Passenger Transport and Lifestyle in the 21th Century

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Synopsis

This paper describes different lifestyles in relation to the demand for passenger transport for four scenarios in the 21th century in the Netherlands.

Abstract

In order to solve congestion and environmental problems, new transport technologies have to be implemented in the 21th century. The implementation of new energy efficient transport technologies depends among others on the acceptance of these technologies by households. The technologies have to fit into their lifestyles.

This paper is based on a study which is part of the project 'Traffic and Transport in the 21th Century'. The study is carried out in cooperation with other institutes in the Netherlands.
In this study four scenarios were set up for which two design dimensions were used. The design dimensions are: high versus low economic dynamics and big versus little value attached to sustainability. This resulted in four scenarios: unrestricted growth, sustainable growth, marking time and sustainable balance. For each scenario transport demand, available technologies, strategies, energy demand, energy supply and in particular electricity supply has to be drawn up by other institutes for the years 2005, 2020 and 2050. ECN Policy studies describes possible lifestyles for the future. For that a diagram has been made, in which variables as households, dwellings and activities are related with background variables, that result in four blueprints.

Although predictions for future lifestyles and their influence on mobility in the 21th century are precarious, the study will give indications in which way lifestyles can develop and what we can expect of future transport technologies. To especially electric vehicles attention is paid.

1. Introduction

Electricity plays an import role in the energy supply in the Netherlands. Until now electricity as a fuel for the transport sector has been limited to rail transport and trolley buses. The share of rail transport in total passenger kilometres is very small in comparison to road transport. The last one has increased so much that environmental standards has been exceeded. Because of these environmental problems electric vehicles has become an option for the future. When electricity will play a significant role in the transport sector, this will have important consequences for the demand for electric infrastructure in the Netherlands. Therefore the SEP (NV Dutch Electricity Generating Board) has started a project called 'Traffic and Transport in the 21th Century', which has been carried out by different institutes in the Netherlands. In this project four scenarios were developed for which two design dimensions were used. The design dimensions are: high versus low economic dynamics and big versus little value attached to sustainability. This resulted in the scenarios: unrestricted growth, sustainable growth, marking time and sustainable balance. The dimension and situation of the scenarios is shown in figure 1-1.

