How sustainable is research on sustainable mobility: a review of five years of ‘Urban Transport’

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**Abstract**

In the past few years policy makers seem to pay more attention to the development of sustainable mobility. One of the main reasons for this change of thinking is due to the deterioration of the environmental conditions in urban areas. However, we think that the research also plays an important part here. Therefore, with respect to this topic an inventory was made concerning the past five years of the Urban Transport conferences. Using a system’s view on transportation, we classified all the research contributions related to the topic sustainable mobility. A distinction is made between people and freight. Longitudinal research can make it more clear to us whether the attentions or differences concerning this topic have changed in relation to the system’s view. In our research we try to identify whether some research efforts have (not) been successfully implemented in practice. To put it more precisely, we will analyse whether managerial, cultural, economic, sociographical, or geographical circumstances have influenced or catalysed some concepts, policies or technologies. For future research it is just a start to evaluate former initiatives regarding sustainable mobility. However, by learning from the past we can determine which technologies, policy measures and concepts still have a sustainable character.
1. Introduction

The last few years sustainable transportation had received more interest by local governments. The main motive for this growing attention is the detoriation of the environmental conditions in towns. The awareness and consciousness of policy makers for the urban problems are mainly fed by ideas and concepts of researchers and consultants in this working field. For the future application of urban transport systems we can learn something from former research initiatives. Since this conference of Urban Transport is held for the seventh time now, we have a splendid opportunity to make an inventory on research activities in the last five years (1996-2000). For this research we hold on to the assumption that the urban transport conference is a representative conference of world’s researchers working in the field of urban transportation. The assumption is based on the fact that 42 different countries had contributed to the conference with a total production of 262 contributions. Therefore we can obtain a rich picture of the research initiatives. Since we are inventorizing the research contributions of five years urban transport we are able to perform some longitudinal research on specific topics and we can specify more precisely whether the attentions or differences concerning the research topic have changed in relation to former years.

To structure the research contributions we use a system’s view on transportation (e.g. van der Heijden [1]). Basic within this view is that the transport system can be seen as a system, which consists of four components of transportation: the potential users, potential subjects of transport (load units & cargo), vehicles of the transport mode and the infrastructure. Furthermore, between each of these components interactions exist which can be regarded as a market, i.e. the dynamic interaction between potential supply and demand. In particular the following markets are specified according to this view: the transport need market, the transport market and the traffic market.
The *transport need market* is influenced by the spatial, social-cultural, economic, temporal and institutional organisation of society. This societal organisation generates a certain need for transport: for instance a fast growing economy generates a relatively high transport growth rate. Reversely, differences between regions with respect to possibilities for transport influence the societal organisation in these regions and cause different economic growth rates between these regions. Hence, there is a dynamic tension between the hidden need for transport and the actual transport possibilities. This tension is influenced by policy measures related to the price for transport (e.g. fuel taxes), household time budgets (e.g. opening hours of shops and flexible working hours) and substitution possibilities (e.g. tele-learning, tele-working and tele-shopping).

The *transport service market* focuses on the logistical organisation of physical transport. Transport companies (or individuals) specify logistical services in terms of the pursued use of certain transport modes, with a certain capacity and price, at specific times and routes, in order to move passengers or freight. The market operates in the context of the tension between means of transport and actual transport needs, which can also be influenced by a variety of policy measures. For instance, many policy measures aim at establishing a substantial modal shift from car and truck use to the use of more environmental-friendly transport modes like trains and boats.

Finally, the use of specific transport services results in traffic. The *traffic market* operates as the dynamic relationship between the physical transport infrastructure and the required use of various means of transport. The result is a certain amount of traffic in specific parts of specific transport networks at a specific period of
The tension in the traffic market is created by the limited availability of transport infrastructure capacity as compared to the required use of it. Evidently, this tension can be influenced by investments in infrastructure, capacity or road pricing.

A characteristic of this system’s view is that lower levels facilitate (offer services to) the processes at a higher level of the system. Conversely, processes at a higher level specify functional requirements to the processes and services at lower levels. This implies that options for improvement of the transport systems performance cannot be evaluated by merely looking at the impacts at one system’s level. Instead, a multi-level, a multi-dimensional and, by consequence also a multi-disciplinary approach is required. Another interesting point of this system’s view is the introduction of the idea of different markets. Within these markets, the interacting behaviour of a variety of parties is of influence.

To frame the research not too strong by the system’s view, we have classified the research approaches in the next categories: Technology improvement, handling improvement, engine improvement, IT-concepts, design, evaluation models technology, evaluation systems concept, evaluation of demand, evaluation of costs, new transport concepts, policy measurement/evaluation on traffic, policy measurement on safety, policy measurement on finances, policy measures on cost reductions, and others.

Technology improvement, engine improvement, evaluation models technology and design are mainly focussed on the transport modes. Handling improvement plays a role in the transport market. IT-concepts, evaluation of demand are of importance in the transport need market. Policy measures on traffic and safety are evaluated in the traffic market. The other categories, such as evaluation of system’s concept, evaluation of costs, new transport concepts, policy measures on cost reductions and finance have influence on all the layers and markets in the systems view.

