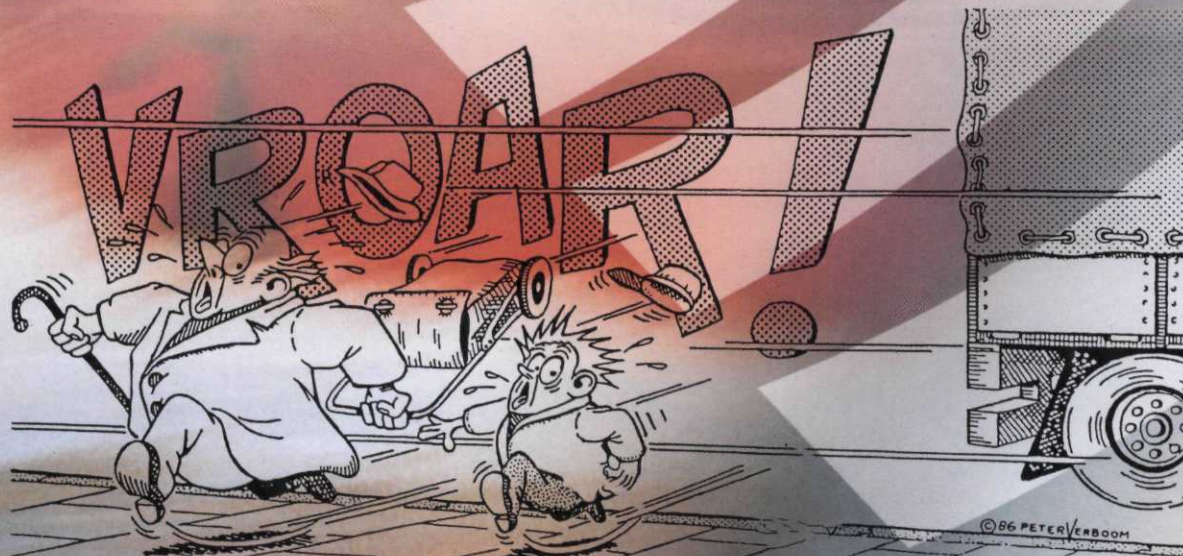


Vulnerable Road Users

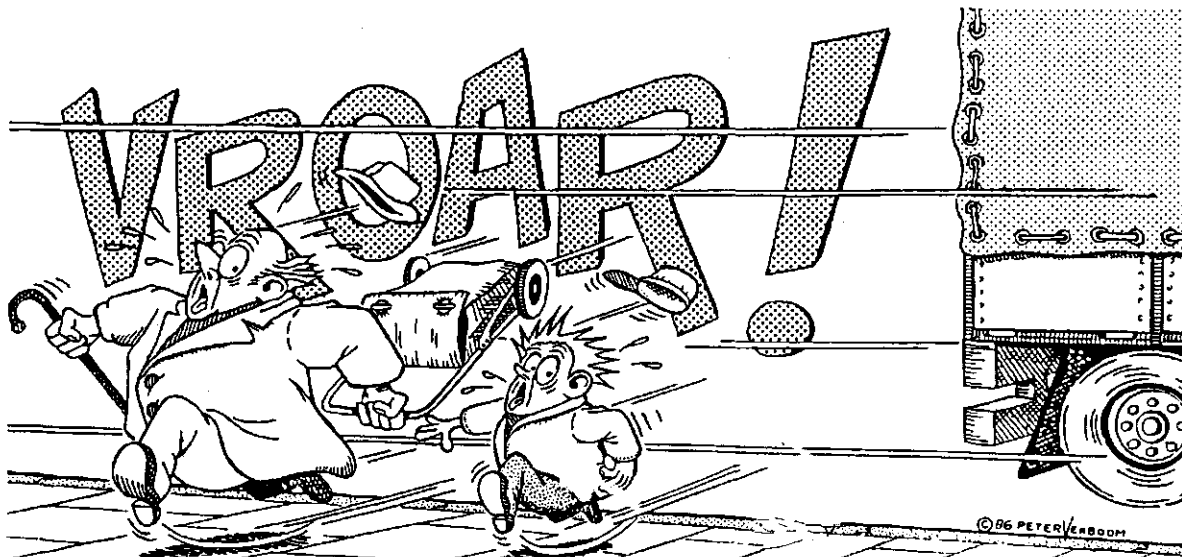
Report on the knowledge base for an effective policy to promote the safe mobility of vulnerable road users

Rotterdam, November 2003



Vulnerable Road Users

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Content

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Summary.....	7
1. Introduction	11
1.1. Reasons for the project.....	11
1.2. Reading guide	11
2. Objective and questions	13
2.1. Objective of the project	13
2.2. Questions of the project.....	13
3. The project in outline.....	15
3.1. Exploratory study	15
3.2. Collection of knowledge	16
3.3. Creating support	17
4. Context of the project.....	19
4.1. Definition	19
4.2. Knowledge, knowledge structure, experts	21
4.3. Theoretical basis for the execution of the project	21
4.3.1. Problem.....	22
4.3.2. Causes	22
4.3.3. Objectives	26
4.3.4. Solutions	28
4.3.5. Evaluation	30
4.3.6. In summary	30
5. Research results	31
5.1. Project products	31
5.2. Nature, scale and seriousness of the problems	31
5.2.1. Limited external protection.....	32
5.2.2. Task competence.....	34
5.2.3. Stamina	36
5.2.4. Road accident risks in relation to mobility	36
5.2.5. Trends in accidents and risks	40
5.2.6. General conclusions with respect to problems of vulnerable road users	43
5.3. Mechanisms with respect to the problems	44
5.3.1. Trip choices.....	45
5.3.2. Route choices	49
5.3.3. Latent causes of accidents	50
5.3.4. Behaviour in traffic	62
5.3.5. Disturbances in the freedom of action	65
5.3.6. Active safety provisions	65
5.3.7. Passive safety provisions	65
5.3.8. Combating the consequences of accidents	65
5.4. Quality needs profiles	66
5.4.1. Human qualities which could be improved	66
5.4.2. Social and public context	77

5.4.3. Spatial environment (planning)	82
5.4.4. Transport system	94
5.5. Present approach	100
5.5.1. Human qualities which could be improved	100
5.5.2. Social and public context	107
5.5.3. Spatial environment	111
5.5.4. Transport system	118
5.5.5. Conclusions regarding the present approach	122
5.5.6. Approach in other countries	124
5.6. Developments in the social positions	126
5.6.1. Position in traffic	126
5.6.2. Position in knowledge collection and knowledge management	128
5.6.3. Negotiating position in processes of change	128
5.6.4. Position in government policy	131
5.7. The degree to which the problem will increase/decrease and the consequences	132
5.8. Important knowledge gaps	138
6. Conclusions and Recommendations	141
6.1. Results of the research	141
6.2. Basic principles with respect to a future policy	142
6.3. Steps to a more effective and efficient approach	143
6.3.1. Knowledge acquisition and management	143
6.3.2. Target group choice	143
6.3.3. Obtaining public support	143
6.4. Advisable measures	144
6.4.1. National Transport Plan	144
6.4.2. National government	144
6.4.3. Provinces, municipalities and non-governmental organisations	145
Consulted sources (selection)	147
Appendices	149
Appendix 1 Definitions	151
Appendix 2 From 'Person-Vehicle-Environment' to Pizza model	159
Appendix 3 Interim recommendations to DGP	163
Appendix 4 Tables of Cross-Section of Fact Sheets	169

Summary

The government of the Netherlands is looking for methods to structurally reduce the numbers of road accidents and casualties. The policy with respect to vulnerable road users has not as yet been developed to any significant extent, even though there seems to be considerable potential here for reducing the total number of road accident casualties. After all, in terms of both numbers and seriousness, the involvement of these groups in accidents is disproportionate. The Transport Research Centre AVV was commissioned by the Directorate General for Passenger Transport of the Ministry of Transport, Public Works and Water Management to establish a practicable basis for the development of an effective and efficient policy.

Following an exploratory investigation it became clear that the available knowledge about the problems and how they might be tackled is limited. It is not yet possible to produce a well-founded proposal for measures. The risk of damage resulting from a policy founded on 'chit-chat' is just too great. It was therefore decided first to obtain insight and an overview, and then in due course to work together with stakeholders on well-founded proposals for packages of measures in the short and longer term. This report presents the knowledge that has been obtained.

A first step was to define the concept of vulnerable road user. Someone is a vulnerable road user if s/he has little or no external protection, or has reduced task capabilities, or reduced stamina (fragility). These criteria formed the basis for distinguishing 21 different groups of vulnerable road users and a further 2 'umbrella groups', which differ from the traditional classification according to age or mode of travel.

The second step in the project was to develop a system for ordering and summarising the knowledge both already available and still to be obtained, and for establishing a basis for a policy with a favourable cost-benefit ratio. The most important components of that ordering system were the PCOSE (Problems-Causes-Objectives-Solutions-Evaluation - *PODOE*) principle, Wagenaar et al.'s model for the causation of accidents and its associated list of Basic Risk Factors, and the so-called Pizza model (in essence, a systematic checklist for points to be covered by an approach).

This ordering system was first used for completing 'fact sheets' (actually: mini-dossiers) for each group. These summarise the available knowledge and information concerning:

- The nature and scale of the problems
- The causal factors associated with the problems
- Quality needs
- The present approach
- Developments in the social position of the group or groups
- The degree to which the problems will increase/ decrease
- Major knowledge gaps

In the development of a package of measures, it is possible to restrict the focus to problems and causal factors for each group, such as pedestrians, children, elderly people or people with a disability. However, one can also investigate whether there are perhaps possibilities of 'killing two birds with one stone', by looking for problems and causal factors that are common to as many groups as possible. The latter option was chosen for this project. It was expected that this would enable a higher yield to be realised from the policy. This report therefore offers a cross-section of the information from the fact sheets for each group. In principle, this makes it possible to form a good picture of the total scale of the problems, the most important causal factors, the quality needs and the most important developments. A complicating element is that there are major gaps in the quality of available figures and knowledge, which means that all in all the overview still leaves much to be desired.

The main conclusions regarding the nature and scale of the *problems* that can be drawn from this study are:

- The problems are large-scale, underestimated and growing. Tackling them will become increasingly urgent
- The responsibility for the safe mobility of vulnerable groups will mainly have to rest on the shoulders of others: vulnerable road users cause little danger to others, but do themselves run serious risks (not risky, but at risk) which they very often cannot evade
- The situation for children, elderly people and people with a disability is likely to deteriorate; the main reasons for this are the growth of vehicular traffic in general and the increase (expected to be considerable) in freight transport
- The road safety of vulnerable road users cannot be dissociated from mobility, its quality and public safety
- For vulnerable road users, problems due to road accidents are much more dominant and far-reaching than for the 'average' road user

In this study it clearly emerged that the knowledge about *causal factors* is badly documented. However, it is possible to discern the following approximate picture of the main causes of the safety problems of vulnerable road users:

- The traffic and transport system is not made for them; both vehicle design and road design exhibit serious ergonomic problems
- Mass and speed differences
- Incompatible goals on the part of those causing the problems (e.g. time = money versus socially-minded and responsible road behaviour)
- Defective management of the traffic and transport system (not only the infrastructure and public space, but also as regards the regulations, traffic management etc.)

In order to formulate the *objectives* of policy it is necessary to have a good insight into the system requirements with respect to vulnerable road users. That insight is at present deficient and fragmented. We do not know (sufficiently well) what a person must be able to do in order to use the road safely, but we do 'oblige' people to travel. We do not know (sufficiently well) what minimum provisions are needed if a person is to travel from A to B without a clearly increased risk of accident. For instance: school-age children are obliged to go to school every day, but are they actually enabled to do this?

As regards the objectives to be formulated, the following conclusions can be drawn:

-
- The traffic and transport system fails on many points to fulfil the most basic demands that should be imposed on it. The concern at present is 'need to have', and nowhere near 'nice to have'
 - The social, public and spatial environments merit the most attention. The capability of (vulnerable) people to change is extremely limited. One should not cherish high expectations concerning the effectiveness of education and public information for vulnerable groups
 - It is also highly advisable to offer transport alternatives; vehicle-related measures (such as pedestrian-friendly fronts and ISA) can be useful, but the effects remain limited to situations in which speed is already restricted to 30 to 40 km/h (residential areas).

The study also shows that the fact that there is a Transport Planning Act, and that a National Transport Plan has to be developed and adopted, offers excellent opportunities for tackling the safe mobility problems of vulnerable road users. *Solutions* with a good chance of success include Design for All and continued steady work on Sustainable Safety. It is important, above all, that good preconditions for safe mobility should be created, such as separation of different types of traffic, proximity of essential destinations, alternatives to car use, and regulations that ensure priority for vulnerable road users.

The chances of the approach succeeding depend on the available knowledge and the organisational quality of the approach. A difficult point is that measures which are good for vulnerable groups are usually painful for others. In connection with this, it is crucial that the approach should have public support. And this requires that the public should have knowledge of the problems and the possibilities of tackling them, plus a certain degree of self-sacrifice.

With respect to the necessary basis of knowledge, it can be stated:

- The Vulnerable Road Users knowledge bank made available by this project must be further filled-in and expanded. Here, particular attention must be given to validation by means of empirical research of the estimates that have been made
- The knowledge must become firmly rooted and experiences must be (more) shared. This does not happen automatically: it has to be organised
- There must be active public monitoring of the situation and the approach to the problems in order to set agendas (political agenda, research agenda)
- Public support for tackling the problems requires a critical mass of knowledge and insight, in both qualitative and quantitative respects. Not only is the quality of the knowledge currently below the critical-mass limit, but also the number of people to whom that knowledge is available

The report ends with (provisional) recommendations concerning: basic principles for the policy that is to be developed; steps to a more effective and efficient approach; matters that should be included in a National Transport Plan with a view to improving the safe mobility of vulnerable road users; and advisable measures at the national government level. No recommendations are made for measures at the regional and local levels, nor for the activities of non-governmental organisations. Such recommendations can be formulated at a later stage of the project.

1. Introduction

1.1. Reasons for the project

The government of the Netherlands is looking for methods to structurally reduce the numbers of road accidents and casualties. Over half of the total number of road casualties fall under the category of 'vulnerable road users',¹ such as elderly people, young people, people with a disability, pedestrians and riders of two-wheelers of various kinds. However, up to present, the vulnerable groups of road users have received relatively little attention in terms of research and policy. As a consequence, considerably less is known about the problems of vulnerable road users than about the safety of car occupants. It is therefore understandable that the policy with respect to vulnerable road users has not been developed to any significant extent, certainly in comparison with car users. This gap is now being recognised on many fronts, both national and international. In view of the nature and scale of the problems, the Directorate General for Passenger Transport (Directorate for Roads and Road Safety) considers that there is now every reason to narrow this gap. Consequently, the draft National Transport Plan (NVVP) states that an integrated package of measures aimed at vulnerable road users will be developed. The Transport Research Centre AVV has been commissioned by the Directorate General for Passenger Transport to make recommendations in this regard.

1.2. Reading guide

This is not an easy report. The objective is to offer an overview of what we know and should know about vulnerable road users, and more in particular what is needed for the development of an effective and efficient policy with respect to those groups. The report is not designed as a 'public report', but as a basic document describing the 'state of the art'. Experts and policy-makers must be able to use it as a 'reference work', providing the most complete possible overview of the issues of importance, the options available for an approach, and the activities that are already taking place in this area. The report is intended as a starting point for discussions with the non-governmental field, with a view to developing support for a structural approach to the problems.

The report is made up as follows:

The first two chapters offer an introduction to the project and discuss its objectives and the questions at issue.

¹ 'Vulnerable road users' refers to groups of road users who, in relation to the extent of their road use, run a higher risk than the average road user, without themselves being a danger to other groups. 'Risk' refers to the chance that a person has of being injured or killed in the event of an accident. A more precise definition is given in Chapter 2 of this report.

Chapter 3 gives a concise outline of the project: the steps that have been taken and the methods that were used.

Chapter 4 describes the context of the project. The concept 'vulnerable road user' is defined, a view is offered of the characteristics of the knowledge world in this area, and a theoretical basis is given for the research work.

Chapter 5 presents the results of the project. It starts by listing the knowledge products that are available, and then gives the substantive results. These relate to:

1. the nature and scale of the problems of the different vulnerable road users and the trends in these [section 5.2]
2. the mechanisms pertaining to the problems: what issues play a role in the causation of the problems [section 5.3]
3. elements that should be included in a schedule of requirements for the approach to the problems, the so-called quality needs profiles [section 5.4]
4. the present policy with respect to vulnerable road users in relation to the elements of the quality needs profiles [section 5.5]
5. the position of the vulnerable groups in traffic, their negotiating position and the developments in that, and the place occupied by vulnerable road users in the government policy [section 5.6]
6. a forecast of the developments in the next two decades if the policy is not changed
7. an overview of the knowledge gaps that form an obstacle to an adequate approach to the problems

The contents of this chapter are based on interpretation of the Fact Sheets Vulnerable Road Users, which have been developed in the context of this project. The Fact Sheets are available on the internet in both Dutch and English at www.rws-avv.nl (click on 'products' - 'traffic safety' - 'vulnerable road users').

Chapter 6 contains the (as yet internal) recommendations given by the Transport Research Centre AVV concerning the measures to be taken at the national level for safe mobility of vulnerable groups.

2. Objective and questions

2.1. Objective of the project

The objective of the Vulnerable Road Users project is to establish a basis for the development and implementation of an integrated policy to reduce the number of accidents for vulnerable groups. That policy must be given a place in the National Transport Plan (NVVP). In this connection, it has been agreed that the project must result in:

- A first version of a widely accessible Vulnerable Road Users knowledge bank
- Recommendations, if possible broadly based, which present clear and practicable ways to improve the safety of the vulnerable road users

In producing these recommendations, attention must be given to:

- Inventorisation of the problems, future trends and possible solutions, as far as possible on the basis of existing knowledge
- Broad inventorisation of measures (including present measures) and prioritisation on the basis of effectiveness, cost effectiveness, practicability and synergy effects
- The relation to the existing package of measures
- Involvement and role of partners (national/ local authorities, professional sector, non-governmental organisations, road users)

2.2. Questions of the project

Questions at issue in this project are:

- What groups can be distinguished on the basis of the nature of the problems?
- What useful indications are there for the seriousness and scale of the problems of the different groups of vulnerable road users?
- What are the most important factors that contribute to those problems?
- To what extent is the present approach effective?
- What gaps in knowledge are there with respect to the problems of the groups?
- What (cause-oriented) measures can be proposed?
- How do these measures score in terms of effectiveness, efficiency, synergy in the short- and medium-term?
- How does a robust package of measures for the benefit of vulnerable road users look? (Basic principle: an integrated package of measures²)?

² Integrated means that the package of measures has a beneficial total effect on road safety by taking account of side-effects. An integrated package of measures will include measures targeting person, vehicle and environment, in the areas of technology, education, and regulations and enforcement; these measures will also be well co-ordinated with one another. All the segments of the Pizza (see Appendix 2) should be covered in the package of measures.

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- What is needed in order to obtain sufficient support for such a package of measures in the relevant layers of administration, government institutions and non-governmental organisations?
 - On what basic principles could the (new) policy be based?³
 - What steps can already be taken in the short term?

³ Giving attention to, among other things: what do we mean by vulnerable road users; what plays a role in this concept; what do we broadly wish to achieve?

3. The project in outline

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This chapter presents a brief outline of the steps that have been taken to answer the research questions, insofar as that has proved to be possible. In the first year of the project (2001), an exploratory study was conducted, forming the gateway to the more far-reaching search process that was carried out in the second year. Then in the third year conclusions were drawn from the information that had been collected, and a start was made on obtaining support for a new policy that is to be developed.

3.1. Exploratory study

In 2001 an exploratory study was conducted by Goudappel Coffeng, as the first step on the way to producing recommendations concerning measures to be taken for the benefit of vulnerable road users. On the basis of a global literature study, an exploratory survey of the internet, and consultation with several experts, the authors gave a global overview of existing ideas and estimations with respect to the problems. Due to the available budget, the time of year when the study was conducted (June - August: the holiday period), and the actual time available, the scope of the Goudappel study was limited. The literature study, the internet search and the discussions with experts therefore had the character of a global scan. Certainly regarding the consultation with the experts, it must be observed that there was no opportunity to compile a comprehensive list of names, and that merely introductory discussions of 15 - 25 minutes were held with the experts concerned.

In addition to the exploratory study, the Transport Research Centre AVV produced a spreadsheet showing the available key figures concerning different groups of vulnerable road users. These spreadsheets contain 5-year series of figures from 1980 - 2020, insofar as these are available, concerning the size of the group, mobility data and road accident data:

- Number of people belonging to the group (divided into male - female - total)
- Number of trips, kilometres travelled, hours in traffic per person per year for the group concerned
- Number of casualties (road deaths, hospitalisation injuries, other injuries) for the group concerned
- Number of accidents in which the group is involved
- Number of casualties per 100,000 members of the group
- Number of casualties per million trips, million kilometres travelled and million hours in traffic

These data are generally available for classifications based on age and principal categories of modes of transport; however, for more specific classifications (e.g. distinction between faster moped (*bromfiets*) - slower moped (*snorfiets*), special vehicles, disabled, immigrants, addicts), virtually no statistical data are available.

The exploratory study (including production of the spreadsheet) gave a global picture of the knowledge that is available concerning vulnerable road users. On the basis of that report, the following conclusions were drawn by the Transport Research Centre AVV:

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- the present policy with respect to vulnerable road users must be improved. It is mainly based on intuition and less on facts;
 - there is insufficient insight into the actual nature and scale of the problems of vulnerable road users;
 - the research in the area of vulnerable road users is fragmented and it is not clear what (major) knowledge gaps exist;
 - there is still insufficient information for the development of an effective and efficient programme of measures for vulnerable road users;
 - the Transport Research Centre AVV itself has more knowledge about the problems than the consultants that we know; unfortunately the knowledge of the Foundation for Scientific Research into Road Safety (SWOV) in this respect is also limited. It is therefore more efficient to do the research work ourselves than to contract it out.

3.2. Collection of knowledge

In 2002, the results of the exploratory study conducted in 2001 were in principle elaborated. Where possible, the database (spreadsheet) on vulnerable road users was further supplemented with figures relevant for the calculation of risk figures. Work was also done on filling in major knowledge gaps, forming an overview, and formulating (interim) recommendations concerning directions in which the solution of the problems can best be sought.⁴

The Directorate General of Passenger Transport DGP stated that it needed to have a document on the problems before the summer holiday (June 2002). A start could then already be made on obtaining support for tackling the problems, by means of consulting experts and discussing the results with them. It was clear that the recommendations could not yet contain any final opinion. After the summer the results could be presented to a wider group of concerned parties, and work could be done on a common standpoint on the matter ('progressive support').

The results of the first phase (2001) made it necessary to reconsider the approach. In that connection, it was considered advisable first to establish more precisely in Phase 2 (2002) what should be understood by a vulnerable road user, what we already know about the scale of the problems, about the knowledge, knowledge structure and experts, and how the present approach can be characterised. It was also necessary to establish what knowledge is needed in order to develop an effective and efficient package of measures, and how the chances of implementing such a package of measures can be increased. Information on these points is contained in the Basic Document Vulnerable Road Users II. This report presents the most important elements from that document.

In the next chapter, Chapter 4, the context of the problems is discussed. The first section states what factors determine whether someone is a vulnerable road user or not. The second section then describes the state of affairs regarding knowledge, knowledge structure and experts in the area of vulnerable road users. Section 4.3 next describes how the questionnaire used in collecting the available knowledge and the subsequent classification structure of the 'Fact Sheets' were produced;

⁴ See Appendix 3, Interim Recommendations to the Directorate General of Passenger Transport DGP.

this last section of Chapter 4 discusses what basic principles were used in the development of an initiative for a robust⁵ Vulnerable Road Users measures package.

Chapter 5 reports the results of the collection of knowledge. This report will show that at the moment it is not really possible to produce a robust package of measures.

It is advisable first to conduct verification of the recorded information and the extent to which the available information is complete. Given the earlier experiences, it will be necessary to approach and interview individual experts personally for this. The aim is to offer reasonably robust information in the Fact Sheets, that is to say, experts must be in agreement concerning the purport of the message. Another option for this verification is, as stated in the Basic Document, to set up a Vulnerable Road Users Working Group or Forum (see below).

3.3. Creating support

Within the framework of the project, consideration was given to the question how support could be obtained for the development and implementation of an improved policy with respect to vulnerable road users. The formulation of ideas began immediately after the exploratory study had been carried out. The basis for this was established in the aforementioned Basic Document Vulnerable Road Users II. Basic principles here are the so-called Policy Life Cycle of Winsemius (see Figure 1) and 'spread-the-word'.

The Policy Life Cycle shows that the realisation of a policy idea follows a fixed rhythm. The first step is always to *know* the problem. It cannot be expected that one will *want* to tackle a problem if there is no insight into it. It is equally not yet relevant to consider *can* and *do*. Support for tackling a problem ('want' in Winsemius' diagram) will only arise when the organisations that are expected to be able to do something about solving the problems develop a certain sense of urgency. That is evidently not yet the case when it comes to vulnerable road users.

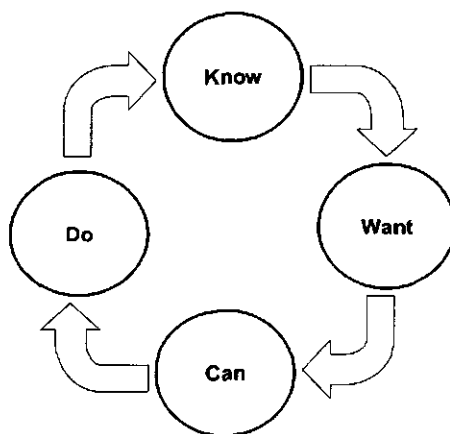


Figure 1 Policy Life Cycle (Winsemius)

⁵ Robust here means: there is support, and the measures are effective and efficient.

In preparation for obtaining support for tackling the problem, a knowledge-field analysis was conducted implicitly within the framework of this project: who has what knowledge; who should have what knowledge; what gaps must be filled; how can that best be done? In addition, an investigation was made of the field of influences in relation to the social position of the various groups and the (resistance to) possible measures to be implemented: who may do what; who has power over what; who influences whom; what steps are needed to overcome existing resistances? The knowledge already available concerning these questions is presented in the Fact Sheets; the outcomes of the searches are given in the presentation of the project results.

Depending on the decision-making within the Ministry, follow-up phases are conceivable. At present, consideration is being given to the following: in a round of consultation within the professional sector, these experts can be asked to supplement and elaborate the list of possible measures and to assess their feasibility. Through involvement of the professional sector, support will be obtained there for the new policy that is to be created.

- Possible activities could include:
- Setting up a Vulnerable Road Users Working Group or Forum
- Possible supplementary research with respect to gaps in knowledge
- Linking up to international developments regarding vulnerable road users
- Producing recommendations for the Minister in collaboration with Vulnerable Road Users Working Group or Forum
- Supplementary PR activities (including presentations, perhaps congress, lobby activities by interest organisations)
- development of checking system for adequate Vulnerable Road Users policy
- 'Competition'.⁶ Ask the professional sector to assist in thinking about policy and the broad contents of that policy
- Development of measures catalogue/ projects database (accessible via internet; to be filled with entries sent in)
- Assessment of entries by professional jury
- Award of prizes

⁶ One of the success factors in Sustainable Safety was that the professional sector took an active part in thinking about the contents of the programme. It must include a certain degree of challenge. 'Thinking with us about existing paths' does not have a motivating effect; a 'competition' or something similar does perhaps have that potential.

4. Context of the project

This chapter outlines the context of the project. During the exploratory study it already became clear that it is necessary to define the concept 'vulnerable road users' more precisely. The first section of this chapter is devoted to doing this.

