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THE CONCEPT OF ENVIRONMENTALLY FRIENDLY INDIVIDUAL MOBILITY IN THE FUTURE

SUMMARY

The European cities are faced today by the phenomenon of expanding everyday activities, affecting directly the traffic development. Physical expansion, the growing number of cars and road networks explain the increase in car utilisation in all types of travelling in the range of 75 to 90%.

Due to the adverse effects on the environment caused by such growing motorisation, the efforts are made in order to establish environmentally friendlier traffic. The paper considers the concept of environmentally friendly individual traffic through MCC (Micro Compact Car) and MCC - mobility system which will provide its linking with other traffic participants, which may have a long-term positive influence on the quality of urban life.

1. INTRODUCTION

The traffic policies of the European cities may be diverse, but the truth is that there is not one issue that has been agreed upon. However, the traffic network reconstruction schemes to improve the transportation of various users are being gradually implemented everywhere, regardless of their level of significance.

For a long time, the traffic policy has had only one target, and that was how to relieve the road traffic and how to build as many parking lots as possible. The streets were widened, pavements were narrowed until getting completely blocked by the parked cars. Many European city centres started to implement the policy of "traffic calming" providing more space for the pedestrians by forming pedestrian areas or whole pedestrian parts of the city, forming pedestrian or combined shopping centres with a very limited vehicle traffic. The public transport was the only kind of traffic allowed in these parts. However, it should be noted that complete ban of vehicle traffic does not provide the solution. Thirty or forty years ago, thanks to the theory that emerged between the two wars, it was fashionable to completely segregate the pedestrian and car traffic by two-level constructions in the new parts of the cities. The pedestrians had the upper level and the cars were enclosed in the lower level, both for traffic and parking purposes. It was a tantalising idea, but, with one or two exceptions, the results were terrible. Even today, there are attempts to convert the pedestrian area into a traffic area at night, which has to be considered positively, since cars, although having many adverse effects, do bring life into the city zone.

Regarding the adverse effects on the environment caused by the growing traffic in modern cities, the efforts are made towards slowing down the environmentally friendlier traffic through the MCC concept (Micro Compact Car) - a system of vehicles intended for city traffic and their linking with various traffic participants. The essential assumption of future mobility that has to be taken into account, is the further continuing growth of traffic demand.

2. THE ASSUMPTIONS FOR THE MOBILITY IN THE FUTURE

The European cities are faced today by the phenomenon of expanding everyday activities, thus reducing the density of population. This phenomenon affects directly the traffic development, since it is the traffic network that contributes to the creation of an area and vice versa, the area dictates the traffic development conditions. Until recently, the tendency to establish better traffic connections of certain areas was characterised by the traffic growth itself, which is directly linked to the increase of daily activities outside the city centres and the resulting higher mobility.

During the period between 1975 and 1990, the distance to the place of work was increasing by 56% in France. The travelling distance and the distance of other daily activities was increasing and cars substituted walking and riding on buses or bicycles. This also happened in other European countries. During the 80s, the average distance between the place of living and the place of work was measured in a straight line, 11 or 12 km in West Germany, Finland, Great Britain, the Netherlands, France, with significant deviations depending on the location of the place of work and gender. According to the surveys carried out in Ger-

