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Occasional Paper

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**Space Demand and Traffic Development
Ways and Means of Reduction**

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0. Introduction

The main purpose of the chapter is to give:

- some hints to what ecologically sustainable mobility could mean,
- to show the interdependence between mobility, traffic and space demand,
- to argue that the reduction of space consumption and of traffic is a prerequisite to sustainability,
- to elaborate on ways and means to that reduction,
- to make some sceptical reservations regarding the feasibility of the aim 'sustainable mobility'.

The chapter is mainly based on the experiences in Germany, especially with regard to the possible instruments which refer to the German institutional and legal context.

1 . What is sustainable development, what is sustainable mobility?

Human settlements and Transport systems lead to consumption of space, air, water, energy and other resources. Settlements and Transport systems that do not consume more than they replace may be considered ecologically sustainable; this is a high pretension on a very abstract level.

A broader definition of sustainability includes not only ecological, but also

economic and social aspects (Camagni). In our view sustainable mobility can only be defined within a broader concept such as this. It is therefore not easy to define sustainable mobility in an operational way. One thing we can state is that the present traffic situation is definitely not sustainable regarding the heavy environmental, social, cultural and economic impacts, especially of motor car traffic. Therefore the most simple definition of sustainable mobility (or ecologically responsible mobility) might be: progress towards sustainable development will be any reduction of negative impacts.

Impacts of motor car traffic:

- Consumption of resources (land, air, water, energy and other)
- accidents and danger
- destruction of urban mode of living (space demand, noise, danger and other)
- impairment of local economy (high speed traffic, longer distances, out-of-town development)

It is well known that motor car traffic is responsible for a great part of the energy consumption and air pollution and that in the future it will be both necessary and possible to reduce both to a great extent. What is less well known is that urban structures which provide for a high degree of access and mobility by car are inherently incompatible with structures served predominantly by other modes of Transport. "This is because the car requires a lot more space than other passenger modes; in fact ten or twenty times more space per person travelling, not to mention the parking spaces required at homes and destinations. Where the car is accommodated, it will to some extent reduce the ability of the urban structure to support both the patronage and quality of public Transport, and the possibility for journeys to be made on foot or by bicycle." "The other inescapable fact is that European Cities have been developing spatially in ways which are convenient for car use, and less convenient for other means of access. As people, jobs and other activities have moved further away from the city core, so the density and structure of built-up areas has loosened, and use of the car has increased. It is not the intention to explore the causal relationship here, but the trend of dispersal is inevitably linked with rising access to cars. Nor is the intention to challenge the undoubted benefits which people seek when they choose to live out of the city, such as more living space, more privacy and proximity to the countryside, but attempts to assess the scope and feasibility of traffic limitation strategies must inevitably take into account the powerful counter trend of city dispersal" (Tim Pharoah, 1996).

2. Traffic System, Space Demand and Urban Structure

Space demand is the one of the key problems of suburban development and traffic expansion. In the first place space demand is caused by tech-economic factors and by social changes. Today we consume for example much more

living space (38 sqm. per person) than forty years ago (14 sqm.). A similar expansion of specific space demands can also be seen for production, office space, retailing, leisure time developments and other facilities. Secondly the expansion of space consumption for settlements and traffic facilities is due, to a much greater extent, to car-based developments. The reasons are:

- car-orientation stimulates low density and dispersed development,
- car-orientation stimulates out-of-town shopping and similar developments with an extremely high space consumption,
- car-based developments need much more space for traffic facilities than structures based on public Transport Systems or pedestrian distances,

For Germany we can state: in the old cities of the agglomerations 226 sqm. per person for settlement (including traffic facilities) are consumed, in the suburban rings around the cities the figure is over three times as high (824 sqm. per person).

Settlement space per person:

	settlement space (including traffic space)
Cities	226 sqm. per person
suburban ring	824 sqm. per person

Source: Dieter Apel, Dietrich Henckel, Flächen sparen, Verkehr reduzieren, Difu Berlin 1995, S. 30.

The interrelations between the traffic system, the space demand, the urban structure and the traffic demand can be also shown by the following considerations, if we compare cities with different structures.

- The "City type Delft" is characterised by high density, functional integration and is based on pedestrian, bicycle and public Transport.
- The "City type Oldenburg" has only a medium density, less functional integration and is based on bicycle and car traffic.
- The "City type Denver" is characterised by a low density and a full car-orientation.