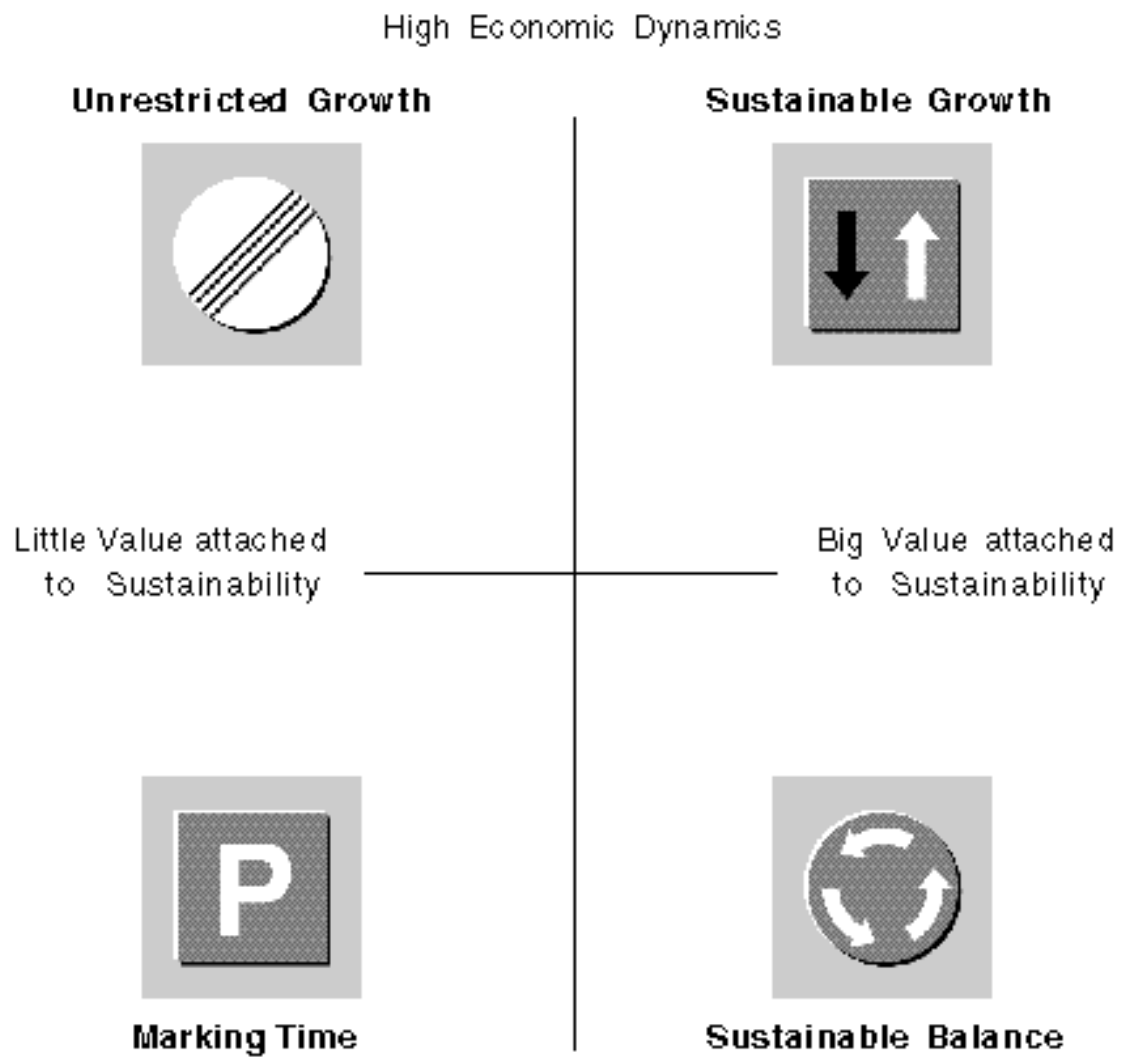

Figure 1-1. Dimension and Situation of the four Scenarios

For each scenario transport demand, available technologies, strategies, energy demand, energy supply and in particular electricity supply has to be drawn up by other institutes for the years 2005, 2020 and 2050. The development of lifestyles are discussed in this paper, based on a study by ECN (Schol and de Paauw 1996).

2. Methodology

Before predictions can be made about lifestyle and transport in the future a look back in the past is very sensitive. Here we only describe developments that have given an impulse to the use of means of transport.

Demographic developments
An increase in population and the number of households has caused an increase in mobility. Also the age structure (the Dutch population is ageing) and the reduction in household size have had influence on the total and composition of mobility. The ageing of the population has caused an increase in mobility, and in particular by car because these persons have grown up with the use of the car. They are healthier than a century ago, have more leisure time and they reach sooner the pensionable age. The reduction in household size has led to an extra increase of the number of households.

Cultural Developments
Individualization, emancipation, secularization and an increase in education level have led to an increase and a change in composition of the mobility. The increasing participation of households in paid work (especially the women) and other activities has led to more mobility. To combine the activities in a certain amount of time, fast and reliable transport is needed.

Increase of Average Income
After the second World War the average income per household has increased and levelling of incomes took place. As a result of this increase more money was available to spent to transport. This was mostly spent to faster and more comfortable transport like passenger cars. The average income share spent on transport has remained the same (about 12%).

Developments in Tourism
Because of an increase in income and the availability of faster means of transport there were more possibilities to discover new places located far away.

Developments in Advertising
More means for advertising are available for producers to influence consumers' choices. Especially car salesmen give a certain status to their mark hoping the consumer will identify himself with it.

Technical Developments
Through development of more comfortable and faster cars it has become possible to travel further and to do more activities in the same amount of time. The improvement of means of transport is stimulated by competition between different means of transport (such as between the car and the train and between the tram and the bus) and wars (development of motors and materials was necessary at that moment). The development of cars and aircrafts has often led to extra transport instead of substitution.

Spatial Policy
The government has started a policy to stimulate centres of urban growth near the big towns (about 15-30 kilometres). For more households it became possible to live in their ideal environment: a house with a garden. Actually the labour market did not move to these centres as was expected. So the travel distance between home and work increased. Because of technical developments in transport (faster and more comfortable transport) it was possible to cope with the longer distances.

Based on above mentioned developments a diagram, figure 2-1, is made to give insight in the relationship between lifestyle and passenger transport. In this diagram the most important variables households, dwellings and activities are related with background variables, that result in the choice and use of transport.

