of how municipalities can further the growth of car-sharing:

- Providing knowledge useful in establishing car-sharing organizations
- Training of persons with responsibility at the municipal level for transportation or environmental matters in how car-sharing works and how such activities can be encouraged
- Spreading information aimed at stimulating interest in car-sharing
- Including the concept of car-sharing in policy documents relating to traffic or to city planning in a manner that will alert people to the advantages car-sharing can have in these areas
- Providing special parking opportunities for cars belonging to car-sharing organizations (e.g. through better chances of obtaining a permanent parking spaces in areas with a shortage of parking opportunities – especially in central areas)
- Establishing projects together with public transportation authorities, with the aim of providing mutual advantages for car-sharing participants and collective traffic customers
- Using car-sharing to help solve the transportation needs of municipal departments
- Considering other measures in connection with their establishment or expansion

A better understanding of what car-sharing is, as well as appropriate quality requirements, can contribute to the readiness of a municipality or other public authority to support car-sharing.

### ***Establishment of car-sharing within an organization***

Increasing numbers of communities, companies and organizations of other types have come to realize the possibilities of making the use of cars more effective. Before carrying out measures of the sort suggested here, however, it is best to assess both the use of cars and the use of other forms of transportation by those within the organization in question.

It is becoming increasingly common today for organizations of various types to solve their problems of car transportation at least in part by use of car-sharing. This has been found to have economic benefits, to create a better working environment and to be positive from a general environmental standpoint. It is important that it be introduced, however, in an appropriate way. An organization can let its employees take advantage of car-sharing services in either of two major ways:

- **Establishing an internal car-sharing scheme** that one administers oneself (buying or renting a fleet of cars, use of which is shared by employees through use of a booking system).
- **Purchasing car-sharing services** from a company providing them, one that owns the cars, has charge of the booking system and manages the system as a whole (such as the firm Statoil or SunFleet in Sweden), or through joining a non-commercial car-sharing organization, e.g. a cooperative.

The definition of car-sharing presented here and the quality standards and requirements discussed can provide guidelines both for the establishment of car-sharing administered by oneself and for the purchase of car-sharing services. To ensure that the car-sharing being established is effective, it is important to bear in mind what distinguishes such a scheme from traditional car-rental services, namely the ready access to vehicles, in terms of where these are placed and how keys are managed, and of its being possible to book cars for short periods of time. For such a system to be as effective as possible, it is also important that there be a large number of vehicles and a large number of users. For a municipal government, this often means the cars involved being made use of by several different municipal departments.

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# Strategies and measures for increasing the use of car-sharing

## ***Preface to this section***

Many different measures for making car-sharing more attractive can be undertaken, although some of these are of only marginal importance or are not very applicable to conditions today. To achieve a rapid and stable expansion of car-sharing, it is important to identify the major hindrances involved, to deal with these effectively, and to take advantage of factors conducive to success. A strategy of this sort having a time perspective of about five years was worked out.

Details of the strategy are based on many years collection of information and observations concerning car-sharing from a variety of countries, and input has also been taken from roundtable discussions with representatives of Swedish organizations that do play a role, or have the potential to do so, for the expansion of car-sharing in Sweden. The strategy is written from a national perspective, and need therefore be adjusted at the local level in order to be relevant to specific conditions in each city or municipality.

The strategy was developed by Per Schillander of the Swedish National Road Administration in collaboration with interested parties both within and external to that organization.

# Summary

The effects of car-sharing have been documented many times and in a variety of different countries. Car-sharing has been found to contribute to transportation being more effective and requiring fewer resources. Car-sharing is regarded as being a desirable component of a sustainable transportation system, representing the missing link between different modes of transportation and the key to a combined mobility.

## Success factors for growth

The factors of success for car-sharing to attract a large numbers of persons (either individually or in firms or public institutions) include the following:

- Convenience! Providing a high level of service through simplicity of booking, ready access to cars of high quality, and availability of cars near where one is located.
- Economy! Being economically advantageous through its being cheaper than having a car of one's own, differentiated tariff system which can attract customers who do not use a car very much as well as more frequent drivers, added value by discounts
- Reliability! Being highly reliable due to the support which a highly professional organization can provide and the use of new, well-functioning, environmentally friendly and highly safe cars.

Accordingly, it is important that car-sharing organizations concentrate on achieving and maintaining high quality services and devote adequate resources for recruitment of new members.