In the evaluation of the exploratory study it also came to light that this is a fairly unexplored area of knowledge. The second section examines this notion in rather more depth. In the third section the theoretical basis for the execution of this project is described. This touches on both how we can work towards the development of the most effective and efficient possible package of measures, and what traffic-related considerations are applicable to that.

4.1. Definition

It is important that the concept 'vulnerable road users' should be clearly defined. While that is not so essential for indicating and identifying the problems, it is in fact essential for an effective approach to them. After all, it must then be clear what people have what problems, how serious they are, what causes problems and with what yields the problems can be tackled.

Like 'weak' or 'strong', 'vulnerable' is a relative concept. That is not, however, a reason to be vague about it. The Workplan 2003 of the United Road Safety Organisations (3VO) contains a clear definition of what 'vulnerable' means. A vulnerable road user is someone:

- with an increased chance of having an accident
- with an increased chance of serious physical injury or death in the event of an accident
- who has the feeling of being endangered by other road users
- who has no protection
- who is at risk of being endangered, without him/herself being a danger
- who is dependent on the behaviour of others
- who is at risk while not being a risk factor for others.

In other words: being vulnerable is determined by many factors, and certainly not only by the number of casualties. In the recent ECMT and OECD reports on vulnerable road users, a fairly customary analysis is used: first an examination is made of the degree of external protection. From that follows the series: pedestrian, cyclist, moped rider and motorcyclist. Then a few special groups are identified: children, elderly people and people with a disability.

This classification is not satisfactory for a number of reasons:

1. there is an overlap between the groups elderly people and people with a disability
2. the group elderly people is extremely heterogeneous. The question is what we should understand in this project by an elderly person: many people aged 75 walk several kilometres every day without any problems, while some people in their fifties are not able to do that. Far from all elderly people are really vulnerable. It is the case, however, that a significant proportion of people with a

disability are older people. A greater age is not, however, the determining factor for increased risk or vulnerability. Deterioration of physical condition, stamina and anticipation capacity through disorders or 'wear and tear' are such factors

3. while an 'ad hoc' classification and a classification on the basis of age do indeed offer chances for problem identification, they do not offer good starting points for an effective, cause-oriented policy. Due to duplications, such classifications cannot be used for weighing priorities. It is not, for instance, possible to make a good estimation of the resources required and the yields of measures
4. when it comes to taking measures, the classification is at odds with public opinion: it is 'not done' to discriminate on the basis of age

The question is now what 'unsuspected' criteria can be used for the identification and subdivision of vulnerable groups. Criteria which may be suitable are:

- the degree of external protection
- 'task competence'; that is to say, the extent to which people are capable of functioning in risky situations. Important here are limitations regarding sensory perception, reduced mental capabilities, motor impairments, limited knowledge and insight (e.g. through immaturity, cultural or social circumstances) and total function loss (e.g. blindness, deafness, missing limbs etc.). This project actually involves only permanent factors that make people less competent. Momentary factors such as tiredness, alcohol consumption, an epileptic attack and other such factors are not included in the considerations⁷
- 'stamina': the extent to which people can take knocks. Elderly people in particular have much less stamina (resilience) than the average road user (fragility). Here too, however, age in years is not the determining factor, but the extent to which 'wear and tear' has occurred or the extent to which someone suffers from certain disorders, and that differs from one individual to the next

On the basis of the 3 criteria, it was possible to distinguish 21 different groups of vulnerable road users, and a further 2 'umbrella groups' (elderly people and people with a disability). In Appendix 1, Definitions, there is a matrix showing what subgroups are distinguished on the basis of these criteria.

The degree of vulnerability is determined *partly* by the risk that a person runs of being injured or killed in the event of an accident. People are vulnerable if they themselves do not constitute a danger for other road users *and* they run a greater than *average* risk of being injured in the event of an accident compared with other people. In this way, we make here a distinction between *at-risk groups* and *vulnerable groups*. If we did not do this, then young male car drivers would be a vulnerable group, while in fact they actually themselves cause great danger. In such a case we speak of an at-risk group.

It is clear that being in traffic and in risky situations, the so-called 'exposure', plays a role in this. People who travel a lot, and in doing so cover many kilometres, will on an annual basis generally have more accidents than people who travel only a little and cover very few kilometres. This can make them an at-risk group, but they need not be a vulnerable group. They are only vulnerable if they run a greater risk than average per trip, per kilometre or per hour of becoming a casualty of and in the event of a road accident.

⁷ Momentary factors are not person-related. In order to develop a group policy, it is necessary that people can be identified and approached on the basis of their task competences. That is hardly if at all possible in the case of temporary impairments.

4.2. Knowledge, knowledge structure, experts

The insight into problems and possibilities of tackling them is limited. Concerning the risks of walking, cycling and riding mopeds (both slower and faster), experts do in fact have knowledge. The most serious knowledge problem is the lack of information about the risks run by people with impaired skills or competences (task competences) and what measures are needed to reduce those risks.

There are only a few experts, both nationally and internationally, in this area compared with the area of car safety. Most of them can devote only a small part of their working time to a sub-area or a (sub-) group, and they have extremely limited budgets for knowledge acquisition. The field is highly fragmented, and there is little collaboration; the possibilities for this are also limited (due to differences in interests, lack of time, limited budgets). Within the Netherlands, as far as we know, there are no experts who cover the entire field of vulnerable road users and who can help to propose a robust, integrated measures package for these people. It is unclear precisely what gaps there are in the knowledge.

In the past there have been a number of working groups at the national level regarding specific groups such as 'elderly people' and 'people with a disability'. A characteristic of these working groups is that they are greatly dependent on one motivated leader. After his or her (inevitable) departure, it has usually not been possible to pass the baton to an equally motivated person, and in a short time the working group has been discontinued. The attention given to vulnerable groups does not have a structural character at the national government level, and equally not at other administrative levels. This means that there is very little continuity in the knowledge structure.

Since only a few people have an idea of the true scale of problems and the main factors that contribute to those, there is a high risk of damage if measures are proposed. Differences in interests play an important role in this. Owing to the limited empirical basis, there is little that can be offered to counter 'chit-chat'.

Very little is known about effectiveness and yields (cost-effectiveness) of measures.

4.3. Theoretical basis for the execution of the project

The objective of the project is, as stated, to give an initiative for the development of an improved or new policy with respect to vulnerable road users. The first question, then, is how one should develop a good approach. A frequently used basic model for the development of measures is the so-called PCOSE model (Methorst 2000; see Figure 2), which could also be put to excellent use in designing the structure of the questionnaire and the Fact Sheets. The use of the model prevents measures being proposed without any clear idea of whether they will actually tackle the causes of the problem, as unfortunately happens fairly often in practice.

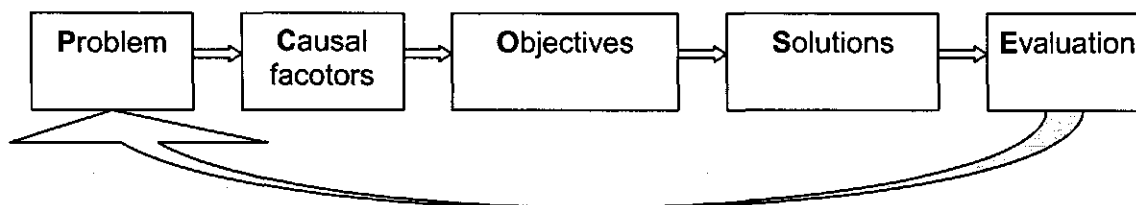


Figure 2 PCOSE model

4.3.1. Problem

The first step to an efficient and effective approach is to ensure that it is known what the problem is. Without that insight, one may not expect that willingness will arise to allot money and manpower to tackling the problem. In this connection, it is necessary to establish to what population the problem relates, where the problem takes place, when, how it is expressed and how serious the problem is. In other words, it is advisable to give a good indication of the nature, scale and seriousness of the problem and trends in those. If it is found that the problem relates only to feelings of danger, it has a different 'significance' than if a problem can be demonstrated with hard figures. If it is a problem that will automatically disappear in the future, it will be given less attention than if it will actually take on more serious forms in the future.

Items included in the Fact Sheets regarding *Problem* are:

- Definition
- What makes the group vulnerable (in key words)?
- What subgroups might be distinguished?
- Trends in the nature and scale of the problems (past, present, future)
- Size of the group
- Mobility characteristics
- Traffic victims and risks
- Developments in the social position of the group or groups
- Degree to which the problem will increase/decrease and the consequences

4.3.2. Causes

It is known from road safety theory that accidents are rarely if ever the consequence of one single cause, but that there is almost always a critical concurrence of circumstances. To illustrate this point, in the 1980s the Foundation for Scientific Research into Road Safety (SWOV) introduced the highly complex SWOV Phase Model of the accident process. The Safety Working Group of the University of Leiden, chaired by Professor Wagenaar (Methorst 2000), developed a simpler model, which expresses the same message and also makes clear that in the various preliminary stages of an accident people make decisions that at a later stage can result in an accident occurring (see Figure 3). Another important message from the model is that it is advisable to make an intervention as early as possible in the process.

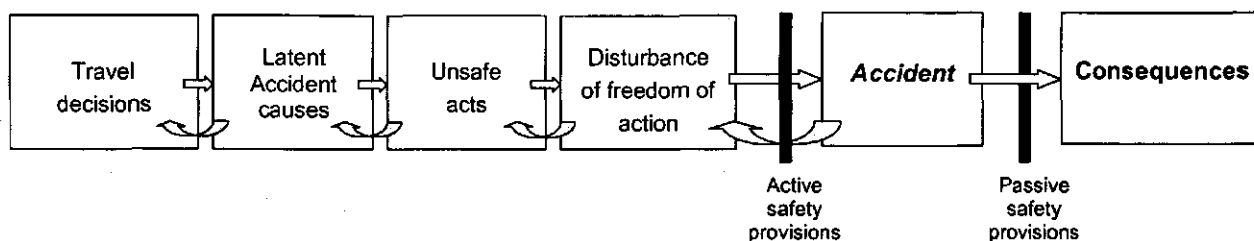


Figure 3 The occurrence of an accident (freely from Wagenaar et al. 1995; Groeneweg 1998)

The questionnaire and the Fact Sheets must therefore express what mechanisms play a role in the occurrence of the problems. In these a number of levels can be distinguished, for which one can indicate what chances of failure there are.

The levels are:⁸

- the context in which trip choices are made
- the route-choice decisions
- latent causes of accidents
- behaviour in traffic
- disturbances in the freedom of action
- active safety provisions
- passive safety provisions
- combating consequences of an accident

Context

As regards the context in which trip choices are made, the following items are included in the Fact Sheets:

- Use characteristics, or the situation in which the choices are made, including the impairments applicable for the group
- Factors that play an important role in trip choices
- Trip reasons

Choice of route

With respect to the issue 'choice of route', knowledge was collected regarding a number of matters that may affect the risks run by the group concerned when spending time in the public space and in traffic.

- Circumstances under which the choices must be made (General)
- Physical characteristics of the group
- Mental characteristics
- Reasons
- Knowledge possessed about the route
- Skills in choosing the route to be taken

⁸ Latent causes of accidents, disruptions in the freedom of action, and active and passive safety provisions were not included in the first version of the Fact Sheets. These items were added later as a result of progressive understanding.

Latent causes of accidents

For industrial accidents, Groeneweg (1998) compiled a list of so-called Basic Risk Factors on the basis of empirical data. A few years later Roelen et al. (2002) developed a different categorisation for the aviation sector. The mechanisms that play a role in the accidents of vulnerable road users are not exactly the same as those of industrial processes or aviation accidents.⁹ However, there are numerous (possible) similarities. The list for vulnerable road users is as follows:

- Design of the infrastructure - to what extent is the road design, including the road environment and in relation to the function of the road, suitable for use by the target group?
- Design of vehicles or mobility aids - to what extent is the vehicle design attuned to the (impairing) characteristics of the target group (ergonomics of the design = man-machine interface); what provisions are there for active and passive safety?
- Physical and mental suitability of road user - to what extent do the physical and physiological characteristics and mental condition of the road user increase the risks?
- Technical state of infrastructure - to what extent is the state of maintenance (drainage, unevenness, lines and marking, loose paving stones) such that it increases the risks for the target group (more than average)?
- Technical state of vehicles or mobility aids - is the state of maintenance (degree to which tyres, brakes, lights etc. are worn or damaged) such that safety is not endangered?
- Obstacles and litter - to what extent are the road use risks of the group increased by inadequate 'daily' maintenance (presence of loose obstacles such as dumped bicycles, advertising boards, litter etc.)?
- Risk-increasing atmospheric situations - influence of temperature, sunlight, wind, precipitation
- Time space - are people given enough time to act safely?
- Procedures and regulations - are there sufficient good manners, agreements, (traffic) regulations?
- Training (knowledge, expertise, skills) - does the road user have enough knowledge of the traffic system, know how to deal with the traffic, have enough experience to fulfil the required tasks safely within the available time space?
- Communication - to what extent do road users, policy-makers and managers of components of the traffic system communicate with one another and among themselves; are there 'missing links' or cultural or other barriers that tend to increase the number of accidents?
- Incompatible goals - are there incompatible goals (e.g. haste and driving at an appropriate speed)?
- Social environment and commitment to safe behaviour - to what extent is someone inclined to behave safely (culture, values, norms)?
- Reacting to changes in traffic - to what extent are people aware of changes in traffic, traffic regulations, values and norms in traffic etc.?

Behaviour in traffic

A great deal has been written and thought about mechanisms with respect to behaviour in traffic. It was possible to determine from in-depth studies in particular what issues are important. In the following model, Vlakveld (2002) shows how behaviour in traffic comes about.

⁹ In Appendix 1, Definitions, a brief description is given of the various Basic Risk Factors regarding industrial accidents and aviation accidents. On the basis of these, a list was formulated of Basic Risk Factors regarding the road safety of vulnerable road users.

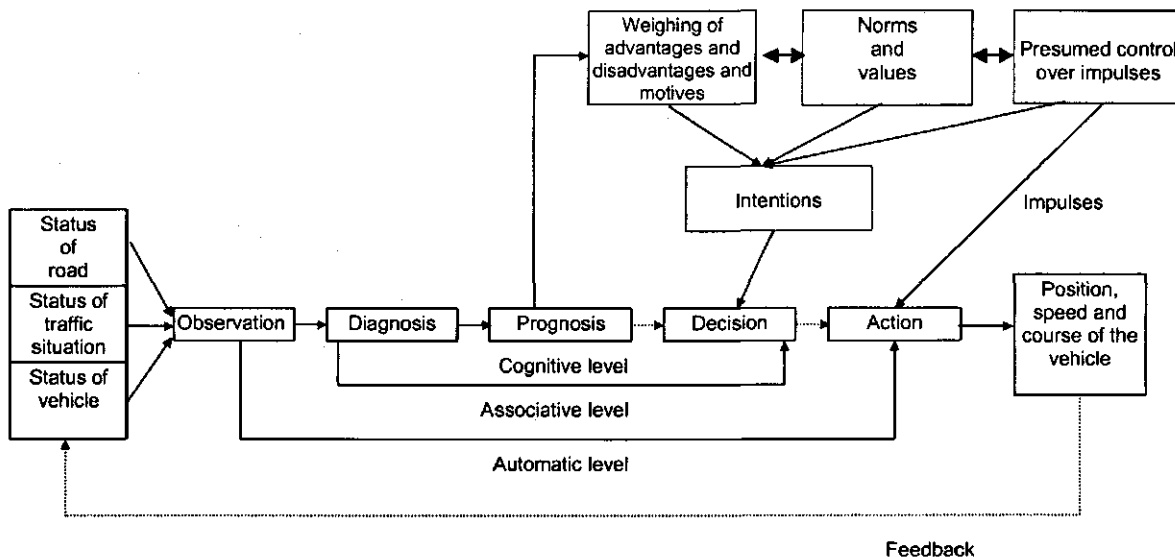


Figure 4 How behaviour in traffic comes about (Vlakveld, 2000)

In the questionnaire and the Fact Sheets based on that, a simplified classification was used. In this connection, information was collected about:

- Circumstances under which behaviour choices have to be made
- Observation
- Judging the situation
- Decision-making
- Action
- Compensation mechanisms

Disturbances in the freedom of action

People can display extremely risky behaviour, such as driving too fast, not looking to the right (or in some countries: left) at an intersection or taking the inside of a bend. As long as there are no other road users in the vicinity, or objects that can get in the way, there is no problem. Only when such disturbances in the freedom of action are present is there a risk that an accident will happen. In the Fact Sheets no separate attention is given to 'disturbances in the freedom of action'. Attention is given to them under 'behaviour in traffic' when there is something to be said about them in general.

Active safety provisions

Active (mostly electronic) safety provisions can help to prevent a collision. Such systems are rarely if ever found in the 'primitive' vulnerable modalities. In the case of the motorcycle and special mopeds, however, examples can be found, such as automatic anti-blocking systems (ABS) and speed governors. No information is included about these in the Fact Sheets under the heading 'What is pertinent to the problems'. Some information may be included under 'Quality needs profiles' and 'Present approach'.

Passive safety provisions

A lack of passive safety provisions, such as a protective steel box, makes people especially vulnerable in the event of an accident. The classification into groups of vulnerable road users takes this into account. In the Fact Sheets there is no separate section devoted to it, but it is discussed under the 'Quality needs profiles' where this is useful.

Combating the consequences of accidents

Combating the consequences (after-care) of an accident is in practice not specifically tailored to vulnerable road users, but is for good reasons organised much more generally. It was therefore not necessary to give any attention to this in the questionnaires and Fact Sheets, except when for special reasons attention is required. This is the case, for instance, with elderly people, who become more fragile as they grow older (bones break more easily, injuries heal less rapidly). In combating the consequences of an accident, these people require extra attention.

4.3.3. Objectives

The situation of vulnerable road users is influenced by many different policy fields. Every policy field has its own objectives and wishes. Policy development with respect to vulnerable road users thus falls under the domain of various ministries and government organisations. Objectives are the consequence of a (political) weighing process. Within the framework of the Vulnerable Road Users project such choices cannot be made; arguments must simply be put forward which can be of use in the formulation of the objectives. Generally accepted values, such as the right to safe mobility, or the need of a cost-effective approach, play a role here. Another important point is the legal framework. Everyone who is permitted to be on the road must actually be facilitated to do this. If a road is open to a truck, the road must be designed and constructed in such a way that it can in fact be used safely by a truck, in terms of dimensions and construction. The same also applies for pedestrians and cyclists, children, blind people, people in wheelchairs and so on.

In this project it is assumed that the vision of Sustainable Safety sets the direction for the development of policy. Sustainable Safety emphasises that prevention is better than cure, and that the person is the measure of the things (Koornstra et al. 1992). With prevention, knowledge about the causes of accidents plays a crucial part. The main role in this is played by human ability. If one knows what people can do, one can establish what requirements should be fulfilled by the traffic and transport system. In practice, however, it has proved to be far from easy to put the human being at the centre.

Over the course of time, norms and guidelines have been developed for design and layout with respect to the infrastructure. In the development of the new Guidelines for the Design of Motorways (ROA) and the Guidelines for the Design of Non-Motorways (RONA), account is explicitly taken of the consequences of changes in the vehicle fleet. Characteristics of this are relatively simple and conclusive to establish. On the basis of the available data about vehicle characteristics, such as width, height, weight, driving characteristics and suchlike, a fictitious so-called Standard Vehicle can be hypothesised, which can be used to assess whether a road is suitable for use by the most commonly used vehicles.

Up to present, human ability has not played any clear role in the development of the guidelines for roads. There is still nothing like a 'Standard Person' that could function as a touchstone for the ergonomics of roads and the public space.¹⁰ That is actually much more difficult. Unlike in the case of vehicles, the 'hardware characteristics' of length, width, physical strength, visual acuity and suchlike are not decisive for people's functioning in traffic. In this connection, the 'software characteristics' are much more important. The main factor, in particular, is task competence, that is to say, the mental and

¹⁰ For motor vehicles the situation is rather better. Manufacturers are increasingly taking more account of human characteristics (of the driver; children seem to get less attention), simply because otherwise they would not be able to sell their vehicles.

physical state in relation to personal characteristics for information processing, insight into traffic processes, reaction speed and traffic skills, experience and education or training.

At present, it is not (yet) possible to describe a 'standard person' to be used for the design of roads. For this, it must be clear to what extent people can fulfil the relevant demands of task competence. This necessitates that we know what demands are made in terms of task competence (that has not been clearly established) and that there are data available concerning the scale and seriousness of impaired functioning and the design consequences of these. That is still only very slightly the case. Within the framework of this project, the available knowledge must be collected, an investigation must be made of what gaps there are in the knowledge, and as far as possible 'best guesses' must be made of the quality requirements that must be imposed.

The basic principle in this project is further that all possibilities that exist to improve the situation for vulnerable road users must be optimally used. The so-called Pizza model shows what starting points there are (see Figure 5; Methorst 2000). In Appendix 2 the model is described and explained.

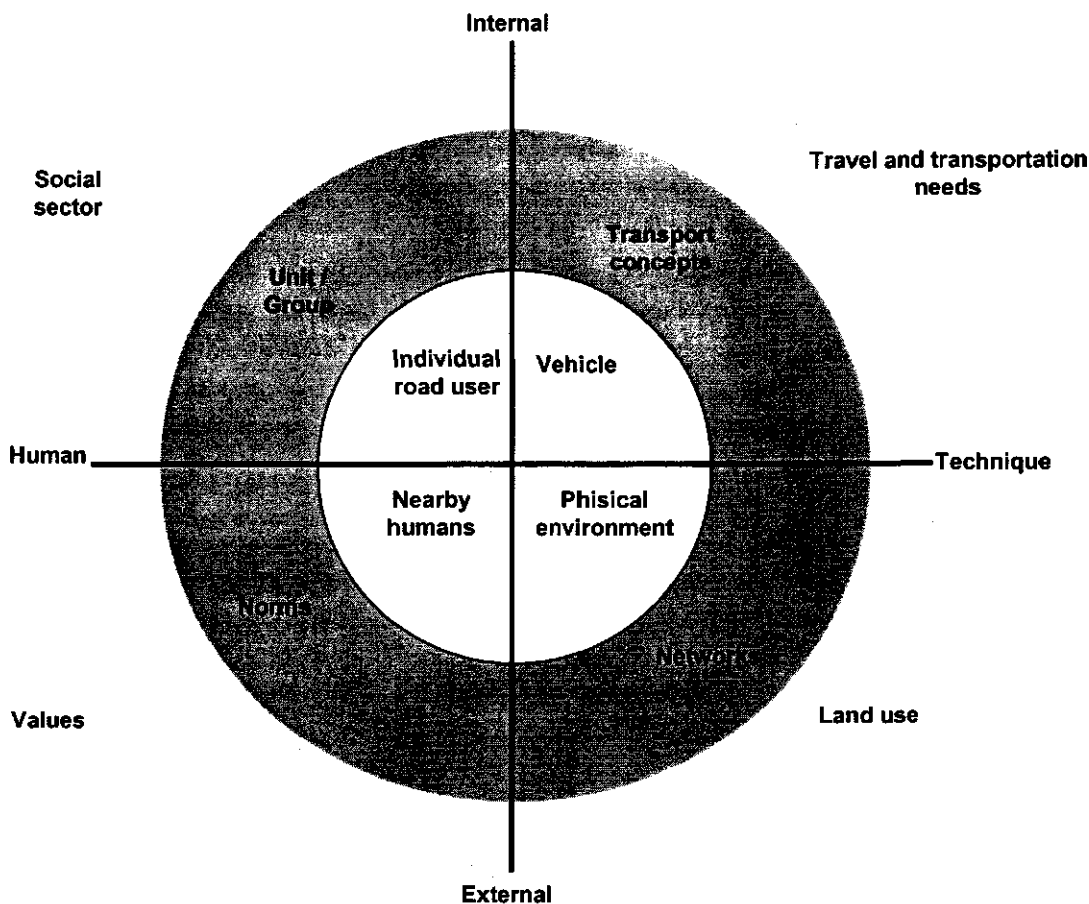


Figure 5 Pizza model

On the basis of the Pizza model one can establish what issues should be given attention in the formulation of *quality needs profiles*. These profiles serve primarily to sketch a picture of the demands that can be placed on road users, the transport system, the public space and the social context

(among other things, legislation and regulations, enforcement, codes of behaviour, social policy, education). The quality needs profiles can, in combination with weightings for nature, scale and seriousness of the problems, constitute the basis for the formulation of concrete policy objectives with respect to the different groups of vulnerable road users.

In the questionnaires and the Fact Sheets, attention was given to the following matters:

Table 1 Aspects of quality needs profiles

Improvable human qualities	<ul style="list-style-type: none">- General/ situation- Observation- Judging the situation- Decision-making- Action
Social and public context	<ul style="list-style-type: none">- Traffic- Standards (regulations and agreements)- Social values
Spatial planning	<ul style="list-style-type: none">- Traffic situations- Network- Spatial structure
Transport system	<ul style="list-style-type: none">- Vehicle- Transport concepts- Mobility needs

4.3.4. Solutions

Once it is known and acknowledged what problems there are, and there is also a will to tackle those problems, an investigation can be made of what concrete solutions are conceivable, fitting in with the known policy objectives. Here it can be important to co-ordinate with existing policy. In connection with this, space was made in the Fact Sheets for an inventorisation of the present approach. The same structure was used for this as for the quality needs profiles. By comparing the information from the 'quality needs profiles' with that from the 'present approach', it is possible to see what room there is for improvement.

In developing packages of measures it can also be important to know the extent to which the problems will increase or decrease, and how the social position of the group will develop. In the event of an increase in the scale and/or seriousness of the problems and a strengthening of the social position of the group, it may be expected that the importance of taking measures will increase, certainly in the long term. For this reason, attention is also given to this in the Fact Sheets.

Finally, the Fact Sheets have space to indicate what important knowledge gaps there are. This too can be important in the development of the package of measures and the prioritising of these.

A role is played in the development of the package of measures not only by aspects relating to their content. The organisation of the approach (process and procedure) also certainly merits attention. The problems of vulnerable road users are relatively low on the political agendas, the knowledge of the problems is, as stated above, deficient and fragmented. This gives a fairly serious damage risk when a

package of measures is introduced.¹¹ The damage risk can be limited by presenting sound, solid proposals:

- Make use of virtually irrefutable information; base the approach on 'state-of-the-art' knowledge;
- Make clear that 'the person is the measure of the things' is more than just fine-sounding words;¹²
- Base the proposals on an integrated approach: work on an optimum package of measures in which relations between road safety and other relevant policy fields are established; in which measures regarding both the hardware (tangible provisions), the software (rules for use, instructions for use) and the 3 Es + O (= Engineering, Education, Enforcement + Organisation) are included; and in which measures are presented for both the short term and the longer term;
- Demonstrate as forcefully as possible the advantages of prevention: by improving the preconditions for safe mobility, a great many accidents (and hence much expense and suffering) can be prevented;
- In developing a package of measures, take explicit account of the trends that are to be expected, such as population ageing, increases in scale of the provision of services, reduction of housing occupancy and suchlike;
- And, perhaps the most important point: ensure as much support as possible for the approach to the problems and the proposed measures.

The systematic approach with the Fact Sheets already ensures that where (reasonably) well-founded arguments are available, these can actually be used in backing up the proposals for measures. This will make it more difficult to brush aside the arguments by saying 'it is just an opinion'.

In the case of a problem area which is fairly low on the agenda, and about which the level of knowledge lags behind that concerning competing problem areas, it is advisable to build up support in a cautious, step-by-step manner.

As regards obtaining support for tackling the problems, a 'spread-the word' approach is under consideration; the first step of this has already been taken:

- matching of knowledge fields (consultation of experts in order to share the available knowledge and validate it as accurately as possible)
- matching of interest fields (ensuring that interest organisations reach agreement as far as possible, by discussing the results of the research and working together on proposals for measures that will benefit as many people as possible)
- matching of policy fields (checking the first proposals against the various sector policy objectives and interests in an [occasional or permanent] forum, which may or may not be set up specially for this purpose)
- making recommendations to the relevant ministers through a forum
- setting up (if possible) a permanent forum with a monitoring function

¹¹ The failure of the congestion charge project (Rekeningrijden) indicates how important it is to take account of the damage risk.

