

COMPARATIVE ANALYSIS OF OPTIONS FOR SUSTAINABLE TRANSPORT AND TRAFFIC SYSTEMS IN THE 21st CENTURY

Peter Nijkamp

Sytze Rienstra

Jaap Vleugel

Economic and Social Institute, Free University, De Boelelaan 1105, 1081 HV Amsterdam, The Netherlands.

In association with:

Marina van Geenhuizen

UCL, London

Edith van der Heijden/

Ton Rooijers

VSC, Haren

Richard Smokers

ECN, Petten

Johan Visser

OTB, Delft.

Abstract

In this project on future sustainable transport alternatives a two-step search process has been followed. First an analysis of critical success and failure factors of new technological options in passenger transport is made. These factors are found in the spatial, institutional, economic and social/psychological environment of the transport system. Next, systematically structured and expert based scenarios are constructed in order to achieve a sustainable transport system in the year 2030 in which possible, expected and desired developments in the distinct fields are analyzed. Finally some policy conclusions are drawn.

1. INTRODUCTION

The current trends in almost all fields show a continuing shift in the modal split towards individual modes and a rising mobility rate. Therefore, the externalities (social costs) caused by transport are still rising, which makes it necessary to bend these trends in order to achieve a more sustainable transport system. In this project we have investigated which technical options are developed (or are being developed nowadays), which may reduce these externalities. The emphasis is here put on the resulting reduction of CO₂-emissions and other greenhouse gases, since this provides a direct link to sustainable development.

In the first phase (*state of the art*) of the project, success and failure factors for the introduction of new technological options have been identified. In the second phase (*scenarios for a sustainable transport system*), several scenarios have been constructed in which these options have been filled in for the transport system. Finally, an assessment of policy choices has been made which may influence the future of transport.

2. RESEARCH STRATEGY

In the first phase, an extensive literature search has been carried out supplemented with an international workshop in order to identify the success and failure factors of several new options (new fuels, electric car, people mover, subterranean transport, telematics, HST, maglev and shuttles through vacuum tunnels), which may contribute to the reduction of externalities when they would replace current modes.

In the second phase of the project reference scenarios, which describe contrasting future developments in the field of transport have been constructed by using the recently developed *spider model*. In this stage also a questionnaire has been sent to Dutch transport experts. The results of this survey have been presented to a second international workshop organized towards the end of the project. With this information 'expected' and 'desired' scenarios have been constructed, based on these expert opinions. This has also allowed us to assess the resulting environmental implications.

3. PHASE 1: STATE OF THE ART

There are many critical success and failure factors which influence new technical options. The most important of them have been summarized in Figure 1.

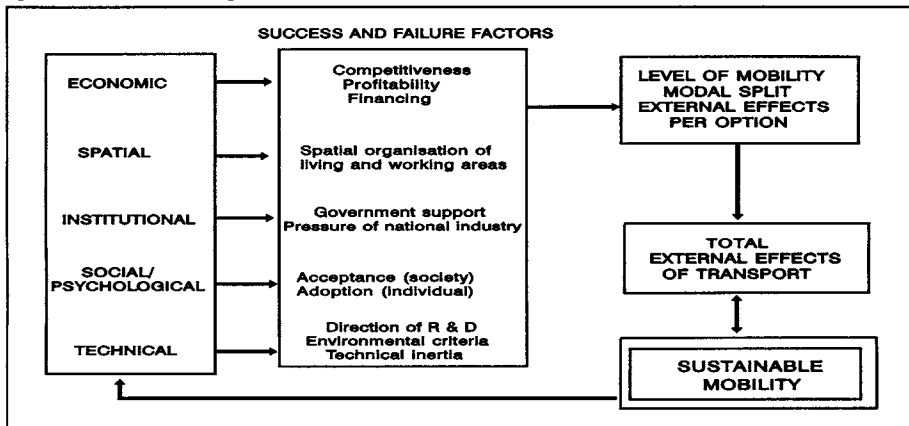


Figure 1. Success and failure factors of new technological options

It appears that especially modes and options which are compatible with existing modes have the best chance to succeed since they may use (temporarily) existing infrastructure and may easily be incorporated in prevailing institutions and existing transport systems. Therefore, the High Speed Train and improvements of the current car - and to a lesser extent also new fuels (and electricity) in cars - have the best chance of being introduced and accepted.

In general however, a principal choice has to be made between an emphasis on individual or collective modes, since both modes require an entirely different spatial organisation, technical development and institutional environment. These also have a significant influence on important economic and social/psychological factors. For a more detailed analysis of these phenomenon and their solution strategies we refer to Nijkamp, Rienstra and Vleugel (1994).

