Traffic, Mobility, Access and Green Thinking in Urban Transportation

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Abstract. Driving the car seems to be the first choice of transportation modes for the majority of people for reaching their destination in urban areas. It is comfortable and most of the people believe it is the quickest way to get to work or to other facilities. As we see, the revolution of leaving the car at home hasn’t arrived yet. Why is the car so attractive and essential for humans and why are other transportation modes less attractive? Moreover, everyone should be aware by now of the environmental impacts of the car which can be called dramatic. The aim of this article is to describe the differences between public and private transportation. Another purpose of this paper is to present projects that can be related to this topic as an example of how traffic in urban areas can be reduced.

Keywords – Accessibility, transportation measurement methods; transportation demand management; urban transportation; sustainable transportation; public transportation; private transportation.

I. INTRODUCTION

Accessibility (also called access, reachability or convenience) refers to how easy it is to reach goods, services, activities and destinations. Physical accessibility can be analyzed on four general dimensions of mobility, mobility substitutes, transportation system connectivity and land use [1]. We believe that one of the most important reasons for automobile dependency with its negative health and environmental effects is simply not recognizing different methods of measuring transportation in urban areas. This unfamiliarity or maybe ignorance on different transportation measurement methods actually gives rise to a very important development: discrimination against sustainable modes of urban transportation (like public transit, walking and cycling), but in favor of automobile transportation.

Among the different transportation evaluation and measurement methods are: traffic, mobility and access based measurements. Definition of transportation is: vehicle travel (including automobile and trucks) in traffic; person and goods movement in mobility (automobile, truck and transit); and ability to obtain goods, services and activities in access (automobile, truck, transit, cycling and walking) methods. Given these definitions, favored transportation improvement strategies are: roadway and parking facility improvements to increase capacity, speed and safety in traffic; transportation system improvements that increase capacity, speeds and safety in mobility; and management strategies and improvements that increase transport system efficiency and safety in access method of transportation measurement.

These different transportation measurement techniques imply that the same road space that could have been reserved for public transit, walking, cycling or residential and recreational purposes in urban areas (by using an access method of transportation measurement), may instead be reserved for roads, automobiles and parking purposes (by using a traffic method of transportation measurement). Dispersed land use patterns also favor this preference for automobile dependency. Therefore, there is the potential for creating healthier and environmentally friendlier urban areas and transportation patterns by means of redesign based on the following factors: Awareness of different forms of transportation measurement methods and implementing policies that provide incentives to end any discrimination against (or even favor) greener forms of transportation.

So far, one aspect of less investment on public transportation has been the infeasibility of public transportation alternatives. When there are not enough users of public transportation, the operational profitability of the mode diminishes, making the infrastructure investment questionable to begin with. However, proper policies favoring sustainable transportation may be implemented and marketing activities describing advantages of greener forms of transportation may be carried. The result will be to reduce automobile dependency in urban areas and public transportation alternatives may become more feasible. Thus, it will be possible to invest more in sustainable transportation modes of public transit, cycling or walking in a connected multimodal network structure, producing positive health and environmental effects both on the local and global scale.

II. PUBLIC TRANSPORT – A GREENER FORM OF TRAVEL

Walking or cycling short distances is good for everyone’s health and additionally prevents the environment from damage which is caused by using the much more comfortable and easy way instead - the private car. Public transportation is also a good alternative for longer distances instead of each individual polluting the environment with much higher emissions caused by using the private car. But in reality the number of cars on the road is continuing to rise.

Public transportation modes like buses and tramways are as a matter of fact much more energy efficient and therefore environmentally friendlier than cars. Motor engine, car
utilization and driving behavior define the comparison between the energy consumption of buses, trams and cars in its individual case. As a general rule, public transportation modes can carry an individual with 50-70% less fuel and energy consumption compared to the usage of a car. Most of us know using public transport is better for the environment and can even be cheaper and quicker. But why do the majority of people still prefer the car as their primary mode for overcoming distance while they would be able to use the mass transit?