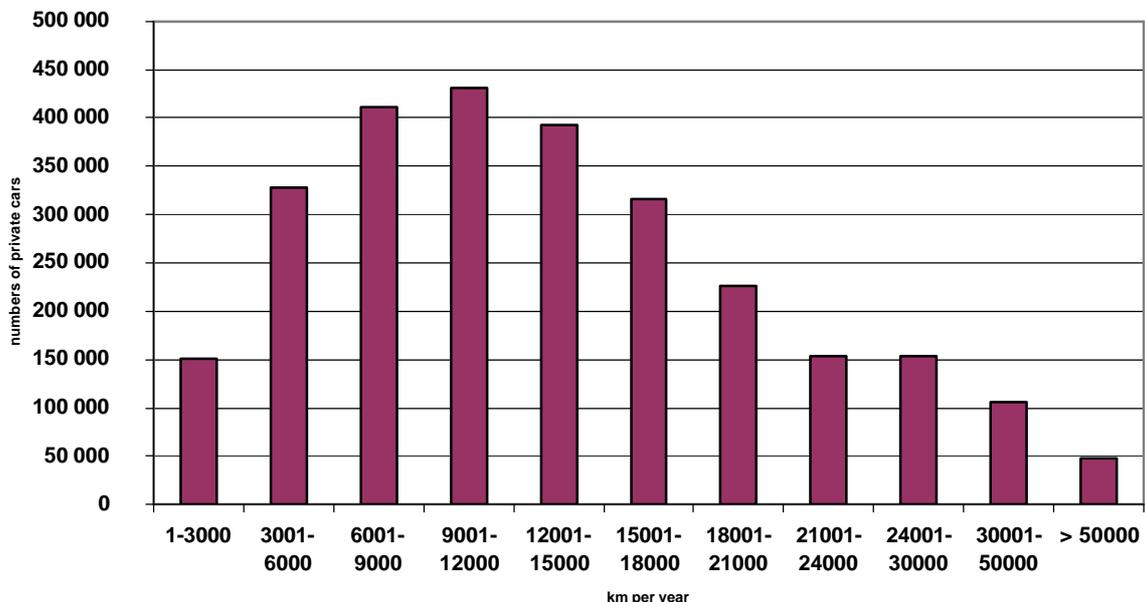


Figure 1. All 2.9 million private cars inspected in Sweden in 2002 divided into classes of yearly driving distances. There are about 1.3 million cars driven less than 12 000 km per year, which means they are often economically beneficial to change into shared cars. (Source: Unpublished data. Bilprovningen 2003.)

### ***Growth and expansion are essential***

Open car-sharing organizations in Sweden today have some 2000 members and have about 200 cars at their disposal. It has been estimated that approximately 870,000 households could be incorporated into such organizations. If large-scale use of car-sharing is to be achieved during the next 10 years, encompassing say 10 % of the potential, the systematic recruitment of members to existing pools, particularly in large cities, will be needed.

Recruitment of many members within a small geographical area results in a high density of available cars and of members, a high level of expertise and of service, and considerable advantages for the local populace. At the individual level it also results in cars being more readily available at a lower cost. In addition, it increases the readiness of local public transport providers to sign collective agreements. Whereas open car-sharing organizations are free in a business sense to recruit both households and firms or other organizations as members, firms need to be cautious for legal and taxational reasons about opening up their pools to employees and to individual households.

Since many people still know so little about car-sharing, their deciding to become a member of a car-sharing organization may involve a decision process taking a year or more. For this reason, providers and other advocates of car-sharing need to be very persistent in their marketing efforts. It has been observed in continental parts of Europe that the numbers of members in an open car-sharing organization tend to accelerate as the organization becomes increasingly well established and recognized as reliable.

### ***Prioritize large cities***

Since the factors favoring car-sharing are much stronger in large cities, the forces of change there are also stronger. One of the most powerful forces involved is that of the price of land in central urban areas, which makes itself felt in terms of the long queues to permanent parking spaces there and their high costs. Car-sharing can provide considerable economic advantages here and increase of available space in the city.

### ***Public support***

Although most car-sharing has been established, been carried on, and has grown in terms of numbers of participants, without any form of public support being provided, the presence of national support could enable car-sharing to develop more effectively. Certain legal restrictions hinder the development of car-sharing at present, although they are probably less of a hindrance than lack of awareness in different organizations which have the possibility to boost the use of car-sharing. Some antiquated legal hindrances to the development of car-sharing should be altered. The favorable development of car-sharing calls for information and education on all levels, as well for cooperation being established between car sharing organizations and public transport authorities, housing developers and landlords.

