

## The Effects of Mobility Management for Companies in the Course of the German Mobility Management Action Programme “effizient mobil”

*Conny Louen, Reyhaneh Farrokhikhiavi, Mechtild Stiewe, Doris Bäumer*

(Dipl.-Ing. Conny Louen, Institute for urban and transport planning University of Aachen, Mies-van-der-Rohe-str.1, 52074 Aachen, louen@isb.rwth-aachen.de)

(Reyhaneh Farrokhikhiavi M.A., Institute for urban and transport planning University of Aachen, Mies-van-der-Rohe-str.1, 52074 Aachen, farrokhikhiavi@isb.rwth-aachen.de)

(Dipl.-Ing. Mechtild Stiewe, ILS–Research Institute for Regional and Urban Development gGmbH, Brüderweg 22-24, 44135 Dortmund, Germany, mechtild.stiewe@ils-research.de)

(Dipl.-Ing. Doris Bäumer, ILS–Research Institute for Regional and Urban Development gGmbH, Brüderweg 22-24, 44135 Dortmund, Germany, doris.baeumer@ils-research.de)

### 1 ABSTRACT

The Action Programme “effizient mobil” of the German Energy Agency is funded by the Federal Ministry for the Environment. It aims for a further dissemination of Mobility Management (MM), as this concept is so far mainly implemented on an ad hoc basis. MM measures promote environment friendly transport modes and an efficient use of the existing transport systems. By shifting trips from cars to environment friendly transport modes noise exposure, pollutant emission, land consumption and separating effects on people’s living space can be reduced. The programme supports the uptake and the effective implementation of MM, both within the municipalities and for different sites and organisations. In the first phase of the programme 15 regional networks are established to address municipalities and companies and to involve different regional actors. In the second phase more than 100 municipalities and companies get free of charge consulting that leads to a specific concept taking the framework conditions into account. The programme has a special focus on possible CO<sub>2</sub> reduction in order to point out the positive outcome of MM on the climate. For MM in companies the possible CO<sub>2</sub> reduction has been estimated by analysing the mobility concepts and data about the staff’s mobility behaviour and the current site characteristics and quality of available mobility options. For estimating the possible CO<sub>2</sub> reduction a two-step approach was developed. It takes different factors in regards to the possible effect into account and calculates in the first step a theoretical potential of CO<sub>2</sub> reduction based on more objective factors. The second step looks at the more realistic potential due to the share that can be achieved in relation to the planned measures.

By extrapolating the data obtained in the staff surveys conducted as part of the consultation sessions it can be seen that there are, in the companies surveyed, around 53,000 people driving to work by car. About 28 % of these cannot use other forms of transportation (bicycle / public transport / car pools) due to their individual circumstances. However, 72 % could, at least in theory, shift to other means of transport. To what extent this potential is tapped depends on the proposed measures and on the local quality of the alternative means of transport. An analysis of 85 concepts showed that on average 26 % of the theoretical potential is being tapped. A full implementation of all concepts of the participating companies could lead to a total CO<sub>2</sub> reduction of 23,600 t/a.

### 2 INTRODUCTION AND BACKGROUND

Even though Mobility Management is more and more seen as a suitable approach to meet the challenges of mobility and transport, a nationwide and top down strategy has been missing in Germany so far. The action programme “effizient.mobil” of the German Energy Agency (dena) (present runtime 01/2009–12/2010) is the first attempt to go a more systematic way to foster Mobility Management strategies and implementations.

It is funded by the Federal Ministry for the Environment (BMU). It aims for a further dissemination of Mobility Management, as this concept is so far mainly implemented on an ad hoc basis. The programme supports the uptake and the effective implementation of Mobility Management, both within the municipalities and for different sites and organisations. Effective structures shall be established which support a better institutional anchoring and a better integration into suitable strategies and programmes. So far more than 100 municipalities and companies got free of charge consulting that leads to a specific concept taking the framework conditions into account.

A special focus is laid on possible CO<sub>2</sub>-reduction. It is estimated by analysing the mobility concepts and data about the staff’s mobility behaviour and the current site characteristics and quality of available mobility options.