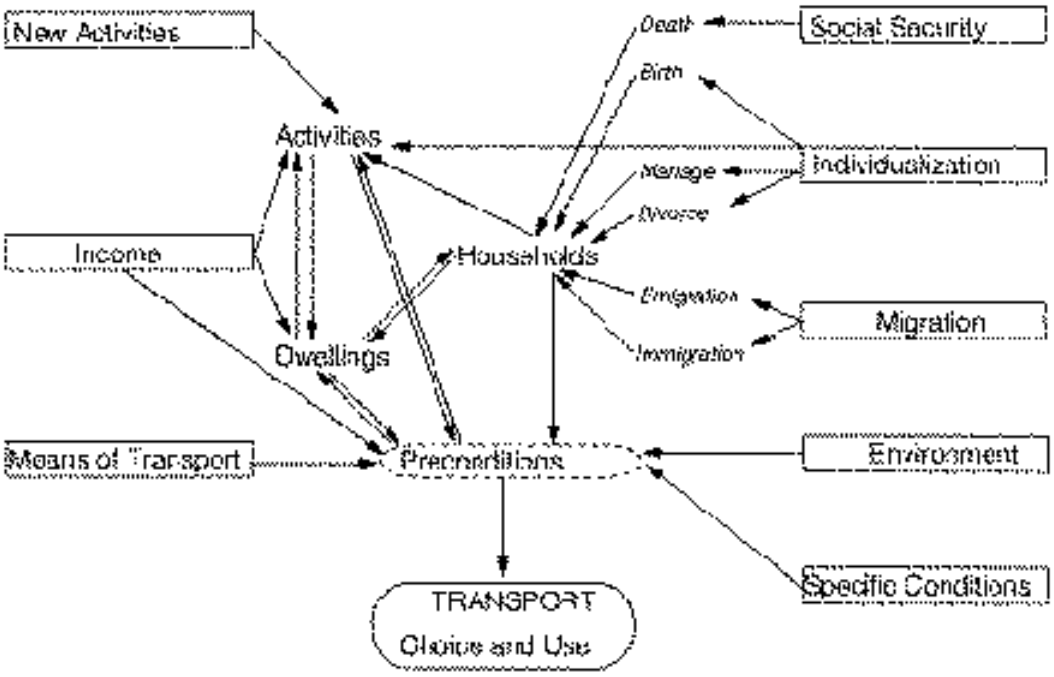

Figure 2-1. Relation Diagram Passenger Transport and Lifestyle

The diagram is meant as a framework to describe the scenarios consistent in a qualitative way. There are background variables mentioned in the diagram that have an impact on the preconditions to determine the choice and use of certain means of transport. Some of these variables need some further explanation. The variable '-Means of transport' means the supply of means of transport, including new technologies. 'Environment' stands for the signals that households receive from the social environment (family, neighbours) and from media (advertising). 'Specific conditions' are conditions considered by households when choosing a transport mode like waiting time, the weather, luggage to take with etc. The arrows in the diagram indicate that there are relations between variables. The relation could either be positive or negative but has no quantitative value.

3. Scenarios

3.1. Base year

The base year for the scenarios is 1990. For this year the division of different types of households and dwellings is given in table 3-1. The table is based on the ELSA model, a lifestyle model developed by ECN (Perrels et al. 1996) and statistics from the Central Bureau for Statistics (CBS 1996).

Only a division in single-family dwellings and flats is made because that division gives an indication how many possibilities there are for electric vehicles when recharging takes place at home. Table 3-1 shows next to the two dwelling types six household types. These types are chosen because they differ in income, activities, dwelling (type and location) and ownership of one or more cars. Table 3-1 shows that a third of the dwellings are flats and that more than a third of the households are families.

Next to 'dwellings' and 'households' the activities of households are very important to explain the mobility and the means of transport choice. In table 3-2 the time spending of different activities of households are given (Hart de 1995). It shows that an average person spend 4% of total time at transport which corresponds to one hour per day. This share has remained the same in time.

For each scenario, see section 3.2 to 3.5, the most important developments will be described. Based on preferenc-

Table 3-1. Type of Dwellings by type of Households for the base year 1990

Household type (years)	Single-family Dwelling[1] %	(x1,000)	Flat[2] %	(x1,000)	Total %	(x1,000)
Single ≤ 60	23	253	77	847	18	1,100
Single > 60	53	389	47	345	12	733
Couple ≤ 60	70	770	30	330	18	1,100
Couple > 60	73	491	27	182	11	672
Family ≤ 60	88	1,882	12	257	35	2,139
1-Par. fam. ≤ 60	65	238	35	128	6	367
Total	66	4,024	34	2,088	100	6,112

1. Detached, semi-detached, terraced and end houses

2. Also housing units are included

Table 3-2. Average Number of Hours spent per week to Different Activities and Transport for the base year 1990