To meet the mobility needs of people a dense network of routes is required to reach a favored increase in the modal share for public transport. Also, ticketing, marketing and service information availability should be integrated across public transport modes within ‘travel to work’ urban areas. Services need to be reliable, frequent, cost- and time competitive, and safe to use and perceived by the public as such. Information about services needs to be up to date, widely available and include predicted arrival times. The network should be attractive and accessible for all communities of interest – including visitors, tourists, the elderly and those with physical mobility problems. Spatial planning should reserve the space necessary for the transport infrastructure (dedicated routes, stopping places, information displays) and ensure that stops are sited within walking distance from key residential, commercial and tourist centers. Spatial planning should deliver the required loading factors to allow public transport to compete with car transport. “Public transport only” and priority routes will be essential policies.

Travelling by car needs to be less attractive. Walking, cycling and public transport can become more attractive alternatives if car travel becomes more difficult or expensive.

A. Pros and Cons of Public Transport

Public transportation has the convenience that it carries people to the place where they want to be and when they want to be there, particularly in cities and towns. In addition, there is the advantage of just sitting back and letting someone else do the driving whereas the time could be used for something else, e.g. planning the day, studying for university etc. Despite the tendency of a delay at some times - which can also effect car drivers due to a traffic jam or similar interferences - in the majority of instances, ones journey from point A to B with the public transport will be quick and often direct as more and more investment is made into new train, tram and bus routes.

Contrary to popular belief, nearly all forms of public transport create less of a cost to the traveler. If people are regularly visiting a place, or planning a trip in advance, they can get season tickets or advance booked tickets for a cheaper price. The cost of running a car goes much further than the mere cost of petrol which is especially increasing nowadays due to high oil prices everywhere in the world. Getting on public transport means no congestion charges, car insurance and tax costs, plus eradicates the expense of maintaining ones car to a high standard.

Furthermore, one of the most frustrating disadvantages about driving a car is the search for a parking space once a person has arrived at the destination. Parking is often scarce and usually expensive. The advantage of getting on public transport is being able to alight and nothing else. Parking can often add extra time to people’s driving journey.

The downside to public transport means that cars and motorbikes can, at times, be more flexible and offer an easier form of travel in the eyes of the commuter or traveler. However the green credentials are far less than attractive for anyone wanting to reduce their carbon footprint. And on the whole, there is a realistic public transport alternative to driving. The biggest challenge is changing our preconceptions. Trying out a train or bus even just once or twice a week – be it to the supermarket or the office – can reduce ones carbon footprint.

III. STRENGTHENING SUSTAINABLE TRANSPORT MODES

Walking and cycling are of course the most sustainable modes of personal transport, providing positive health benefits whilst reducing congestion and averting the need for vehicles at the same time. In the hierarchy of sustainable transport modes, public transport follows close behind. Whilst increasing the proportion of personal trips made by walking, cycling and public transport it helps to improve the quality of the urban environment and therefore the quality of life by reducing noise, emissions, pollution and congestion, while at the same time improving public health. Reducing the need for personal motorized travel is central to sustainable urban transport.

To increase the attractiveness of walking, cycling and public transport an integrated program of plans, polices and projects across the urban area is needed that also discourages the personal use of cars. The choice of transport mode is influenced by a variety of factors as e.g. convenience, travel time, (perceived) cost, flexibility, comfort, safety, social acceptance etc. The first two categories of measures aim at making alternative travel solutions more attractive relative to the car. Measures in the field of information and marketing are important to raise knowledge and the acceptance of alternatives to the use of cars – people need to know about their transport alternatives and, furthermore, they must be perceived as attractive.

A. Requirements for Walking and Cycling

Increasing the modal share for walking requires a dense network of well-maintained routes that are both safe to use and perceived by the public as safe to use. Furthermore, the network should be attractive and accessible for all communities of interest – including visitors, tourists, the elderly and those with physical mobility problems. Spatial planning should reserve the space that is necessary for the walking infrastructure and ensure that local services are sited within walking distance from residential areas. Infrastructure design should ensure that routes are safe, attractive, well-lit, signposted, maintained year around and accessible to all as well as integrated with green space, roads and the buildings of urban areas.