In detail the programme aims at the following:

- Initialisation and encouragement of conceptual design and implementation in order to support concrete Mobility Management strategies and measures on the municipalities' level as well as on the site level.
- Creation of a nationwide network of stakeholders to concentrate the knowledge and to use it for an area-wide implementation of Mobility Management.
- Anchoring of the subject in politics and the public
- Evaluation of the effects on a structural and organisational level and development of a standardised method and tools to estimate the expected CO<sub>2</sub>-reduction of the programme.

The ISB-Institute for Urban and Transport Planning and the ILS-Research Institutes for Regional and Urban Development are assigned with both the evaluation of processes (mainly ILS) and the estimation of effects (mainly ISB). That is why the paper concentrates on the last bullet point and here mainly on the method and tools to estimate the expected CO<sub>2</sub>-reduction of the programme. In addition first results relating to potential CO<sub>2</sub>-reductions are presented.

### **3 GENERAL APPROACH OF THE EVALUATION**

The evaluation of the processes takes place throughout the whole project duration. Therefore results will be available at the end of the project runtime (until end of 2010). The process evaluation looks at all relevant procedures and processes within the action programme. With the help of interviews and surveys with the regional coordinators the effectiveness of the coordination offices for the regional networks in regards to their networking capabilities and the dissemination of the concept of Mobility Management will be deeply analysed. A survey of all mobility advisors and beneficiaries will generate findings about factors of success in the consultation processes.

The estimation of possible CO<sub>2</sub> reduction will be described in detail in the following chapter.

### **4 ESTIMATION OF THE POTENTIAL OF CO<sub>2</sub> REDUCTION**

Mobility management is a concept to promote sustainable transport by the use of "soft" measures like information, communication, organisation and coordination, as well as an accompanying marketing. Thereby different fields are distinguished. Mobility management for cities and regions is mainly strategically. At this level measures aim to create the basis for further mobility management measures, linking the policy level with the management level in order to ensure the support of the responsible authorities or management and create new offers like car sharing or new public transport tickets. Mobility centres offer intermodal information about travel options. Mobility management for target groups or locations develops concepts based on the individual demands and conditions of the group or location, e.g. mobility packages for new citizens. Accordingly mobility management in companies focuses mainly on employees. Measures aim at the promotion of environment friendly transport modes such as adjusting the public transport schedules to the working time at companies, establishing job tickets or participate in action programmes such as "Cycling to work"<sup>1</sup>.

Within the framework of the project the development of a method to estimate the CO<sub>2</sub> reduction focuses on mobility management in companies, because most of the mobility management concepts within the programme are made for companies. Due to the strategically focus of mobility management for cities and regions the benefit of these concepts cannot be estimated by the reduction of CO<sub>2</sub>.

The base for the development of a standardized assessment of soft measures and the estimation of CO<sub>2</sub> reduction for these measures is complex. On one hand mobility management combines many different measures, which have different effects and can be combined in different ways in concepts in order to adapt the services to the specific individual needs and demands. On the other hand there are just a few mobility management measures or concepts which have been verified due to their effect on modal shift.

---

<sup>1</sup> ILS, ISB (2000)

Examples for scientific evaluated measures are the Dialogue Marketing Campaigns for New Citizens <sup>2</sup> or the mobility management for companies at Infineon in Dresden <sup>3</sup>.

Mobility management measures have effects on different target fields (see fig. 1). With the aim to promote the environment friendly transport modes and an efficient use of the existing transport systems mobility management has an important effect on the environment. By shifting trips from cars to environment friendly transport modes noise exposure, pollutant emission, land consumption and separating effects on people's living space can be reduced. Another target field of mobility management is health. The modal shift from car use to non-motorized transport leads to more exercise and therefore to a better health. The safety of transport can be described by the number of accidents due to transport modes. As each mode has a different accident rate (the risk of an accident is higher for nonmotorized modes) modal shift has an impact on safety. In addition mobility management has an influence on costs. On the one hand the measures can lead to decrease mobility costs of people, if trips are shifted from car to environment friendly transport modes. On the other hand companies or authorities need to carry the costs of the measures.