¹² The key concept here is 'Design for All' (In some countries called Universal Design). The basic principle of this is that people's environment is designed in such a way that at least 95% of the population can function without problems. In this project, incidentally, the 'environment' includes not only the tangible environment, but also the social and legal environment (culture, laws and regulations). Design for All relates not only to traffic, but to all design activities, including industrial design, spatial planning, urban design, architecture, vehicle design, public transport, rehabilitation aids etc. The basic principle can also be applied to creating regulations and to (government) administration.

4.3.5. Evaluation

Some evaluation of the present approach has naturally already been conducted in the earlier phases. In order to increase the effectiveness of the package of measures, it is advisable to monitor their success. The forum mentioned above could take upon itself a task of this kind.

4.3.6. In summary

The main structure of the questionnaires and the Fact Sheets is based on the PCOSE model.

This main structure is as follows:

1. Making definitions and describing characteristics of the group in key words
2. Trends in the nature and scale of the problems
3. Mechanisms pertaining to the problems
4. Quality needs profiles
5. Present approach
6. Developments in the social position of the group
7. Degree to which the problems will increase or decrease
8. Knowledge gaps

In order to flesh out the main structure, use was made of the model for accident causation (Wagenaar), the model for how behaviour in traffic comes about (Vlakveld), and the so-called Pizza model.

5. Research results

5.1. Project products

At present, the following 'products' are available:

- Fact Sheets
- The Fact Sheets state for each group the characteristics of the group, trends in the nature and scale of their problems, an overview of factors and mechanisms contributing to the problems, quality needs profiles, present policy and future developments. For each field, the information is accompanied by an indication of its certainty, using a star system ranging from 1 to 5.
- The Fact Sheets are available on the internet in both Dutch and English at www.rws-avv.nl. On the Dutch part of the site they are under 'producten - verkeersveiligheid - kwetsbare verkeersdeelnemers'; on the English part they are under 'products - traffic safety - vulnerable road users'.
- A sources database
- In this the reports, statistics, articles etc. that were used for the Fact Sheets can be found on the basis of the allocated number.
- A list of experts and their expertise
- The 'Basic Document Vulnerable Road Users II'
- The Basic Document, which presents the reasons, context, objectives and questions, and indications of possible solutions is included in its entirety in this report, in a rewritten form.
- Interim recommendations to the Directorate General for Passenger Transport DGP
The interim recommendations, containing provisional conclusions and recommendations, is appended to this report as Appendix 3. This report also contains the progressive understanding obtained since the recommendations were presented.
- This report

5.2. Nature, scale and seriousness of the problems

The urgency of a problem is largely determined by its scale. It is therefore important to have a picture of the number of accidents in which vulnerable road users are involved, and of what proportion of the total number of casualties they represent. These questions are not easy to answer, simply because they are very closely linked with the definition that one chooses for 'vulnerable road user'. In this project, three elements are used, namely the degree of external protection, the task competence and the stamina (resilience).

5.2.1. Limited external protection

Pedestrians and cyclists are more vulnerable than drivers of trucks and cars. There is no doubt about that. The question is where one draws the boundary. In this project that boundary is drawn, for practical reasons, at the car. Thus the driver of a four-wheeled moped (actually a small car) is here (but only just) a vulnerable road user, purely because this vehicle, from a legal point of view, is a moped, and accidents involving these vehicles are placed under the heading of 'moped' in the road accident statistics. A driver of a small car like a Volkswagen Lupo or a Suzuki Alto is not taken to be a vulnerable road user. It is recognised that there are large differences in external protection between different categories of cars, but in the case of cars strict requirements are imposed on the construction with respect to the protection of the occupants. For the four-wheeled moped that does not apply.

In this project, seven groups are distinguished on the basis of the external protection. These are summarised in Table 2; the numbers correspond with those of the Fact Sheets.

Table 2 Groups with limited external protection

no.	Group	Size of the group ¹³
1	<i>Pedestrians</i>	Virtually the entire population
2	<i>Pedestrians Plus (people who require an aid for walking)</i>	600,000 people
3	<i>Cyclists</i>	7.6 million active cyclists
4	<i>Slower mopeds</i>	425,000 active riders of slower mopeds
5	<i>Faster mopeds</i>	633,000 active riders of faster mopeds
6	<i>Motorcyclists</i>	155,000 - 210,000 active motorcyclists
7	<i>Special vehicles (incl. skates, autoped, wheelchair, four-wheeled moped, tuk-tuk, quad)</i>	Unknown

The classification into groups used in this project is more refined than the classification of the standard products of accident recording and the general mobility statistics. Table 3 shows how the classification used in this project relates to that in the accident records.

Table 3 Vulnerable modes of travel distinguished in accident records

<i>In accident statistics:</i>	<i>This covers:</i>
<i>Pedestrian</i>	Pedestrian, Pedestrian Plus, some of the Special Vehicles (skates, in-line skates, autoped, wheelchair, electric scooter, large autoped)
<i>Bicycle</i>	Bicycle, 'wipfiets', rickshaw, delivery bicycle
<i>Moped</i>	Faster moped, slower moped, four-wheeled moped, tuk-tuk
<i>Motorcycle</i>	Motorcycle, quad, trike

Table 4 presents accident data of Transport Research Centre AVV-BG¹⁴ with respect to the number of road accident casualties. The numbers represent the number of people killed in road accidents and

¹³ The figures relating to the size of the groups are estimates; the figures for cyclists and riders of mopeds (slower and faster) correspond with the results of the Periodic Regional Road Accident Research (PROV) 2001. 'Active' means: use the conveyance more than occasionally (1 - 2 times per year); it is estimated that around half of the Dutch population under the age of 80 use the bicycle more than once a month.

¹⁴ Source: CD-ROM of AVV-BG publication: Road Accidents in the Netherlands 2001. These are the 'true figures'. Data from the 2002 records are not yet available, which is why figures for 2002 are not used.

people hospitalised as a result of injuries sustained in road accidents. The table gives the average numbers per year over the years 1999 to 2001. The data show that if we look only at the aspect 'external protection', 65.5% of the road casualties fall under vulnerable modes of travel. The largest number of casualties fall under cyclists; one in three road casualties is a cyclist. It must be noted here, however, that the figures, especially regarding pedestrians, give a distorted picture. There are two causes of distortion: under-recording (not all road accidents are recorded) and the definition of 'road accident' that is used (an accident must involve at least one moving vehicle). One-sided pedestrian accidents in which injury is sustained while walking in the public space, such as a fall on the pavement or the public road, are not counted as a road accident. Each year this involves around 50,000 cases requiring treatment in Accident and Emergency units; a proportion of these casualties are subsequently hospitalised, or die. This means that in total almost as many pedestrians as cyclists are injured (on average 57,100 cases are treated in Accident and Emergency units per year).

Table 4 Numbers of casualties per year (1999 to 2001 incl.) per mode of travel

<i>Mode of travel</i>	<i>Number of casualties per year (1999-2001)¹⁵</i>	<i>% of total casualties</i>
<i>Pedestrian¹⁶</i>	1,434	7.2
<i>Bicycle</i>	7,176	35.8
<i>Moped</i>	3,157	15.8
<i>Motorcycle</i>	1,367	6.8
<i>Others</i>	6,907	34.5
<i>Total</i>	20,042	100.0

The AVV-BG data show further that the average seriousness of the consequences of accidents differs greatly per group. Table 5 gives an indication of the seriousness of the consequences of accidents by means of the so-called Seriousness Quotient.¹⁷ It is striking that the highest quotient is scored by 'others', and that those are mainly cars. Despite the fact that a car offers greater protection, there is a relatively large number of deaths. In the event of a collision at low speed or with 'soft' road users, the car occupants have a relatively good outcome; in the event of a collision at high speed or with 'hard' objects, the outcome for the occupants is relatively bad.

If one looks only at the vulnerable groups, it is found that especially collisions with pedestrians are relatively often fatal. Bicycle-bicycle and bicycle-moped accidents within the built-up area result in a relatively large number of injuries. Accidents involving motorcyclists are relatively serious in nature.

¹⁵ The tables give 3-year averages because these provide a better indication of the exact figures for one year. This evens out annual fluctuations as far as possible.

¹⁶ The figures presented here are only for road accidents in which at least one moving vehicle is involved; figures including one-sided accidents are not available.

¹⁷ This number is calculated in steps; first the number of deaths per group is divided by the number of hospitalised injuries, then the same calculation is made for the total. Next the result of this calculation per group is indexed by dividing the result per group by the result for the total, and finally multiplying this by 100.

Table 5 Seriousness of the consequences of accidents

<i>Mode of travel</i>	<i>number of deaths per year (1999-2001)</i>	<i>number of hospitalised injuries per year (1999-2001)</i>	<i>seriousness quotient</i>
<i>Pedestrian</i>	108	1,327	146.1
<i>Bicycle</i>	196	6,980	50.4
<i>Moped</i>	97	3,060	57.2
<i>Motorcycle</i>	80	1,287	111.9
<i>Others</i>	574	6,333	163.2
<i>Total</i>	1055	18,987	100.0

5.2.2. Task competence

Also in the case of 'task competence' one can wonder what the standard is. It was decided that one can speak of limited 'task competence' when a certain group scores (considerably) lower in it than the average fit adult road user. Table 6 shows what groups are distinguished in the framework of this project, and how large the groups concerned are. It must be noted that there is overlap between the groups. It is estimated that the size of groups 15, 17, 18 and 19 together is around 2 million people; as regards group 16 (people with reduced stamina), it should be observed that the estimate of 3.5 million people is a summation of all people who have disorders that reduce stamina. Many of these people will, due to their reduced stamina (fragility), choose modes of travel which cause them minimum difficulty from the disorder, such as the car, a spartanet, a four-wheeled moped or electric scooter, a taxi or some form of transport for disabled people.

Table 6 Groups with limited task competence in traffic

<i>Fact Sheet no.</i>	<i>Groups</i>	<i>Size of the group</i>
8	Pre-school children	781,000
9	Primary school children - infant and lower junior	987,000
10	Primary school children - upper junior	670,000
11	Special education needs	124,000
12	Secondary school children - 12-15 years	560,000
13	Young people - 16 and 17 years	370,000
14	Young people - 18-25 years	1,398,000
15	People with function loss	430,000
16	People with reduced stamina	¹⁸ 500,000 - 3,500,000
17	People with reduced sensory perception	450,000
18	People with reduced mental capabilities	350,000
19	People with motor impairment	1,580,000
20	Immigrants	800,000
21	Addicts and homeless	15,200
	Total	Circa 8,000,000

¹⁸ The size of the group depends on the definition used. In the rest of the report, the lowest value of 500,000 people with (seriously) reduced stamina is used in the calculations.

In the accident records no relation is established with people's task competences. As regards personal characteristics, a distinction is made with respect to gender, age and nationality. Refined distinctions in line with the group classification used in this project therefore cannot be made. The distinction by age used in the accident records gives only a rough approximation. From the AVV-BG figures (see Table 7) it can be seen that, in relation to task competence, 52.5% of the road casualties fall under the vulnerable groups (= 0 - 24 years + over 64 years) and 47.5% under the groups of adults from 25 to 64 years. Here it can also be noted that the 'vulnerable groups' defined in this - highly debatable - way comprise 44.3% of the population. A person in the 'vulnerable' group is 18.5% more likely to be killed or seriously injured in a road accident. In particular, there is a relatively large proportion of casualties in the groups 16 - 17 years, 18 - 24 years and elderly people; and no account has yet been taken of the degree of exposure to traffic or to more risky situations. This will be discussed in the next section. It will become clear that the risks run by vulnerable groups are substantially higher than the above indications might suggest.

Table 7 Number of road accident casualties 1999 - 2001 by age groups

<i>age groups</i>	<i>number of casualties per year</i>	<i>% of total casualties</i>	<i>size of population x1000</i>	<i>population %</i>	<i>number of casualties per 100,000 residents</i>
0 - 4 years	400	2.0	973	6.2	13.7
5 - 9 years	797	4.0	977	6.3	27.2
10 - 15 years	1,343	6.7	1,097	7.0	40.8
16 - 17 years	1,313	6.6	370	2.4	118.2
18 - 24 years	2,931	14.6	1,398	9.0	69.9
25 - 34 years	3,077	15.4	2,609	16.8	39.3
35 - 49 years	3,570	17.8	3,587	23.0	33.2
50 - 64 years	2,871	14.3	2,472	15.9	38.7
65 +	3,740	18.7	2,084	13.4	59.8
Total	20,042	100.0	15,567	100.0	42.9

Table 8 shows indicative figures concerning the seriousness of the consequences of accidents. In the groups 18 - 34 years and elderly people (65 years and over) there is a relatively large proportion of deaths.

Table 8 Seriousness of the consequences of accidents (1999 - 2001)

<i>age groups</i>	<i>number of deaths per year</i>	<i>number of hospitalised injuries per year</i>	<i>seriousness quotient</i>
0 - 4 years	14	387	63.61
5 - 9 years	20	777	46.34
10 - 15 years	27	1,317	36.45
16 - 17 years	56	1,257	80.68
18 - 24 years	194	2,737	127.58
25 - 34 years	187	2,890	116.45
35 - 49 years	180	3,390	95.74
50 - 64 years	144	2,727	95.04
65 +	233	3,507	119.58
Total	1,055	18,987	100.00

5.2.3. Stamina

With increasing age, people's stamina (resilience) generally declines. Bones become more brittle, broken bones and wounds take longer to heal, and they cause the person more difficulty. In addition, there are also disorders (diseases of the bones, muscles and blood) that can give people reduced stamina (resilience). In situations where 'ordinary', fit people under the age of 50 escape with slight injuries, the consequences for elderly people can be considerably more serious. This is shown in Figure 6, in which the seriousness factor offers an indication of the seriousness of the consequences of accidents. These are indexed figures, in which the mean is set at 100.

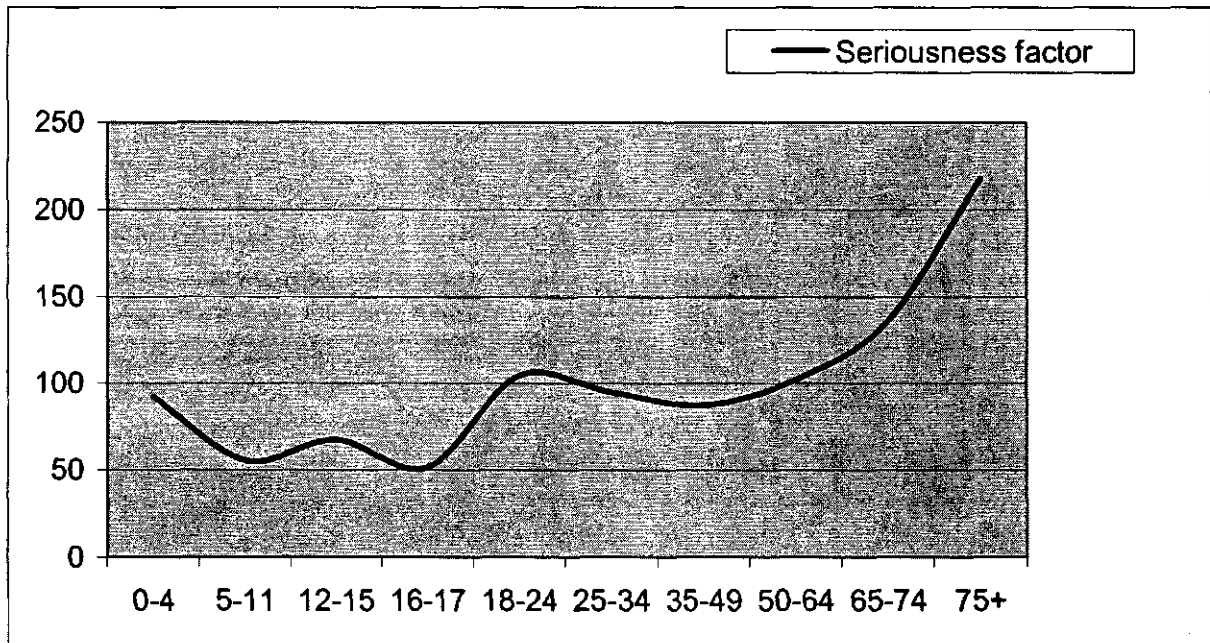


Figure 6 Seriousness of the consequences of accidents

In the Pedestrian Statistics 1998 (*Voetgangers Cijferboek*, Kavsek 1998) there is in this connection an illustrative set of figures about the chance of being killed in traffic for various categories of road users in comparison with car drivers in 1992 (see Table 9).

Table 9 The death rate of road users in comparison with the average car driver

Elderly moped riders (60 years and over)	65 x as great
Young moped riders (15 - 17 years)	12 x as great
Elderly pedestrians (65 years and over)	25 x as great (incl. one-sided accidents) 19 x as great (excl. one-sided accidents)
Elderly cyclists (65 years and over)	16 x as great
Motorcycle/ scooter riders	15 x as great

5.2.4. Road accident risks in relation to mobility

Accident and casualty figures only become really meaningful if they are related to people's mobility. In general, 'mobility' is equated with the number of kilometres covered. Table 10 shows, in relation to distance covered, the risks run on average by people travelling on foot, by bicycle, moped (faster or

slower), motorcycle and other modes of transport (car, bus, tram, train, other). Per kilometre travelled, the risk of pedestrians, cyclists, moped riders and motorcyclists is 10 or more times higher than the average of people using other modes of transport. The use of the moped is shown to be extremely risky. The chance of being killed or seriously injured is 22 times higher than the average risk, and more than 40 times higher than that of a car user. Motorcyclists also run exceptionally high risks. The chance of serious injury is approximately 30 times higher than average, the chance of being killed approximately 20 times.

Table 10 Risk per billion kilometres travelled (1999 - 2001)

Mode of travel	Total number of km travelled in NL per year (x 1 bn)	Number of road deaths per bn km travelled	Number of hospitalised injuries per bn km travelled	Number of road accident casualties per bn km travelled
Pedestrians	3.25	33.23	408.31	441.54
Bicycle	13.00	15.08	536.92	552.00
Moped	1.25	77.60	2,448.00	2,525.60
Motorcycle	1.05	76.19	1,225.71	1,301.90
Others	158.10	3.63	40.06	43.69
Total	176.35	5.98	107.67	113.65

Clearly, the view that mobility is the same as the number of kilometres travelled reveals in this connection too limited a concept of mobility. After all, it concerns not how many kilometres are travelled, but how easily one can complete the trip. The quality of the trip is in essence more important than the quantity. It is precisely here that the problem lies for vulnerable groups. Situations during the trip can be so bad that the trip is not made at all or only with assistance or supervision. It is known that young children are decreasingly permitted to use the roads on their own. Their parents consider the traffic too dangerous and accompany them to school, take them by car to visit friends and so on. Elderly people and people with functional limitations impose restrictions on themselves because they feel unsafe: they travel less often, less far, and under the conditions that are most favourable for them. The figures consequently show that the number of accidents involving children and elderly people and the number of casualties are not keeping pace with the changes in the size of the groups. Is this not a cause for concern?

The Fact Sheets contain the available figures and statements from experts concerning the safety in relation to travel behaviour of the groups that have been distinguished. It emerged that very few figures are available regarding the refined classification that was used in this project. Mobility data are available concerning trips on foot, by bicycle, moped, car, public transport and other modes of transport, but there are scarcely any data concerning the road accident risks connected with limited task competence.

Research conducted by the Pedestrian Association (*Voetgangersvereniging*; Knippenbergh 1993) revealed that the mobility statistics give a distorted picture of mobility on foot. Unlike in the case of other modes of travel, much of this type of travel takes place as pre- and post-transport. The mobility statistics give a good picture of door-to-door trips, but not of the different parts of trips. The figures concerning the 'standard' categories of modes of travel in the Pedestrian Statistics (Kavsek 1998) show that the risks of travelling by moped, both per kilometre and per hour spent in

traffic, are by far the highest. Trips made by bicycle and 'others' (including the motorcycle!) are, by comparison with the car, fairly risky. Trips made by public transport are very safe. For a pedestrian, the chance of a road accident with (serious) injury is, over the same trip distance, approximately four times as great as that of a car driver. Calculated in terms of time, however, the chance is only half as great.¹⁹

An analysis was made of the risks run in relation to the number of trips made (see Table 11). Again in this respect, the moped (both the faster and the slower) is conspicuous in the negative sense. For motorcycles, no data were found on this point, but it is reasonable to assume that they too will not have a positive score. In this respect, walking and cycling are relatively safe modes of travel.

Table 11 Risk per million trips (1999 - 2001)

Mode of travel	Total number of trips per person per year	Number of road deaths per million trips	Number of hospitalised injuries per million trips	Number of road accident casualties per million trips
Pedestrians	210	0.03	0.39	0.43
Bicycle	292	0.04	1.50	1.54
Moped	11	0.55	17.48	18.04
Motorcycle	not known	not known	not known	not known
Others	623	0.16	2.54	2.71
Total	1,135	0.06	1.05	1.10

The road accident risk for each mode of travel can also be expressed in terms of the time spent in traffic. Table 12 gives data on this. Here again the moped (and probably also the motorcycle) scores very badly (risk 18 times higher than the average); the road accident risk per hour is approximately twice as high as the average.

Table 12 Risk per million hours in traffic (1999 - 2001)

Mode of travel	Total number of hours in traffic per person per year	Number of road deaths per million hours in traffic	Number of hospitalised injuries per million hours in traffic	Number of road accident casualties per million hours in traffic
Pedestrians	41.5	0.16	2.00	2.16
Bicycle	69.8	0.18	6.25	6.43
Moped	3.5	1.75	55.21	56.96
Motorcycle	not known	not known	not known	not known
Others	276.8	0.13	1.43	1.56
Total	391.5	0.17	3.03	3.20

An analysis was also made of how the risks are divided across the different age groups. People aged 75 and over run by far the greatest risks per kilometre, per trip and per hour in traffic. Their chance of a fatal accident is more than 4 times as high as that of the average road user, an (average) person

¹⁹ The figures for pedestrians in the Netherlands are extremely favourable from the international point of view. This is due in part to the fact that pedestrian provisions are good in comparison to those in other countries. In the Netherlands a relatively large number of pedestrian trips are also made within urban areas.

aged between 25 and 65 years. Children, on the other hand, run a relatively small risk per kilometre, per trip and per hour in traffic. For the group 16- and 17-year-olds, the risk per kilometre and per trip of being injured is about as high as that of the very elderly, but the risk of a fatal accident is considerably lower. The same applies but to a slightly lesser extent for the group 18 - 24-year-olds (see Tables 13 to 15).

Table 13 Risk per billion kilometres travelled (1999 - 2001)

age groups	Total number of km per year (x 1 bn)	Number of deaths per year	Number of road accident casualties per year	risk per bn	
				Fatal	Casualty
0-4	6.9	11	137	1.55	19.86
5-11	6.9	18	391	2.66	56.67
12-15	3.9	32	557	8.12	142.74
16-17	4.6	44	1,003	9.49	218.04
18-24	18.5	198	2,241	10.70	121.15
25-34	37.4	183	2,285	4.90	61.11
35-49	51.3	178	2,405	3.47	46.89
50-64	34.5	133	1,544	3.86	44.76
65-74	9.3	91	791	9.78	85.05
75+	3.4	132	720	38.92	211.86
Total	176.7	1,020	12,075	56.17	68.34

Table 14 Risk per billion trips (1999 - 2001)

age groups	Total number of trips per year (x 1 bn)	Number of deaths per year	Number of road accident casualties per year	risk per bn	
				Fatal	Casualty
0-4	1.12	11	137	9.50	122.03
5-11	1.56	18	391	11.77	251.04
12-15	0.83	32	557	37.97	667.39
16-17	0.40	44	1,003	109.85	2,523.29
18-24	1.44	198	2,241	137.06	1,551.51
25-34	3.09	183	2,285	59.27	738.81
35-49	4.82	178	2,405	36.92	498.96
50-64	3.08	133	1,544	43.24	500.78
65-74	1.11	91	791	82.03	713.01
75+	0.57	132	720	233.06	1,268.60
Total	18.17	1,020	12,075	5.77	664.75

No data on mobility and accidents are available for people with a disability. Presumably their chances per kilometre, per trip and per hour in traffic of sustaining an injury in traffic are considerably greater than those of the average road user. The increased chance of being killed in an accident will correlate with their physical stamina (resilience) and will run somewhat parallel with age (cf. Figure 6 Seriousness of the consequences of accidents).

Table 15 Risks per billion hours in traffic (1999 - 2001)

age groups	Hours in traffic per year (x 1 bn)	Number of deaths per year	Number of road accident casualties per year	risk per bn Fatal	hours in traffic Casualty
0-4	14.90	11	137	0.72	9.19
5-11	20.67	18	391	0.89	18.91
12-15	15.52	32	557	2.04	35.86
16-17	8.42	44	1,003	5.19	119.10
18-24	35.22	198	2,241	5.62	63.64
25-34	63.13	183	2,285	2.90	36.20
35-49	94.01	178	2,405	1.89	25.59
50-64	66.54	133	1,544	2.00	23.21
65-74	22.50	91	791	4.05	35.16
75+	10.73	132	720	12.34	67.15
Total	348.68	1,020	12,075	2.93	34.63

5.2.5. Trends in accidents and risks

Since the 1970s there has been a decrease in both the number of recorded²⁰ road deaths and the number of recorded road casualties. That decrease was not the same for all groups. Unlike for pedestrians, cyclists and car occupants, in the case of motorcyclists, riders of slower mopeds, and others there was more a rising than a falling trend (see Figure 7). When one looks at age groups, all the groups display a decrease in the number of road deaths and the total number of road casualties. The decrease in the number of road deaths was greatest for the group 75+, and to a slightly lesser degree the group 50-64. The greatest decrease in the number of road casualties was in the groups 5-11, 16-17 and 18-24 years. As regards schoolchildren (5-11 years) there has in fact been a decrease in the number of casualties since the 1970s. The causes of this decrease, which is more than the trend, have not been well researched, but there has been a good deal of speculation. One plausible explanation seems to be that children use the roads less on their own, but instead are transported more by car ('back seat generation'), or play outside under supervision. The number of road casualties in the group 25-49 years shows little if any decrease over the last 20 years (see Figures 9 and 10).

As regards the seriousness of the consequences of accidents by mode of travel, no clear changes in the proportions have taken place, with the exception of the slower moped. In the case of the slower moped, it is easy to identify the point when it became no longer almost exclusively used by older age groups. In 1980 the chance of death in the event of an accident with a slower moped was exorbitantly high (extremely high seriousness factor, see Figure 8). Since 1985, when the scooter models of the slower moped were introduced, the chance of death has been at an average level. The chance of death in the case of the faster moped is considerably lower than that of other modes of travel. This is not related to the protection offered by a faster moped, but rather to the relatively high stamina (resilience) of the (young) riders.

²⁰ No data are known about the recording level of road accidents and road accident casualties before 1990. In this section, for the sake of comparability, data from the road accident records are used without the numbers being increased to compensate for under-recording.