	Total time (hours)	Transport time (hours)	Transport time/Total time (%)
Paid work	17	2.0	12
Home-work travel		1.4	
Business travel		0.6	
Domestic work	12	0.3	2
Care of Housemates	3	0.4	13
Shopping	4	1.0	23
Personal care	6		
Eat and Drink	10		
Sleep and rest	60		
Education	7	0.9	12
Social Participation	3	0.3	13
Social Contacts	10		
Going out	6	1.3	24
Sports, Hobbies, Games	6	0.5	9
Gardening, pets	3		
Recreation Outdoors	1		
Tv, Radio, Audio	13		
Reading	5		
Relaxing, Meditation	1		
Other Time spending	3	0.7	22
Total	168	7.3	4

es of consumers related to desired characteristics of passenger cars given in each scenario, projections can be made of the market share of new technologies. For that, the possibilities of electric vehicles based on consumer preferences are given in this paper. In the near future electric vehicles will still have a limited range (100 kilometre). The purchase price of electric vehicles is about two or three times the price of gasoline vehicles. As electric

vehicles are in the beginning of their life cycle it can be expected that the range will extended to 200 kilometre in 2020, or earlier, and the price of electric vehicles will also decrease. This range of an electric vehicle depends on the style of driving, for example speed and acceleration.

3.2. Unrestricted Growth

Scenario Unrestricted Growth is characterized by high economic dynamics and a high economic growth. Also a prompt technical development is characteristic for this scenario. A free market philosophy is subscribed by everyone and the society is open and very competitive.

The number of households in this scenario experience the largest increase in 2050 (about 65% growth in relation to 1990). This is meanly ascribed to the increase of the household type ‘singles’ and to a high immigration surplus. Singles will occur the most in comparison with the other scenarios (about 40% of total households in 2050). This is caused by young people that will leave home at an early age. Moreover, in relationships individual freedom is valued high which will lead to many LAT (Living Apart Together) relationships. In this scenario the society can be typified as a society with egocentric civilians. Personal development is very important that will lead to a move in time spending from domestic work to paid work and education. Because of this change more kilometres will be made.

Individualizing expressed itself the most in this scenario. Because of that households need a large variation in supply of individual transport. Aspects they find important in transport are: speed, range, technical safety, comfort and the extent to individual transport can be a status or welfare symbol. For collective transport the next aspects are important for households: chance to have a seat, comfort, speed, number of transfers, average waiting time and security.

As consumers find speed and comfort important aspects of vehicles, the market share of electric vehicles can be neglected in this scenario. Gasoline or diesel vehicles on the short term and hybrid vehicles on the long term will have the best prospectives.

3.3. Sustainable Growth

Scenario Sustainable Growth is typified by high economic dynamics and prompt technical development. Opposite to Unrestricted Growth there is much public support for a sustainable society. A part of the income of households is spent to more environmentally friendly technics. In this scenario the moral civilian is characteristic. However the moral behaviour of civilians is limited; the individual desire to have a free choice for consumption may not be affected too much.

Also individualizing plays an important role in this scenario that will cause a large number of households. The mean households size is in comparison with Unrestricted Growth higher because of a relative high fertility rate. There are favourable services for day care. These services make it easier for parents to combine children with a job. Next to this service there are more services, especially environmental friendly ones.

Just as in Unrestricted Growth a large variation in the supply of individual transport is needed. A difference is that in this scenario the most polluting vehicles are no longer in the market. Although everyone will have a car, it will not always be used. Especially for short trips the bicycle will be used. Aspects that households find important in individual transport are: speed, environmental burden, technical safety and reliability. For collective transport the next aspects are important for households: environmental tax, number of transfers and average waiting time. In this scenario the division in collective and individual transport will fade in time. Transport suppliers will offer transport that will fit to individuals needs. Car sharing can play an important part in this scenario but less than in Sustainable Balance. Even as in Unrestricted Growth speed is considered as important which means that not electric vehicles but hybrid vehicles have the best prospectives on the long term. The sustainable society in this scenario can lead to zero-emission cities in which urban cars with hybrid or electric drive have good opportunities.

3.4. Marking Time

Scenario Marking Time is characterized by low economic dynamics. There is not very much public support for a sustainable society and economic growth is limited.