Many urban areas have already produced design manuals that provide the detailed specifications for the practical tools and techniques that deliver high-quality, walking friendly urban environments. Examples of such environments are pedestrian only zones and home or low speed zones with lower vehicle speed limits that allow pedestrians and cars safely share the same space. On these areas pedestrians always have priority to the cars.
Increasing the modal share for cycling also requires a dense network of well-maintained routes which is safe to use. Spatial and transport planning should treat cycling as an equal mode of transport with cars and public transport: reserving the space that is necessary for the cycling infrastructure direct connections and continuity with attractive and secure cycle parking facilities at transport hubs (train and bus station) and workplaces.

Many cities have produced design manuals that provide the detailed specifications for the practical tools and techniques that deliver high-quality cycle-friendly urban environments: reducing the speed limits of motorized vehicles on important shared cycling routes and opening up one-way streets for two-way use by cyclists. Making bikes more available through subsidized hire and free schemes is particularly successful in increasing the modal share for cycling – particularly where this is associated with an attractive infrastructure and good marketing.

**B. Possible Disincentives on Private Car Use**

Disincentives could include pricing, parking management and information and marketing. In terms of pricing, drivers can be charged some of the societal costs of urban driving by making them pay a fee for driving in the city centre, thus also making the car a less attractive option. Experience from cities that implemented congestion charging can reduce car traffic considerably and enhance the use of other transport modes. Pricing can be an effective instrument to reduce congestion and increase accessibility for important transports.

Parking management is a powerful tool for cities to manage or even better decrease car use. Cities have several tools to manage parking, e.g., pricing, time restrictions and controlling the number of available parking spaces. Parking time restrictions for non-residents are a proven tool to reduce commuting by car. As an example in Cologne, Germany 1 € (2.20 TL) is charged at the least for half an hour of parking in the inner city center. The number of parking spaces is often regulated by the local building act, demanding a certain number of parking spaces for new developments. By reducing the minimum demand and introducing a maximum level of parking spaces per living unit or shop area, the city can control the number of parking spaces available. Some cities have building regulations where location and accessibility by public transport influence the number of parking spaces allowed. Adequate pricing of urban parking lots is another important tool with similar potential to influence urban driving as congestion charging.

Buying and using cars is a global business reinforced by massive commercial advertising and promotion budgets that refer not only to mobility issues but provide emotional life style and image appeal. Similar local marketing campaigns that provide personally tailored information about public transport, walking and cycling alternatives have been successful in reducing car use and increasing levels of public transport use. These campaigns should also use the emotional and intellectual appeal of the health and environmental benefits that walking cycling and public transport provide. As this would be a step forward to an environmentally friendlier urban area the example of cigarettes comes to mind. People know in general it is unhealthy and can cause an early death. But do the people really react? The cigarette industry prints pictures of e.g. a dead man lying in the hospital, he died from smoking. Still the people continue to buy cigarettes due to their addiction. Metaphorically, the car can be seen as a cigarette. People know about its harmfulness to the environment and humans but still buy it and black out the negative effects.

**IV. EXAMPLES FOR ENVIRONMENTALLY FRIENDLIER URBAN AREAS**

The following examples will describe different projects that have been adapted in different cities of Europe to make public transport and a green way of thinking more attractive. The question is how long it is going to take that pollution – let it be air pollution or the decreasing quality of life because of it – can be limited to a minimum. In most of the cases it is still the people’s self initiative to be a part of creating a more environmental friendly life. On the other hand, as in the following described, also governmental rules and investments, companies and communities can change behaviors of whole cities.