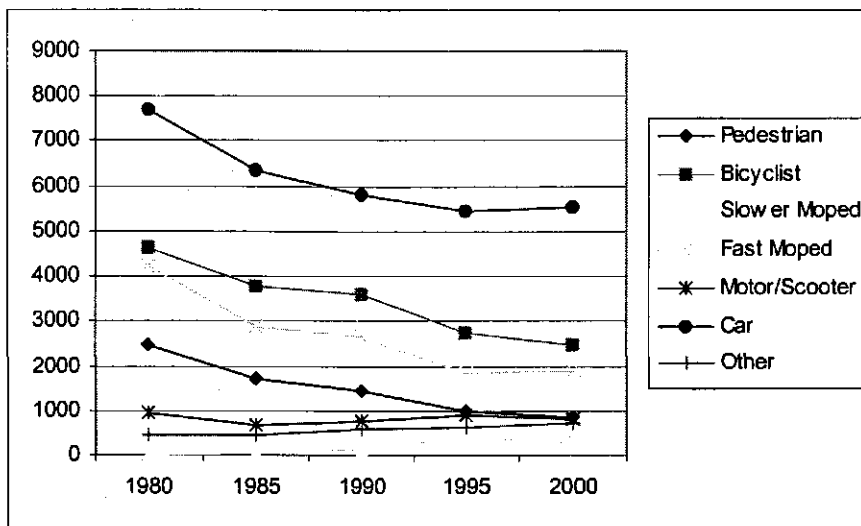


Figure 7 Trends in road casualties by mode of travel

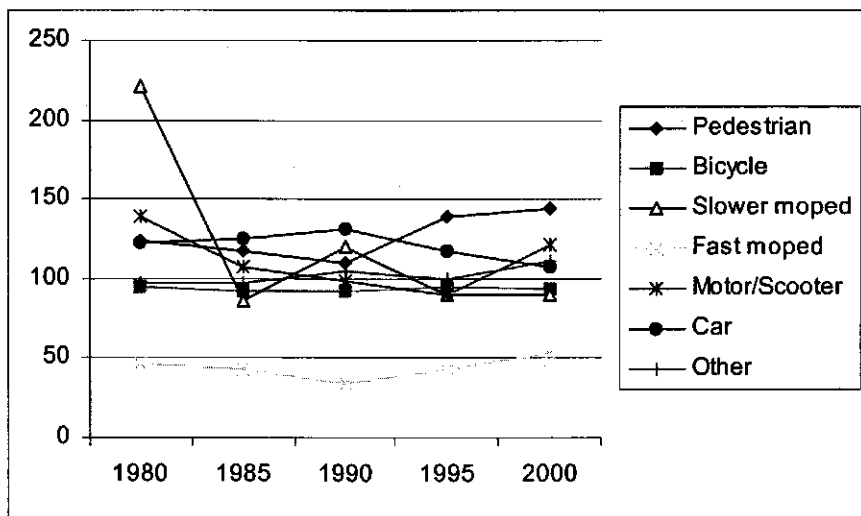


Figure 8 Trends in the seriousness of consequences by mode of travel (seriousness factor)

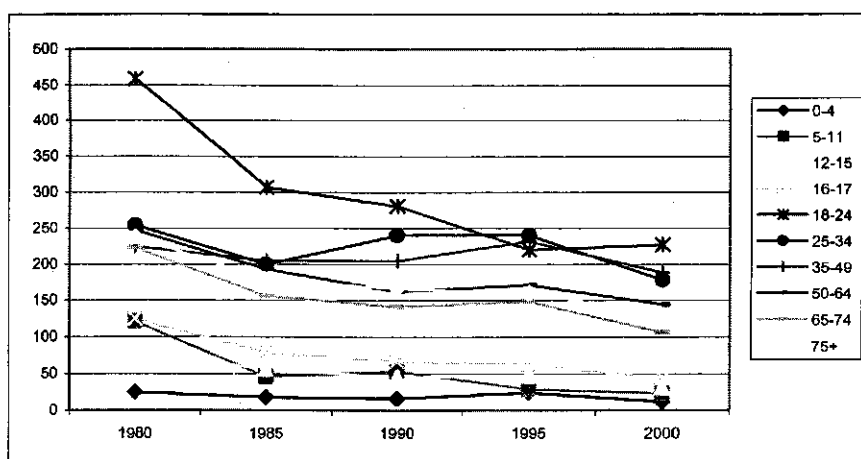


Figure 9 Trends in the number of road deaths by age

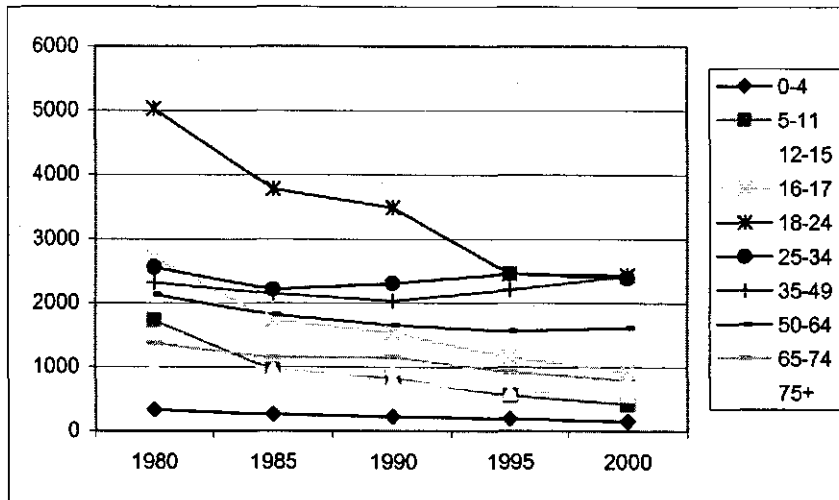


Figure 10 Trends in the number of casualties by age

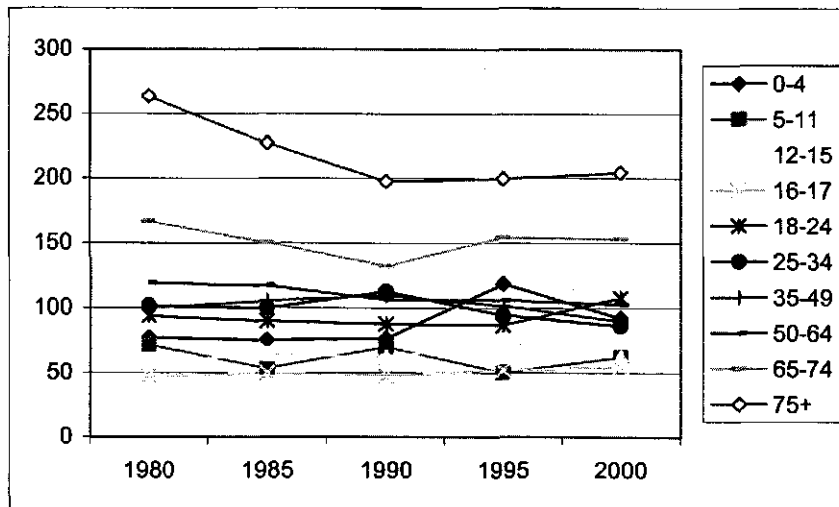


Figure 11 Trends in the seriousness of the consequences by age (seriousness factor)

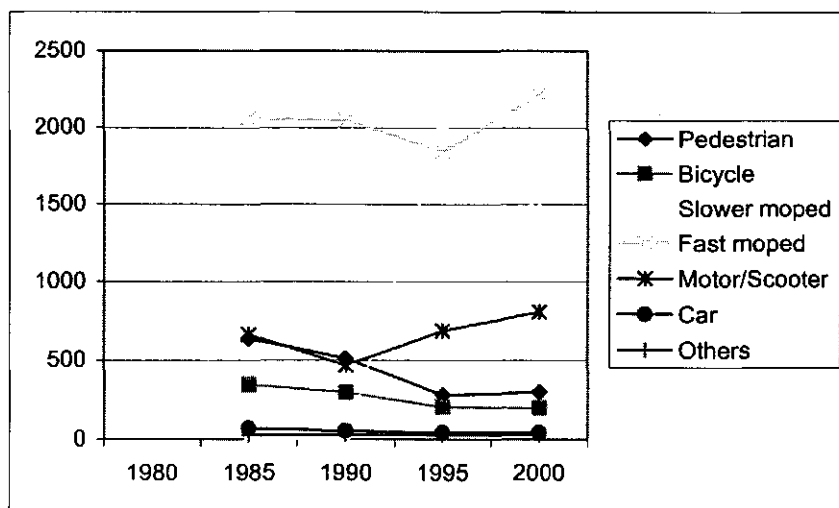


Figure 12 Trends in the chance of being a casualty per bn km travelled by mode of travel

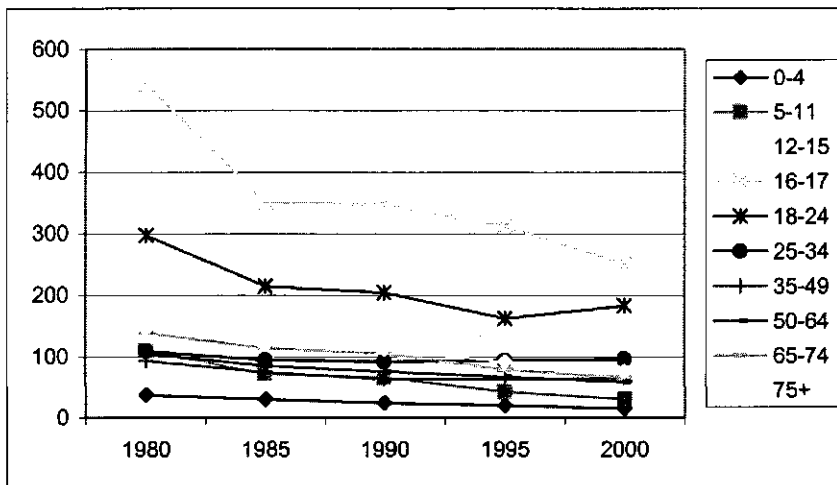


Figure 13 Trends in the number of casualties (hosp. + death) per 100,000 population

5.2.6. General conclusions with respect to problems of vulnerable road users

From the above, the following conclusions can be drawn with respect to problems of vulnerable road users:

- There is a kind of magnifying glass effect: complex situations that are difficult even for 'ordinary' people cause major or even insurmountable problems or risks for people with less than average competence;
- There is also a compensation effect: if people find traffic too dangerous, they use the roads less (independently), with negative social and health effects as a consequence;
- Particular groups have specific problems (e.g. blind people). If those specific problems are treated in isolation, there is a risk of stigmatisation and marginalisation of the group. This is not helpful to either the group or society as a whole;
- In most cases, the problems of vulnerable road users go (much) further than only road safety; public safety and accessibility and mobility issues (social functioning) are also involved; the social costs of these are probably very high;
- The most important trend regarding vulnerability is the ageing of the population. The negative consequences for road safety will be enormous, if there is no change of policy and the mobility of other groups continues to grow;
- In addition to population ageing, the increasing level of car dependence is alarming. This worsens the social position of those who are not car-users, with the consequence that it becomes more difficult to get their problems onto the (political) agenda.

Nature and scale of road accidents:

- With respect to the general categories of modes of travel and age groups that have been distinguished, there is global insight into the size of the groups, the numbers of accidents and the seriousness of these in relation to exposure. The largest problem is that of cyclists (most casualties); the highest risk is run by riders of faster mopeds (casualties per km travelled) and the seriousness of the consequences of an accident is the worst for motorcyclists. As regards limited competences, children (0 - 16 years) and elderly people (65 years and over) are the largest groups;
- Although, in comparison with other groups, young people (17 - 25 years) are often involved in accidents and there are a relatively large number of casualties in this group, it cannot be said that this is a group that from the standpoint of vulnerability merits special attention. After all, these

people take on average more risks in traffic than others, and more often constitute a danger to others than they are themselves endangered;

- The list of vulnerable groups also includes 'Immigrants' and 'Addicts and homeless people'. Although there are few 'hard' data on these groups, the signs indicate that from the road safety point of view they are a relatively minor problem (small numbers of people in the groups; there are no reliable data available concerning the problems). The impression seems provisionally to be that their problems can be solved by means of generic measures or measures recommended for other vulnerable groups;
- The knowledge about the risks of subgroups, such as users of the slower moped and special vehicles (four-wheeled moped, electric scooter, skates) is very inadequate;
- Concerning the risks associated with limited competences, there is too little knowledge for an effective approach to the problems. There is some (fragmented) insight into the size of the groups, but little if any concerning the numbers of accidents and the seriousness of these, with the exception of children (all groups to 16 years);
- Little or nothing is known about susceptibility to accidents in relation to competences and the extent to which mobility is also restricted by danger. Precisely that information is crucial for the development of a programme of measures;
- Even more than for other groups, most of the trips made by vulnerable road users take place within the built-up area. The number of intercity, long-distance trips is small; the main modes of travel for intercity trips are as a car passenger and on public transport;
- There is a great deal of 'double vulnerability': people with limited competences must necessarily make use of unprotected modes of travel (walking, cycling).

5.3. Mechanisms with respect to the problems

Road accidents are to a large extent caused by human behaviour. The risks are related to the decisions that people make. The Fact Sheets contain information about decisions at different levels: the choice of trip and mode of travel, the choice of route, and the behaviour in traffic. This section presents a cross-section of these; there is also discussion of 'latent causes of accidents'. In each instance, an estimation is made of:

1. the size of the group to which the limitation relates. Here an indication is given, insofar as this is useful, of which groups of vulnerable road users are concerned; this is done by stating the classification number of the groups
2. the extent to which the limitation results in a greater risk for the people concerned
3. the extent to which the limitation has an influence on the total number of accidents that happen in the Netherlands
4. the influence on the seriousness of the consequences (or the relation between the number of hospitalised injuries and deaths)
5. the extent to which the limitation (in general) is open to direction (regardless of by whom); the extent to which in theory there are possibilities either now or in the (distant) future to improve the situation (openness to direction, policy freedom).

For points 1 to 4 a fairly rough 'consumer association' estimation of the influence is made:

--	increased risk: strong (increase of 10% or more)
-	increased risk: moderate (2% – 10% increase in risk)
0	has little or no influence (-2% to +2% increase in risk)
+	decreased risk: moderate (2 – 10% decrease in risk)
++	decreased risk: strong (decrease of 10% or more)

The openness to direction of the issue, or in other words the policy freedom that exists, is a similar assessment made using stars. The meaning of the stars in the tables under the heading Openness to Direction is as follows:

*	not applicable
**	not open to direction
***	scarcely open to direction
****	somewhat open to direction
*****	open or easily open to direction

5.3.1. Trip choices

The Fact Sheets describe, insofar as information is available, what factors play a role in the trip choices of the different vulnerable groups (see Appendix 4, Tables 4.1 and 4.2). Attention is given to the situation in which the choice is made, the reasons for the trip, the choice of mode of travel and the action radius of the person.

Situation in which the choice is made

As regards the situation in which trip choices are made, it must be noted that decisions about trips are not in principle related to the specific role. It is therefore not so useful to look at the situation of pedestrians, cyclists and so on, because people are not actually that, but rather they choose to become that. Only after someone has decided to do something that cannot be done in their present location does the choice of mode of travel become important.

For the groups distinguished according to task competence, a number of limitations may exist in their choice of trip. These limitations can be 'may not' or 'can not'. Pre-school children and other people with mental limitations are in general not considered able to make independent decisions to travel, and are usually not actually given the latitude to do so. Primary school children and those with special education needs are given limited decision-making latitude. It is restricted to trips in the immediate environs of the home and to trips that it is assumed they can make without too many problems. Their age and traffic skills, assessed by their parents/ carers, play a role in this.

For young people and adults there can be special reasons for their freedom of choice being limited, as in the case of people in detention, women in certain cultures who may not go out without permission from the head of the family. Although no data are available on this, it is estimated that the size of the group with such limitations is very small in comparison with the total road-using population.

Other limitations of the freedom of choice as to whether or not to make a trip are:

- the need to ask for help in making the trip, as in the case of people with a serious disability
- the feeling that traffic is dangerous
- lack of public safety

Reasons for the trip

Table 4.2 of Appendix 4 shows for each group what specific aspects apply to their reasons for making a trip, their action radius and time span. The overview reveals that the reasons for using the vulnerable modalities, with the exception of walking, are more related to the user groups than to the modalities themselves. Work-related trips are rarely made entirely on foot. On the other hand, virtually every trip by car and public transport is preceded and followed by some walking.

The dominant reasons for trips relate mainly, as noted, to characteristics of the groups. Vulnerable groups have a pattern of trip reasons that differs from the average picture. It is striking that they restrict their trips to those that are urgent and essential, and that trips 'for fun' have a subordinate position; young people aged 16 - 25 years form an exception to this.

In the case of schoolchildren, the trip reason "education" accounts for more than 30% of the trips. In the older groups, this reason is less important. In the groups 18 - 25, the principal reasons are work-related trips and entertainment. In the case of elderly people and people with functional limitations, work-related trips are not so important, and most trips are made in order to buy groceries and other shopping, and for social reasons.

Trips for medical or health reasons are also important, although there are no hard data available on this.

Action radius

The action radius of the groups is related to the options they have with respect to choice of mode of travel. The most vulnerable modalities are not suitable for covering very large distances. The moped, four-wheeled moped and motorcycle impose the least restrictions in this respect.

The largest action radius is available to those who have the possibility of choosing the car. For most of the people with limited task competences, however, that is not an option. This also applies for people aged 18 - 25 years and for elderly people, a large proportion of whom do not have a car at their disposal and do not have a driving licence. Many young people aged 18 - 25 years do not (yet) have a driving licence; elderly people too, especially women, are less likely to have a driving licence than those in the group 25 - 65 years. Both young people and elderly people have a lower rate of car ownership than average. It is expected that possession of a driving licence and a car will increase sharply among elderly people in the coming years; in 2020 over 90% of elderly people will have a driving licence and the same proportion of households will have at least one car.

The action radius of people on foot is in practice around 1,000 to 1,500 metres. Walking is mainly an option for trips within the neighbourhood, to buy groceries, for recreation, visiting friends, taking a stroll and, not least, for pre- and post-transport to and from the car and public transport. People usually regard 'just' walking, without some kind of conveyance, as not really travelling.

Almost all Dutch people use the bicycle, but young people and women use it more than average. The most important reasons for cycling are going to school, doing shopping, and trips between home and work. The action radius of the bicycle is approximately 7.5 km, and it is used mainly within the person's own city, town or village. During the quieter evening hours, lack of public safety can be a reason not to make the trip or to choose a different modality, especially for women. The motorised modalities have a greater action radius. The 'real' slower moped (spartamet) is mainly used by middle-

aged and elderly people, and in principle is an alternative to the bicycle. The scooter model of the slower moped and the faster moped are mainly popular among young people aged between 16 and 20 years who do not yet have a driving licence and a car.

Time spent in traffic

As regards the time spent in traffic, it has been calculated that an average person in the Netherlands spends some 100 hours per year in traffic as a pedestrian. This figure is, however, considerably higher among those who do not have a car. The highest average is scored by the bicycle, which is used on average around 140 hours per year. Here too it can be observed that there are large differences between the various groups. The average Dutch person spends some 450 hours per year travelling in traffic. Pre-school children, primary school children in infant and lower junior schools, and people with a serious disability spend less time than average in traffic: estimated at 200 - 350 hours per year. At an average moment of the day, there are more pedestrians and cyclists making trips within the built-up area than there are people using motorised vehicles.

Conclusions regarding the influence of issues relating to trip choice

- In general it can be stated that vulnerable road users, with the exception of the groups 16 - 18 years and 18 - 25 years, have limited freedom in their choice of trips. In total, this amounts to some 5.5 million people. Less essential trips ('for fun') are largely not made. The limited freedom results in the number of accidents involving vulnerable road users remaining small; it does not, however, have any influence on the seriousness of the consequences. There are not many possibilities of introducing changes to the freedom of trip choices. The best option is to ensure that destinations that are essential for them lie within safe residential areas.
- Approximately 1.7 million people have such serious mental limitations that they are not equal to the complexity of traffic, and that independent trips entail exorbitantly high risks. These people include children up to the age of around 8 years, people with reduced mental capabilities, people with brain damage and people with disorders that limit brain functions, such as the advanced stages of Alzheimer's disease. Because these people are rarely permitted to go out in the traffic outside of the immediate, familiar home surroundings, the number of accidents in which they are involved remains small. Little if any influence can be exerted on this.
- Some 2 million people need help in travelling. This help makes their trips relatively safe. The need to call in help when making a trip can be reduced in a small number of cases by making routes to destinations that are essential for them as short as possible, and adapting these routes to their specific needs.
- Parents and carers of young children and people with reduced mental capabilities, and people with function loss or a serious physical disability, consider traffic too dangerous for an unaccompanied trip. An accompanied trip is relatively safe. The fact that these people are accompanied makes the number of accidents small; accompaniment has no influence on the seriousness of the consequences of any accidents that nonetheless happen. The perception of danger of traffic can be influenced. While this does not have any positive consequences for road safety, it can improve the mobility of the persons concerned.
- For slightly more than one in three people in the Netherlands (6 million people), trips by car (as driver or passenger) are in most cases not an option. In comparison with walking and cycling, the car is a safe mode of travel. Only public transport is safer (however, the pre- and post-transport on foot and by bicycle again reduce the safety).

- Some 8 million people in the Netherlands do not have a car driving licence. In order to travel by car, they must rely on others. This means that for a large proportion of trips, the (safe) car is not an option. It is estimated that 3.5 million people can never in any way make use of the car.
- Vulnerable groups spend in total less time in traffic than others. The risks per person are in general (much) higher, but this has little if any influence on the total number of accidents and the seriousness of their consequences.
- The vast majority of vulnerable road users have a smaller action radius than the average Dutch person. Both the risks per person and the total number of (serious) accidents in which they are involved are higher than average. Little if any influence can be exerted on the action radius.

The above is summarised in Table 16.

Table 16 Estimation of the influence of issues relating to Trip Choice

Issue (1)	Size of group (group no.) (2)	Accident risk per person (3)	Influence on number of accidents (4)	Influence on seriousness of consequences (5)	Openness to direction (6)
Limited freedom of trip choice	5,500,000 (8, 9, 10, 11, 15, 16, 17, 18, 19)	-	++	0	***
Mental limitations	1,750,000 (8, 9, 18)	--	++	0	**
Help needed in travelling	2,000,000 (8, 15, 17, 18)	+	+	+	***
Perception: traffic is dangerous	2,700,000 (8, 9, 11, 15, 18)	+	+	0	****
Lack of public safety	2,500,000 (some elderly people and women)	+	+	0	****
Limited freedom of choice in mode of travel	6,000,000 (8, 9, 10, 11, 12, 15, 16, 17, 18, 19, 21)	-	-	--	**
No driving licence	8,000,000	-	0	-	**
No car available (also not indirectly)	3,500,000 (11, 12, 13, 15, 17, 18, 19, 21)	-	0	--	**
Less time in traffic	2,750,000 (8, 9, 11, 15, 17, 18)	--	0	0	***
Limited action radius	5,750,000 (8, 9, 10, 11, 12, 15, 16, 17, 18, 19)	-	-	0	**

5.3.2. Route choices

The Fact Sheets describe, insofar as information is available, what factors play a role in the route choices of the different vulnerable groups (see for a summary Appendix 4, Table 4.3). Attention is given to specific preferences, knowledge aspects, physical aspects and mental aspects.

Specific preferences

Children and people with reduced mental capabilities are in many cases not free to decide on their route themselves. For elderly people (and women) in particular, public safety plays an important role in route choice, especially during the hours of darkness.

With respect to route choice, all groups except recreational walkers and (motor)cyclists have a clear preference for the shortest route. In the case of pedestrians, and to a certain extent also cyclists, this preference is quite far-reaching. They are prepared to leave the paved paths for this. Recreational motorcyclists have a preference for country roads.

Knowledge aspects

The knowledge that people have of their surroundings has an influence on their choice of route. In the case of young children, knowledge about the surroundings is usually limited to their home neighbourhood.

People with functional limitations need to know whether there might be awkward obstacles on their route. The more serious the limitation, the more difficult it is to deal with any obstacles and barriers, and the more trouble people take to ensure that they know what they will encounter on the route. The importance they attach to that knowledge correlates largely with the perceived seriousness of the functional limitation.

Physical aspects

In the Netherlands, pedestrians, cyclists and moped riders (and all modalities equated with these in the law) are not permitted to use the trunk roads and motorways. On the other hand, pedestrians have more freedom in their choice of route than bicycles and motorised vehicles, because they can also use non-paved paths.

For pedestrians and cyclists, it is a problem if they are forced to walk or ride around barriers like trunk roads, railways, canals or large buildings. For people with a functional limitation, some obstacles, depending on their limitation, are insurmountable, and they are forced to make a diversion. When this entails that they have to use the roadway rather than the pavement, they are at greater risk.

Mental aspects

Young children and people with reduced mental capabilities are in general not capable of choosing a route. Their 'mental map' of their surroundings is limited. Due to their mental limitations, they are nearly always accompanied when they make trips beyond their immediate, familiar area.

Conclusions regarding the influence of route choices on road safety

In general, it can be stated that little empirical research has been conducted into the route choices that people make. In theory, there is a relation with road safety. After all, if one knows that a certain route is unsafe, one would be able to avoid it. In practice, however, that turns out to be difficult to demonstrate, and the route choice process depends on the chosen modality and (mental) group characteristics. Habit plays an important role. People *prefer* to choose the shortest route. Only when it is fairly certain that a different, longer route takes considerably less time or effort will they choose it. In

the choice of route, road safety usually plays no part, except in extreme situations and in the case of young children and people with serious functional limitations. Public safety, by contrast, plays a decisive role.

Table 17 Estimation of the influence of issues relating to Route Choice

Issue (1)	Size of group (group no.) (2)	Accident risk per person (3)	Influence on number of accidents (4)	Influence on seriousness of consequences (5)	Openness to direction (6)
Limited mental map	2,900,000 [8, 9, 10, 11, 18]	- -	0	0	**
Limited route choice	n/a (role dependent)	0	0	0	**
Also outside paved paths	n/a (pedestrians)	+	+	0	**
Preference for shortest route	n/a (role dependent)	- / 0	- / 0	0	**
Preference for country roads	150,000 [6]	0	0	0	**
Obstacles on the route	2,900,000 [15, 16, 17, 19]	-	-	0	****

5.3.3. Latent causes of accidents

This report is based on the first version of the Fact Sheets. No specific information concerning the Basic Risk Factors, as described in Section 4.3., has (yet) been collected. In the following, insights and data are used which were entered under other items of the Fact Sheets.

Design of the infrastructure

Road safety research has shown that the risks increase (Koornstra et al. 1992):

- with greater differences in speed, mass and direction (non-homogeneous traffic)
- when the design and function of the road are not appropriate for the use that is made of it (non-functional use), and
- when the design or layout of a road and its environment give people a wrong impression, which makes road users behave in an uncertain manner.

When designing the infrastructure, in general account is taken of the 'hardware' characteristics (dimensions, driving/ riding characteristics, speed of travel etc.) of the travel modalities: the pedestrian, the bicycle, the moped, cars and freight traffic; the extent to which road users, and in particular vulnerable groups, can be considered to be capable of using the road safely is usually not known by the designers. How well road users can get along with the quality of the infrastructure offered is determined largely by their task competence. People with limited task competence more readily make 'mistakes' and hence run more risk than people with average or good task competence. What is a small problem for an 'average' road user, to which they easily react appropriately, will take on more serious forms for someone with limited task competence. This is the 'magnifying glass' effect.