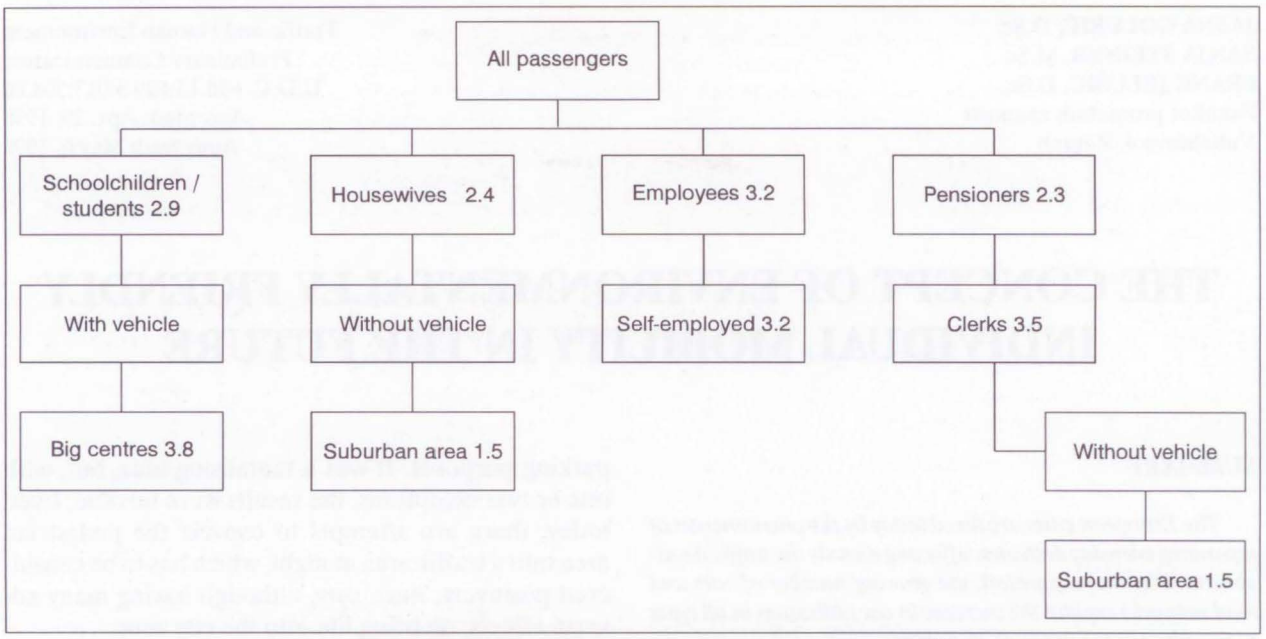

Figure 1 - Trips per passenger / day (D.Benz Ag 1993) [5]

many [5], the total number of destinations and travelling distances per person seems almost not to have changed over the recent twenty years, i.e. in the period between 1960 and 1980 there were on average 2.9 trips per passenger/day. (Figure 1)

What changed first of all are the travelling distances (which means also the travelling time) and the used means of transport. It may be concluded that factors such as physical expanding, growing number of vehicles, and road networks explain the substantial increase in using the cars for all kinds of travelling, in all the European cities, in the range of 75 to 90%, and the public transport participates with 10 to 25%.

Political and legislative authorities have soon realised the urgency to protect the environment in the urban area, due to such growing motorisation, and the issue has been considered from various aspects. Some cities advocated drastic bans and limitations for the vehicle owners, according to the maxim "life without cars", whereas others considered in detail the technical possibilities in vehicle manufacture, still tolerating the use and purchase of passenger cars. However, the experience in numerous cities has shown that neither restrictions themselves in using passenger cars, nor even top quality public transport itself, can contribute to the substantial improvement of the city traffic situa-