The comparison demonstrates the different space demands. The whole space consumed for housing areas, social facilities, industrial areas and traffic facilities is nearly four times larger for the "city type Denver" than for the "city type Delft".

This comparison demonstrates: in cities with a high density and little car ownership travel distances are relatively short and can mostly be made on

foot, by bicycle or public Transport. If car-orientation dominates, traffic problems and ecological problems arise: high space consumption, consumption of energy, pollution, noise, destruction of landscape and amenities, hampering pedestrian, bicycle and public Transport, destruction of urban mode of living etc. All these problems are much less important if we maintain and develop cities with a high density, with multifunctional land uses and a great deal of pedestrian and bicycle traffic and public Transport.

3. Objectives, Strategies and Regulatory Instruments

Regulating space consumption and traffic levels can be seen as major components of strategies for a more sustainable urban development. Space consumption and growth of traffic are - as already shown - mutually dependent, therefore the only solution which seems conceivable should adopt a cohesive approach to both. Solutions in this field must also lend themselves to an integration within broader reform projects for an ecological restructuring of the economy in the highly industrialised countries.

The first question is: which kind of urban structure is qualified to reduce the need to travel? In principle qualifying elements are:

- generally an urban structure with a high density, mixed use (functional integration) and a good environment. (These elements are often to be found in old towns and city quarters with historic character). For this purpose it is necessary to reduce car traffic and the number of parked cars;
- a good balance between the number of dwellings and places of work in towns and in quarters of larger cities;
- the concentration of new developments in locations accessible by a wide range of transport modes, not only the car;
- the concentration of traffic-generating activities (major centres of employment, leisure facilities etc.) at locations with a high accessibility by public transport and the bicycle;
- higher densities in locations well served by public transport;
- the discouragement of low density and car-based developments on peripheral sites, especially out-of-town shopping centres and small, free-standing new dwellings in the countryside.

Following we summarise the objectives, most important strategies and regulatory instruments which are necessary to reduce space consumption and the need to travel and therefore the traffic, especially motorised traffic. These are the results of a Difu-study worked out by an interdisciplinary group. This broad overview does not show the whole number of suitable strategies and instrument. We focus here on key regulations on a general level (national, state and regional level) which mark the "regulatory framework" for local policy.

Reducing space consumption and traffic:

objectives	strategies	regulatory instruments
reducing space consumption	<ul style="list-style-type: none"> · internalising the external costs of land absorption · promotion of higher density and multifunctional land uses · improvements of housing culture · improvements of planning culture 	<ul style="list-style-type: none"> · combined tax on land value and used space · housing subsidies only below a maximum amount of space absorption · abolishing the current parking space duty · tax allowances for car-free housing areas
concentration of development, "compact city"	<ul style="list-style-type: none"> · promotion of integrated land use and transport planning and policy on the regional level · promotion of compact urban areas · discouraging dispersal and low-density developments 	<ul style="list-style-type: none"> · constitution of urban regions with more legitimisation and responsibilities for development and transport policy · improvement of planning laws to promote more multifunctional land uses · subsidies for private and commercial building only within compact developments

reduction of motorised traffic	internalising the external costs of transport removal of tax deductions for cars reduction of investment in road construction	continuous increase in energy prices especially the petrol tax introducing a levy on heavy goods traffic instead of a motorway toll completion of the parking-charge system in towns removal of tax deduction for cars
encouraging alternative means of transport	concentration of traffic-generating activities at locations well served by public transport, bicycle and pedestrians more investments for public transport and bicycle traffic promotion of pedestrian and bicycle traffic and public transport uses	introduction of the Dutch A-B-C-planning instrument amendment of the national transport network plan introduction of a sounder financial base for public transport

The table is organised into four groups with respect to the objectives:

- reducing space consumption,
- concentration of development, "compact city",
- reduction of motorised traffic,
- encouraging alternative means of travel.

We can not elaborate on the whole range of strategies and instruments here, rather we concentrate on the three most promising strategies and instruments.

- Space consumption generates substantial external costs which need to be internalised. Land values, as the long-established traditions of debate illustrate, are the outcome of social processes (rather than the consequence of a single investor's actions). The potential has not been utilised by the fiscal system where public measures have led to increases in land value. The present land tax solves neither the question of increases in value nor the ecological problems posed by the urban

consumption of space and its external costs. We therefore propose a combined tax based on both land value and the quantity of used space. The land value component is based on market value (here the local benchmarks can be used for calculation) and the other component is based on the amount of land absorbed. Each component contributes in its own way towards an economic incentive for a lower rate of land take-up, denser development and functional integration.