Latent causes of accidents that are known in relation to vulnerable road users are:

- discontinuity of routes and missing links in a route (incomplete network), which 'force' people to do 'strange' things, such as crossing the road at places that are illogical for the motorised traffic. In relation to categorisation of roads, traffic is now being concentrated onto main roads; these can therefore (more often) form a barrier for pedestrians and cyclists
- a design speed of the road that is too high, so that motorised traffic drives faster than is sensible in the event of a confrontation with a vulnerable road user
- deficient ergonomics of the design imposes requirements on the task competence that cannot be fulfilled²¹
- incorrect or illogical design elements, such as a zebra crossing on a bend, elements that obscure the view (MUPIs and tram/ bus shelters) near a crossing point etc.
- lack of safe playing space for children
- lack of, or insufficient provisions in the case of construction work

Table 18 Estimation of the influence of issues relating to Design of Infrastructure

Issue (1)	Size of group (group no.) (2)	Accident risk per person (3)	Influence on number of accidents (4)	Influence on seriousness of consequences (5)	Openness to direction (6)
Discontinuity of routes	16,000,000	--	-	-	*****
Too high design speed	16,000,000	--	--	-	*****
Deficient ergonomics	16,000,000	--	--	-	**
Lack of safe playing space	1,650,000 [9, 10]	-	-	0	***
Inadequate provisions during construction work	16,000,000	-	-	0	****

Design of vehicles or mobility aids

Vehicles and mobility aids are designed to be used for a certain purpose by an 'average' person or a specific target group (use). People who do not meet those design criteria will in general not be able to use them so well, or even not at all. The worse the attunement to the user (man-machine interface), the greater the risks. The same can be said about the use function of such a vehicle or aid. Thus an

²¹ Common deficiencies in ergonomics are:

- too narrow dimensions
- unnecessary complexity
- confusing road markings and road signs
- careless colour use so that colour blind people are unable to pick up important signals
- illogical crossing point
- unnecessarily long crossing distance
- such uncomfortable paving that people look for another (but unsafe) route
- a lack of resting points
- inadequate landmarks
- parked cars obscuring the view for and of slow traffic
- unfortunate location or absence of bicycle parks/ racks
- unfavourable traffic light regulation, so that red-light discipline is undermined or there is too little time to cross over

ordinary bicycle is not suitable for use heading into a strong wind, on long distances or on a flight of steps, or to transport heavy or bulky objects.

With regard to the design of vehicles or mobility aids, the Fact Sheets discuss, among others, the following latent causes of accidents:

- a pedestrian is very flexible and can easily manoeuvre, but that works to the pedestrian's disadvantage because the other traffic expects him/her to wait 'a moment' or to move aside; people with functional limitations are not always able to react as quickly as expected
- wheelchairs and pushchairs are difficult to steer if a pavement has a steep slope
- the bicycle operates as an equilibrium machine that becomes unstable if ridden (too) slowly. Elderly people ride slowly for reasons of caution and therefore swerve more. This results in higher risks. For children, looking round when turning off is a problem
- a bicycle is usually not fitted with mirrors; elderly people therefore have no view of the traffic behind them; their hearing cannot compensate for this problem
- a pedestrian, cyclist, moped rider and also a motorcyclist have little visual mass and are therefore less easy to see than a car or a truck. This means they are not seen by the motorised traffic
- it is difficult for a moped rider to hear traffic noises because of the helmet
- a pedestrian, bicycle and moped demand no respect and pose virtually no threat for the car user, who therefore has less than the necessary attention for them
- special vehicles do not fit into existing frameworks and the expectation pattern of the other traffic; insufficient account is therefore taken of them
- the moped and the racing bicycle are actually not suitable to make appropriate compensation for disturbances in the freedom of action at the speeds at which they are ridden

Table 19 Estimation of the influence of issues relating to Design of Vehicles/ Mobility Aids

Issue (1)	Size of group (group no.) (2)	Accident risk per person (3)	Influence on number of accidents (4)	Influence on seriousness of consequences (5)	Openness to direction (6)
Flexibility of pedestrians	14,000,000	+	0	0	*
Wheelchair cannot be steered	250,000	-	0	0	***
Bicycle = equilibrium machine	500,000	--	-	-	**
Rear view from bicycle	500,000	-	0	0	****
Limited visual mass of pedestrian/cyclist	16,000,000	-	-	-	**
View with moped helmet	400,000	0	0	0	**
Pedestrian/cyclist no threat	16,000,000	0	0	0	*
Special vehicles	500,000	-	-	0	****

Physical and mental capability of road user

Especially in the case of vulnerable road users, limited physical and mental capability is an important factor in the causation of road accidents. Everyone is permitted to use the road as a pedestrian; virtually no formal requirements are imposed on the use of the road as a pedestrian, but in practice there are actually expectations regarding their physical and mental task capability, which a not inconsiderable proportion of the population, in complex situations, cannot fulfil. This also applies to a slightly lesser extent to cyclists, moped riders (both faster and slower) and users of special vehicles. Only for motorcyclists and car/ truck drivers are the 'requirements for road use' so high that their physical and mental capability is in practice at issue in only very exceptional cases. If there is doubt about the task competence of a driver of a motor vehicle, his/her authorisation to drive such a vehicle can be taken away (temporary driving ban, forfeit of driving licence).

As regards physical characteristics, limited height and size (children!), reduced muscle strength and fragility are factors that contribute to a higher chance of accident.

Children are not yet fully grown. They are smaller than the 'standard person', namely the adult. Their peripheral vision and detection of noise sources are not yet strongly developed; only at the age of 7 to 8 years can they make a distinction between left and right; they are not yet able to recognise dangers; the difference between pavement and street only gradually acquires meaning; they are not yet able to make a good estimation of speeds, and they make many interpretation mistakes; their knowledge of rules is basic; action scripts are not yet fully developed, which means that they quite often make a wrong judgement and are not yet sufficiently capable of predicting situations and the behaviour of others. Children are not primarily focused on the traffic task, and do not yet make rational decisions and are easily distracted. People with reduced mental capabilities have similar characteristics. Children, young people and elderly people have a relatively low information processing speed and hence reaction speed. In complex situations, they need more time for perception, diagnosis and prognosis than adults aged 25 to around 50 years.

Visual acuity and hearing already start to decline at around the age of 40; with increasing age there is a decrease in concentration, divided and selective attention, and a reduction in the speed of information processing and reaction speed. Many elderly people and people with a functional limitation know that they are vulnerable; they compensate for their increased risk by trying to be more careful. Function loss and reduced sensory perception in fact make that necessary. Due to reduced sensory perception, these people have limited information about the behaviour of others, and they can more easily make a wrong decision, simply because they are not capable of it. Reduced agility, stiffness and fragility, and also fear, increase the chance of accidents. This chance is even further increased because other road users do not (easily) recognise, and hence take account of, the functional limitations.

A special limitation is colour blindness. In traffic this limitation can cause problems when it is insufficiently taken into account by the highways authority.

For mental limitations, however, whether or not due to the use of psychotropic substances,²² this applies to an even greater extent. A provisional survey has shown that a relatively large proportion of casualties among pedestrians, cyclists or moped riders were under the influence of a psychotropic substance. The percentages of casualties under the influence were higher than among car drivers. No data are available concerning the risks of addicts and homeless people, but it is assumed that their reduced decision-making ability (reaction capability) is a contributory factor to their being involved in accidents more often than average.

²² Psychotropic substances are substances that affect (detrimentally) the working of the brain. Examples are alcohol, tranquillisers and drugs.

In the case of immigrants, a role can be played by the different frame of reference (they do not always make correct judgements)²³ and sometimes also by limited knowledge of the situation.

As the speed of travel increases, any physical and mental limitations become more critical. The field of vision decreases with increasing speed. Pedestrians and cyclists are less obstructed in their sensory perception (field of vision, traffic noises) than those using other modes of travel. The use of a walkman, umbrella, hood and suchlike increases the risks. The field of vision of moped riders and motorcyclists is narrowed by the helmet; noises are muffled.

Table 20 Estimation of the influence of Physical and Mental Capability of Road User

Issue (1)	Size of group (group no.) (2)	Accident risk per person (3)	Influence on number of accidents (4)	Influence on seriousness of consequences (5)	Openness to direction (6)
Height/not fully grown	3,100,000 [8, 9, 10, 11]	-	-	0	*
Reduced muscle strength	2,500,000 [22, 19]	-	-	-	***
Fragility	500,000 [16]	0	0	0	***
Mental limitations	2,900,000 [8, 9, 10, 11, 18]	-	-	0	****
Low processing speed	6,000,000	-	-	0	****
Reduced sensory perception	500,000 [17, 22]	--	-	0	****
Colour blindness	1,500,000	0	0	0	*****
Under influence of psychotropic substances	25,000	--	-	-	***
Different frame of reference	250,000	0	0	0	***
Narrowed field of vision	250,000	0	0	0	*

Technical state of infrastructure

There are clear indications that the technical state of the road, and in particular of pavements and cycle paths, is a not unimportant factor in the causation of accidents. Especially the technical state of pedestrian and cycle infrastructure leaves much to be desired. Falls on the pavement occur regularly, and often have serious consequences (more than 500,000 injuries that must be treated in Accident and Emergency units); there are indications that a large proportion of these accidents are connected with a poor state of maintenance. Unfortunately these accidents are virtually absent from the road accident statistics, because an accident that does not involve a moving vehicle is usually not regarded as a road accident. The chance of accident is increased if the technical state of the pavement or cycle path is so bad (puddles, holes, broken surface) that pedestrians have to use the road and then encounter cyclists or motorised traffic. The technical state of pavements receives even less attention

²³ E.g. someone who is used to traffic driving on the left: looks the wrong way when crossing the road.

than that of cycle paths. For most pedestrians that is not an insurmountable problem, but for people with a functional limitation it is.

The technical state of the infrastructure is in danger of deteriorating because the budgets of the local authorities for maintenance are not keeping pace with the still increasing area that has to be maintained.

Table 21 Estimation of the influence of Technical State of Infrastructure

Issue (1)	Size of group (group no.) (2)	Accident risk per person (3)	Influence on number of accidents (4)	Influence on seriousness of consequences (5)	Openness to direction (6)
State of pedestrian domain	16,000,000	- -	- -	-	*****
State of cycle paths	9,000,000	-	-	-	*****
State of roadway	8,000,000	0	0	-	*****

Technical state of vehicles or mobility aids

Numerous studies have shown that the technical state of cars and motorcycles can rarely be seen as an important cause of accidents. The introduction of the periodic motor vehicle test (APK) has reduced even further the importance of this factor. Only a very small proportion of motor vehicles have serious technical defects and the share of this factor in the causation of accidents is small: less than 3% of accidents involving cars.

The same cannot be said about bicycles and mopeds. Especially in the large cities, the technical state of many bicycles is atrocious. The Foundation for Scientific Research into Road Safety (SWOV) has established that around 10% of accidents involving bicycles are connected with technical defects (brakes, lights). No similar data are available for mopeds, but it is presumed that a poor condition (and especially tuning-up) is responsible for a relatively large proportion of accidents. The introduction of registration plates can bring about considerable improvement in this.

Table 22 Estimation of the influence of Technical State of Vehicles or Mobility Aids

Issue (1)	Size of group (group no.) (2)	Accident risk per person (3)	Influence on number of accidents (4)	Influence on seriousness of consequences (5)	Openness to direction (6)
State of bicycle	9,000,000	-	-	0	***
State of moped	500,000	-	-	-	****

Obstacles and litter

The roadway for cars is generally kept free of obstacles and litter. While this is already less true for cycle paths, the pedestrian domain is filled with obstacles: abandoned bicycles, rubbish bags, dumped rubbish, displays and boards, cars on the pavement, loading and unloading on the pavement. Especially for people with a disability, obstacles range from inconvenient to dangerous. They can fall over them, and are therefore forced to use the dangerous roadway. Displays and advertising and road-sign boards can block the view of and from traffic. Obstacles and litter in the pedestrian domain are a problem because maintenance is expensive. Those who manage the public space prefer to spend the money on investments.

Table 23 Estimation of the influence of Obstacles and Litter

Issue (1)	Size of group (group no.) (2)	Accident risk per person (3)	Influence on number of accidents (4)	Influence on seriousness of consequences (5)	Openness to direction (6)
Obstacles in roadway	8,000,000	0	0	-	*****
Obstacles in pedestrian domain	16,000,000	-	-	-	****
Obstacles in cycle paths	9,000,000	0	0	-	****

Risk-increasing atmospheric conditions

It is known from accident analyses that, in general, precipitation, wet road surface, fog, low sun, twilight and darkness increase the risks in traffic. This also applies for vulnerable road users. On the other hand, they will, whenever possible, go out less often during such unfavourable conditions.

Elderly people in particular run the risk of being dazzled when the sun is low.

Situations of poor light increase the risks for pedestrians and cyclists because car drivers are more likely not to see them. Motor vehicles are visible because of their lights; pedestrians and cyclists are lost in this race to be noticed. With regard to elderly people, it must further be noted that reduced light sensitivity makes it more difficult for them to perceive dangers. Many of them compensate for this limitation by going out less during the evening hours.

Table 24 Estimation of the influence of Risk-Increasing Atmospheric Conditions

Issue (1)	Size of group (group no.) (2)	Accident risk per person (3)	Influence on number of accidents (4)	Influence on seriousness of consequences (5)	Openness to direction (6)
Precipitation	16,000,000	-	-	-	*
Wet road surface	16,000,000	-	-	-	***
Fog	?	0	0	0	*
Twilight/night	3,000,000	-	-	0	**
Low sun	3,000,000	-	0	0	*
Compensation by elderly people	2,000,000	+	+	0	**

Time space

In situations where vehicles are travelling fast, where a great deal of traffic has to be taken into account and where traffic is coming from different directions, the complexity is so great that everyone needs more time to make the right decisions. In the case of children and people with a functional limitation, the limits of their task competence are soon exceeded, and the risks increase exponentially with the complexity. Young drivers feel time pressure because they have not yet 'automated' their behaviour. Elderly people feel time pressure due to their slower than average information processing. In standard situations, elderly people can fall back on their traffic experience, which enables them to

look for and anticipate potential dangers. In situations that differ from their familiar standard situations, they are placed at an extra disadvantage.

Table 25 Estimation of the influence of Time Space

Issue (1)	Size of group (group no.) (2)	Accident risk per person (3)	Influence on number of accidents (4)	Influence on seriousness of consequences (5)	Openness to direction (6)
Complex situations	8,000,000	- -	-	-	****
Non-uniform traffic measures	3,000,000	-	-	-	*****
Functional limitations	3,000,000	-	-	-	*

Procedures and regulations

Approximately half of the accidents that occur involve wrong decisions regarding right-of-way and free passage. Evidently the regulations on this point are very difficult to apply in practice, assuming that people actually know them sufficiently well. However, the general impression is that recent changes in the traffic situation, such as the categorisation of roads, the new rule that all drivers coming from the right have right-of-way, and the rule that mopeds are permitted to travel on the roadway, have considerably simplified the regulations.

A point of difficulty in the regulation of right-of-way and free passage is that there is a tension between human justice and road safety. There is a difference between 'natural' behaviour regarding the right of the strongest and the more humane behaviour that is desirable. It may well be that a pedestrian or a cyclist has the right to free passage, but it is far from certain that they will actually get that.

Traffic regulations and manners are by no means known to everyone. Pedestrians and cyclists are not required to hold a 'road traffic diploma'. Nevertheless, they are expected to know what is necessary (everyone in the Netherlands is considered to know the law). However, for a considerable proportion of road users, such as children and people with reduced mental capabilities, this is not a reasonable expectation. It is also known that a large proportion of moped riders, despite the mandatory moped certificate, do not know how fast they are permitted to ride.

Table 26 Estimation of the influence of Procedures and Regulations

Issue (1)	Size of group (group no.) (2)	Accident risk per person (3)	Influence on number of accidents (4)	Influence on seriousness of consequences (5)	Openness to direction (6)
Right-of-way regulations	16,000,000	-	- -	0	****
Knowledge of rules	8,000,000	0	0	0	****
Mental limitations	4,000,000	-	-	0	*
Speed rules	1,000,000	-	-	- -	****
Knowing, but not applying	?	-	-	0	***

Even if someone knows the rules, it is not certain that they will actually apply them. There can be a variety of reasons for this: they do not see the point of a rule, they are driving or riding just a little too fast to stop in time, the 'opposite party' (e.g. an elderly person) hesitates and they use this as a reason to take right-of-way anyhow.

Training

Every role in traffic requires skills. The extent to which a lack of traffic skill plays a part in the causation of accidents depends very much on the complexity of the traffic situations to which one is exposed. Skills have to be acquired in one way or another. Children must first learn to deal with traffic as they play on foot within their still restricted residential environment. From around the age of eight they are considered to be sufficiently trained to explore their environment by bicycle. At the age of 16, the moped enters the picture, and at the age of 18 the car, motorcycle and so on. Every new mode of travel demands new skills.

Research has shown that inexperience, that is to say, insufficient training, is a strong risk-increasing factor with all 'new' modalities. This can clearly be seen in the case of young cyclists, moped riders and car drivers. It can also be seen that vehicle skill is often a general problem in the case of new 'special vehicles'. For instance, in the first few years after skates became popular there were many accidents and casualties. The craze for these has now passed; the average skater has mastered the skills reasonably well, and the number of accidents and casualties among skaters is therefore substantially lower than in the early years.

A special case is the risk run and caused by people who use a 'last resort for mobility' of elderly people and people with a disability, such as the electric wheelchair, the electric scooter and the four-wheeled moped. The last of these has characteristics of a car, but is used by people who are not (or no longer) permitted to drive a car. The risks of this for others are evident.

Table 27 Estimation of the influence of Training

Issue	Size of group (group no.)	Accident risk per person	Influence on number of accidents	Influence on seriousness of consequences	Openness to direction (6)
(1)	(2)	(3)	(4)	(5)	
New modalities	500,000	-	-	0	***
Inexperienced drivers/riders	1,000,000	-	-	0	***
Four-wheeled moped etc.	500,000	0	0	0	***

Communication and co-ordination

At different levels within the traffic and transport system, communication and co-ordination of action are necessary. A lack of communication can result in a sub-optimal supply and use of the system:

- a lack of communication between the national government and the managers of components of the system can result in preconditions (availability of money, manpower, resources) for tackling possible shortcomings not being made available, and (potentially) dangerous situations remaining untackled
- a lack of reciprocal communication between managers of the system can result in them not learning from each other's experiences and road users being confronted with unnecessary inconsistencies within the system

- a lack of communication between the managers and the road users can result in lack of understanding about, and resistance to, measures that are taken
- reciprocal miscommunication between road users can result in them coming into conflict with one another.

As regards reciprocal miscommunication between road users, it is known that, among other things, the extent to which vulnerable groups are visible and eye-catching still sometimes leaves much to be desired. Drivers of vans and trucks have fairly large blind spots and can easily fail to see pedestrians and cyclists. Daylight running lights restrict the relative visibility of the non-lighted pedestrian or cyclist.²⁴ The faster someone is driving, the narrower the field of vision becomes, and the less they are able to communicate with other road users. Thus car drivers on main roads communicate almost solely with other car drivers; in residential areas, by contrast, they also communicate with pedestrians and cyclists. The surrounding steel and coloured car windows restrict the possibilities of communication.

Communication in traffic is primarily non-verbal communication and 'body language'. It is an inadequate language, so people can easily fail to understand one another properly. Communication is influenced by, among other things, the kind of situation and also the pecking order in traffic. Lack of understanding plays a role. In a quiet residential area people communicate more easily with one another than on a busy main road. In a designated residential area the pecking order is scarcely relevant. On a main road, however, it is relevant. A motorcycle on the motorway is not very popular. Some car drivers do all kinds of things to make clear that they do not appreciate being overtaken in the traffic jam. Driving on the motorway, a car driver joining the motorway from a sliproad is 'for a moment' not allowed to enter between the traffic. An elderly car driver travelling relatively slowly is ignored. Pedestrians who wish to cross the road 'ask permission' from the oncoming traffic. Some groups, such as children, have not really mastered the art of communicating and become the victim of that. Others, such as pedestrians doing shopping, are not paying any attention whatsoever to traffic. And others simply do not want to communicate.

Table 28 Estimation of the influence of Communication

Issue (1)	Size of group (group no.) (2)	Accident risk per person (3)	Influence on number of accidents (4)	Influence on seriousness of consequences (5)	Openness to direction (6)
Government – managers	?	?	-	0	*****
Manager – manager	?	?	-	0	*****
Manager – user	?	?	-	0	*****
User - user	16,000,000	-	-	0	***

Incompatible goals

Various studies have shown that incompatible goals diminish road safety. Haste prevents calm, safe driving. Playing and watching out for traffic are at odds, especially if this takes place close to a main road. The same applies for shopping and walking attentively. A residential area is not compatible with

²⁴ For example: in complex situations a car driver restricts observation to looking for lights and misses the less eye-catching signals given out by a pedestrian or cyclist.

traffic. It should be noted, however, that playing, shopping and residing are goals in themselves, while road use is a means to an end and is therefore actually a lower order goal for individuals.²⁵

A person's frame of mind can also result in 'incompatible goals'. If they have just heard bad news about someone close to them, their mind is not really on the traffic.

In the case of elderly people and people with a physical disability, 'incompatible goals' are much less a risk factor than in the case of young adults. For the former, the safety objective is often dominant and they therefore have an extremely defensive attitude.

Table 29 Estimation of the influence of Incompatible Goals

Issue (1)	Size of group (group no.) (2)	Accident risk per person (3)	Influence on number of accidents (4)	Influence on seriousness of consequences (5)	Openness to direction (6)
Haste - socially-minded traffic behaviour	?	--	-	-	**
Playing – attention to traffic	2,000,000	-	-	0	**
Shopping – attention to traffic	?	0	0	0	**
Recreational walking/touring – attention to traffic		0	0	0	***
Interfering emotion - attention to traffic	?	--	-	0	**

Commitment to safe behaviour

In general, it can be said that vulnerable road users are more sympathetic towards road safety than other road users. The main exceptions to this are the group 12 - 25 years and children under the age of 6 years. The motorised traffic causes the danger, but is not the problem owner. Drivers of motor vehicles often do not recognise or acknowledge vulnerable groups, or simply do not give them any thought, and fail to see them. These remarks do, however, require some qualification.

Children are often absorbed in playing. They have their own rules. Yet observations have clearly shown that they make conservative decisions when their attention is on the traffic, for example, when crossing the road. However, only half of children aged 12 - 15 have a 'sense of danger'.

Young people aged 15 and 16 are seeking their boundaries and on occasions will exceed them. They have little knowledge of, and respect for, rules of the road. Group pressure plays an important role and there are often interferences (walkman, telephone, friends, alcohol/drugs). Girls experience less group pressure regarding danger and have a somewhat stronger sense of danger than boys. Young men aged 18 - 25 are impulsive and somewhat 'couldn't care less'; young women are less sure of themselves and more socially-minded.

With respect to pedestrians, it must be remarked that they are often not regarded as traffic, and they in fact do not regard themselves as traffic. In many situations they are concerned neither with the traffic nor with road safety, but with shopping, the dog, children or the surroundings. Pedestrians, but also cyclists, break the rules because they think that at that particular moment they are not relevant for

²⁵ From the standpoint of road safety, of course, we take a different view...

them. Users of special vehicles, especially those with 'sport-and-play' vehicles such as skates and autopedes, behave in an unpredictable manner; they too are not really concerned with the traffic, but with sport, playing and image-building.

Elderly people and people with a disability generally adopt a defensive attitude, but in complex situations are sometimes forced to 'hope for the best' (clumsy decisions). Their strong commitment to safety comes across to others as hesitation, and that works to their disadvantage.

Table 30 Estimation of the influence of Commitment to Safe Behaviour

Issue (1)	Size of group (group no.) (2)	Accident risk per person (3)	Influence on number of accidents (4)	Influence on seriousness of consequences (5)	Openness to direction (6)
12 – 15 years	560,000	-	-	-	***
16 – 25 years	1,600,000	- -	- -	-	***
Pedestrian	16,000,000	0	0	-	***
Sport-and-play (incl. joggers and racing cyclists)	800,000	-	-	0	***
Elderly people	2,000,000	+	+	0	***

Reacting to changes in traffic

Traffic and the traffic environment change in the course of time. It is necessary to keep oneself informed about this. In practice, not everyone is aware of that. Many elderly people and people with reduced mental capabilities do not realise that the traffic regulations, norms and values, knowledge and etiquette in traffic have fundamentally changed. The sense of urgency and the willingness to brush up on these matters are very limited. It is unclear, however, to what extent this factor plays a role in the causation of accidents.

Table 31 Estimation of the influence of Reacting to Changes in Traffic

Issue (1)	Size of group (group no.) (2)	Accident risk per person (3)	Influence on number of accidents (4)	Influence on seriousness of consequences (5)	Openness to direction (6)
Elderly people	2,000,000	0	0	0	***
People with reduced mental capabilities	350,000 [18]	0	0	0	**

Summary of estimations of Basic Risk Factors

From the above descriptions of estimations of the Basic Risk Factors (latent causes of accidents) the following conclusions can be drawn:

- While defective design and technical state of the infrastructure and the available time space are indeed the greatest risk-increasing factors for vulnerable road users, all the other identified factors also have an influence
- With regard to the total number of accidents, it can be stated that the 'design of vehicles' is not a strong determining factor

- For a proportion of vulnerable road users (especially the group 18 - 25 years and over half of elderly people), physical and mental capability does not play a significant role. For the other groups, it is one of the determining factors
- As regards the factor 'commitment', it can be said that elderly people and people with functional limitations stand out positively on this point, while young people (16 - 25) stand out negatively
- Reacting to changes in traffic is not a very important factor, except in the case of some elderly people
- For the factors 'design of the infrastructure', 'risk-increasing atmospheric conditions' (especially rain and wet road surface), 'time space', 'incompatible goals' and 'commitment', there are indications that these not only have an influence on the number of accidents that occur, but also have an unfavourable influence on the seriousness of the consequences of those accidents
- The factors 'incompatible goals' and 'atmospheric conditions' appear to be the least open to direction. The possibility of limiting or even neutralising the influence of the other factors appears to be reasonable to good.

Table 32 Summary of estimations of the influence of Basic Risk Factors

Issue (1)	Accident risk per person (3)	Influence on number of accidents (4)	Influence on seriousness of consequ- ences (5)	Openness to direction (6)
<i>Design of infrastructure</i>	- -	-	-	****
<i>Design of vehicles or mobility aids</i>	-	0	0	***
<i>Physical and mental capability of road user</i>	-	- / 0	0	***
<i>Technical state of infrastructure</i>	- -	-	0	*****
<i>Technical state of vehicles or mobility aids</i>	-	-	0	****
<i>Obstacles and litter</i>	-	-	0	****
<i>Risk-increasing atmospheric conditions</i>	-	-	- / 0	**
<i>Time space</i>	- -	-	-	****
<i>Procedures and regulations</i>	-	-	0	*****
<i>Training</i>	-	-	0	***
<i>Communication with fellow road users</i>	?	-	0	****
<i>Incompatible goals</i>	-	-	-	**
<i>Commitment to safe behaviour</i>	- / +	- / +	- / 0	***
<i>Reacting to changes in traffic</i>	0	0	0	***

5.3.4. Behaviour in traffic

This section gives a description of the extent to which decisions and actions in traffic of the different vulnerable groups have consequences for road safety. There is also a brief examination of behaviour towards vulnerable groups. The descriptions are based on the information included in the Fact Sheets

(see for a summary of this Appendix 4, Tables 4.4.1., 4.4.2. and 4.5.). These state, insofar as information is available, what factors play a role in risk-increasing behaviour in traffic for the different vulnerable groups. Attention is given to specific aspects of the situation, observation, judging the situation, decision-making and actions. The information given in the Fact Sheets under the first three of these headings is covered in the above description of the Basic Risk Factors under 'Latent causes of accidents'.

Decision-making

While using the roads, people make decisions about the position on the road, the course and the walking, riding or driving speed.

Most road users make those decisions routinely and unconsciously. At one time they made a conscious decision, and while doing so weighed all kinds of arguments against one another, including the extent to which they were going to conform to the rules of behaviour and what safety margins they were going to employ.

As regards decision-making in traffic, vulnerable road users are an extremely heterogeneous group. Children do not yet really make decisions, but just make a guess (trial and error). They do not (yet) make rational and well-considered choices. People with serious functional limitations, on the other hand, are forced to make traffic decisions at the operational level fairly consciously.

