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Effects of environmental oriented traffic concepts on the municipal household

Summary

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Effects of environmental oriented traffic concepts on the municipal household Summary

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Abkürzungsverzeichnis

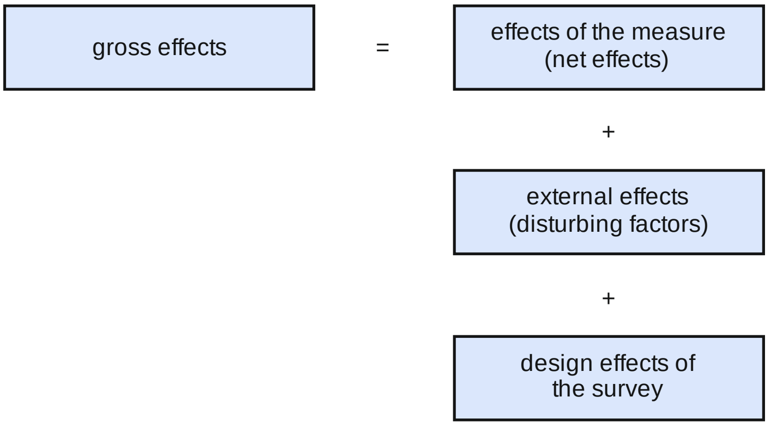
EW	Einwohner
Kfz	Kraftfahrzeug
MiD	Mobilität in Deutschland
MIV	Motorisierter Individualverkehr
NRVP	Nationaler Radverkehrsplan
ÖPV	Öffentlicher Personenverkehr
ÖPNV	Öffentlicher Personennahverkehr
SrV	Mobilität in Städten

Summary

In the course of the research project „Effekte umweltorientierter Verkehrskonzepte auf den kommunalen Haushalt", the cost efficiency for measures of pedestrian and bicycle traffic should be analysed. For this purpose, the results of another project[1] (VPVS 2015), which was carried out by the Chair of Transportation Planning and Traffic Systems at the University of Kassel, has been used. In this project, supported by the Bundesministerium für Verkehr und digitale Infrastruktur, a method has been developed to distribute a whole community's amount of income and expenditures among the four transport systems public, motor vehicle, bicycle and pedestrian traffic, and was used for the cities Bremen, Kassel and Kiel. Using these results and the impact of measures for pedestrian and bicycle traffic in the three examined cities, statements for the relation between the communal use of resources and the demand of pedestrian and bicycle traffic can be derived.

The impact assessment of single traffic measures regarding the pedestrian and bicycle traffic' promotion in the course of this research project was not realizable. There is a problem of demarcation, because measures are influencing each other. Only the gross effect of a measure would be generally quantifiable (see Fig. 1). This gross effect consists of the net effect, which is required as the actual value searched for, external effects as well as design effects of the underlying survey.

Figure 1: Determination of gross effects of a measure



Source: own illustration according to FGSV 2012, p.12

To determine the net effects of a measure, design effects of the underlying survey (e.g. bias caused by lacking willingness to participate) must be known. Furthermore, external effects and framework conditions must be known exactly. This again means that net effects of all other measures that possibly influence the measurement of the currently regarded measure's impact, have to be known. Finally, this approach results in a dense network of cause- and- effect- relationships of a series of measures that cannot be separated and whose net effects cannot be determined individually.

In addition to that problem, the annual resource spending for non-motorized traffic was not calculated for single measures but for the hole municipal expenditures and incomes of a year and the depreciation costs include all investments of the last decades. For that reason and because measures for non-motorized traffic become fully effective foremost after years, this study considers the political