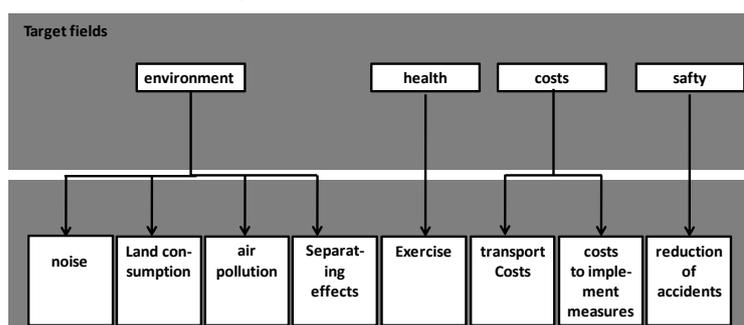


Fig. 1 Target fields of Mobility management Within the framework of the project the focus is on the estimation of CO<sub>2</sub> reduction in order to point out the positive outcome of mobility management on the climate.

## 5 REQUIRED DATA

The essential factor to estimate effects is the available data on which the method can base on. Therefore the survey of the parameters which have an influence on the effects of mobility management measures plays a crucial role.

- The outcome is in general influenced by:
- Conditions of location and surroundings
- Activities of the companies and
- the travel behaviour and opportunities of the employees

As part of the project these data are measured with different survey tools. The conditions of location and surroundings are recorded trough a standardized profile of the companies. This profile consists of collected data of the location and the circumstances of the companies. This includes the existing accessibility to public transport, the existing bike infrastructure in the surroundings, the situation for pedestrians, the existing accessibility for motorized transport and the situation of stationary transport. In addition information about the activities of the company are recorded through the profile such as if sustainability is already an issue in the company. In order to determine the travel behaviour and the opportunities of the employees an employee survey is carried out. For this a questionnaire was developed based on the data needed to estimate the CO<sub>2</sub> reduction. The data collected is for example the frequency of use of transport modes of the employees, the availability of transport modes and the reasons for car-use.

In addition to this survey the distances from residence to workplace of the employees is calculated by using residence location data. This is the basis to determine the distance travelled of trips to and from work.

<sup>2</sup> ISB (2009)

<sup>3</sup> PGN, BiP (2003)

## 6 METHOD TO ESTIMATE THE CO<sub>2</sub> REDUCTION OF MOBILITY MANAGEMENT MEASURES

The estimation of the potential of CO<sub>2</sub> reduction of trips to and from work is based on the reduced distance travelled by motorized private transport. The kilometres of motorized private transport are calculated by today’s distance travelled and the estimated distance travelled after the implementation of the measures proposed in the concept. The change in CO<sub>2</sub> emissions by public transport is more difficult to calculate because there is no information about the occupancy rate in public transport in the different regions. Therefore it has been neglected in this method.

Today’s distance travelled by motorized private transport is calculated by the distance between residence and workplace of the employees and their use of motorized private transport. The estimation of the distance travelled made by motorized private transport after the implementation of mobility management measures is based on the collected data of conditions of location and surroundings and the travel behaviour and opportunities of the employees. Figure 2 shows an overview of the steps of the estimation. In a first step a theoretical potential is determined. This is defined by the proportion of car-users that could be shifted to different modes of transport, based on their personal conditions. The conditions of the location determine the level of this potential which can be obtained by the measures proposed in the concept.