Children, young people, people with a disability and elderly people have, compared with others, a limited processing speed. They need more time to make adequate decisions, whether they are made consciously or unconsciously. Pedestrians and cyclists can easily break traffic rules, and in fact they do so. They break the rules because they think that they are not relevant for them at that particular moment. However, as a pedestrian or cyclist you know that you are vulnerable. On a cycle path or in the pedestrian domain you are safe. When you are there, you do not need to pay so much attention to the other traffic. Young people are exploring their boundaries and in doing so they deliberately break the rules. Elderly people and people with a functional limitation are generally very aware of their limitations and adopt a defensive attitude, also in their operational decisions.

Actions

Again with respect to actions in traffic, vulnerable road users form an extremely heterogeneous group. Pedestrians and cyclists are very flexible and can manoeuvre easily, and scarcely have to take account of the ergonomic restrictions imposed by their mode of travel. Children 'act randomly'; young moped and scooter riders go (much) too fast and ignore rules; elderly people and people with functional limitations travel relatively slowly and hesitate at critical points. Motorcyclists weave in and out between the traffic (which sometimes creates aggression).

An important factor is the predictability for others. Many particularly vulnerable groups are not recognisable as such (people with a non-visible disability!) and that makes them unpredictable. Riders of slower mopeds (spartamets) are more predictable than the average cyclist. It is relatively rare for special vehicles to be in traffic, so they are not found sufficiently in the expectation patterns of others. For most vulnerable groups, it can be said that their defensive and anticipatory attitude, due to (presumed) vulnerability, makes them fairly predictable. Children are unpredictable because of their play behaviour. They do not, in general, have traffic skills. Yet research has shown (Howarth 1985) that 99 out of 100 children make conservative decisions about crossing the road, and that in this way they compensate for the rather predictable behaviour of car drivers, who in fact take little or no account of them in their actions.

Behaviour towards vulnerable groups

Vulnerable road users constitute virtually no threat for less vulnerable groups. In consequence, they are already given less attention during the observation process and are easily overlooked, certainly in complex situations where decisions have to be made in a short time.

When vulnerable road users are in fact recognised as such, that does not automatically mean that the other road users will take account of them and actually behave appropriately, by slowing down, giving space or stopping in advance for them. The willingness to do this is connected with, among other things, specific personality characteristics (women are usually rather more socially-minded than men), the traffic situation (residential area versus main road: see above) and the behaviour of the vulnerable road users themselves. Some cyclists, moped riders and motorcyclists do indeed catch the attention, but cause resentment through their behaviour. This then means that the other road users are not prepared to give them space. Others, such as elderly people, act so hesitantly that people just take right-of-way. People are generally tolerant towards children in residential areas, and people with a disability who are recognisable as such are usually also treated (a little) more kindly.

Conclusions with respect to behaviour in traffic

Important conclusions are:

- The behaviour of vulnerable road users is heterogeneous, but as a rule is defensive and anticipatory in nature, thus compensating for the risks that they run
- Young people (12 - 25) form an exception: they do not compensate for their limited task competence through adapted behaviour, and behave in a relatively offensive way
- Other road users often fail to recognise and acknowledge vulnerable road users

Table 33 Estimation of the influence of issues relating to Behaviour in Traffic

Issue (1)	Size of group (group no.) (2)	Accident risk per person (3)	Influence on number of accidents (4)	Influence on seriousness of consequences (5)	Openness to direction (6)
Limited decision-making ability	4,200,000 [8, 9, 10, 11, 12, 13, 15, 18, 21]	-	-	0	***
Limited ability to act	7,500,000	-	-	0	***
Anticipatory behaviour / defensive action	4,700,000 [9,10,11,15, 16, 17, 19]	+	+	+	***
Offensive action	2,300,000 [13,14,15]	--	--	0	*
Unpredictability	8,000,000 [all]	-	-	0	**
Inadequate recognisability of vulnerable groups	3,300,000 [15, 16, 17, 18, 19]	-	-	0	***
Limited compassion Reaction to...	8,000,000 [all groups]	-	--	-	***

5.3.5. Disturbances in the freedom of action

A characteristic of the majority of the vulnerable groups is that they largely restrict their mobility to the built-up area; the most vulnerable groups even restrict their mobility almost entirely to residential areas, where there is very little fast-moving traffic. In this way they limit their chance of serious accidents.

It is within the built-up area that most of the traffic movements that can result in encounters take place. There are also more objects that limit the freedom of action in critical situations. Driving speeds within the built-up area are not as high as those outside of it. The lower driving speeds increase the time space for evasive manoeuvres; however, the number of encounters means that the chance of conflict is higher than on non-urban roads. Conflicts on non-urban roads are potentially more serious, but disturbances in the freedom of action occur less frequently.

5.3.6. Active safety provisions

Active safety provisions are not available for the pedestrian, cyclist, moped (faster and slower) rider and most of the special vehicles. A small number of motorcycles have ABS and other electronic devices.

5.3.7. Passive safety provisions

One of the important reasons for vulnerability is that the pedestrian, two-wheeled vehicles and most special vehicles do not have adequate passive safety provisions, such as a steel box. Moreover, it must be noted that most passive safety provisions in cars are not designed for the elderly and children and are in fact (mostly) not tested on that point. Due to the brittleness of their bones, the dashboard design, seat belts and airbags can cause serious injuries.

Cyclists, moped (faster and slower) riders and skaters can protect themselves by using a helmet. Wearing a helmet is not popular. Making the use of a helmet compulsory would have an influence, certainly in the case of the bicycle, on the choice of mode of transport. The Cyclists' Union has calculated that the adverse health effects of this (using the bicycle is good for the physical condition) are greater than the advantages through reduction of the number of head injuries. It is also conceivable that cyclists who wear a helmet feel protected and take more risks. This could neutralise the advantageous effect of wearing a helmet.

5.3.8. Combating the consequences of accidents

Combating the consequences of accidents (after-care) is not specifically tailored to vulnerable road users. Most of the accidents involving vulnerable road users take place within the built-up area, where the chance of rapid and adequate after-care following an accident is greater than in the non-urban area. Speed of after-care is especially important in the case of elderly people. Their injuries are more often fatal than in the case of younger people.

After-care also encompasses rehabilitation and psychological support. In this, vulnerable groups do not have a special position; this is not in fact a problem.

5.4. Quality needs profiles

This section on the Quality Needs Profiles presents elements for a 'schedule of requirements' for the approach to safety problems of vulnerable road users. The elements discussed are: possible improvements as regards the vulnerable road users themselves, their social and public context, spatial planning and finally the modes of travel and the organisation of transport.

5.4.1. Human qualities which could be improved

In the Pizza model three levels are distinguished in the potential points for improvement of road safety. For the sector 'road users', those levels are 'the individual road user', 'group/company' and 'social sector'. In the following, a description is given of the issues which require attention at those different levels.

Key questions in this section are 'what possibilities are there to enable people to function more safely and easily in traffic?' and 'what is needed to achieve that?'. The question 'what requirements can reasonably be set for a person's task competence?' cannot be answered in a general way. The answer depends on the specific trip situation and the mode of travel chosen.

5.4.1.1. Individual road users

The basic premise is that the traffic and transport system must in principle be or be made suitable for human use. The human being, as s/he is, must be the measure, regardless of outer form and basic skills. No consideration is given to whether it might be desirable that s/he could be improved.

One of the main criteria in the definition of 'vulnerable road users' is limited task competence. There are many insufficiently skilled, one might say, well-trained road users. Training is in many cases not required and is sometimes simply not yet, or no longer, possible or opportune. Everyone is a pedestrian and it is not possible to demand that everyone should fulfil high skill requirements. Young people must be given the opportunity to grow to adulthood; one should not over-emphasise to elderly people and people with a disability that their skills are less than those of a fit adult.

Within certain boundaries, the 'human material' is open to improvements. Knowledge, attitude and skills can be optimised. The information collected for the Fact Sheets showed that there are several categories of points which could be improved (see also under 4.3. Theoretical basis, Figure 4 of Vlakveld):

- physical and mental capability
- trip preparation
- perceptual faculties
- diagnosis and prognosis of risky situations
- behavioural intentions
- decision-making routines
- control over impulses
- action skill
- vehicle skill.

In the following, a description will be given of what can be done to enable vulnerable people to function better.

Physical and mental capability

The present traffic and transport system and subsystems take account in practice of a fictive 'standard person', who has a certain shape, fulfils certain minimum and maximum dimensions, has a certain degree of agility and muscle strength and possesses certain minimum skills, such as being able to see, hear, feel, think, speak, read, communicate non-verbally, walk, hold something, pick something up and so on. Those 'system requirements' are usually assumed to be known.²⁶ They are seldom explicitly established, but at the same time are taken as a 'hard' basis. There are people who cannot fulfil those 'system requirements', and that makes them vulnerable in the world of traffic.

The requirements set for an individual's physical qualities are not the same under all circumstances and for all modes of travel. Where pavements are wide, the fact that someone is a giant is not really important. If there are no cars around, the fact that someone is only 75 cm tall is not exceptionally risky.

If a person is to use the roads, there must be a minimum degree of certainty that s/he is capable of completing the entire trip without endangering self or others. This requires an adequate physical and mental condition. What exactly this entails depends on, among other things, the mode of travel chosen, the distance to be covered, and the extent to which the actions that have to be performed on the trip require effort.

For a trip on foot, the emphasis lies on strength and stamina; with the bicycle, strength is rather less important, but higher demands are made in terms of agility and so on. Out of concern for road safety, in the case of 'difficult' modes of transport, minimum requirements of physical and mental constitution are provided for by law. Thus, in order to obtain a driving licence a person must have a Declaration of Fitness, and a re-assessment can be required.

In the case of elderly people and people with a disability, attention to physical fitness can enable them to continue using the roads independently up to a great(er) age.

Table 34 Estimation of potential of improving physical and mental capability

Issue (1)	Size of group (group no.) (2)	Accident risk per person (3)	Influence on number of accidents (4)	Influence on seriousness of consequences (5)	Openness to direction (6)
Promote physical exercise	2,500,000 [15, 19, 22]	+	+	++	****

Trip preparation

The freedom of choice as regards making the trip, the mode of travel and the choice of route is largely determined by the person's situation, but also by their relevant knowledge and skills and their intentions. The person's situation, including aspects such as age, fundamental limitations to freedom of choice,²⁷ place they wish to depart from, must in this connection be regarded as a 'constant'. Knowledge, skills and intentions, on the other hand, can be optimised.

²⁶ E.g.: the human being as an animal of minimum 1.50 m height, 40 kg weight, which can perceive colours, read a street name at a distance of 50 m, estimate how fast a car is travelling, estimate how much time there is to cross the road, walk and so on.

²⁷ E.g.: children are not permitted to decide for themselves whether they go somewhere; a person might not have money for petrol, etc.

Such optimisation relates to the following issues:

- the best way for people to prepare their trips;
- removal of any misunderstandings as regards traffic dangers, lack of public safety or latent causes of accidents that may be encountered on the trip;
- how people can arm themselves against any dangers or problems on the trip, how they can safely compensate for limitations (coping with their own limitations);
- what possibilities there are to make the trip despite the feeling that there are problems: the possibility of being accompanied or receiving financial support, the existence of certain mobility aids or a telephone number to call in case of emergency.

Table 35 Estimation of potential of improving trip preparation

Issue (1)	Size of group (group no.) (2)	Accident risk per person (3)	Influence on number of accidents (4)	Influence on seriousness of consequences (5)	Openness to direction (6)
Public information on preparing trips	2,000,000 [15, 16, 17, 19]	+	+	+	****
Public information on misunderstandings	2,000,000 [9, 10, 22]	0	0	0	****
Training in compensating for dangers on the trip	3,000,000 [9, 10, 15, 16, 17, 19, 22]	+	+	+	****
Public information on support provisions	3,000,000 [15, 16, 17, 18, 19, 22]	++	+	0	****

Perceptual faculties

Most people can see, hear, feel and smell, but they are not all equally good at those things. In the case of children, the senses (especially sight and hearing) are still developing. As people get older, there is a decline in visual acuity and the sensitivity of hearing and smelling. There are people who are less able to see, hear, smell or feel as a result of diseases, disorders or accidents. Limitations to seeing and hearing can to a certain extent be compensated by the various aids available for this (spectacles, contact lenses, hearing aid, high-tech night sight optimisers etc.). Blind and partially-sighted people can use a stick to feel their way in their surroundings, and a guide dog can also serve as their 'eyes'.

The input from the eyes, the visual sense data, is processed in the brain. This is done selectively. Additional information is supplied by the hearing and to a lesser extent the other senses. Not everything attracts attention, and not everything that might, technically speaking, be seen, heard, smelled or felt is actually noticed. More information comes towards us than our brains can process. People can often react to only one thing at a time. The attention is attracted by eye-catching things: objects that are large or brightly-coloured, or contrast with their background; loud noises, noises of a certain pitch; movement, flashing, sudden appearance, a bang etc. Also the extent to which people are expecting something of that kind, the familiarity and acquaintance with it, plays a role. People's attention can be distracted by eye-catching things or occurrences, because they are performing actions that have nothing to do with the walking, riding or driving task, because their minds are

elsewhere, or because they are not alert and therefore can apply little attention to the walking, riding or driving task (Vlakveld, 2002).

In traffic it is visual information that in general is most important. In the case of pedestrians and cyclists, the hearing also plays an important role in attracting attention. People with partial sight also orientate with smells, touch and the vibrations they pick up. It is also well known that the faster one travels, the narrower one's field of vision is. In addition, characteristics of the vehicle used can also interfere: wearing a moped or motorcycle helmet can prevent or hinder people from hearing the sounds around them, and the peripheral vision is somewhat restricted; engine noises mask envrioning noises, window frames and coloured windows restrict vision etc.

It is also known that driving speed is a determining factor for observation. The faster one is driving, the narrower is the field of vision and the less one can notice of the environment.

Table 36 Estimation of potential of improving perceptual faculties

Issue (1)	Size of group (group no.) (2)	Accident risk per person (3)	Influence on number of accidents (4)	Influence on seriousness of consequences (5)	Openness to direction (6)
use of (technical) aids	3,000,000 [15, 16, 17, 18, 19]	+	++	0	****
training concentration	800,000 [10, 11]	+	+	0	**
training search strategies	1,000,000 [10, 18]	+	+	0	**
raising awareness of negative relation driving speed - perceptual faculties	2,300,000 [12, 13, 14]	+	+	++	****

Diagnosis and prognosis

Diagnosis and prognosis are based on a person's (limited) perceptions, traffic knowledge and traffic insight. In residential areas, where there is little traffic and the traffic is not going fast, the skill regarding diagnosis and prognosis is in general not so critical. However, it is critical in complex situations, where it is necessary to make decisions in a short time. Then, in addition to perception, knowledge and insight, the speed of information processing is also important.

Children and people with mental limitations cannot be expected to have a great deal of traffic knowledge and insight. In general they have considerable difficulty with estimating speed of traffic and what others can and cannot do. Moreover, the speed of their information processing is relatively low. They are consequently likely to make mistakes in their diagnosis and prognosis, which cannot be better than their stage of development permits.

People with reduced vision or hearing have to make their diagnosis and prognosis on the basis of limited input. In general, they are fairly aware of their limitations and wide safety margins are built in. However, they are still more likely to make mistakes in diagnosis and prognosis than able-bodied people. Training in the context of rehabilitation can help, albeit in a limited way, to improve diagnosis and prognosis to some extent.

Elderly people have acquired a great deal of traffic insight and traffic experience during their lives, and therefore manage to estimate reasonably well what others can or cannot do. It is true that impaired visual faculties make it more difficult to estimate travelling speeds, but they compensate for that by building in wider safety margins. Traffic experience also compensates in many cases for their slower information processing. After all, it means that they know what they must look out for in familiar situations and they do not have to estimate consciously all the risks. A problem is that they do not always remember what has changed in the traffic system over the years, especially as regards the rules and the increasingly hectic nature of traffic.

Table 37 Estimation of potential of improving diagnosis and prognosis

Issue (1)	Size of group (group no.) (2)	Accident risk per person (3)	Influence on number of accidents (4)	Influence on seriousness of consequences (5)	Openness to direction (6)
Training traffic insight children / young people	2,300,000 [9, 10, 11, 12, 13]	0 / +	+	0	**
Training compensation for limited vision and hearing	1,000,000 [15, 17]	+	+	0	***
Brushing up knowledge and insight	2,000,000 [22]	0	0	0	****

Behavioural intentions

Behaviour in traffic is influenced by values and norms of the particular road user. The perception of risk plays an important role in this. Most vulnerable groups have a pronounced sense of danger, leading to a defensive, anticipatory attitude. Young people aged 12 – 25 are an exception to this. This is partly due to poor knowledge of the traffic rules and also low awareness of their environment. They feel that nothing much can happen to them. They estimate the chance of being caught out for dangerous traffic behaviour as low. It is therefore reasonable to assume that a high subjective chance of being caught out will influence them to behave more safely.

Table 38 Estimation of potential of improving behavioural intentions

Issue (1)	Size of group (group no.) (2)	Accident risk per person (3)	Influence on number of accidents (4)	Influence on seriousness of consequences (5)	Openness to direction (6)
Improve knowledge of rules	2,300,000 [12, 13, 14, 20]	0	0	0	***
Raise (subjective) chance of being caught out	1,800,000 [13, 14]	+	+	0	***

Decision-making routines

Experienced road users perform the necessary actions almost automatically (skill based decisions). Somewhat less experienced road users have to work out what previously devised solution or rule they now have to apply. Already for this they need rather more time (rule based decisions). Inexperienced road users, on the other hand, do not yet have any ready-made solution and therefore first have to analyse the problem before performing an action (knowledge based decisions). It is clear that for this they need considerably more time. In complex situations, such as a lot of fast traffic coming from different directions, there is little time available and time pressure can occur. An important factor in this is the speed at which information can be processed. Children, elderly people and people with functional limitations are at a disadvantage on this point. Elderly people can draw on their considerable experience; this is also the case for many people with functional limitations, but because of their limitations they often need extra time to react. Children and people with functional limitations are thus at a double disadvantage here. For all three groups one can say that training their decision-making routines can improve their decisiveness. This will prevent them from encountering time pressure in such cases, and running the risk of performing a wrong, risky action.

In the 1980s the Traffic Research Centre (Verkeerskundig Studiecentrum) developed safe road-crossing routines for young children. Parents and teachers could train their children in these, reducing the age at which they could be considered safe to cross the road by themselves. However, there is a risk of the children over-estimating their own abilities.

For adults, skill tests and traffic refresher courses are used to investigate whether people's decision-making routines are (still) the safest, and if necessary to update these. In the future there will also be electronic information systems that can support quick decision-making.

Table 39 Estimation of potential of improving decision-making routines

Issue (1)	Size of group (group no.) (2)	Accident risk per person (3)	Influence on number of accidents (4)	Influence on seriousness of consequences (5)	Openness to direction (6)
Training road-crossing routines	800,000 [partly 8, 9, 11, 17, 18]	++	+	0	***
Decisiveness training courses	2,000,000 [22, 23]	0 / +	0 / +	0	***

Control over impulses

It is almost impossible for children to concentrate on the traffic for a long time. Also in the case of young people aged 12 – 18, 'wildness' is still in evidence and controlling impulses is far from perfected. Educative programmes can change this little if at all. Elderly people and people with a disability, on the other hand, concentrate on the traffic task when in traffic, influenced by their estimation that traffic is dangerous.

Table 40 Estimation of potential of improving control over impulses

Issue (1)	Size of group (group no.) (2)	Accident risk per person (3)	Influence on number of accidents (4)	Influence on seriousness of consequences (5)	Openness to direction (6)
Training in controlling impulses / children	2,500,000 [8, 9, 10, 11]	++	+	+	**
Training in controlling impulses / young people	900,000 [12, 13]	+	+	+	**
Training in controlling impulses / adults	12,000,000 [14 - 23]	0	0	0	**

Action skill

Action skill in traffic entails, among other things, that one has good control of the physical functions and has adequate reflexes. In the case of children, as mentioned above, if they are trained early in certain risky actions, such as road-crossing routines, turning left on the bicycle (in countries where traffic drives on the right; in the others: turning right), this can help them to become skilled in traffic at an earlier age. For people with a functional limitation, learning to cope with the limitation is an important aspect. With increasing age, people become naturally less supple, so their action skill declines. Fitness training, including walking and cycling, can help to keep their action skill up to standard.

People from countries where traffic drives on the left and where there are few cyclists are at risk in the Netherlands because they are not in general prepared for traffic coming from the 'wrong' direction and for the presence and unpredictability of cyclists. They are particularly at risk as a pedestrian. They can be prepared for this by providing information about the special circumstances in this country.

Table 41 Estimation of potential of improving action skill in traffic

Issue (1)	Size of group (group no.) (2)	Accident risk per person (3)	Influence on number of accidents (4)	Influence on seriousness of consequences (5)	Openness to direction (6)
Training in critical actions	2,500,000 [8, 9, 10, 11]	+	+	+	****
Training in coping with limitations	1,000,000 [15, 16, 17, 19]	++	+	+	**
Informed foreigners	?	++	+	+	****
Training in controlling impulses / adults	12,000,000 [14 - 23]	0	0	0	**

Vehicle skill

Walking is the most basic mode of travel; it is assumed, incorrectly, that everyone is capable of it. Walking must, like all other traffic skills, be learned. Toddlers learn by trial and error. People with a disability learn it again in the context of their rehabilitation.

Also when it comes to cycling, it is assumed that people, with the exception of children, have automatically mastered the art. It takes children years to become an accomplished cyclist. In the case of immigrants to the Netherlands, but also elderly people, it is found that cycling skill should not (anymore) be taken for granted, and training courses are sometimes strongly advisable.

If someone can ride a bicycle, the transition to the moped is usually not too great. A moped can be ridden faster; a moped has more technology on board than a bicycle. It is less easy with a moped to safely ride away, manoeuvre and brake than with a bicycle. The tricks for performing these actions can be learned fastest and best in a practical moped training course.

Special vehicles, such as skates, electric scooter and four-wheeled moped, each require their own skills. Instruction and training are ways of mastering these quickly and thoroughly.

Driving a motor vehicle has become increasingly difficult over the course of time, due to the ever-increasing complexity of the traffic. It is true that the ergonomics of cars, motorcycles, vans and trucks has improved, especially the uniform positioning of the controls and the standard use of power brakes and steering, but new functions are being introduced all the time, such as information systems, which require new skills.

With increasing age, people become less supple, it becomes more difficult to keep an eye on traffic coming up behind and intersecting traffic, and it becomes more difficult to handle complex situations. The decreasing driving/ riding skill should be monitored, and where necessary corrected or compensated.

Driving ability tests, such as those of the Platform for Elderly and Mobility (BROEM), can be used to detect any limitations. In some cases, supplementary driving lessons are advisable in order to eliminate risky routines that have crept in. Compensation is sometimes also possible by restricting road use to times and situations that are less risky, or by attaching supplementary equipment to the bicycle or in the car (mirrors etc.).

Table 42 Estimation of potential of improving vehicle skill

Issue (1)	Size of group (group no.) (2)	Accident risk per person (3)	Influence on number of accidents (4)	Influence on seriousness of consequences (5)	Openness to direction (6)
Teaching how to walk	1,000,000 [8, 15, 19]	+	0	0	**
Cycling skill	2,000,000 [9, 10, 11, 19, 20]	++	++	0	****
Moped skill	400,000 [13,]	++	++	+	****
Compensation for limited suppleness	2,000,000 [19, 22]	+	+	++	***
Skill with special vehicles	?	+	++	+	****
Keeping motor vehicle skill up to standard	2,000,000 [22, 23]	+	+	+	****

5.4.1.2. Group/company

Individual people are (locally) members of (social) groups and the group can influence the traffic knowledge, attitude to traffic and traffic skill of individuals. Only in the case of professional drivers is functioning well in traffic a dominant issue. In other cases, functioning in traffic must be seen as a means to realise other group goals, and it is therefore a subsidiary goal. That is not to say, of course, that the group concerned has no formal or informal task or function in that area. An important issue in this connection is the increase in the care population. By having attention for one another's functioning in traffic, any problems can be prevented in time.

The social world of children is very much determined by the group in which they find themselves. In that group setting, they learn how to handle their environment and they can also be made 'ready-and-able for traffic'. In that connection it is mandatory for primary schools to give attention to traffic and road safety. Lessons should include instruction on how seriously they should take traffic dangers, what they must know about traffic and road use (traffic knowledge) and what values and norms apply with regard to traffic. In addition, it is advisable for schools to give practical training and to exert influence on parents to train their children in the necessary traffic skills, and to set a good example themselves.

Secondary schools also have a function with respect to traffic education. Here, knowledge is less important than traffic insight and attitude. However, the relations between the school and the parents are not as close as at primary school. A further point is that parents themselves have less of a grip on the social world of their children. It is therefore not realistic to cherish high expectations as regards calling upon parents to improve the traffic behaviour of secondary school students. Group norms are very important, especially for secondary school students, and form the framework for their traffic behaviour.

Table 43 Estimation of potential of influencing groups

Issue (1)	Size of group (group no.) (2)	Accident risk per person (3)	Influence on number of accidents (4)	Influence on seriousness of consequences (5)	Openness to direction (6)
Traffic education primary school	1,700,000 [9, 10, 11]	+	+	+	****
Calling in parents of (young) children	1,700,000 [9, 10, 11]	+	+	0	***
Traffic education secondary school	900,000 [12, 13]	+	+	0	****
Influence group norms 12-18 year- olds	900,000 [12, 13]	++	+	+	**
Driving schools	500,000 [14]	+	+	0	****
Training via associations	2,000,000 [13, 14, 22]	0 / +	0 / +	0	***
Safety culture of transport companies	?	+	+	0	****

In order to obtain a driving licence, lessons have to be taken with a driving school. It is not a formal requirement for obtaining a theory certificate, but it is a good input. Some secondary schools offer courses for the moped certificate or even practical moped courses.

Associations can play an important part in traffic training, and shaping the attitude to traffic. Skaters associations offer their members the chance to learn basic skills; cycling associations are 'automatically' engaged with traffic problems of the mountain bike or racing bike. Associations of elderly people can place traffic skills as a pedestrian, cyclist and car driver on their agenda.

5.4.1.3. Social sector

At the regional and national level, people and groups/ companies belong to one or more social sectors. In relation to vulnerable road users, these are, among others, the sectors of Traffic, Education, Social Affairs and Health.

The Traffic sector in this connection bears responsibility for promoting the traffic and transport interests of the vulnerable road users, including road safety. People's interests are not the same. It is therefore important that the sub-interests should be well-represented by strong organisations like the United Road Safety Organisations (3VO), the Cyclists' Union, the Royal Dutch Touring Club (ANWB), the Council for the Disabled (Gehandicaptenraad), elderly people's associations and suchlike. That is especially important for groups that 'by their nature' do not have a strong negotiating position, such as people with low incomes, with little social standing or with mental or physical limitations. It is evident here that the most vulnerable groups require some extra support.

The framework for mobility and road safety is formed by the traffic and transport policy of the Ministry of Transport, Public Works and Water Management (V&W). The Ministry is responsible for the functioning of the traffic and transport system. This also includes the rules for the use of that system. Within this framework, guarantees must be given for safe mobility of vulnerable groups. Instruments for this are legislation and regulations, agreements about provisions for the different users, planning of provisions and suchlike, knowledge and knowledge management.

Although one might think that the Traffic sector would be the most important umbrella for vulnerable road users, in most cases the influence of other sectors is just as important or even more important. People do not feel that they belong to the Traffic sector, but feel more affinity with the sectors Education, (children, secondary school students), Welfare, Public Health and Sport (people with a disability, addicts and homeless people, people with mental limitations, people with reduced stamina) and so on. The social position, and hence often the position in the traffic system, of people is more strongly influenced by those sectors than by the Traffic sector. One may therefore speak of shared responsibility.