- An indispensable step is to internalise the external costs of transport. A long-term, continuous increase in energy prices is needed. For transport, a higher petrol tax (implemented in well-defined, rising steps) seems to be the most appropriate and simplest measure. (This measure affects different classes of traffic to varying degrees. Higher petrol tax would probably have the least impact on freight traffic and the highest on leisure traffic.)
- The high degree and continuous increase in space consumption and road Transport is considerably enhanced by a lack of coordination within the regions. It would appear essential to achieve a more cohesive urban development and transport policy at a regional level. Our proposal is to constitute urban regions within a distinct local authority framework. This means urban regions which would draw their legitimacy from a directly elected assembly and assume responsibility for all matters which can only be solved at the regional level. They would also take over certain functions from the federal and state governments. The aim is not to create another tier of local government, as the regions would replace the districts or evolve from them.

The proposed fiscal instruments will generate markedly higher revenues from these taxes. Since, however, it is not the aim of an ecologically oriented reform to increase government expenditure as a whole, fiscal revenue can be adjusted by reducing other taxes and levies, such as income tax or employer contributions.

The three main instruments described could and should be complemented by a wide spectrum of other instruments, although these also require reform. Examples are as follows.

- Under the current system of housing subsidies (especially of owner occupied houses) subsidies are given to any kind of development. In the future they should be given only to housing under the conditions of a maximum space consumption or a minimum density.
- Subsidies for commercially used buildings should be given only for concentrated developments according to the regional development plan.
- The current regulations preventing higher density parking and favouring out-of-city developments.
- Instead of parking space construction, there should be fiscal promotion of car-free housing areas.
- The existing parking-charge systems in towns and cities should be

completed with regard to the whole higher density built-up-area. Secondly parking charges to the inhabitants should be included, as in Amsterdam and Stockholm where it has been in practice for more than 10 years.

- Instead of the current global motorway toll for lorries which leads to more traffic on other roads in some cities and regions, a levy on heavy goods traffic (based on the kilometres driven per year on all kind of roads) should be introduced.
- The many different tax deductions to car-drivers (for example the "kilometerpauschale") should be abolished.
- Enterprises and other facilities should be located near public transport facilities with regard to their mobility characteristics. In the Netherlands the so called ABC planning instrument ("the right company at the right location") is a model of this. This planning instrument should also be introduced in other countries.
- Last but not least: investors will not prefer locations near public transport facilities, if the transport systems do not change. To break the dominance of car traffic and road transport, transport policy must change considerably, for instance by increasing the petrol tax, as already mentioned. It is also necessary to alter the priorities within the national transport network plan (Bundesverkehrswegeplan) (i.e. less money for motorways, more money for rail transport.). Moreover, an improved financial base for the municipal public transport is urgently needed. (In Germany we have to bear in mind that new problems for financing local public transport will arise due to deregulation of public utilities like electricity, because cross subsidisation will no longer be possible.)

4. Concluding Remarks

We gave only a rather weak and negative definition of sustainability; any progress in the reduction of space consumption and traffic can be regarded as a step towards more sustainability. Even with this limited perspective the aim is very ambitious, it is not a trivial task.

We are rather sceptical about a short term improvement with respect to a reduction of space demand and traffic development for various reasons.

- The proposed strategies are necessary, but there are insufficient conditions for an improvement of the current situation. We are not convinced that the political will to introduce these measures is there, or that the political majorities to attain this will come into being in the near future.
- The major trends run counter to an improvement. The high investments in highspeed transport modes (high-speed railways, motorways, airports) will "shrink" the world further, i.e. reduce time distances and therefore

extend the travel distances. This will lead to more inter-regional traffic and generate additional traffic on the local and regional level.

- The acceleration of many processes in our society (e.g. product cycles, land use cycles) foster a functional disintegration, a functional specialisation which in turn leads to more traffic.
- The world wide integration of telecommunication and information networks will in the net effect - also increase material transport, thus leading to more space and energy consumption.
- As already mentioned the implementation of the proposed strategies is a necessary, but by no means sufficient condition for an improvement; it is definitely not a solution for a more rigorously defined sustainable mobility; at best we can reach some relief in comparison to the current situation.
- The conclusion of this sceptical view is that we have to take every measure which tends to lead to an improvement, and that despite the grim perspectives we have to do all we can to make mobility more sustainable.