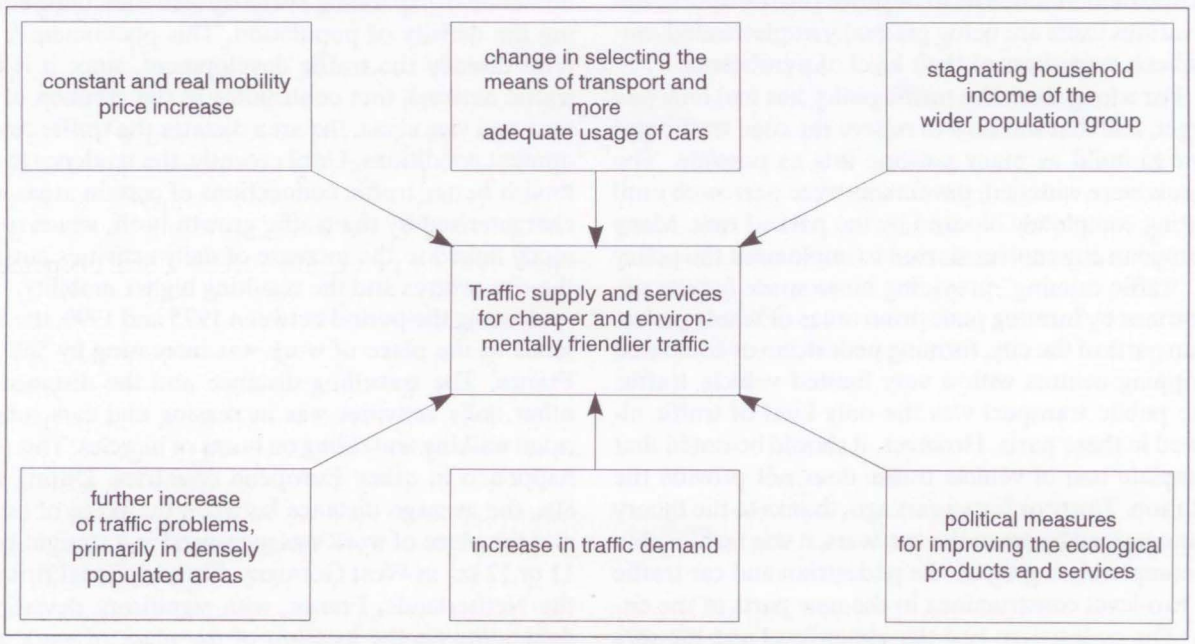

Figure 2 - Factors that influence the behaviour in traffic [5]

Table 1 - Criteria of environmentally sustainable traffic for the year 2030

CO_2 The change in climate is prevented by reducing the carbon dioxide traffic emissions by retaining the atmospheric concentrations of CO_2 emissions at the 1990 level, or below. Also, the total CO_2 emissions from traffic should not exceed 20% of the total CO_2 traffic emissions from the year 1990.	**NO_x** By meeting the WHO guidelines regarding the air quality for human health and eco-toxicity the damage caused by NOx and ozone imissions and the nitrogen depositing have been significantly reduced. The total NOx traffic emissions should not exceed 10% of the total NOx traffic emissions from the year 1990.
Volatile Organic Compounds (VOC) Damage caused by carcinogenic VOC and ozone have been significantly reduced by meeting the WHO guidelines regarding air quality for human health and eco-toxicity. Total VOC traffic emissions should not exceed 10% (or less for extremely toxic VOC) of their total traffic emissions in 1990.	**Noise** Noise caused by traffic does not reach those limiting levels any more, which would mean danger for health or serious trouble. Depending on the local and regional conditions, this may mean a reduction of traffic noise of up to a maximum of 55 - 70 dB during day and 45 dB at night and in a closed area.
Solid particles Dangerous imission levels have been avoided by reducing the solid particles emissions (especially of those smaller than 10 microns). Depending on local and regional conditions, this may mean a reduction of 55 to 99% of particle traffic emissions (PM_{10}).	**Land-use** The infrastructure for driving, maintaining and storage of traffic vehicles is developing in accordance with the local and regional requirements for protection of air, water and eco-system. Compared to the 1990 levels, this is likely to include also a minor part of the urban area intended for traffic infrastructure.

tion, with an already existing high level of motorisation. Every traffic policy attempting to deal only with mitigating the negative consequences caused by mass usage of cars, and at the same time tolerating the very favourable conditions of purchasing and owning a car, is doomed to fail. Due primarily to the "urban philosophy" of the European cities, the opinion started to prevail that the complex city problems should be attacked in all fields of efforts. This brought about the realisation that the mobility costs are going to continue to grow - through higher taxes on petroleum products, through fines and restrictions on traffic in the city centres, etc. At the same time, the traffic demand will continue to grow, and the income of the wider population group will stagnate (Figure 2).

According to the presented conditions, wider population groups and their effect on traffic are taken into consideration, as well as the vehicle used to realise their traffic needs.

Expressing of such development is a tendency towards cheaper and environmentally friendlier, for city conditions adapted vehicles, and also to reduce the growing traffic demands by such transportation services. This should be supported by the change in the population structure, finding with the help of these vehicles their new mode of behaviour and expression of traffic needs.

3. A POSSIBLE SOLUTION FOR ENVIRONMENTALLY FRIENDLIER TRAFFIC

The current tendencies allow the prediction that in 2030 the traffic in many countries members of the OECD will be characterised by the following: [6]

- significant increase in the number of cars and total length of travelling distances in relation to 1990 (up to a double), although vehicles will be more economic and less environmentally adverse,
- the fuel consumption per vehicle using the same comparison will be slightly reduced,
- petrol and diesel fuel will continue to be the most widespread source of power in traffic, along with a slight increase in the usage of liquid oil gas and other alternative fuels, as well as electric vehicles.