Communities should take note of the relevance of car-sharing for traffic conditions generally, for the environment and for the land use disposition. They should provide public support of marketing, recruitment and the dissemination of information on behalf of car-sharing. In addition, they should provide special support of car-sharing in connection with city planning, public policy generally, and use of parking spaces. Much is also accomplished if communities in the future arrange for car-sharing services to be provided in the same way as they arrange today for public transport and other publicly subsidized means of transportation.

# The practical and theoretical potential of car-sharing

## ***Preface to this section***

Attitudes toward car-sharing and the potential for development of it have been investigated in many European countries. The methods have varied and the results obtained have thus not always been directly comparable with each other. Studies of this sort are discussed in the section "Car-sharing and reduction in carbon dioxide emissions".

There is one earlier investigation of attitudes toward car-sharing in Sweden ("Vägar och Trafik" ["Roads and Traffic"] 1999, Vägverket [Swedish National Road Administration]). In that study, 15 % of those asked expressed an interest in joining car-sharing. The present investigation has been designed so as to enable direct comparisons to be made with the results of studies carried out in other countries.

It is always difficult to assess the value of an investigation of this sort. On the one hand, people may not know exactly what they answer "Yes" to, and the potential that car-sharing has may therefore be overestimated. On the other hand, they may not know precisely either what they answer "No" to, since their interest in car-sharing might increase considerably when car-sharing has become more widespread and been more clearly shown to function well. The investigation can be seen, however, as providing an indication of the size of the target group. The reasonable degree of support for car-sharing shown is both inspiring and emphasizes the need of greater marketing efforts.

Despite the difficulties in assessments like this – this potential added to the data in the next section gives us a reduction of 600,000 tons of carbon dioxide per year.

The study in question, commissioned by Per Schillander of the Swedish National Road Administration, was carried out by the firm Markör AB in January and February of 2003. The views expressed in this section are those of the author and do not necessarily coincide with those of the Swedish National Road Administration.

## **Summary**

A study commissioned by Region West of the National Swedish Road Administration was carried out to investigate the attitudes of Swedish households toward joining a car-sharing organization. The underlying aim was to assess the potential for car-sharing in Sweden. Members of a large number of households were asked questions concerning their daily travel and various demographic facts, in efforts to characterize what patterns or profiles tend to characterize those open or potentially open to the idea of car-sharing. Sweden has a population of about 8,900,000 persons and the country is estimated to have about 4,400,000 households.

Telephone interviews with 1,000 people in the age range of 18-70 belonging to households that satisfied the following criteria were carried out:

- At least one person in the household having a driver's licence.
- The household being located in a community of at least 10,000 inhabitants.

Two different methods for assessing car-sharing potential were employed. These yielded the practical and the theoretical potential, respectively. The practical potential concerned participants' indicating an interest in joining a car-sharing organization within 2 years or less. The theoretical potential involved the following criterion being met:

- That the time needed to go to work or to school would not be prolonged by more than 30 minutes by refraining from use of the car.

There is a total of some 3,700,000 households in Sweden today possessing the following characteristics: living in communities of at least 10,000 inhabitants, at least one person in the household being between the age of 18 and 70, and at least one person in the household having a driver's licence. These 3,700,000 households represent the population that forms the basis for the calculations made regarding car-sharing potential.

### ***Practical car-sharing potential***

Approximately three of four households had heard of car-sharing and showed a positive attitude toward it. Asked to imagine how they would respond if given the opportunity of joining a car-sharing organization, 25% of the participants indicated a readiness to accept such an offer (6 % of the total group saying they were definite about this and 19 % that it was probable). Of those indicating a readiness, 94 % said that they were very sure or fairly sure of their answer. Thus, 23.5 % of the total group (25 % x 0.94) felt they could definitely consider joining a car-sharing organization. This corresponds to some 870,000 households in the population. The number of households that felt prepared to join a car-sharing organization and responded to the offer with a definite yes (6%) in addition to feeling sure of their answer (0.94x6%=5.6 %) suggested there to be around 210,000 households in the population with this level of commitment.