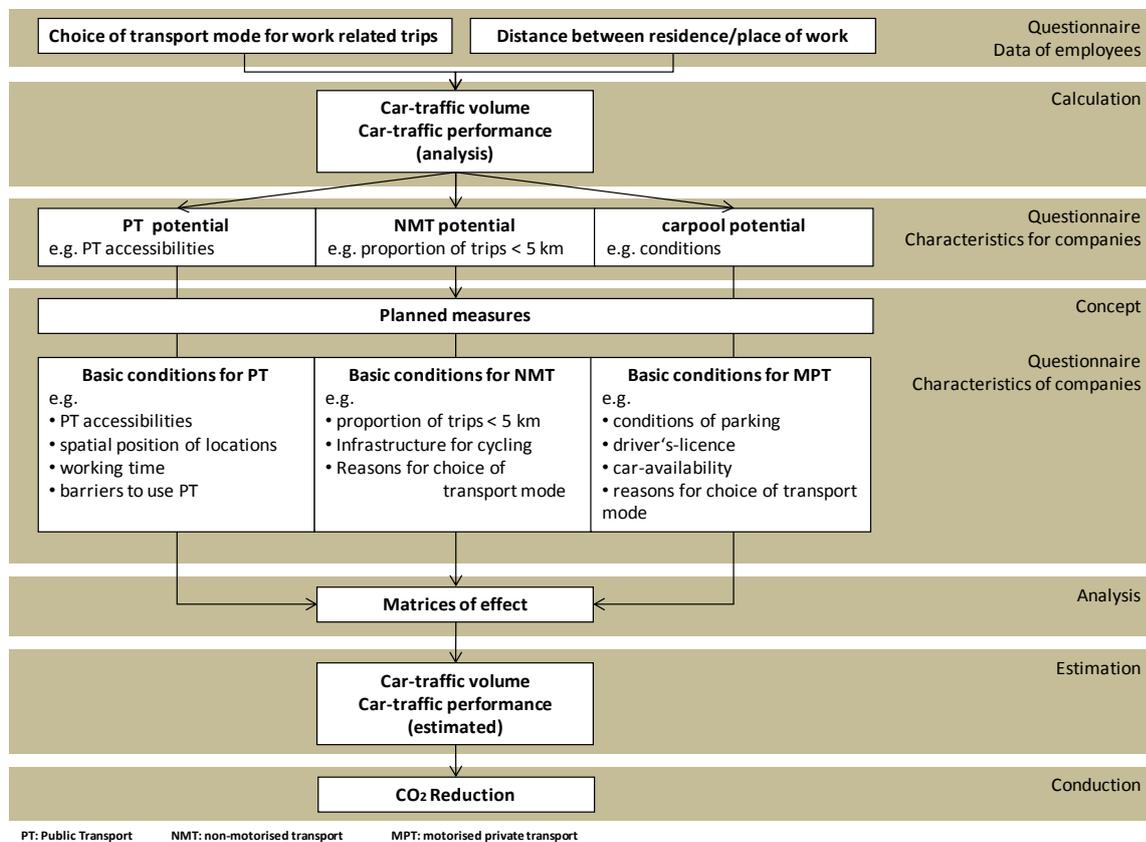


Fig. 2 Overview of the estimation

The determination of the theoretical potential is carried out on the basis of the car-drivers. This group of people is divided based on their personal circumstances whether they can be shifted to other modes of transport or not. The group of car users is divided into those who can theoretically use a bike or walk, those who can use public transport, those who are willing to use car pooling and a group of car users which have to use the car due to their personal circumstances.

This classification of people is carried out based on the data collected from the employee survey (see figure 3). In a first step the group of car users is divided in potential pedestrians and cyclist and potential public transport users based on the distance between residence and workplace. Those people whose trips to work are less than three kilometres are fully added to the potential of non-motorized transport, those whose trips have more than five kilometres are fully added to the potential of public transport. Car users with trips between three and five kilometres are divided into the potential of non-motorized transport and public

transport due to the quality of the location for public transport and non-motorized transport. The result is a clear assignment of each person to one potential group. The interaction of public transport and non-motorized transport can be neglected in this context, since the CO<sub>2</sub> estimation is based on the change of distance travelled by car.

In a second step the potential groups of cyclists and pedestrians as well as public transport are further divided by different parameters such as the availability of transport, the working time model, the ownership of a bike or the reasons for car use. People, who for instance live in an area with no public transport service to their workplace, are split off at this point. The result is a number of car users who can theoretically be shifted to public transport and non-motorized transport. The remaining persons are divided into a car pooling potential and those, who cannot be shifted to other transport modes based on their circumstances and their personal attitude towards car pooling.

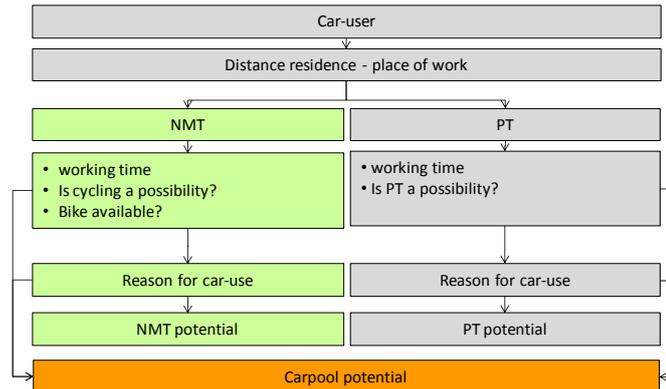


Fig. 3 Simplified description of the determination of the theoretical potential

The rate of the theoretical potential which can be realized is estimated depending on the proposed mobility management measures of the concept and the conditions at the location for different modes of transport. As mentioned before there is only little knowledge about the effects of mobility management measures. Therefore calibration and validation of the estimation method can only be made based on these few conclusions. In general it may be said, that the presented method needs to be calibrated and developed further with additional empirical data that needs to be generated.