As regards schoolchildren, the influence of the Education sector is indisputably the most influential. That is where children's traffic education is largely determined. With regard to traffic education, the Traffic sector is the demand-side party. The preconditions for traffic education are formed by agreements and regulations concerning the education programme, in particular the 'Key Objectives' of that education. Children's safety is best served with key objectives that emphasise traffic skill and independence. It is also important that the subject Traffic should be structurally included in the curricula, that effective teaching methods and teaching materials should be available for it, and that sufficient time should be set aside for traffic education. Needless to say, the Traffic sector has an important role in monitoring the quality of the implementation of the agreements.

For people with a disability, people without work and elderly people, the sector Welfare, Public Health and Sport is highly influential. The responsibility of this sector is that the care of the said groups is up to standard, that they can function in society as well as possible (within set limits). Ensuring their independence is an important aspect of this, for which it is crucial to promote people's good physical and mental health.

Finally, it can here be noted that the Tourism sector should also play a part in the road safety of vulnerable groups. An important point in this context is that people visiting the Netherlands should be informed about the special circumstances. To those from countries where traffic drives on the left, it should be pointed out that traffic here drives on the right, and therefore comes from the 'wrong' direction. They should also be prepared for the sheer numbers and the characteristics of Dutch cycle traffic.

Table 44 Estimation of potential of influencing social sectors

Issue (1)	Size of group (group no.) (2)	Accident risk per person (3)	Influence on number of accidents (4)	Influence on seriousness of consequences (5)	Openness to direction (6)
Strong non-governmental organisations	8,000,000 [all groups]				*****
Rules with a view to safe mobility of vulnerable groups	8,000,000 [all groups]				*****
Vision and agreements about introduction of provisions	8,000,000 [all groups]				*****
Knowledge and knowledge-management regarding vulnerable road users	8,000,000 [all groups]				*****
Adequate key objectives of traffic education	2,700,000 [8, 9, 10, 11, 12, 13]				****
Availability of good teaching materials	2,700,000 [8, 9, 10, 11, 12, 13]				***
Monitoring realisation of key objectives of traffic education	2,700,000 [8, 9, 10, 11, 12, 13]				*****
Promoting health	3,500,000 [15, 16, 17, 18, 19, 22]				***
Information for foreign visitors	?				****

5.4.2. Social and public context

This section describes the 'schedule of requirements' that should be set for the 'social and public context' of the Pizza model. The three levels to which the various 'requirements' relate are respectively 'people in the environment', 'standards' and 'social values'.

5.4.2.1 People in the environment (traffic)

The 'people in the environment' of vulnerable road users mainly refers here to the road users and other people in the environment who in some way or another have an influence on the functioning of vulnerable road users. Most attention here is focused on the road users who have a privileged position compared with the vulnerable groups: in particular, motorised traffic. The information in the various Fact Sheets shows that what is expected of them in terms of understanding and compassion is as follows:

- that they should moderate their speed when travelling in a residential area or other place where they can constitute a danger for vulnerable road users
- that they should accept that pedestrians, especially children, act without thinking
- that they should take account of the fact that it is mandatory to give free passage to people who are (recognisably) blind, are visually impaired or have difficulty with walking
- that they should give children within residential areas the opportunity to play safely on the street
- that they should take account of idiosyncrasies of secondary school students
- that they should be aware that moped riders and motorcyclists are substantially more vulnerable than they are themselves, and that it is therefore important to keep sufficient distance from them.

There are also wishes reciprocally between vulnerable groups. Pedestrians, especially those with a disability, would prefer cyclists not to ride their bicycles in the pedestrian domain and not to park them in such a way as to cause an obstruction.

Table 45 Estimation of potential of influencing people in the environment

Issue (1)	Size of group (group no.) (2)	Accident risk per person (3)	Influence on number of accidents (4)	Influence on seriousness of consequences (5)	Openness to direction (6)
Understanding and compassion	8,000,000 [all groups]	+	+	++	***
Ban on bicycles on the pavement	2,000,000 [8, 9, 10, 16, 17, 18, 19]	+	0 / +	0	****
Keep to traffic rules regarding pedestrians	8,000,000 [1, 2, 23]	+	+	++	****
Take account of moped riders and motorcyclists	500,000 [4, 5, 6]	+	+	++	***

5.4.2.2. Standards

In the case of standards, a distinction can be made between formal and informal standards. Formal standards regarding traffic behaviour and the traffic system come in many gradations of strictness of enforcement. The main gradations are:

1. standards that may certainly not be infringed (infringements are punished, regardless of whether anything went seriously wrong or not). Such standards are written down in laws and jurisprudence. These are the formal rules.
2. standards that may be infringed only in the case of good arguments (in serious cases infringements may be punished). These standards are also written down, but sanctions can only be imposed when something has gone seriously wrong (liability).
3. standards that in general are supported, but to which one does not necessarily have to conform ('good policy'). Such standards are not laid down as laws or codes of conduct, but are quite generally accepted as decent behaviour.

As regards vulnerable road users, there should be standards for the extent to which they are capable of using the traffic and transport system, for the actions of road users and for the management of the traffic and transport system.

Table 46 Examples of formal and informal standards

	Formal	Informal
'Strict'	Road Traffic Act, Civil Code	Strong/fast before weak
'Serious'	General municipal bye-laws, administrative law	Cheeky before reserved
'Polite'	Etiquette	Large group first

The above table gives a number of examples of formal and informal standards. Formal and informal standards can be at odds with one another. It must be noted that there are also informal standards within decision-making bodies. Safety in the city centre is more often regarded as important than safety in a working-class district.

Capability to use traffic and transport system

The traffic and transport system is made up of sub-systems. The most basic sub-system is that for pedestrians. From that system no-one can be excluded, because that would undermine the function of the traffic and transport system, namely to permit all people to travel. In order to make use of the other sub-systems, such as those for public transport, the bicycle and motorised traffic, people have to make use of the pedestrian domain. The pedestrian domain must be a free place for everyone on foot; no requirements can be imposed on pedestrians with respect to task competence. The pedestrian domain is, of necessity, also used by people who cannot use the other sub-systems, such as wheelchair users, electric scooter users and skaters. The mass and speed of those modes of travel are greater than those of the pedestrian and their use demands a certain degree of skill. However, only informal requirements can be set for their use.

The sub-system for public transport can be seen as an extension of the pedestrian system. That too must in principle be open for all people and must therefore always be accessible from the pedestrian domain.

For the other sub-systems it is advisable to have clear rules regarding the requirements that are imposed in terms of task competence (including requirements regarding physical and mental

condition) for road use in various situations: what must someone be able to do if they wish to be permitted to use the sub-system concerned.

The use of the bicycle sub-system must have a low threshold. Most people can learn to cycle relatively quickly; the bicycle is a simple and affordable mode of transport and in the Netherlands there is access by bicycle to just about everywhere. Cyclists generally constitute a danger to pedestrians only to a limited extent. For all those reasons, the requirements regarding task competence for use of the bicycle can remain restricted to (informal) requirements in terms of skill and physical and mental condition.

When a vehicle can travel faster than around 30 km/h and has a greater size and mass than the bicycle, higher requirements of task competence must be imposed. After all, the higher speed in itself makes it more difficult to control these vehicles and makes them more risky both for the drivers/ riders themselves and for other road users. Because of the risks, it is advisable that minimum requirements should be laid down with respect to the capability of the drivers/ riders and their driving/ riding skills. They must be physically and mentally capable of driving/ riding the vehicle concerned, they must know the applicable rules of conduct, and must be able to drive/ ride the vehicle in such a way that they do not cause danger to themselves and the people around them.

Table 47 Estimation of potential of capability requirements of road users

Issue (1)	Size of group (group no.) (2)	Accident risk per person (3)	Influence on number of accidents (4)	Influence on seriousness of consequences (5)	Openness to direction (6)
No requirements regarding pedestrians' task competence	16,000,000 [all groups]	-	-	-	*****
Informal requirements regarding cyclists' task competence	8,000,000 [3, 4]	-	-	-	*****
Formal requirements regarding moped riders' task competence	1,000,000 [5]	+	+	+	*****
Formal requirements regarding motorcyclists' and car drivers' task competence	8,000,000 [6, 22 among others]	+	+	+	*****

Rules of behaviour for road users

As regards the formal rules of behaviour for road users, it can be stated that in practice those rules are not always considered to be equally important, not only by the 'public' but also by those who enforce the traffic rules; and in fact, the formal rules in themselves are less important for behaviour than the informal rules to which road users conform. *Public* tolerance for deviant behaviour must be extremely low. This will make it clear, also for vulnerable road users, what may and may not be expected. The point is that there should be a generally known and widely accepted system of behavioural rules, which guarantees the safe mobility of vulnerable groups.

Important behavioural rules in this connection include:

- in residential areas the true maximum speed is 30 km/h and not 'a little more'
- in residential areas children are permitted to play on the street; motorised traffic and other non-pedestrian traffic must behave as a good guest
- at allocated crossing points, pedestrians and cyclists are truly given free passage; stopping for pedestrians must once again become the normal behaviour
- no parking is permitted close to crossing points on main roads, on both sides of the road for a distance of 25 meters (2 seconds stopping distance view) from the crossing point
- in the pedestrian and cyclist domains, routes are kept free of obstacles (no dumped bicycles, parked cars, displays, advertising boards, rubbish containers etc.)
- NL-approved protection devices for children in the car or on the bicycle are standard practice and are used by everyone
- the attachment of collision-unfriendly elements on cars ('bull bars') is impermissible
- trucks and vans are fitted with blind-spot mirrors and closed side panels and emit a penetrating noise signal when reversing.

Table 48 Estimation of potential of behavioural rules in consideration of vulnerable groups

Issue (1)	Size of group (group no.) (2)	Accident risk per person (3)	Influence on number of accidents (4)	Influence on seriousness of consequences (5)	Openness to direction (6)
30 km/h in residential areas	16,000,000 [all groups]	+	+	+	*****
Motorised traffic guest in residential areas	8,000,000 [3, 4]	+	+	+	*****
Unhindered crossing by pedestrians and cyclists	16,000,000 [5]	++	++	+	*****
No parking near crossing points	16,000,000	+	+	+	*****
Obstacle-free pedestrian and cyclist domains	16,000,000	+	+	+	****
Use of good protection devices	1,000,000 [8, 9]	+	+	+	***
Ban bull bars etc.	8,000,000	+	0	++	*****
Protection devices for trucks and vans	8,000,000 [all groups]	+	+	++	*****

Management of the traffic and transport system

The various authorities are jointly responsible for the management of the traffic and transport system. The traffic and transport system must be and must remain suitable for vulnerable road users. It must be clear what requirements are imposed on traffic provisions and means of transport, what standards must be fulfilled by the management and organisation of these, and how the use of the system is regulated. The requirements set for provisions and resources for traffic are discussed in sections 5.4.3 and 5.4.4.

An important point with respect to management is consistency of the approach. If the highways management authority gives little or no attention to the quality of pedestrian and cycle provisions, this

gives the signal that these are not serious modes of travel. This has consequences for the credibility of rules that are laid down regarding the behaviour of cyclists and pedestrians. The same applies for the enforcement of rules aimed at the protection of vulnerable road users. Citizens must be able to count on the established rules being implemented and enforced in a consistent manner. The perceived chance of being caught influences the extent to which people feel compelled to obey behavioural standards.

Pedestrians and cyclists are permitted to make use of the provisions available for them, regardless of their task competences. If a certain category of people are permitted to use a provision, this means in principle that the manager of the provision must ensure that such use is actually possible. In the framework of the WALCYNG project, the WALCYNG Quality Scheme (WQS) has been developed. This can be used as a standard for the quality of pedestrian and cycle provisions. Part of the WQS is adequate maintenance of the public space. Citizens should be able to derive rights from this.

In residential areas there is often too little space available to permit large trucks to use the road. Large trucks are intimidating and also actually dangerous for pedestrians and cyclists, and should therefore be structurally excluded from residential areas.

Table 49 Estimation of potential of the management of the traffic and transport system

Issue (1)	Size of group (group no.) (2)	Accident risk per person (3)	Influence on number of accidents (4)	Influence on seriousness of consequences (5)	Openness to direction (6)
Consistent management of the public space	8,000,000 [all groups]	+	+	+	*****
Enforcement of traffic rules in favour of vulnerable road users	8,000,000 [8, 9, 10, 16, 17, 18, 19]	+	+	++	*****
Implementation of WALCYNG Quality Scheme, monitoring, road safety audit	8,000,000 [1, 2, 23]	+	+	+	*****
Exclusion of large trucks from residential areas	8,000,000 [4, 5, 6]	+	+	++	*****

5.4.2.3. Values

In order to fill in the Fact Sheets, a survey was made of, among other things, social values that improve the position of vulnerable road users. From this the following values and visions emerged:

- Walking is healthy and must be encouraged for this reason in itself.
- The basis of the traffic and transport system is formed by the availability of a pedestrian network that can be used by everyone, and the public transport system connected with this for longer distances. For these modalities, a person does not need to have their own means of transport. The 'next best' is the bicycle (which costs almost nothing).
- When (large) events are organised, a basic principle must be accessibility by public transport.

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- Walking and cycling together account for a larger part of people's mobility and the functioning of society than the car. These modalities should therefore receive at least as much attention in policies.
 - The fact that requirements are not imposed on the task competences of pedestrians means implicitly that the environment must be arranged in such a way that everyone can actually make use of it, and also that requirements must be imposed on other road users in order to guarantee the safe mobility of pedestrians.
 - The level of civilisation can be measured by the way in which people who are less fortunate are treated. Solidarity with and compassion for such people are a 'great good'. People with serious problems must not be abandoned to their fate, but rather helped; compassion for and tolerance of people with a disability is essential; the protection of vulnerable individuals is a basic principle of human action.
 - Design for All: structure society in such a way that everyone can function in it. Everyone has a right to safe mobility, and independent mobility must be no more restricted than is absolutely necessary. Measures must be intelligible, low-threshold and attuned to use.
 - With regard to elderly people, the basic principle is applied that they may not be compelled to move from their familiar surroundings ('growing old in place'). The consequence of this is that their essential mobility must be facilitated or that increasing car use by elderly people must be tolerated.
 - With regard to young people, there is a double standard: in traffic it is not accepted that young people act experimentally. This double standard must be eliminated.
 - The social costs of economic activities must form the criterion. The costs of longer trips due to increases in scale and concentration that businesses shift onto individual citizens (who together constitute society) must be charged to them. In this connection, for example, a higher value must be placed on the independent mobility of elderly people than on the commercial interests of companies.
 - The interaction between the citizen and his/her government must be improved. This must be done by, among other things, encouraging the citizen to report to local authorities any 'simple' defects of the pavement and crossing facilities; the local authority should react very quickly to such a report.
 - In the case of change processes, it is advisable to bring in representatives of stakeholders, i.e. also vulnerable groups, as equal partners.

Public acceptance of an approach is an important aspect. The quality requirements with respect to the 'hardware' of the traffic system, spatial environment, vehicles and the person him/herself must be perceived by those concerned as realistic. This applies in particular for those who are responsible for the design and management of the public space: local authority administrators and their officials. Local authority administrators are highly sensitive to public opinion (or what passes for this). In the development of the quality requirements, this fact must play a role: what requirements are acceptable and how can less immediately popular requirements also be made acceptable.

5.4.3. Spatial environment (planning)

This section lists the quality requirements that the spatial environment (planning) should fulfil in order to guarantee safe mobility of vulnerable road users. The description of the quality requirements links in with the classification made in the Pizza model (see Figure 5, Section 4.3.3.). As regards the spatial environment, a distinction is made between the physical environment (site - traffic situation), the network (route) and land use (spatial planning - classification of current and future zoning plans). It must be noted that in this study, statements are made only about the public space, that is to say, all

the space that is or should be freely accessible for everyone: streets, paths, squares, public parks etc. The central focus here is the Design for All principle, the principal aim of which is that (virtually) everyone who so wishes can make untroubled use of the public space. This means that the measure of things must not be the average person, but rather people who have the most limitations in the situation concerned, and who run more than the average risk. Determining factors in this are:

- what it must be possible to do in the public space (the needs, the functions of the public space now and in the future)
- expectations with respect to the use (how much use will be made of the area, the site or the facility; to what extent is misuse to be expected and what can be done about this; what conflicts in use are to be expected and what can and/or must be done about these; are people clear about what behaviour is expected of them etc.)
- criterial characteristics of people (actual skills, mental and physical capacities, including perception, orientation etc.)
- practical feasibility and affordability of management and maintenance. Making a good design in one go is cheaper and also presents fewer management problems than adjusting the design or making improvements a later time.

The Fourth Memorandum on Spatial Planning introduced the concept 'spatial quality'. This involves a distinction between three values, namely the *use value*, the *experiential value* and the *future value*. In addition to this trio of values, the Fourth Memorandum on Spatial Planning distinguishes another five 'basic values' which are extremely important for the everyday-life environment. These five basic values are: a well-maintained environment, a clean natural environment, a safe environment, spatial freedom of choice and spatial diversity. It is clear that these values are also applicable to the spatial quality for vulnerable road users. It must be noted that 'spatial quality' is not a fixed concept. It is influenced by the spirit of the times (RARO, 1990).

With respect to safe mobility of and for vulnerable road users, the emphasis lies on the functionality, in this case the use value now and in the future (= future value). As regards the experiential value: this largely determines whether and to what extent people think they can make use of the public space. If they think it is dangerous, even if that is not objectively true, they will avoid such a place. In cases where the behaviour of road users is undeniably influenced by the experiential value, this will also have to be included in the quality requirements. As regards future value: the layout of the public space costs a great deal of money and lasts for a very long time. It is therefore advisable to take account of future developments.

The table below (Table 50) indicates that various quality levels are possible with respect to the spatial environment. In this report it is assumed that at least the 'basic quality' level must be attained and that in most cases the 'good quality' level should be attainable.

As regards the functionality of the spatial environment for traffic, many studies have already been conducted, so a fairly large amount of knowledge is available on that subject. For the layout of the traffic space, the guiding principles are the safety principles published by the Foundation for Scientific Research into Road Safety SWOV in 'Towards Sustainable Road Safety' (Koornstra et al. 1992).

These principles are:

1. prevent unintended use of the infrastructure
2. prevent encounters involving large differences in speed, direction and mass
3. prevent uncertain behaviour of road users.

Table 50 Possible quality levels

Quality level	characteristic property in keyword	functional requirements	perception of the provision
Basic	acceptable	> 95% of people can use the public space independently (esp. travelling), without likelihood of physical injury	- it's all right, but it's only just adequate; user has to be tolerant about it; - perception: 'not positive'; 'surely it could be better'
Good quality	comfortable	- everyone can use the facilities in the public space independently and safely - > 95% of people can do that comfortably	- good provision; no threat whatsoever; comfortable - perception: neutral (seen as a given)
'Super'	enjoyable	- everyone can use the facilities in the public space comfortably - > 95% of people feel (pleasantly) pampered there	- very good provision - perception: (very) positive

5.4.3.1. Physical environment (site)

Regarding the design of the infrastructure (= traffic situations), knowledge is available from a number of publications, projects and initiatives. That knowledge forms a useful starting point for the development of quality needs profiles. As stated in Chapter 4, account can be and is taken of consequences of changes in the vehicle fleet in the guidelines for the design of infrastructural provisions, because the characteristics of vehicles can be established relatively simply and conclusively. On the basis of data available on such vehicle characteristics as width, height, weight, driving characteristics and so on, it is possible to hypothesise a (fictive) 'Standard Vehicle'. For road users, that is considerably more difficult, but there have already been a number of projects that have provided basic knowledge for this. In June 2001 a European Workshop was held in Brussels on the subject International Human Factors Guidelines for Road Systems. The report of this workshop²⁸ lists the current knowledge about Human Factors (that is, task competences), with a central focus on the identification of basic principles. The Workshop gave (as yet) little if any attention to characteristics and quality needs of specific groups and trends in these.

For a number of specific groups, task analyses in relation to infrastructural provisions are available. With regard to the task competences of young children, thorough task analyses were conducted around the start of the 1980s by the former Traffic Research Centre (Verkeerskundig Studiecentrum). Recently the Foundation for Scientific Research into Road Safety (SWOV) carried out studies on the task competences of older drivers, which were also translated into requirements that must be set for road design.²⁹ These studies made use of, among other things, the recent American publication 'Older Driver Highway Design Handbook'. Good publications are also available concerning the design requirements relating to colour-blind people (Colour Blindness Foundation SBC). Important lessons from these studies are:

²⁸ Netherlands Organisation for Applied Scientific Research TNO Report TM-02-D009

²⁹ Foundation for Scientific Research into Road Safety SWOV Report R-2002-8

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1. Ensure that people know at all times where they are, and offer sufficient possibilities for them to be able determine where they must go;
 2. Minimise complexity: the simpler the better; especially in complex situations, predictability and time pressure are important factors. In complex situations, surprises must be prevented; avoid confusing road markings and road signs (need for uniformity, homogeneity and consistency in the approach). Do not use experimental or 'fantasy' measures, such as mini-roundabouts, diverted cycle paths etc. and choose a layout that allows people to determine their own time pressure (timely warnings, possibility of driving more slowly etc.). By using familiar, existing principles and familiar traffic measures, the older driver can make use of experiential knowledge and automatism; in complex situations this results in crucial time-saving in decision-making processes.
 3. Elderly people and people with very little driving experience need a wider lane width than experienced adults of 25 – 50, because of their greater swerving. This applies for the use of all vehicles: both the car and the bicycle.
 4. Use colours consistently everywhere in the same way, and never use red and green next to each other, but rather underneath each other. This applies especially in complex situations.
 5. In critical situations it is necessary to increase contrast; in twilight, rain and snow, a very sharp contrast is needed.
 6. In the design, take account of a stopping distance view of at least 2.5 seconds.
 7. Visibility and legibility of road signs requires extra attention. The signs and lettering used must be sufficiently large.
 8. Prevent dazzle; elderly people are more easily dazzled and the adverse effects of this last longer.

It must be noted that the knowledge regarding the actual task competences of road users, and the requirements that should be set for the layout and design of roads on the grounds of those competences, still leaves much to be desired. Thus, it is still unclear, for example:

- what requirements the existing layout and design of the infrastructure implicitly imposes on the various road users
- to what extent and under what circumstances road users can already at present not fulfil those implicit requirements
- to what extent there will be a change in this in the future, as a result of, among other things, the ageing of the population and the declining numbers of young people in the population
- what consequences that would have for road design now and in the future.

Although they are certainly not based on thorough task analyses and empirical research, it can nevertheless be stated that there are reasonably well-founded publications for pedestrians, cyclists and people with a disability,³⁰ from which one can distil what requirements the design of the spatial environment should fulfil. There are also numerous publications available concerning the requirements for children.

General³¹ requirements for safe mobility of slow traffic regarding the design of traffic situations (the site) are:

³⁰ Those publications are respectively the Handbook of Pedestrian Provisions (Wegwijzer Voetgangervoorzieningen - Pedestrian Association 1998), Signing up for the Bicycle (Tekenen voor de fiets - Information and Technology Centre for Transport Infrastructure CROW 1995), Handbook of Traffic Provisions for People with a Disability (Handboek Verkeersvoorzieningen voor mensen met een handicap - Ministry of Transport, Public Works and Water Management V&W 1984; now included in the Recommendations for Urban Traffic and Transport Provisions (Aanbevelingen voor Stedelijke Verkeers- en Vervoersvoorzieningen - CROW (under revision)).

³¹ These relate to the highest common denominator of functional requirements that must be set for the design of a concrete traffic site: a road section, a bend, an intersection, a crossing situation etc.

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1. There must be sufficient height and width available in order to carry out the necessary manoeuvres.
 2. It must be totally clear for whom the provision is made, both for the users and those who are otherwise confronted with it. In that connection, it is essential to have a clear distinction between the pavement and the road, especially when traffic at that site is permitted to travel faster than 30 km/h.³² Playing areas near the home must be recognisable as such, and be strictly separated from the roadway. Cycle paths must be recognisable as such. In connection with this, it is advisable to use a red surfacing material.
 3. When motorised traffic at a certain site is permitted to travel faster than 30 km/h, separation of types of traffic is required.
 4. In crossing situations, the view that the person crossing the road has of the traffic and vice versa must be such that they can see one another in good time, and the motorised traffic is capable of stopping for the person crossing the road. In crossing situations there may be nothing to restrict the view, such as obstacles or parked cars. In this connection, it is advisable, for instance, close to a school entrance/exit to ban parking on both sides of the road for some 100 metres. The crossing point must be appropriately marked for blind people.
 5. In places where the roadway must be crossed, it is necessary to have adequate provisions which make it possible to cross over without hindrance. This entails that there must be minimum waiting times in the case of crossing main roads, that the crossing must take as little time as possible, and that sufficient time must be given to cross the road. Uncertainty about the time still available must be prevented. Long crossings (for example over 2 x 2 carriageways) must be avoided, or at any rate divided into phased crossings. It must further be noted that an unfavourable regulation of traffic lights undermines the red-light discipline. At traffic lights, blind and partially sighted people need a sound signal that makes the green phase identifiable (rattle-ticker).
 6. In connection with the view of and from the motorised traffic, parking of cars in the pedestrian and cyclist domains must be prevented as far as possible.
 7. Pedestrian provisions must be comfortable to walk, with no major irregularities over which one might fall; otherwise, if the adjacent path or roadway is comfortable, that will be used instead, despite the higher risks (e.g. footpath = gravel, cycle path = tiles: people walk on the cycle path).
 8. In connection with use for pushchair, wheelchair and rollator, differences in height at crossing situations, gradients in the route and sharp slants and slopes must be kept to a minimum.
 9. The traffic environment must be 'forgiving'. After a mistake has been made, there must be sufficient time and space to stop in time or to avoid a conflict. This applies in particular for sites where there are many vulnerable people, especially e.g. school routes (taking account of behavioural limitations of children), shopping areas, residential streets. In this connection, in residential areas the intensities and speeds of motorised traffic must remain restricted. Without special provisions, two-way cycle paths are too risky at junctions to be used. Obstacles in the grass verge must be screened off.
 10. There must be no ruts in the road surface that is used by two-wheelers.
 11. Good, practicable bicycle parks are a necessity; inappropriate location or absence of bicycle parks/ racks causes considerable inconvenience and increases the risks for people with a disability.
 12. When construction work is in progress, adequate provisions are needed to ensure that pedestrians and cyclists are not forced to use the (dangerous) roadway.

³² In Designated Residential Areas (woonerven), where traffic may not travel faster than walking pace, separation of the pedestrian domain is not necessary.

13. Traffic situations can not, by definition, be geared to the requirements of special (non-standard) vehicles.

Table 51 Estimation of potential of an optimised physical environment (site)

Issue (1)	Size of group (group no.) (2)	Accident risk per person (3)	Influence on number of accidents (4)	Influence on seriousness of consequ- ences (5)	Openness to direction (6)
Provide means of orientation	2,000,000 [22,23]	+	+	0	*****
Minimise complexity	8,000,000 [all groups]	++	++	++	*****
Increase contrast in critical situations	2,000,000 [22,23]	+	+	+	*****
Stopping distance view 2.5 seconds	8,000,000 [all groups]	++	++	++	*****
Consistent use of colours	1,500,000 [colour blind]	+	+	+	*****
Sufficient width and height of roadway	8,000,000 [all groups]	+	+	+	*****
Visibility and legibility of road signs	2,000,000 [22,23]	+	+	+	*****
Prevent dazzle	2,000,000 [22,23]	++	+	+	*****
Clarity about user group of provision	8,000,000 [all groups]	++	++	++	*****
Separate different types of traffic where speeds above 30 km/h are permitted	8,000,000 [all groups]	++	++	++	*****
Adequate crossing situations	8,000,000 [all groups]	++	++	++	*****
Measures promoting visibility off/for people crossing road	8,000,000 [all groups]	++	++	++	*****
Comfortable provisions	8,000,000 [all groups]	+	+	+	*****
Pedestrian provisions suitable for wheelchair and pushchair	500,000 [15, 16]	+	+	+	*****
Forgiving traffic environment	8,000,000 [all groups]	0	+	++	*****
No ruts	8,000,000 [3, 4, 5, 6]	+	+	0	*****
Bicycle parks / racks	8,000,000 [all groups]	+	+	0	*****
Measures during construction work	8,000,000 [all groups]	+	+	+	*****

5.4.3.2. Network (route)

In studies of standards, attention is also given, albeit often indirectly, to the requirements that must be imposed on the quality of routes. Most of these are fairly universal. Thus, with respect to pedestrian, bicycle and motorised traffic networks, the requirements are that they must be connected, functional, recognisable and easy to follow, safe, comfortable and also attractive. In the following, the quality requirements for pedestrians (and those equated to them in the law) and cyclists are discussed in outline. Requirements that must be imposed on routes for motorised traffic (including the moped) are to be found in the Guidelines for the Design of Motorways (Richtlijnen Ontwerp Autosnelwegen - ROA) and Guidelines for the Design of Non-Motorways (Richtlijnen Ontwerp NietAutosnelwegen - RONA). The reader is referred to those documents.