After this introduction this paper shows the results of our research in chapter 2, and in chapter 3 we will draw some conclusions and remarks towards the research on sustainable transport.
2. The evaluation of 1996-2000 Urban Transport research

Since the authors are no specialists in the field of the environmental studies and environmental impact studies, the research contributions have not been taken into account in the research analysis. We have mainly orientated ourselves towards the developments of new concepts or technologies. For identifying real sustainable progress on research issues we developed a research framework in which we categorised the research by transport modes and research focus in the categories already described before. After reading the paper we made a judgement about the precise cell-location in the matrix. We have made this judgement based on four people, but we could still have made interpretation errors. For having really sustainable development on research topics we assume an every year contribution on this topic and we assume a kind of natural research shift on the topic from a technical improvement, towards an evaluation of demand towards an evaluation of a concept towards accompanying measurements in policy.

In this paragraph 2.1 we show the total research contributions in structure by the matrix. Paragraph 2.2 contains a specific scope on the most popular transport mode ‘vehicle’. Paragraph 2.3 contains conclusions regarding the most popular research category ‘evaluation on demand’. Paragraph 2.4 shows the results of a popular cell in the matrix ‘policy management/evaluation traffic/regulation’.

2.1 Research matrix

To do an inventory on all the urban transport research, contributions give us a rich picture of all potential transport modes. In the matrix we have not included all contributions since high-speed vessels and air transport are mentioned just once. To fill in the matrix, we used two index-systems (I,j) where I stands for the corresponding Volume of the Urban Transport Series and j for the corresponding page number. Also some shading is used to make differences between several year contributions. The bold indices represent freight transport contributions. In the column ‘general’ no particular transport mode was mentioned. At a first glance the matrix understates our ideas that the vehicle is still popular. The attention for ways of multi-modal transport has got more research attention over the last three years.

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<tr>
<th>Rail</th>
<th>Bus</th>
<th>General</th>
<th>Vehicle</th>
<th>Mode split</th>
<th>Taxi</th>
<th>Light Rail systems</th>
<th>Trolley bus</th>
<th>People mover</th>
<th>APM</th>
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<td>Policy measurement &amp; safety</td>
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<td>Policy measurement &amp; Finance</td>
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Table 2.1a: Matrix view of all the research contributions
Table 2.1b: Matrix view of all the research contributions
2.2 Vehicles

The graph 2.2 shows that especially Japan, Italy, the Netherlands and the United Kingdom put strong effort into vehicle research. From the graph we can see that most research effort is focussed on evaluation on demand (19 contributions). Policy measurement/evaluation traffic has a strong second attention field. This topic is further analysed in paragraph 2.4. It is remarkable that the research focus on technology improvement is less, and only provided by Germany and the United Kingdom.

For checking the sustainability of the research on ‘Evaluation on demand/vehicles’ we have derived the next scheme. This scheme clearly shows that most research did not have a continuation over the years. On the other hand there is a strong line in Japanese research in finding and evaluating demand, in order to gain efficiency and to reduce the use of energy consumption.
Scheme 2.3: Research continuation on 'evaluation on demand/vehicles'

2.3 Evaluation on demand
On this research topic we have counted 53 research contributions. So far we could conclude that the attention for this topic has slightly diminished throughout the years. Important to see is the attention for new transport modes like light rail systems and modal split services. For the other contribution we suspect that they will shift to more concept evaluation studies if the evaluation on demand has proven to be feasible. Italy and Japan are the two countries that perform most research on this topic.

2.4 Policy management/Evaluation traffic reduction/regulations

This research topic is the third cell in the matrix that has a large number of contributions. It is an interesting field while there is no country that significantly peaks in this area. We found 13 contributions divided over 9 countries. In order to analyse the sustainability of this topic we derived the next scheme based on the contents of the research contributions:

<table>
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<th>Traffic flow, Drivers behaviour</th>
<th>Traffic &amp; Environment control</th>
<th>Road pricing</th>
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<td>- Traffic capacity (Palestine)</td>
<td>- GIS model (Sweden)</td>
<td>- Public attitude (Japan)</td>
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<td>- Urban planning (Chile)</td>
<td>- Cost &amp; Benefit</td>
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Traffic flow, Drivers behaviour
- Intersection flow (Italy)

Traffic & Environment control
- Traffic control by water bus (Japan)

Traffic flow, Drivers behaviour
- Managing traffic flow (Japan)

Traffic & Environment control
- Traffic calming scheme

Road pricing
- Feasibility (Greece)

Freight
- Urban freight (Holland)
- Urban freight (Spain)

For this research topic we can see really some follow-ups in research contributions. From individual drivers behaviour, to intersection flow management of the total traffic flow seems to be developments which have a sustainable character. Real research progress and continuation of research can be found in this area. We can also trends of traffic control to other types of transport modes in order to control the environmental pollutions. Interesting are the papers regarding road pricing as growing topic of interest.
3. Conclusions

The evaluation of sustainable research contributions in the field of Urban Transport seems to focus on all the markets we described in our system’s view. To our opinion it is remarkable that the attention for real technology improvement on vehicles is still less. Evaluation of policy measures regarding the reduction of vehicles is still the most popular research topic. Within this topic the evaluation of demand for the use of vehicles have a tremendous attention from the research. Many evaluation model descriptions can be found in this area with many times a real application in cities. If the research contributions on transport modes are analysed, we have to conclude that the vehicle is still favourite. To our opinion other transport modes have been studied over too less on their real potentials. The last years we see a small increase towards intermodal transport where the vehicle is combined with other more, environmental-friendly, transport modes. The switch to these contributions comes mainly from researchers in countries with high-density cities where continuation of the current vehicle traffic is not tolerable anymore.

References