The generalisation in the current assessments of unjustified traffic costs indicates that it is expected that the traffic in 2030 will present economically and socially a significant burden for the society, moving away from the sustainability of environment. New policy is therefore required, which would place the environmental protection measures at the top, together with other policy objectives.

The sustainable traffic system is the one which 1) satisfies the generally accepted objectives of health and environment quality, 2) does not present a major danger to the integrity of the eco-system, and 3) does not worsen the potentially adverse global phenomena such as changes in climate, and depletion of stratospheric ozone.

Table 1 presents the traffic criteria of environmentally sustainable traffic for the year 2030. The environmentally sustainable traffic criteria are not likely to be satisfied solely by technology, but stronger criteria will be required regarding the traffic demand rather than traffic supply. Since many countries develop mid-term or long-term traffic policy strategies, this knowledge is of great importance in that it can favourably influence the direction of their efforts.

The current city traffic development tendency and the resulting behaviour (use of cars in all types of trav-

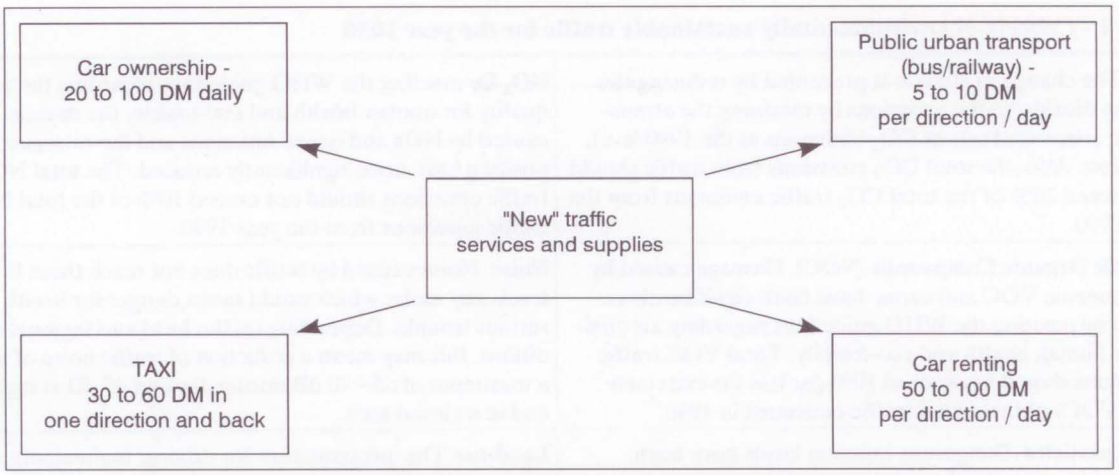

Figure 3 - Factors influencing the new concepts of traffic services and supplies [5]

elling in all the European cities from 75 to 90%), and the consequent burden on the environment, require an attempt to re-define the solution for environmentally more adequate mobility. Principally, there are five steps that need to be considered (Behrendt, Kreilibich, 1994):

1. Gradual elimination of the car traffic by voluntary self-denial on automobility.
2. Re-direction of traffic to public urban transportation and non-motorised traffic.
3. Improvement of driving techniques through ecologically more adequate vehicle concepts.
4. Connecting of various traffic participants through better systems for automatically controlled traffic.
5. Restrictions in traffic combined with the limitations in automobility.

Two objectives are of priority here:

1. The environmental burden should be reduced by reduction of traffic.
2. The mobility of population should not be limited, paying attention to reducing (shortening) the travelling distances and number of trips per traffic participant, thus reducing also the total traffic effect, and thirdly, possibly leading to the change in selecting the environmentally friendlier means of transport. The development of MCC vehicles and MCC systems may lead to mass usage of such vehicles and their linking to other traffic participants.

4. MCC - THE SYSTEM OF VEHICLES FOR URBAN USAGE

An important criterion in selecting the individual means of transport is the cost and availability of purchase (time of purchase and waiting time for the vehicle to be delivered).