**A. Example 1: Germany’s Environmental Zones**

As there are many different topics how to reduce traffic and therefore pollution in cities the purpose of the following is to give an example for sustainability among urban areas in Germany. Due to frequent and regular crossing of the EU air quality limits for particulate matter and nitrogen dioxide 40 cities in Germany set up environmental zones. Other cities will follow. Within these zones only vehicles that do not exceed a certain level of pollutant emissions may enter. These levels are based on the European emission standard. The reason for this introduction is to reduce environmental and health risks due to motorized traffic and to animate the people for walking, cycling and using the existing good public transportation system.

Many pollutants are responsible for health problems as e.g. nitrogen dioxide, sulfur dioxide, carbon monoxide, benzene, ozone, etc. According to the World Health Organization (WHO) in 2004 worldwide 370,000 deaths were caused by a high particulate pollution. Afterwards the EU Air Quality Directive required a reduction in particulate matter.

The German federal government has created the so-called labeling regulation which contains uniform rules for driving restrictions. All motor vehicles (cars, trucks and buses) are in accordance with their emissions of pollutants categorized into four groups and marked with colored stickers.
environmental badge. Therefore, it may also occur that very old vehicles receive a green environmental badge. These are mostly gasoline catalytic converter. Vehicles whose contaminant emission is too high do not receive an environmental badge and may not pass through the environmental zones, otherwise 40 € will be charged and a penalty point in Flensburg will be noted.

All in all, having a green badge is the best or even better would be a hybrid or electric car. As you can see in the following figure Germany is reducing the permissions to enter cities stepwise. Hannover as an example only permits green badges. With the gradual introduction, many owners of diesel cars that do not fit into the expectations respectively the limitation of emissions get the chance to retrofit their cars with particulate filters and therefore get a yellow or even green sticker.

According to these strict limits for cars to enter the cities, the intention is to encourage people to either purchase a much more environmental friendly car or even better activate them for walking and cycling or to use the public transport system. Though, this concept regulates just the particulate matter emissions which can be highly decreased through this concept, but not the CO₂ emission. Therefore, another concept exists through which a climate vignette should be adapted. Still it is one step forward to an environment that is “green”.

Figure 2. Environmental Zones in Germany, Status 2011.

B. Example 2: London’s Way-finding System

The city of London has been progressive in its aim to promote public transport and reduce private car use with measures such as the congestion charging system being introduced in 2003. London Underground and bus journeys have increased dramatically in recent years and in turn so has crowding on transport, particularly on the tube. It was therefore proposed that walking should be promoted as an alternative to public transport use, reducing crowding as well as improving the health of the pedestrian, making the streets safer (by providing passive surveillance) and boosting the economy by creating more passing custom for retailers. There would be nearly no possibility to get lost - at every corner is a map.

Figure 3. London’s Prototype Way-finding System

The objectives of the prototype way-finding system are journey time savings and connectivity improvements, change in the quality of the environment, and improve pedestrian satisfaction.

C. Example 3: Poland’s BikeOne Bike Rental System

The main purpose of this project was to establish a city owned bicycle renting system in the city centre of Krakow, Poland. The system has been built based on the public transport system, to integrate those two modes of transport.
The idea of this bike renting system was to make people leave their private car at home and go further by bicycle after using a tram or bus - to decrease car traffic and to make the bicycle a more popular mean of transport.

BikeOne bike rental system has been developed and installed within 2005-2009. Germany also integrated a bicycle renting system in some of its cities which is owned by Deutsche Bahn (German passenger train) and very well adapted.

D. Example 4: Austria’s “Radhouse” - A New Type of E-bicycle Storage

Radhouse which means bicycle house is an innovative form of bicycle parking that combines the benefits of secure storage with environmental friendly solar electricity, and at the same time it is very space efficient. Stored in the Radhouse the bicycle is well protected against weather and theft and batteries can be charged. The “Radhouse” provides storage and charging for 5 e-bikes all in the space taken by 1 parked car.