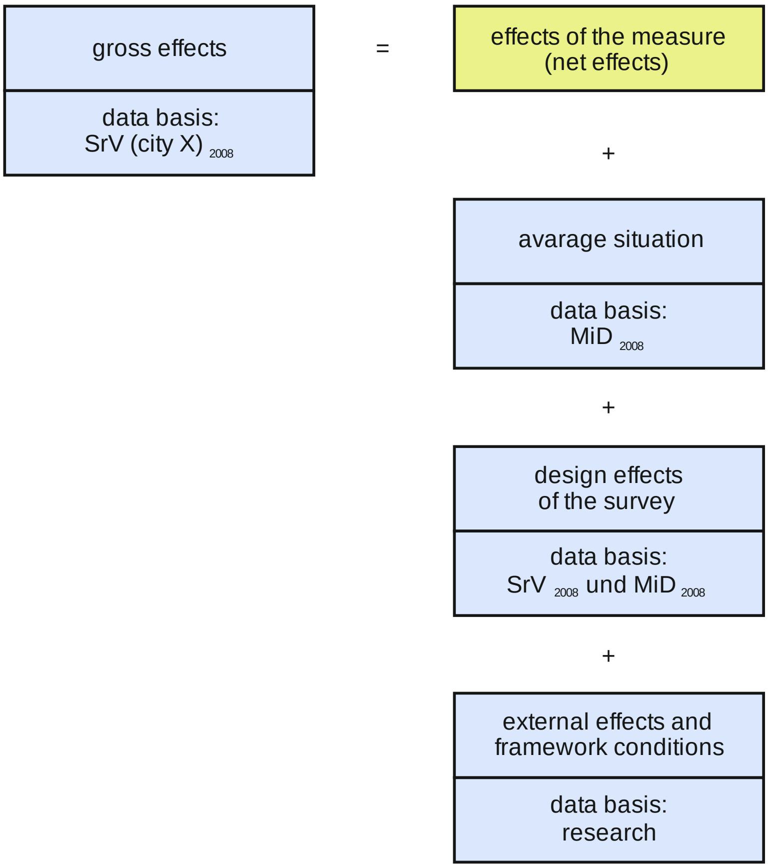
[1] projekttitle: "Was kosten Radverkehr, Fußverkehr, öffentlicher Personennahverkehr und Kfz- Verkehr eine Kommune?- Entwicklung und Anwendung einer Methode für den Vergleich von Aufwendungen und Erträgen verschiedener Verkehrsmittel anhand von kommunalen Haushalten"

promotion for pedestrian and bicycle traffic in its entirety. The cities of Bremen, Kassel and Kiel promoted the non-motorized traffic in different intensity in the last few decades and build a heterogeneous group that suits or a study like this.

The traffic condition, which was recorded in the survey “Mobilität in Städten” (SrV) in the year 2008, has been equated with the result of all measures that has been carried out in two or three decades in this study. More up-to- date data was not available at the time of preparation of this study. Because of the long term of consideration the whole approach became consistent while the municipal expenditures and incomes include the costs of investments of the last two to three decades in form of amortization costs.

The whole methodical approach to measure impacts is illustrated in Fig. 2. Out of the data from the survey “Mobilität in Städten”, which was realized in all exemplary cities in the year 2008, different urban characteristic values of the traffic demand as Modal- Split, daily frequency of movements and length of movements, has been analysed (see Fig 2 “Gross Effect”). These characteristic values of the cities are already significant as a result of the long- lasting (pedestrian and bicycle) traffic policy. To determine the “net effect”, the data has been compared with the data of the nationwide survey “Mobilität in Deutschland” (MiD) in the same year (“average condition”). According to the city size group of the particular cities, the MiD- data was evaluated to enable a comparison with the SrV- data. Additionally, only the record days Tuesday to Thursday have been considered since the SrV- approach collected data exclusively on these days (consideration of design effects). This comparison enables to compare the characteristic values SrV- data per city with the average characteristic values of other cities of the same size. Furthermore, the influence of the cities’ different demographic structure on the characteristic values of the traffic demand has been checked (“external effects and framework conditions”). The testing discovered that the impact is negligibly small. Therefore no correction needs to be considered when comparing the three regarded cities.

Figure 2: Determination of measure impacts in the cities



Source: own illustration

The main measures of promotion for pedestrian and bicycle traffic were identified to determine their effect in the following. For this purpose, an inventory of all crucial measures that has been carried out before 2008 in the range of pedestrian and bicycle traffic based on own research, was made for all three cities. It has been discovered that Bremen implemented a lot of measures to promote the bicycle traffic, but did not influence the pedestrian traffic over a long period of time. Kassel has focused on the support of non- motorized traffic and since then has implemented a series of projects only in recent years, thus after 2008. Before that, a city- wide supporting strategy was lacking totally. In Kiel, similar to Bremen, a series of support measures to promote the bicycle traffic have been implemented. A targeted improvement of the pedestrian traffic's condition has been achieved slightly earlier in Kiel than in the other two cities and has been supported by adequate measures. However, Kiel focused more on the promotion of bicycle traffic, too.