In what ways did those open to car-sharing differ from the others with regard to their demographic characteristics and daily travel patterns? No notable differences were found, although there appeared to be a slight tendency for those showing an practical car-sharing potential to belong to blue-collar households and to less frequently have cars.

### ***Theoretical car-sharing potential***

There were 30 % of the households that satisfied the criteria for showing a theoretical car-sharing potential, which corresponded to about 1,110,000 households in the population. Compared with the overall population, more of these households were of the white-collar type, having reasonably high incomes (more than SEK 400,000 or some €45,000 annually), had children, were gainfully employed and made use of a car more frequently.

Of the 298 households that showed a theoretical car-sharing potential, 70 indicated a definite readiness to accept an offer of joining a car-sharing organization, 61 of these feeling sure of their answer. This represents 6.1% of the total group studied and corresponds to 225,000 households in the population.

### ***Further results***

Many of those interviewed showed a positive attitude towards car-sharing and considered the practical benefits, the positive effects for the environment, and the financial advantages to be important. Those answering more negatively mentioned the importance of having the freedom of using one's own car, often claiming that access to it was essential for getting through the day.

### ***Conclusions***

The results of the study suggest the potential for joining a car-sharing organization in Sweden to encompass about 800,000 to 1,100,000 households, approximately 200,000 of which would be ready to accept a concrete offer of joining a car-sharing organization.

# **Car-sharing and reduction in carbon dioxide emissions**

## ***Preface to this section***

Many studies have been carried out with the aim of assessing the potential for the intensive establishment of car-sharing and the effects this would have. Since car-sharing is a rather recent phenomenon, so that most car-sharing organizations are fairly small, few case studies relating to this have been reported. In addition, the members of present car sharing organizations probably provide no representative picture of how future members of car-sharing organization that might well be 100 times as large. Nevertheless, the investigations carried out have led to a number of interesting observations and also allow many tentative conclusions to be drawn regarding the potential effects car-sharing could have.

During the time while preparation of this report was in progress, two further studies of relevance were published. The organization Stattauto München (Germany), reported a dramatic reduction (78%) in the number of kilometers members drove compared with the time prior to their becoming members. A study of three car-sharing organizations in Lund published during this period likewise showed a reduction of this sort, although a more modest one of 30 %.

The present section, commissioned by Per Schillander of the Swedish National Road Administration, was written by the firm Michael Koucky Konsult. The author bears all responsibility for the views expressed, which do not necessarily agree with those of the Swedish National Road Administration.

## Summary

The aim of the report summarized here is to consider the extent to which car-sharing can contribute to a reduction in carbon dioxide emissions in the transportation sector. It is based on literature concerning international research on the effects car-sharing can have on such emissions and can be regarded as providing a rough summary of current knowledge in the area.

At an individual level, car-sharing has been found to reduce carbon dioxide emissions through members of car-sharing organizations reducing the distance they drive as well as their consumption of gas per km. At the same time they do make greater use of public transport than otherwise and thus contribute to a slight increase in the carbon dioxide emissions produced in that manner.

How great the overall reduction in carbon dioxide emissions is depends to a considerable extent on the percentage of those belonging to car-sharing organizations who were owners of cars just before joining. The studies regarding this matter taken account of here all indicate a radical reduction in the distance driven on the part of those who owned a car just prior to becoming a member. In contrast, the use a car by those who did not own a car beforehand seldom increased after they became members, due to the shared car simply replacing cars that had been rented or been borrowed from friends or acquaintances.

It is estimated that membership in a car-sharing organizations can lead to a reduction in carbon dioxide emissions of about 400 kg per member each year. The uncertainty regarding this figure is very great, however, since it is based on a number of different assumptions, and since the empirical material is very limited. The results obtained lie anywhere between a reduction of 170 and of 700 kg in carbon dioxide emissions per member each year.

If one assumes each shared car being used by 15 members, the use given any one car would thus result in a reduction of about 7 tons in the carbon dioxide emissions produced per year, the range of the values estimated lying between a 2- and a 10-ton reduction in carbon dioxide emissions per year.

The potential reduction at the national level would be still more difficult to assess, any result presented being quite uncertain. On the basis of findings obtained in other countries, the potential for growth in membership could be estimated to be such that over a 5-10 year period about 0,3-0,7 % of the populace would become members, or for Sweden some 26,000 to 62,000 persons altogether. In view of the potential for reduction in carbon dioxide emissions at an individual level, this would mean a reduction for the country as a whole of some 10,000 to 24,000 tons of carbon dioxide per year, or 0,1 % of the amount of the emissions presently produced by traffic.