The measures proposed in the concept for the companies are classified in three categories by their probability to obtain a modal shift. It is hereby considered that, for example a job-ticket with a high cost-reduction compared to a monthly ticket has a higher effect on the modal split of the employees than information about public transport service in general. The classification of the measures is based on a Delphi survey carried out with the regional coordinators of the programme.

To take into account the conditions at the location for different modes of transport the quality of the location for the different transport modes is classified.

Due to the effect of restrictions in stationary traffic these types of measures are separately taken into account. The restriction of motorized private transport at the location of the companies is classified based on the following factors:

- number of company-owned parking spaces
- authorization for use the company-owned parking spaces
- fees for company-owned parking spaces
- utilization of company-owned parking spaces
- parking space management in public space
- utilization of parking space in public space

Measures that increase the restriction of motorized private transport such as the increase of fees are considered in the classification of the location. Each factor is weighted according to its influence. The specifications of each factor are marked with points. According to the total mark the total restriction of motorized private transport of the location can be ranked.

The quality of a location for non-motorized transport and public transport is classified by the influencing factors such as location of the company and existing infrastructure and service. To classify the quality of public transport at the company`s location the following factors will be considered:

- location/spatial position of the company
- existence of a rail network
- existence of a tram or subway network
- distance to the next public transport stop
- travel time to the city centre
- travel time to the next rail station
- number of arrivals between 7 and 9 o`clock or in a two-hour-range at start of work (if working hours start differently)
- accessibility to company grounds

Each factor is weighted according to its influence. The specifications of each factor are marked with points. According to the total mark the quality of the location for public transport can be ranked.

To evaluate the quality of the location for non-motorized transport the attitude towards cycling is taken into account on the basis of the proportion of urban bicycle traffic. In addition the opportunities to park bikes, the infrastructure and the accessibility to company grounds is considered. In particular the following factors will be considered:

- proportion of urban bicycle traffic
- quality of bicycle racks
- utilization of bicycle racks
- existence of showers and dressing rooms
- quality of bike infrastructure in the area of the company
- accessibility to company grounds

The factors are weighted due to their influence and marked with points. Based on the total mark the quality of the location for non-motorized transport can be ranked.

The quality of the location for car pooling is not classified since there will be only little influence on the effect of the measures due to small differences in quality for motorised private transport.

Based on the classification of the location for different modes of transport and the proposed measures of the concept the rate of the theoretical potential which can be realized is estimated. By multiplying the theoretical potential with the rate which can be realized the estimated number of shifted car users is calculated. The distance travelled by motorized private transport is obtained by multiplying this estimated number of shifted car users and the distance of trips to and from work.

## **7 RESULTS OF THE CLASSIFICATION OF LOCATION**

The companies that took part in the programme differ by number of employees, business sector, location and accessibility for different modes of transport. So does the classification of their locations. The classification of non-motorized transport and public transport is classified in the three categories good, moderate and poor, whereas the classification of motorized private transport is classified in the three categories strong restriction, moderate restriction and poor restriction.

The analysis is based on data from 85 companies. It shows that with 64% of all locations a major proportion is well accessible by public transport only a few locations are difficult to access. The classification of location for non-motorized transport is in the upper and medium range. At many locations there is already a high restriction of motorized private transport (47 % of the locations). At 18% of the locations though is only little or no restriction (cf. figure 4 and 5).

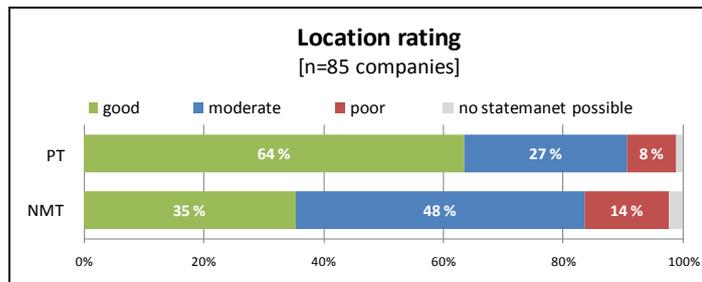


Fig. 4 Results of the classification of location–non-motorized und public transport