Subsequently, the cities' traffic parameters were compared with the national average of the respective same size cities. The results are presented exemplary in Table 1 and Table 2. Table 1 shows that the whole frequency of movement of the cities Kassel and Kiel is matching the nationwide average levels. However, in both cities, people walk outstandingly often. Bicycle traffic in Kassel is used rarely, whereas Kiel's frequency of movements in bicycle traffic is nearly conform to the double of the average of the same size cities. Kiel's comparatively high efforts in the range of bicycle traffic support seem to have led to this result. The high frequencies of movements in pedestrian traffic of both cities cannot be explained directly by means of support measures as in both cities no extraordinary efforts were made in this field. The two most obvious explanatory approaches are:

1. Other framework conditions in Kassel and Kiel have an outstanding positive impact (e.g. a compact city structure) and compensate the lack of support measures.
2. The amount of support in Kiel and Kassel is outstanding compared to other communities of the same size.

Table 1: daily frequencies of movement for cities with 100-500k inhabitants

	Average of all cities with 100-500k inhabitants (MiD 2008)	Kassel (SrV 2008)	Kiel (SrV 2008)
Ways per inhabitant and day (in total)	3,57	3,60	3,62
Ways per inhabitant and day (on foot)	0,96	1,13	1,12
Ways per inhabitant and day (bicycle)	0,37	0,21	0,68
Ways per inhabitant and day (motorized private transport)	1,76	1,56	1,50
Ways per inhabitant and day (public transport)	0,49	0,70	0,32

Source: own evaluation of SrV- data of the cities Kassel and Kiel 2008 as well as the MiD- data 2008

Table 2: daily frequencies of movement for cities > 500k inhabitants

	Average of all cities with more than 500k inhabitants (MiD 2008)	Bremen (SrV 2008)
Ways per inhabitant and day (in total)	3,72	3,45
Ways per inhabitant and day (on foot)	1,02	0,85
Ways per inhabitant and day (bicycle)	0,46	0,77
Ways per inhabitant and day (motorized private transport)	1,54	1,39
Ways per inhabitant and day (public transport)	1,22	0,43

Source: own evaluation of SrV- data of the city Bremen 2008 as well as the MiD- data 2008

In Bremen, the average number of daily footways is lower than the nationwide average of the respective same size cities and clearly under the comparative values of the cities Kassel and Kiel. Since there was only less promotion for the pedestrian traffic in Bremen too and the value differs from that of the other cities, it might be possible that other influencing factors play a role. In Bremen bicycles were used outstandingly often. Similar to Kiel, it seems as if the high frequency in movement corresponds to the cyclist friendly policy in Bremen's city.

To determine the local use of funds, a method, that was originally developed for another research project at the University of Kassel (see above), has been applied. Based on this method, all traffic oriented income and expenditures from the city's accounting records, the city's municipal enterprises and the city's public transport companies has either been allocated directly to one of the traffic systems vehicle traffic, public traffic, pedestrian or bicycle traffic or distributed among the systems mentioned above. For this purpose, several distribution keys have been defined to which the positions were assigned. As a result of the allocation method arise the absolute expenditures and income per traffic system. In addition, several parameters, derived from that, have been developed to facilitate not only the interpretation of the results but also the comparison between different cities. In the result, for example, it has been determined the difference of income and expenditures ("local subsidy") or the quotient of income and expenditures (cost recovery quota). Furthermore, related to structural sizes or traffic parameters, result values per traffic system (e.g. subsidy per inhabitant or subsidy per way) have arisen.

To compare the cities' use of resources, Table 3 describes the parameters subsidy/ inhabitant for all four traffic systems. These specific values are suitable for a comparison since the monetary term is standardized relating to the number of inhabitants. By comparing the values it should be taken into account that there are several differences between the cities, for example the various public transport system (bus-system or tram-system) or different climate conditions that influence the results.