The number of households will increase in relation to 1990 but not that much as in the growth scenarios (about 20%). Although there is still an immigration surplus it is much smaller than in the growth scenarios. The fertility rate will decrease in relation to 1990. Because of the uncertainty on the labour market many women will postpone the having of children in order not to weaken their position on the labour market. The average civilian in this scenario can be characterized as a calculating civilian.

Because of a limited economic growth it is hard to find a job, especially in the neighbourhood. This is the case for couples and families of which both adults are working. This means that they need a large range for transport. A large part of the households has not enough income to have more than one car. So cars with a limited range, like electric vehicles are not attractive to them.

In this scenario education is very important to the youth and adults younger than 60 years. Households older than 60 can be typified as ‘cocooners’. They are not active out doors, especially at night because they feel not safe there. ‘Door-to-door’ transport can become important here.

Aspects households find to be important in individual transport are: costs, freedom of movement, flexibility in time and place, vandalism resistant, range and the extent to individual transport can be a status or welfare symbol. The first two aspects are important to low and modal income groups and the last two aspects to high income groups. Vandalism resistant is important to all. For collective transport the next aspects are important for households: comfort, available space per passenger and security.

3.5. Sustainable Balance

In Scenario Sustainable Balance there are a low economic dynamics and a high public support to stimulate a sustainable society. In comparison with Sustainable Growth the social and political climate is collective oriented instead of individual oriented. Differences in economic growth between various countries in the world will diminish. Therefore emigration and immigration rates will decrease. However there will still be an immigration surplus.

People will work part-time on a large scale. This means that the average income per household will be lower. High value is given to leisure time. People also want collectively take care of children and elderly. Therefore there is no reason to postpone the having of children. In this scenario people consume less than in comparison with the base year. In this scenario the society can be typified as a society with social civilians.

Important aspects to households for individual transport are: durability, capacity, lifetime of transport and safety. For collective transport the aspects durability, capacity and lifetime of transport are important to households.

It is assumed that shared car ownership will grow in Sustainable Balance. In this context shared car ownership is an organization which owns, operates and maintains the cars, while the users can participate in the organization by means of some sort of contract. Such a contract usually involves some participation fee in the form of a one-time investment or yearly subscription fee. Furthermore the use of the cars can be charged by means of some sort of variable tariff system. For frequent trips such as commuter trips and for car-owners who drive more than 10,000 kilometres per year, shared car ownership will not be interesting as a substitute for private car ownership. From (D&P 1994) it appeared that the number of cars in the service area covered by a shared car ownership company can decrease by as much as 27%. The privately owned passenger cars that are being disposed are replaced by a smaller number of car sharing vehicles which are used much more efficiently. The absence of a privately owned car, parked in front of the house and always available at low variable costs, will reduce the number of car trips as well as the number of kilometres driven.

Moreover, shared car ownership will have possibilities for introducing electric vehicles in the market. Because consumers can rent electric vehicles for short distance trips in urban traffic, while the conventional vehicles (running on other motor fuels) are used for long-distance trips. Car ownership provides a professional environment in which the 'growing pains' of electric vehicles can be dealt with and cost aspects are perceived in a rational manner. The experience with and visibility of electric vehicles in shared car ownership, and also other car rental concepts, may therefore provide an important stepping stone on the way to introducing these vehicles to private car owners.

4. Discussion

Although predictions for future lifestyles and their influence on mobility in the 21th century are precarious, the paper has given indications in which way lifestyles can develop and what kind of aspects of means of transport households will value high in the future.

The growth of population and households will go on to 2050 except in Marking Time. In this scenario the population size will decrease after 2020. In every scenario the individualization process will go on. In the sustainable scenarios the collective well being of the society will become important. The average income per household keep on increasing.

The kind of aspects of means of transport households value high are: speed and technical safety in the growth scenarios, costs in Marking Time, and durability in Sustainable Balance.

A conclusion that can be drawn is that electric vehicles will not play a significant part in all scenarios. Only in niche markets electric vehicles will be implemented. Especially in Sustainable Balance electric vehicles will be used for different purposes (home-work and leisure time travel) and in Sustainable Growth for home-work travel. In Sustainable Balance the government must be a big stimulator. In Unrestricted Growth electric vehicles will only play a role in leisure time transport as fun cars. In Marking Time electric vehicles will play no role because households mainly have one car that they want to use for different purposes. In especially the growth scenarios hybrid vehicles have good prospectives in 2050.

Finally, the question rises which scenario can become reality in the Netherlands. The answer is short: none of them. Apart from the lifestyles of consumers, the government, car manufacturers, technology development and of course developments outside the Netherlands will have impact on passenger transport.

5. References

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