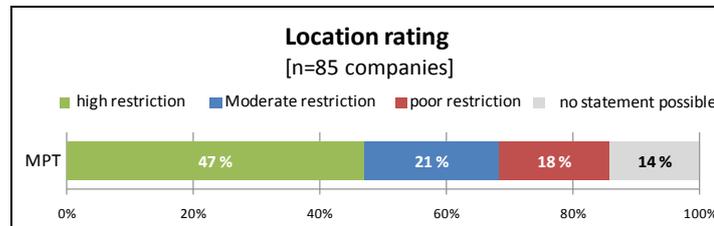


Fig. 5 Results of the classification of location–motorized private transport

By examining the classification of location with regard to the spatial position of the company in town it is obvious that, with exception of few locations, urban locations have a better accessibility for public transport due to their higher-valued offer. The classification of non-motorized transport is in the middle range for urban locations while locations at a periphery position are distributed across all ranges with tendency to good location for non-motorized transport. As expected the restriction of motorized private transport is in urban areas relatively high due to lack of parking spaces and the related management and utilization fees of these (cf. figure 6 and 7).

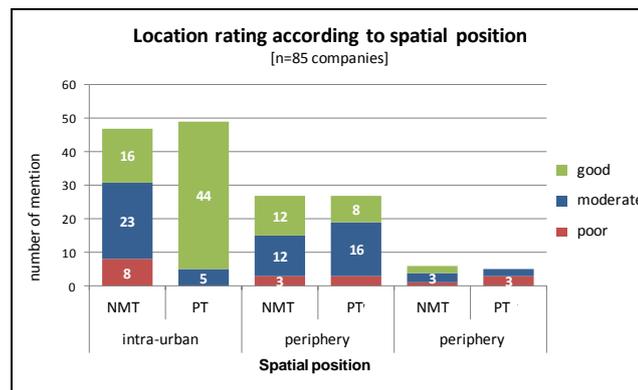


Fig. 6 Results of the classification of location–acc. to spatial position–non-motorized and public transport

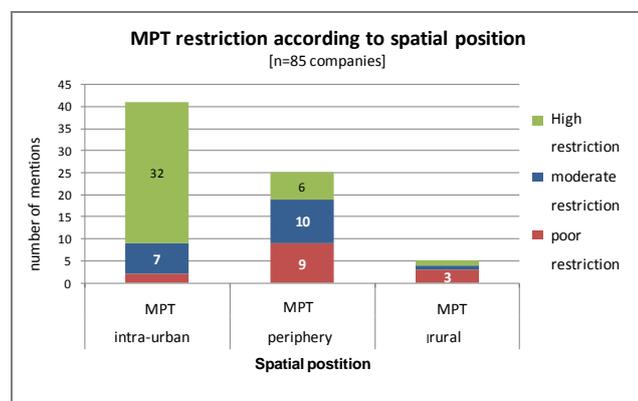


Fig. 7 Results of the classification of location–acc. to spatial position–motorized private transport

The analysis of the classification of location according to the business sector shows a heterogeneous dispersion. At first it is noticeable that public institutions are well accessible by public transport and the restriction of motorized private transport is high. However the explanation of this correlation is that most of

public institutions are situated in the urban area. The classifications have no correlation with the size of the company, measured by the number of employees.

### 8 RESULTS OF THE THEORETICAL POTENTIAL

Based on the employee survey about 53.000 people out of 102.794 employees can be identified, who use a car for their trip to and from work each day. About 28% of these people cannot be shifted to either environment friendly transport modes or car pooling due to their individual circumstances. The majority of the remaining car users, 33%, could be shifted to public transport. In addition about 13% could be shifted to public transport if the travel time with public transport could be reduced due to measures improving the public transport supply (additional PT potential). The theoretical potential of non-motorized transport is about 6%, this seems to be relatively low compared to today’s car-users (cf. fig. 8). But it shall be taken into account that the potential of non-motorized transport is based on a distance of max. 5 kilometres between residence and workplace. This distance may be considered to be, manageable by bike especially for those who are used to go by car to and from work each day.

The theoretical potential of those people, who use a car between one and three times a week for their trips to work, is rather similar. But in comparison to the high proportion of daily car users only a small number of people drive to work 1-3 times a week by car, therefore only daily car users are depict in the following analysis.