Table 3: Average (2009-2011) subsidy/inhabitant in the cities Bremen, Kassel and Kiel

	Vehicle traffic	Public transport	Bicycle traffic	Pedestrian traffic	Total
Subsidy per inhabitant [€ / inhabitant] – city Bremen	156,1 €/ inhabitant	115,0 €/ inhabitant	9,3 €/ inhabitant	16,0 €/ inhabitant	296,4 €/ inhabitant
Subsidy per inhabitant [€ / inhabitant] – city Kassel	175,6 €/ inhabitant	141,3 €/ inhabitant	1,8 €/ inhabitant	38,4 €/ inhabitant	357,1 €/ inhabitant
Subsidy per inhabitant [€ / inhabitant] – city Kiel	69,4 €/ inhabitant	33,0 €/ inhabitant	6,7 €/ inhabitant	25,5 €/ inhabitant	134,6 €/ inhabitant

Source: VPVS (2015)

In comparison with the other communities, Bremen subsidizes the pedestrian traffic the lowest whereas it subsidizes the bicycle traffic the highest. In contrast, in Kassel the bicycle traffic is considered lower than one percent out of the total subsidies. In return, the resource input for the pedestrian traffic is the highest in Kassel. The city Kiel is found between the two extremes. However, it needs to be considered that the total subsidy in Kiel is significantly lower than in the other two cities. In relation to the total subsidy, Kiel provides the highest subsidy for the non- motorized traffic in the cities' comparison. Here, the pedestrian traffic receives approx. 19 %, the bicycle traffic 5 %. Generally, when comparing the parameters, it should be taken into account that within the scope of the NRVP-project it was figured out that the absolute expenditures in Kassel are only partially comparable with the numbers of the other cities. The evaluation of the cities' infrastructure, on the basis of which the depreciation costs with introduction of the double- entry accounting of urban households were calculated, were not based on the same method in the cities. Therefore, it can be assumed that even with a comparable infrastructure, the monetary assessment in the cities would be diverging.

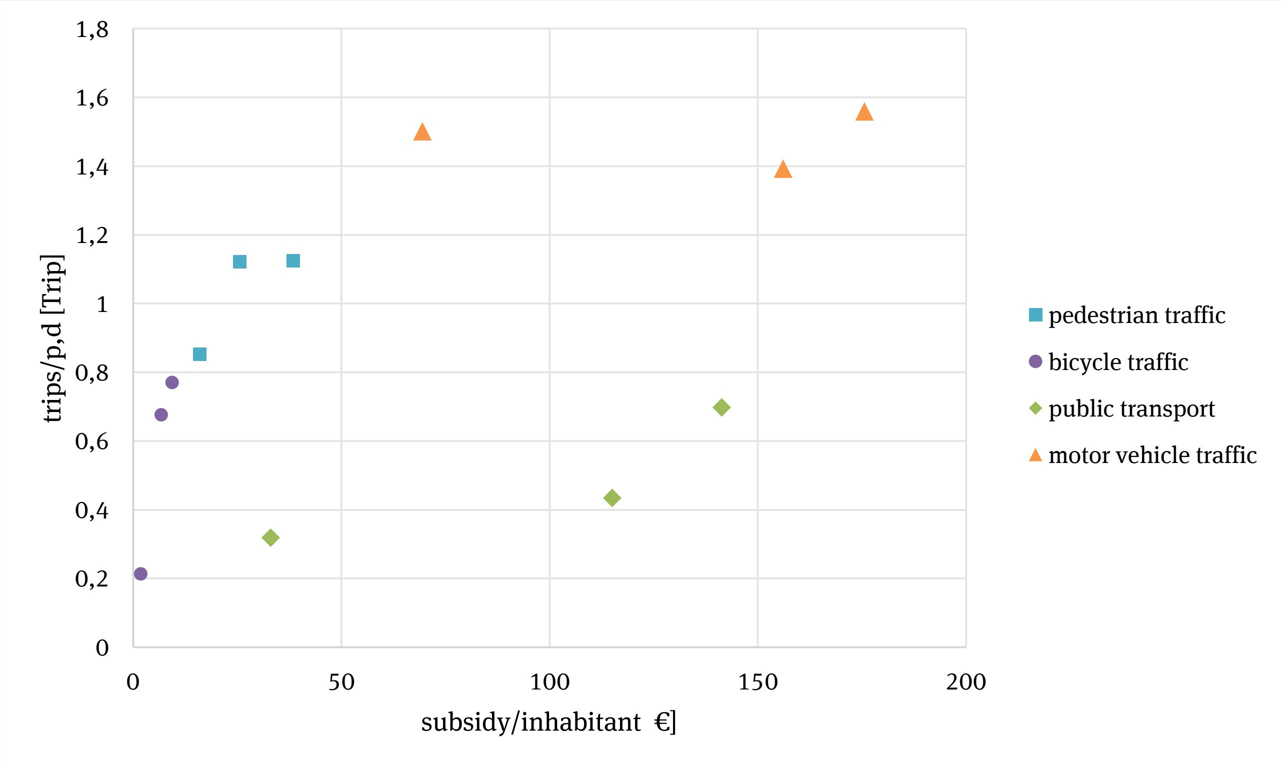
Overall, it appears that the city Bremen implemented a lot of support measures for the bicycle traffic. Compared to the other cities, it promoted the bicycle traffic with the highest subsidies per capita and therefore achieved a high proportion of bicycle traffic. The promotion of pedestrian traffic played a more subordinated role in Bremen. This is demonstrated by the traffic parameters and the low subsidy for the pedestrian traffic. The city Kassel promoted the pedestrian traffic on a low level as well. However, it seems as if the pedestrian traffic in Kassel benefit from the poor conditions for the bicycle traffic or other external effects. Moreover, the subsidy per inhabitant shows that at least the pedestrian traffic is considered with comparatively high subsidies. In regard to the bicycle traffic, it applies that Kassel, analogous to the pedestrian traffic in Bremen, has deployed only few funds and only a small number of journeys were made by bicycle. Kiel subsidizes the urban traffic in total comparatively low. The non- motorized traffic receives a larger portion of the resources in Kiel than in the other two cities. Consequently, Kiel has an above- average amount of bicycle traffic. The proportion of pedestrian traffic is comparable with that of the city Kassel, but Kiel spends a much lower subsidy per inhabitant for the pedestrian traffic. Hence, it seems that Kiel is more efficient in terms of the pedestrian traffic policy.