4. PHASE 2: SCENARIOS FOR 2030

4.1 The methodology of the spider model

Based on the phase 1 study and various scenario experiments developed by others, we have identified eight main factors, which influence the future transport system; these are to be found in four distinct scientific fields. These factors are presented in the so called spider model (see Figure 2).

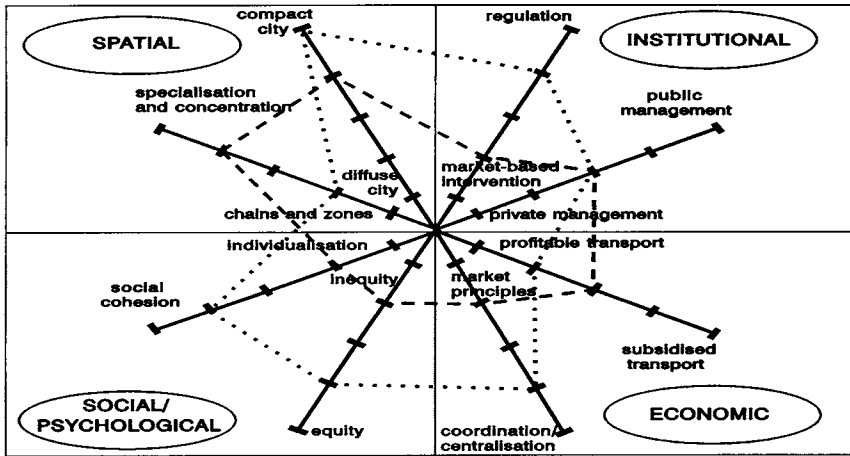


Figure 3. The expert based scenarios

Legend ----- expected developments
 desired developments

Scenarios can be constructed by connecting characteristic points on the distinct axes. In this way in principle thousands of scenarios may be constructed. On the basis of assumptions on the developments in the several axes the resulting transport system can be identified and described. We constructed two scenarios which form the inner and outer circle of the spider and are used to analyze the scenarios designed by means of expert opinions; therefore these are called *reference scenarios*.

The *regulatory scenario* forms the outer circle of the spider. A compact and concentrated spatial development is combined with an emphasis on equity and regulatory measures. In this scenario a transport system occurs which is largely based on collective modes, while individual modes largely disappear. The *market scenario* on the other hand is formed by the inner circle. In this scenario diffuse spatial developments have been combined with market-oriented measures. In this way a transport system occurs in which individual modes are dominant.

4.2 The expected and desired scenario

Both an expected and desired scenario have been constructed next by means of the questionnaire and the information gathered from the second international workshop. In the expected scenario (see Figure 2) it is expected that current trends will largely continue. Therefore, mainly improved versions of the current car will be dominant, while also measures which are common nowadays (reducing parking places, raising parking tariffs and fuel prices) will be introduced to a larger extent. Also road pricing may be introduced to some extent. It is expected that also other main trends in

society and economy will largely continue.

In the desired scenario an entirely other transport system is found. Measures which will be introduced to make the car more unattractive are introduced at a much larger scale, while collective modes are supported much more than expected. Also many trends in society are reversed in order to favour such a transport system.

It is clear that the expected scenario will only lead to more sustainability, if a much larger improvement of the current car will occur than is now expected by technical experts. In the desired scenario much more sustainability may be achieved. In this scenario however, many more changes and measures are necessary, which will have a much larger impact on the life of individuals and the society at large. It is noteworthy that the latter phase generated many new insights into the feasibility and desirability of transport systems alternatives, in particular from the viewpoint of global environmental changes. More details can be found in a forthcoming publication (see Nijkamp, Rienstra and Vleugel, 1995).

5. CONCLUSIONS

The current trends in transport are not expected to lead to a more sustainable transport system. Therefore, a change in the behaviour of individuals and a stricter government policy seem to be necessary. Several consistent and effective policy choices have to be made. The most important concern is the one between an emphasis on an individual or a collective transport system, because both systems require an entirely different policy in many fields, which have a profound impact on many other aspects in society, like individual lifestyles, the level of equity and individualisation, the choice of housing locations etc. Other issues related to this choice are the necessary reduction of the mobility growth, the investments in transport infrastructure, the direction of technical development, the way in which transport may be regulated etc.

From the expert opinions it may be concluded that government policy alone may not be sufficient for achieving a more sustainable transport system, for example in the expected scenario the CO₂-emissions will probably not be reduced in a sufficient way. The policy solution chosen by experts appears to favour a more collective transport system (as is shown in the desired scenario).

It may be concluded that the road towards a (more) sustainable transport system will be very hard, but that with sufficient behavioural changes and other changes in society such a (more) sustainable transport system seems to be socially and technically feasible.

REFERENCES

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