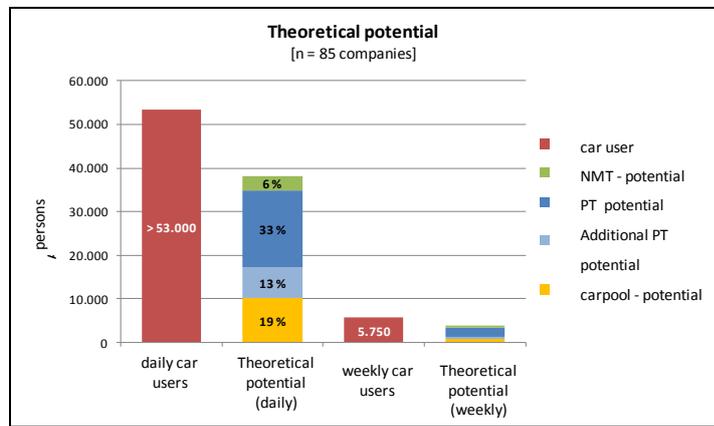


Fig. 8 Results of the theoretical potential

Car-drivers who are employed at a company in an urban area or in the periphery could be easier shifted to non-motorized transport than those who are employed in rural areas. In rural areas, due to the lack of public transport offer, only few car-users could be shifted to public transport, however they could be shifted to car pooling (cf. figure 9).

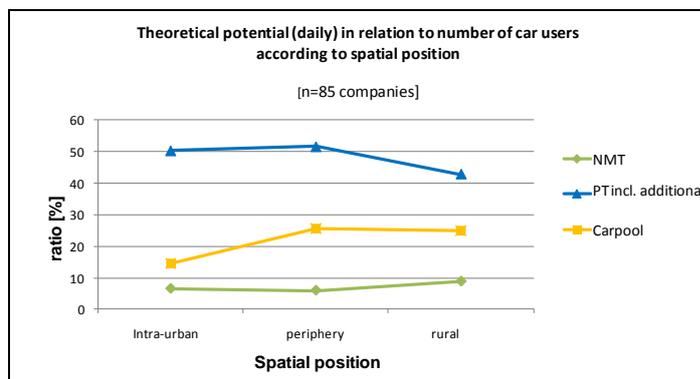


Fig. 9 Results of the theoretical potential–acc. to the location

#### 8.1 Modal shift due to the measures proposed in the concepts

The level of the theoretical potential which can be obtained by the proposed measures depends on the quality of location for each transport mode. The better the public transport quality of a location and the higher the restriction of motorized private transport is, the higher is the proportion of the theoretical potential that can

be obtained. The calibration of this method is made on basis of evaluated examples. Since there are just few examples available which have been evaluated it is necessary that the calibration continues with further empirical data.

The estimation of the 85 concepts shows that on an average 26% of the theoretical potential could be obtained. Averaged 119 daily and 17 weekly car users of each type of location could be shifted (see figure 10).