However, it has not been finally clarified, which impact the promotion policy in the pedestrian traffic has and whether the importance of the pedestrian traffic depends on the compact structure of a city or on the offer of local supply. This two influencing factors are more important for the result, than the promotion policy for pedestrian traffic, in the authors' opinion.

Figure 3 demonstrates the relationship between subsidy/ inhabitant and the daily frequency of movement of the traffic systems. Apparently, along with more used funds, the number of ways by bicycle or on foot increases. The same tendency can also be recognised concerning public transport. Regarding the vehicle traffic, the more than twice as high subsidy per inhabitant in municipal comparison, causes no significantly changed daily frequency of movement. In contrast, regarding the bicycle traffic, it is especially remarkable that small increases of the subsidy per inhabitant might have a comparable high impact on the demand.

A balance line across all surveyed points would show the highest gradient for the bicycle traffic. Regarding the vehicle traffic, it can be observed that the amount of supplies that were undertaken in the examined cities, seem to have no significant impact on the demand. A functional relationship on the basis of these three communities cannot be derived. Moreover, it is still unknown where the limiting ranges of the traffic systems' demands, which cannot be underrun or exceeded, are located. Analogous to other persons who are dependent on a mode of transportation (public transport or vehicle transport), on principle and independent of the quality of the offer, it can be expected that there is a "critical mass" of persons who are using the bicycle for many distances (for example for the purpose of saving costs). Even when the use of funds is extremely low, people would still create a "basic demand" for bicycle traffic. Hence, a decline in the use of funds causes no proportional decline in the demand.

Figure 3: Relationship between local subsidy and daily frequency of movements



Source: own illustration

Altogether, it is shown that the bicycle traffic seem to have the highest potential to increase the demand according to a sustainable urban transport, with the help of an enhanced use of funds. In all three examined cities, the bicycle traffic received by far the lowest amount of subsidies. Therefore, it might be advisable to increase the use of funds at this point whereby the most positive effects can be expected. In two out of three cities, the vehicle traffic is subsidised heavily but nevertheless this seems to have no great effects on the demand. Even though, general statements should not be made with the examined three cities, the reduction of subsidies for the vehicle traffic over 70 euros per inhabitant seems to be uncritical. It has to be noted here, that the recommendation to reduce the subsidies does not mean that the already limited funds for the maintenance of the road infrastructure must be reduced. In fact, streets should be downsized or traffic areas should be rededicated to reduce the costs for the vehicle traffic. Moreover, the income side can be increased due to several instruments. When considering the three cities Bremen, Kassel and Kiel in the course of the mentioned project (VPVS 2015), it was already noted that crucial differences regarding the determination of urban parking fee zones or street development contributions and therefore potentials for a higher level of user financing are existing.

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