If one assesses the potential for participation in car-sharing on a more long-range basis, car-sharers can be thought to comprise as much as 8-9 % of the Swedish populace, or some 3/4 of a million persons. Making the same assumptions regarding the reduction in emissions per individual as above, this would mean a reduction in carbon dioxide emissions of about 300,000 tons per year, or close 2 % of the present level for car traffic as a whole.

At an individual level, therefore, car-sharing can lead to a marked reduction in carbon dioxide emissions. Nevertheless, the results of the investigations suggest that the potential of car-sharing for reducing emissions of carbon dioxide in the transportation sector as a whole is limited to some few percent of present-day emissions. However, car-sharing is able to also

contribute to a reduction in emissions of other substances dangerous to health, it can markedly reduce the area of parking spaces needed, and it can contribute to create a transportation system with a higher level of traffic safety and gender equality.

# **Choosing IT-solutions for managing car-sharing**

**Administrative systems  
available commercially in Sweden**

## ***Preface to this section***

In small car-sharing organizations in which most of the work is performed on a voluntary basis, simple manual systems for booking and billing often suffice. For managing a large, successful and rationally run car-sharing organization, on the other hand, access to a highly effective administrative system can be essential. At present, more than ten different IT-based systems of this sort designed for car-sharing are available on the market. Yet knowledge of their existence generally and of the characteristics they possess is rather poor. The establishment and growth of car-sharing is limited to a considerable degree by ignorance of this sort. It is hoped that the present report can contribute to alleviating this situation.

The study presented in this section was written and carried out by the firm Miljöbyrån Ecoplan, at the request of Per Schillander of the Swedish National Road Administration. All responsibility for the contents is borne by the authors, whose views do not necessarily coincide with those of the Swedish National Road Administration.

## Summary

The Swedish National Road Administration conducts work aimed at helping firms and other organizations deal with environmental problems and traffic safety problems within the transportation sector. The report summarized here contains guidance for organizations who are about to select a system for administering car-sharing.

In car-sharing, a group of persons shares the use of one or more cars. The system for administering use of the cars varies, as does the degree of refinement it is expected to possess. The complexity of the system can range from use of a manual booking list to the system being completely computerized.

The need for computerization increases as a car-sharing organization becomes larger. The present report takes up different components of a computerized car-sharing system. These usually include a web-based booking system, a database in which facts concerning the users are placed on a server, and a computer located in each of the cars, containing a card reader able to read the smart card each user possesses, providing the user access to the car. The central server communicates with the user by way of Internet, as well as with the computer in each car by way of the cellular-phone net.

A set of questions is available that can be useful to anyone deciding what system to select. It is important that one bear in mind what types of users of car-sharing are involved and what their present and their future needs are.

For a person or an organization who could benefit from car-sharing, different alternatives are available:

- Becoming a member of an existing car-sharing organization
- Purchasing car-sharing services
- Establishing a car-sharing organization, maintaining and developing it oneself.

Both when one joins a car-sharing organization and when one purchases car-sharing services, one makes use of an already existing system. This means one has little chance of influencing the administration of the organization or the technical solutions selected to any degree. Anyone who joins an existing car-sharing organization may well be required to contribute to maintaining it through carrying out a certain amount of work, yet this is generally cheaper than purchasing car-sharing services.

Establishing and maintaining a car-sharing organization oneself gives one greater freedom but requires that one purchase each of the cars, keep them serviced, and purchase an administrative system.

The report provides an account of the different systems for the administration of car-sharing that were commercially available in Sweden in the spring of 2003 and of their suppliers. Various matters one should take into account in selecting a system are also discussed.

Car computers and smart cards are often purchased separately. The prices for them do not vary to any great extent. Access to the booking system, use of the database and maintenance of the server are often paid by means of a booking fee, although it is also possible to purchase a licence to the component systems or to the entire system. Costs are also associated with installation of the car computers and with configuration and installation of the overall system.

Car-sharing is relatively new, both as a phenomenon generally and as an area for which computer-based systems have been developed. Thus, it is important that one investigates the supplier of such a system carefully and that references of its previous deliveries are checked. Reliability of functioning and user-friendliness are perhaps the most important aspects of a system to consider.