The number of owners of e-bikes is increasing which brings with it some specific infrastructure needs. Protection against weather and theft, and the opportunity to recharge batteries are the most important needs of e-bikes. To meet this demand, a local business has invented the bicycle storage Radhouse. A “Radhouse” occupies the same area as one car parking space but provides separated spaces for 5 e-bikes along with some equipment. It helps to close the multi-modal transport chain, especially for commuters who cycle to the train station and take the train to their workplace. During the day the e-bikes are adequately supplied. Additionally users have the ability to store belongings (e.g. rain shield, cloths) in the box. Electricity for charging is produced with photovoltaic cells assembled on the roof. A big advantage of the concept of the Radhouse is that it offers a lot of flexibility for adaptation to suit the demands of the multifaceted owner.

E. Example 5: Spain’s E-driving

The Royal Automobile Club of Catalonia (RACC) started this year a mobility campaign, focused on minimizing emissions through more energy-efficient driving. The campaign “E-driving” wants to contribute to lower energy consumption through a change of the drivers’ behavior. A survey realized by RACC, shows that 86% of the Spanish drivers say about themselves that they care for the environment. In reality, the drivers’ level of knowhow on sustainability and environmental aspects is limited. Only 16.7% of the surveyed persons admit that they themselves show an active behaviour. More than half of the Spaniards, 67%, would buy an ecological vehicle. Measures related to incentives for buying less contaminating vehicles are evaluated positively in the survey. The survey also shows that 21% of the people do not use public transport due to its low speed and 15.4% because no suitable transport routes exist for their mobility needs.

F. Example 6: Turkey’s “The Streets Belong to Us”

In four separate events, a selected residential street In Istanbul was closed to motorized traffic on a Sunday for 4 to 5 hours to demonstrate benefits of car-free living and car-free environments, and to show the residents how they can benefit from their streets as a safe open urban space. On the sidelines of the Towards Car-free Cities Conference, held in Istanbul in August 2007, were a wide range of activities to be implemented throughout the year that aimed at raising awareness of the negative consequences of the car-oriented growth of cities, and to highlight opportunities for creating car-free living in car-dominated urban neighborhoods. One of the most important events was an awareness-raising campaign entitled “The Streets Belong to Us”.

G. Example 7: Germany’s Hydrogen Buses

The EU-project “HyFLEET” is part of the European initiative “Hydrogen for Transport”. 14 hydrogen buses are run in Berlin. The project aims at developing and demonstrating the advantages of hydrogen buses as well as the refueling process and technologies and procedures for the production of hydrogen.

The most important partners of the Berlin initiative are Berlin’s local public transport company (BVG), the energy companies TOTAL Germany and Vattenfall Europe, the supplier of commercial vehicles MAN AG/NEOMAN Bus GmbH, and the University of Technology Berlin. The BVG is Germany’s largest public transport company and plays a role model function in protecting climate and environment.

The Objectives of the project were:
- Reduction of HC-, PM10- and NO2-emissions while therefore improving the local air quality.
- Reductions of CO2-emissions.
- Improvements of its own image as a green transport service company.
- Development of a hydrogen powered bus technology in order to reduce the consumption of fuel and energy in the whole transportation system.
- Development of efficient and environmentally 'friendly' ways to produce hydrogen.

The results show that hydrogen is a possibility to minimize emissions and noise, but the high investment costs and the lower range of the buses are continuous problems.

V. CONCLUSION

Whilst connecting all descriptions and examples it can be seen that the world is trying to develop more environmentally friendly urban areas, especially by reducing the attractiveness of the car. The existence of a high number of “green” projects is only contributing to this. But one essential question remains: Do countries work on this together effectively? In our opinion all countries where possible should join and even more important look and learn from each other. As the examples show they have a great value of impact on peoples’ behavior by reducing the usage of the private car, it is a matter of fact that the ability to travel in an area conveniently, without a car, is an important component of a community’s livability. Public transportation provides opportunity, access and freedom. All of this contributes to an improved quality of life which should therefore be more presented to the public.

REFERENCES