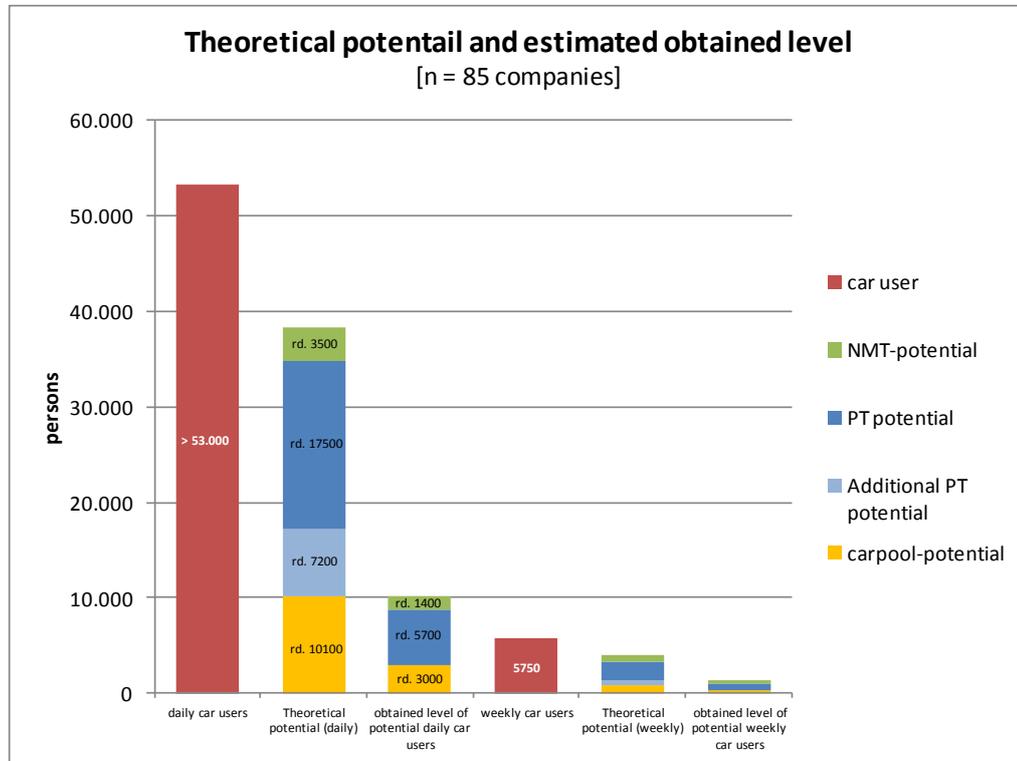


Fig. 10 Part of the theoretical potential which can be obtained

### 8.2 Potential of the concepts to reduce CO<sub>2</sub>

To determine the reduction of CO<sub>2</sub> the estimated reduction of car distance travelled is multiplied by an average CO<sub>2</sub> value for cars (177 g/km).

A full implementation of the concepts of these 85 evaluated companies would lead to an average CO<sub>2</sub> reduction of 0.19 t/a for each employee and an average reduction of 248 t/a for each company. The total CO<sub>2</sub> reduction of these 45 companies is about 23.000 t/a.

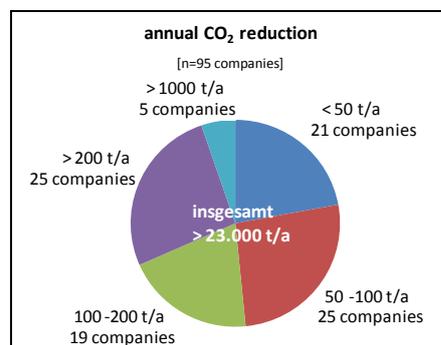


Fig. 11 Annual CO<sub>2</sub> reduction

## 9 CONCLUSION AND PERSPECTIVE

By extrapolating the data obtained it can be seen that there are, in the companies surveyed, in all some 53000 people driving to work by car. Some 28 % of these cannot use other forms (public transport / car pools) due to their individual circumstances. However, 72 % could, at least in theory, shift to other means of transport. To what extent this potential is tapped is dependent on the proposed measures and on the locational quality

of the alternative means of transport. An analysis of the 85 concepts showed that on average 26 % of the theoretical potential is being tapped.

As mentioned at the beginning it is not possible to calibrate all possible combinations of locations and measures with existing examples, since there is only little knowledge about the effects of mobility management measures so far. Therefore the different combinations of measures may, with regard to their potential of shift, only be classified roughly. In general it may be said that there is only little empirical data available, so that the presented method needs to be developed with additional data. This data needs to be generated.

With the standardized survey tools the programme offers the opportunity to carry out a comparison of the situation before and after the implementation of the concepts and evaluate the effect of realized measures.

## 10 REFERENCES

- ILS, ISB „Mobilitätsmanagement Handbuch“; S.9–13 EU-Projekte MOSAIC/Momentum; Institut für Landes- und Stadtentwicklungsforschung gGmbH (ILS) Institut für Stadtbauwesen und Stadtverkehr (ISB); 2000
- ISB: Evaluation von Dialogmarketing für Neubürger. In:Forschungsprojekt des Forschungsprogrammes Stadtverkehr (FoPS) (Abschlussbericht); Institut für Stadtbauwesen und Stadtverkehr (ISB); Bamberg, 2009
- PGN, BiP Betriebsbezogenes Mobilitätsmanagement und Stadtentwicklung; Forschungsprojekt des experimentellen Wohnungs- und Städtebaus (ExWoSt) des Bundesministeriums für Verkehr; Bau und Stadtentwicklung (BMVBS); Planungsgruppe Nord (PGN),Büro für integrierte Planung (BiP); Dresden, 2003