The motivation for selecting a certain means of transport is conditioned significantly by the costs provided in relation to the already existing competition, i.e. the existing traffic supply in relation to passenger cars, public urban transport, taxi, and the car renting possibilities (Figure 3).

Cheaper traffic supply leads to reducing the adverse effects on the environment by individual traffic, as soon as such environmentally friendlier vehicles start to show obvious advantages in the costs, i.e. when they start to be available due to their attractive prices to a wide number of inhabitants. MCC is one such system of vehicles intended for city use, due to their adequate length (2.5 m), and weight (600 kg), because of the used material, and small fuel consumption of 3 litres per 100 km, and negligible pollution. MCC vehicles offer technical assumption for ecological mobility (Figure 4). This fact has been proven also by the reduced costs of purchasing and fuelling such vehicles as well as through the additional offer of hybrid or electric propelling.

Individual traffic with such environmentally friendly car will not solve all the existing problems. Therefore, apart from the MCC vehicle also the so-called MCC mobility system has been conceptualised.

Figure 4 - Micro Compact Car (MCC)

It includes five foundation stones that may have a long-term positive influence on the mobility in towns:

1. supply on the parking lots in densely populated areas
2. supply of vehicles for an optimal motor fleet
3. passenger traffic centres
4. system of public individual transport
5. model of multiple car usage (part-time leasing)

1. This means providing special parking spaces for small vehicles in attractive places in the densely populated areas. Particularly in the residential areas, this concept may drastically reduce the number of required parking spaces - with direct consequences e.g. as costs caused by the building of new flats. The existing parking spaces could be better used by partly laterally parked MCC vehicles.
2. The supply of vehicles for an optimal motor fleet would provide a substantial reduction of burden on the vehicles. The idea is to improve the level of utilisation from the today's 40% to 65% through the modern management system.
3. Passenger traffic centres are direct civil engineering measures for connecting the public and individual transport. They are planned in the suburbs of densely populated areas so as to relieve the inner urban centre from the conventional vehicles.
4. The public individual traffic system would serve as a supplement to the conventional public transport system, and primarily during off-peak hours it might mean a significant traffic supply substituting e.g. the bus lines with minimal number of passengers.
5. The model of multiple car usage would in principle adopt its main advantages referring to its maximum utilisation. On the other hand, its drawbacks would be reduced according to the motto: "use a car rather than own it". Recently, this concept has been developed and tried out (car-sharing).

5. CONCLUSION

In order to alleviate the negative ecological consequences of the growing motorisation in modern cities, it is becoming obvious that what is needed are drastic measures. The possible attempts to overcome the crisis are less reflected in restrictions and retaliatory measures, but are rather more significant within the concept of the environmentally friendlier vehicle and its adequate mobility system which will enable its linking with other traffic participants. The concept of MCC vehicles indicates a possibility to solve the urban mobility issue, which may have a long-term positive influence on the human environment and health. The concept of environmentally friendlier individual mobility of the future may be reflected in and supplemented by five foundation stones:

- the technology of vehicle manufacturing
- supply at parking spaces
- supply of vehicles for the optimal motor fleet
- passenger traffic centres
- public individual transport system
- model of multiple car utilisation

SAŽETAK

KONCEPT EKOLOŠKI POVOLJNOG INDIVIDUALNOG MOBILITETA BUDUĆNOSTI

Europski su gradovi danas suočeni s fenomenom širenja svakodnevnih aktivnosti što ima direktan utjecaj na razvoj prometa, a geografska širenja, rast broja automobila i mreže cesta objašnjava povećanje korištenja automobila u svim tipovima putovanja u rasponu od 75 do 90%.

S obzirom na opterećenje okoliša uzrokovano takvom rastućom motorizacijom, napori idu za uspostavljanjem ekološki povoljnijeg prometa. U radu se razmatra koncept ekološki povoljnog individualnog prometa kroz MCC (Micro Compact Car) vozila i MCC - sistema mobiliteta koji će omogućiti njegovo povezivanje s ostalim učesnicima prometa, što bi se dugoročno moglo pozitivno odraziti na kvalitetu života u urbanoj sredini.

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