Connected

It seems self-evident that a network, hence also one for pedestrians, cyclists and moped riders, must be connected; that is to say, they must be able to go to the place where they want to be (destination) from the place where they are (origin) via the network. In practice, however, it is far from self-evident, especially if limited task competences impose 'special' requirements on the quality of the route. A general truth in this context is further that the chain is as strong as its weakest link. If a link is missing somewhere, people simply cannot get to where they want to be. The basic value must be that all sites and buildings must be accessible via a pedestrian network that is separated from the fast traffic,³³ which is also suitable for people with a rollator, wheelchair, electric scooter and pushchair. In places where other networks are intersected, it must be possible to cross that road or railway without (great) danger to life and limb. It must at least be possible to fill in any missing links with public transport. All sites must also be accessible by bicycle. Within residential areas, however, it is not necessary, and in most cases even not advisable, to have a network separated from the fast traffic. For the crossing of other networks, the same applies as for pedestrians: it must be possible to cross in safety.

Functional

The requirement of functionality goes a step further than pure accessibility. It entails especially that the route must be:

- as short (direct) as possible
- as simple as possible (few turn-offs, crossings, no complex situations en route)
- free from hindrance (little or no hindrance from other road users, obstacles, smell or noise pollution etc.)

Recognisable and easy to follow

People need to know where they are and be able to find their way easily to their destination. They have to be able to recognise their route and there must be means of orientation for those who are not familiar with the area (such as street names and house numbers). For blind and partially sighted people it is necessary to provide 'guiding lines'; in places where such lines are absent, and where there is a chance of conflicts with motorised traffic and bicycles, guide lines and warning markings are required. Such route markings are especially necessary in the immediate vicinity of public transport stops and stations.

Cycle paths must be easily recognised as such, and it must not be possible to confuse them with footpaths or pavements. In connection with this, it is advisable to make them recognisable by means of red surfacing material.

³³ If the motorised traffic can and may not travel faster than walking pace, as in a designated residential or shopping area, separation is obviously not required.

For both the cycle and the pedestrian network, route signs are only necessary in places with an (important) function for recreational use, that is to say, where a relatively large number of people are not familiar with the area.

A not inconsiderable proportion of the Dutch population are unable to read or write well. For them it is also important that public transport routes should be recognisable.

Safe

One of the important principles within the Sustainable Safety Vision is that as much of the route as possible must follow the safest part of the infrastructure. For motorised traffic this means that as much of the route as possible must be covered on the relatively safe 'flow' roads and as little as possible through residential areas and on 'access' roads. For slow traffic, the situation is not so simple. Firstly, the distance to be covered weighs heavier in the balance. Diversions are met with greater resistance. For pedestrians and cyclists, it is important to minimise their need to cross main roads with a lot of fast-moving traffic ('access' roads and 'flow' roads); they must kept free, as far as possible, from conflicts with the motorised traffic. This also applies for confrontations with mopeds.

Comfortable

The more physical disabilities a person has, the more important is comfort during the trip. People with reduced stamina have a serious need for resting points on the route: benches and other types of seats. For people with walking difficulties, the quality of the paving is extremely important. For people with a wheelchair, rollator, pushchair or electric scooter, height differences in the route must be kept to a minimum. For them it is important to be able to travel the entire route at one level. For people with visual impairment, however, this is not desirable, because they are then unable to make use of natural guiding lines, and they run the risk of ending up on the dangerous roadway. Marking is therefore needed at those points.

Table 52 Estimation of potential of optimised route quality

Issue (1)	Size of group (group no.) (2)	Accident risk per person (3)	Influence on number of accidents (4)	Influence on seriousness of consequences (5)	Openness to direction (6)
Connected network	8,000,000 [all groups]	0	0	0	*****
Functionality	8,000,000 [all groups]	+	+	+	*****
Recognisable route	8,000,000 [all groups]	+	+	+	*****
Safe route	8,000,000 [all groups]	++	++	++	*****
Comfortable route	2,000,000 [22,23]	+	+	+	*****
Attractive route	2,000,000 [22, women]	+	+	+	*****

Attractive

It may seem to be a luxury, but the attractiveness of routes within the network is, like comfort, for some vulnerable road users a precondition for safe mobility. Routes through areas where there are problems with respect to public safety, however safe they may be in terms of traffic, are dysfunctional for many children, elderly people and women, and are therefore avoided.

5.4.3.3. Spatial structure (planning)

In recent years, a considerable amount of knowledge has been amassed on the relation between spatial planning and mobility. Attention has also been given in this to road safety. Studies have shown, among other things, that New Towns such as Lelystad, Houten, Zoetermeer and Almere score better on road safety than old towns and cities. These studies are in general of an extremely global character. Pronouncements about the relation between mobility and safety and about spatial distribution, even those that are quite generally accepted, are based on the thoughts and beliefs of experts. They are rarely supported by empirical research. As far as we know, almost no research has been conducted into the relation between spatial characteristics and safe mobility of vulnerable groups.³⁴ The following quality requirements are therefore based on nothing more (or less) than 'best professional judgement'.

Planning principles

Planning principles that ensure the safe mobility of vulnerable groups are:

- *Restrict need for long trip distances*
Ensure that essential functions such as school, shop for everyday groceries, medical facilities and basic services are within walking distance. After all, vulnerable groups are largely dependent on slow modes of travel and public transport. Long trip distances to essential functions restrict their social functioning; create a walkable neighbourhood containing all essential functions.
- *Prevent conflicts between vulnerable groups and through motorised traffic*
Large differences in mass, speed and direction are, especially for vulnerable groups, exceptionally risky. Ensure that vulnerable groups do not have to cross a main road.
- *Prevent the occurrence of complex situations*
Locate functions in such a way that confrontations with complex traffic situations for vulnerable groups are kept to a minimum. Complex situations include: concentrations of traffic, many different types of traffic, fast-moving traffic, traffic from different directions, situations where people get little time to make the right decision in traffic.
- *Prevent unintended use of the infrastructure and the public space*
Introduce a strict separation between traffic areas and residential areas and ensure that the through traffic in no way benefits from (undesirably) driving through a residential area. On the other hand, ensure that residents also have no reason to be on or close to the main road.
- *Prevent misunderstandings about function*
The mixing of functions (homes, shops, services) along main roads, as was traditionally the case along through roads in villages and towns, is misleading and creates unintended conflicts between residential and traffic functions. On the one hand people are shown that the environment is a residential area, on the other hand there is a great deal of traffic on the road that does not have its origin or destination there, and is therefore scarcely concerned with the desire of the residents for safety and security.

³⁴ One of the few examples is a study conducted by Delft Technical University in the 1980s, which looked at the consequences of closing schools for the safety of schoolchildren (De Boer 1984).

Spatial characteristics

For the majority of vulnerable road users, using a car is not an option. This restricts their action radius. They need to have essential destinations within walking or cycling distance. The Compact City is the best way to fulfil this need, but within the spatial planning world this concept has come under fire. One objection to the compact city is that it cannot satisfy the ambition of much of the population to have a single-family residence with the largest possible garden and sufficient space for the car (preferably two per residence). Homes of this kind are currently selling better and more readily than multi-storey residences. The national government wishes to meet this ambition as far as possible. This means that when expansion plans are drawn up, 'the market' is a strong opposing force. The question is, however, whether the demand for such homes will remain the same in the future. There is a good chance that in the near future such homes will not meet people's needs, and that they will remain empty because they are too large and too expensive. It seems socially undesirable for temporary market situations to stand in the way of the functioning of society in the future.

A spatial structure that is favourable for vulnerable road users is characterised by:

- *Large residential areas*

The larger the low-traffic residential areas, the greater the freedom of movement of vulnerable groups in traffic and the greater the chance that the basic package of facilities will lie within their reach, without the possibility of their being confronted with fast-moving traffic. Through motorised traffic must be kept out of residential areas. Such traffic is a source of danger and actually has no reason to be in the neighbourhood. Motorised traffic must be guided by the shortest possible route to the access roads outside the residential area. This ensures that nuisance from motorised traffic is kept to a minimum.

- *Proximity of facilities and essential destinations*

Due to the limited nature of travel options, proximity of essential functions is an important criterion. Essential functions mean shops for daily necessities, health centre, primary school, cashpoint or bank/ post office, hairdresser's, chemist's, community centre, playgrounds and public transport stops. These should be located a short distance from the home, preferably within walking distance.

- *High building density and mixing of functions in the centre of the neighbourhood*

Only through compact construction of a neighbourhood³⁵ is it possible to obtain sufficient economic support for the location of the essential functions within walking distance. Compact construction also promotes a good position of the pedestrian in the public space. There is 'automatic' supervision of the public space. The public space is a meeting place, and thus also has a clear social function. The compactness also makes it possible from the financial point of view to give the space a pleasant layout and to maintain it well.

- *User-friendly layout of public space*

The public space must be suitable for use by all residents and visitors of the area. Children, home-makers, elderly people and people with a disability make relatively intensive use of the public space. The public space has a function as travel space, but also as play area, meeting space and a place for relaxation. Guarantees must be created for accessibility for people with a disability, road safety and public safety. Places where young people 'hang out' do not combine well with residential places and walking routes of elderly people and people with a disability.

³⁵ Compact need not mean that the densities are (oppressively) high everywhere. As long as the distances to the centre remain short, it is perfectly conceivable that, given radial access, densities are highest in the centre of the area and decrease gradually further away from the centre.

- *Strict separation of residential area - main roads*

Main roads should be located outside the residential area, and may be spacious in character. The network of main roads is wide-meshed. Roads within the residential area, by contrast, should not be spacious, because this would make it easy for motorised traffic to travel faster than the desired 30 km/h or below. In connection with suitability for slow traffic, being fine-meshed is a good characteristic.

- *Strategic positioning of functions*

The homes of people who have, or may soon have, a restricted action radius (people with a disability and elderly people) should be localised as close as possible to the functions that are essential for them (including public transport). Relations with external functions that are important for vulnerable groups also merit attention. Secondary schools, sports grounds and functions such as music schools should be localised in such a way that they can be reached via a direct route with a minimum of confrontations with large amounts of fast-moving traffic.

- *Entertainments in central location, accessible by public transport*

For elderly people and young people, going out is an important activity. The traffic risks involved can be high. One way of controlling those risks is to offer a favourable transport alternative and to give the place of entertainment a relatively central location.

Traffic engineering characteristics

In the design and (re-)layout of a neighbourhood, the following traffic engineering aspects merit particular attention:

- *Categorisation of road network*

It must be clear what function the various roads and streets have for motorised traffic; the primary distinction is that between residential area and main road. Next, a further distinction can be made within the category of main roads between access roads and flow roads. On main roads the slow traffic should be separated from the motorised traffic. Intersection solutions are related to the category classification. In addition to this categorisation, it is useful to also make a distinction within the networks for cyclists between 'ordinary' routes, main connections with a utilitarian function and intercity connections that have a purely recreational function. It goes without saying that the routes concerned should be designed and laid out to form a connected network.

- *Parking*

Keeping the car out of the street scene allows the public space to function better. It will be necessary to offer alternatives for on-street parking, e.g. small-scale parking garages that offer protection from break-ins and vandalism. In other countries (e.g. Spain) many good examples of these can be found.

- *Bicycle parking*

Bicycles must be parked where they do not cause hindrance. In this connection, cycle sheds must be available near homes, and they must be easy to access and enter. Functions that attract a large number of visitors must be provided with suitable and attractive cycle parking facilities.

- *Public transport stops*

The public transport must be regarded as a basic provision, which is at least accessible in terms of location and boarding for vulnerable groups. In that connection, important aspects are both localisation of the stops in relation to the target groups and the quality of the walking routes to the stops.

- *Crossing/ intersection of main roads*

If the destination of a vulnerable road user is on the other side of the road, crossing that road is unavoidable. In that case, crossing facilities are needed, if possible conflict-free (separation in space is best).

- *Accessibility in terms of location and use for people with a disability*

Routes for people with a disability must fulfil higher requirements than 'ordinary' pedestrian provisions. The important characteristics in this respect have already been discussed in Subsection 5.4.3.2. These certainly include the strategic positioning of resting points and seats.

- *Accessibility of essential functions*

Essential functions in a neighbourhood must in principle be accessible without the need to cross any main roads. Children must be given the opportunity to go to school independently at an early age. This is good for their development. The location of the school must be chosen in such a way that it is more attractive to take and collect children on foot or by bicycle than by car.

- *Child-friendliness*

A child-friendly environment is one in which children are confronted as little as possible with moving and parked vehicles, and where routes pass interesting objects and situations that challenge them to play; and the school environment must naturally be low-traffic or traffic-free.

Process and organisation

It is not sufficient in the spatial planning to set substantive quality requirements. Those requirements can not be the same in all cases, and will not have to be of the same weight in all places. This means that weighing processes will have to be conducted. There will have to be integration of, among other things, mobility policy, housing policy, economic policy, health policy and public safety policy. The process organisation is therefore an important issue. From research in the framework of the development of the 'Mobility Test', it is known that it is extremely important what specific assignment is given to the planners, and that there must be a neutral project leader who is responsible for ensuring that all the design disciplines can provide their input on a basis of equality. Moreover, the involvement of the present and future stakeholders can be important.³⁶ When the Fact Sheets were filled in, a number of concrete desirable points regarding the process and the organisation came to light, namely:

- Participation of children in the design of the public space
- Conducting a Mobility Test as a mandatory part of the planning process
- Obtaining public support for an updated Compact City Concept
- Obtaining public support for effectively encouraging elderly people to live as close as possible to the facilities that are essential for them
- Well-considered use and management of public spaces.

To illustrate the above points: in the congress publication of the American National Conference on Aging & Mobility held in 2002 in Scottsdale (USA), the organisers list ten principles that can be used to prepare the mobility of elderly people in the 21st century. These are:

1. mix land uses
2. take advantage of compact housing
3. create a range of housing opportunities and choices
4. create walkable neighbourhoods
5. foster distinctive, attractive communities with a sense of place
6. preserve open space, farmland, natural beauty and critical environmental areas

7. strengthen and direct development toward existing communities
8. provide a variety of transportation choices
9. make development decisions predictable, fair and cost effective
10. encourage community and stakeholder collaboration in development decisions

Table 53 Estimation of potential of optimised spatial planning

Issue (1)	Size of group (group no.) (2)	Accident risk per person (3)	Influence on number of accidents (4)	Influence on seriousness of consequenc es (5)	Openness to direction (6)
Large residential areas	8,000,000 [all groups]	++	++	++	*****
Proximity of essential facilities	8,000,000 [all groups]	++	++	+	****
Compact City layout	8,000,000 [all groups]	++	++	++	*****
User-friendly layout	8,000,000 [all groups]	+	+	+	*****
Categorisation of roads	8,000,000 [all groups]	+	+	0	*****
Strategic positioning of functions	8,000,000 [all groups]	++	++	+	****
Keep vehicles off the street scene	8,000,000 [all groups]	+	+	+	***
Cycle parking facilities	2,000,000 [22,23]	0	0	0	***
Balanced input of design disciplines	8,000,000 [all groups]	0	0	0	*****
Use Mobility Test	8,000,000 [all groups]	0	0	0	*****
Participation of stakeholders	8,000,000 [all groups]	0	0	0	***

5.4.4. Transport system

The fourth sector of the Pizza model concerns the transport system. This section discusses the quality requirements that should be imposed on the transport system in order to ensure safe mobility of vulnerable groups. Three levels can be distinguished in the quality requirements, namely: requirements with respect to individual vehicles, transport concepts and mobility needs.

³⁶ Participation of stakeholders works best for concrete layout plans. Planning for a distant future and working at above-street level requires more expertise than may be expected from 'ordinary' citizens.

5.4.4.1. Vehicle

Many requirements can be imposed on the qualities and construction of a vehicle in relation to the interests of vulnerable road users. 'Standard' quality requirements, for which the manufacturer or supplier must be held responsible, are covered in the next subsection 'Transport concept'. This subsection deals with quality requirements for which the individual user or carrier must (as yet) be held responsible:

Collective transport

- accessibility of vehicles for wheelchairs
- easy-exit of vehicles in the event of emergencies
- reserved, well-designed seats
- no sharp corners in the interior of vehicles
- safe facilities for wheelchair transportation

Bicycle

- good technical state of bicycle, especially the brakes, lights and tyres
- improve visibility of bicycle with a bicycle flag or use of eye-catching bicycle helmet (children)
- good mirrors on the bicycle (elderly people)

Moped (faster and slower)

- good technical state of moped, especially the brakes and lights; engine may not be tuned-up, and noise level may not be higher than the standard
- lights switched on as standard
- good mirrors

Table 54 Estimation of potential of quality requirements regarding individual vehicles

Issue (1)	Size of group (group no.) (2)	Accident risk per person (3)	Influence on number of accidents (4)	Influence on seriousness of consequenc es (5)	Openness to direction (6)
Collective transport measures	2,000,000 [22,23]	0	0	0	***
Bicycle measures	7,000,000 [3]	+	+	0	***
Moped (faster and slower) measures	500,000 [4, 5]	+	+	+	***
Motorcycle measures	200,000 [6]	+	+	++	***
Car measures	8,000,000 [all groups]	+	+	+	***
Special vehicle measures	1,000,000 [7]	0	0	0	***

Motorcycle

- good technical state of motorcycle, especially the brakes and lights
- lights switched on as standard
- restricted noise level

Car

- safety of child seats
- mirrors to eliminate blind spots

Special vehicles

- good technical state, especially the brakes
- when used during hours of twilight and darkness: lights
- where applicable: fitted with good mirrors

5.4.4.2. Transport concepts

In relation to the safe mobility of vulnerable groups, standard requirements can be imposed on the means of transport that they use themselves and vehicles with which they are confronted. As regards the latter, the requirements are:

- soundness of construction
- vehicles must fulfil the applicable safety requirements for occupants
- vehicles must be collision-friendly; sharp objects and injury-increasing (retrofit) devices such as bull bars are not permissible
- speed restriction within residential areas
- good all-round vision
- optimum visibility and audibility when speeds above 30 km/h are permitted
- visibility and identifiability of the driver/ rider in connection with communication
- easy to maintain

When information was collected regarding quality requirements for vehicles used by vulnerable groups, the following points emerged:

Collective transport

- easy-boarding and easy-exit of vehicles for people with a physical disability
- providers of transport (for people with a disability) must demonstrate that the vehicle is suitable for wheelchair users
- reserved seats for people with a disability
- for people who themselves can/ may not drive a car: ready availability, affordable, easy-boarding, easy-exit alternatives
- adequate travel information available during the trip

Bicycle

- concrete, testable requirements of technical construction and technical state of the bicycle, at any rate with respect to brakes, lights and visibility/ eye-catching appearance
- protective devices for children to prevent e.g. feet being caught in the spokes
- development of practicable and attractive mirrors for elderly people
- good mirrors on bicycles

- combine low crossbar of bicycle (for ease of mounting) with attractive design
- development and promotion of new methods to improve all-round vision (e.g. mirror on spectacles)

Moped (faster and slower)

- ban tuning-up of mopeds
- high safety standards from factory
- introduction of moped registration plates
- restrict noise level
- compulsory daylight running lights
- good mirrors on the moped

Motorcycle

- compulsory daylight running lights

Car

- fit cars with devices for easier and safer transport of babies and toddlers; promote the use of these devices
- minimise blind spot
- facilities to compensate for declining suppleness, hearing, visual capacities in connection with reaction time in emergencies
- improve collision-safety of cars ('softnose' etc.)
- easy-entry and easy-exit for people with a disability

Special vehicles

- recognisability of invalid vehicles
- development and promotion of new methods to improve all-round vision (e.g. mirror on spectacles)
- supplier of a new mode of transport must demonstrate that use of that special vehicle is safe for the user and other road users

Table 55 Estimation of potential of quality requirements for vehicle categories

Issue (1)	Size of group (group no.) (2)	Accident risk per person (3)	Influence on number of accidents (4)	Influence on seriousness of conse-quences (5)	Openness to direction (6)
Collective transport measures	2,000,000 [22,23]	0	0	0	*****
Bicycle measures	7,000,000 [3]	+	+	0	*****
Moped measures	1,000,000 [4, 5]	++	++	+	*****
Motorcycle measures	200,000 [6]	0	0	0	*****
Car measures	8,000,000 [all groups]	+	+	+	*****
Special vehicle measures	1,000,000 [7]	+	+	+	*****

5.4.4.3. Mobility needs

The quality needs profiles regarding mobility options vary greatly between the different groups. One important factor here is that lifestyle is quite closely related to the specific group. There can be various reasons for desirability of influencing mobility options. It is not possible to give a simple list of quality requirements.

Babies and toddlers depend on their parents and carers for their travel decisions. There can be no question of independent mobility. From the safety point of view, it is reasonable not to offer space for this.

For primary school children, the situation is different. They have to attend school, and that places an obligation on the government to ensure that they can arrive at school unharmed. Furthermore, they must be enabled to play in the immediate vicinity of their home. For this, it is necessary that there is a school close by, that they are not confronted on the school route with fast-moving motorised traffic, and that the residential environment is sufficiently safe. For non-everyday trips outside the immediate home environment, it is essential that they are accompanied; that is a responsibility of the parents/carers.

Taking and collecting by car creates dangerous situations near the schools, and should therefore be discouraged. Ensuring safe school routes seems the most appropriate way to do this, and it can be helpful to expressly encourage parents to send their children to the nearest school.

Secondary school students (12 – 15 years) also have to attend school, and must therefore be enabled to walk or cycle independently to school. That requires a safe school route, and safety measures at crossing points of main roads that they have to cross. If this is not possible, it is necessary to arrange safe transport for them. Trips that are not related to school fall under the responsibility of the parents/carers.

In the case of young people aged 16 and 17 years (and over), compulsory school attendance is no longer a main factor in the travel pattern. Many of them wish to use the moped. From the safety standpoint, there are good reasons to discourage moped use and to encourage safer alternatives. The student public transport pass can be seen as a good alternative to individual transport by moped. Accompanied car driving from the age of 17 can also help to undermine the appeal of the moped.

For most people in the age group 18 – 25 years, education is still the most important reason for travel. The majority still do not have a driving licence, and are not in a position to buy and drive a car. For them, the student public transport pass offers a safe alternative to individual transport by moped and car. Another important reason for travel is entertainment. Here too, the student public transport pass can be a safe alternative, provided that the place of entertainment is actually accessible by public transport. Unfortunately, that is often not the case, but it should in fact be a basic principle.

The use of dangerous modes of travel should be discouraged. Conversely, the use of safe modes of travel should be encouraged. Public transport is the safest mode of travel, and also reduces the quantity of traffic. The moped, motorcycle, four-wheeled moped and most other special vehicles are relatively dangerous. The marketing of these should therefore be extremely restrained. In the case of new special vehicles, the government should be able to ask the supplier to demonstrate that the vehicle is not detrimental to road safety.

Social developments have greatly increased the dependence of adults on the car. For local trips, the bicycle is in principle a good alternative, but many people do not feel that this is the case. Encouraging bicycle use at local level has no negative consequences for road safety, and can in fact lead to less car use, and hence a lower number of vehicles posing a 'threat'. For many intercity trips there is no reasonable alternative to the car. Given that public transport must be cost effective, it can not (anymore) fulfil the safety net function.

Promoting the use of the bicycle by younger elderly people has an important positive side-effect: physical exercise means they can stay fit for longer and enjoy independent mobility to a high age. Improving the safety of the bicycle is a means to promote safe mobility.

For elderly people it is important that they are familiar with alternatives to the car before reduced task competence forces them to stop driving. At that point, the bicycle is no longer a realistic alternative. Availability and emphatic promotion of affordable, user-friendly and accessible (in terms of location and boarding) public transport or demand-responsive collective transport can fill the transport gap. In that connection, it is also desirable to have good chain management of taxi - intercity train - taxi.

Table 56 Estimation of potential of directing trip options

Issue (1)	Size of group (group no.) (2)	Accident risk per person (3)	Influence on number of accidents (4)	Influence on seriousness of consequenc es (5)	Openness to direction (6)
Discourage car use for taking/ collecting children	1,000,000 [9, 10]	-	0	0	***
Encourage choice of school close to home	1,000,000 [13, 14]	+	+	+	****
Student public transport pass	1,000,000 [4, 5]	+	+	+	*****
Discourage moped use	400,000 [6]	++	++	++	*****
Restrained marketing of motorcycle and four-wheeled moped	8,000,000 [all groups]	+	+	+	****
Promote bicycle use	3,000,000 [non-cyclists]	0	0	0	*****
Offer transport alternatives	2,000,000 [22, 23]	+	+	+	*****
Take services to the home	1,000,000 [22, 23]	++	+	+	****

The increasing car orientation of society is a problem for people who cannot have a car at their disposal, especially if they are also unable to use the bicycle. That is the case for many people with a disability, some immigrants and some elderly people. They are more or less forced to live in the immediate vicinity of the destinations that are essential for them, or to look for alternative modes of transport. For short distances the electric scooter can be a suitable alternative, as long as this, like the walking stick, rollator, wheelchair and suchlike, is provided by the government (Services for the

Disabled Act - WVG). The wider spatial distribution of residences and other functions means that an ever-increasing proportion of trips have a criss-cross character. For this, traditional public transport offers no consolation. In those cases, individual solutions (such as the taxi) are the most suitable for people with a disability.

Spatial distribution and organisation of services should closely match the wishes of people with a disability. Mobility needs can be reduced by, among other things, having services come to people with a disability in their own homes. ICT developments actually make some routine trips (visits to bank, some contacts with the local authorities, routine visits to the doctor) no longer necessary. These transactions can be dealt with electronically. This creates space for essential trips.

5.5. Present approach

In Section 5.4. Quality Needs Profiles an outline was given, insofar as that is possible with the available knowledge, of the issues to which attention should be given in a good road safety policy for vulnerable road users, on the basis of the classifications made in the Pizza model. This section will now consider the present approach to the various issues. This will involve (implicitly and globally) discussion of:

- What knowledge do the relevant policy developers, policy decision-makers and policy implementers have about the problems and the causes?
- What objectives do they have?
- What measures are taken?
- What is known about the effectiveness and yields of the policies?

5.5.1. Human qualities which could be improved

5.5.1.1. Individual road users³⁷

Physical and mental capability

In the course of time, the government has formed a picture of the requirements that must be set for the physical and mental capability of road users. The starting point for that has always been the causation of danger. The requirements have been set down in legislation and regulations, and in guidelines for tests and assessments for certain specific groups of road users. For pedestrians, and all those who are equated with them in the law, no formal requirements for physical and mental capability are set. Also for cyclists and moped riders, there are no requirements of physical and mental capability, except that they may not use the road under the influence of psychotropic substances. Other drivers/ riders of motorised vehicles have to possess a valid driving licence. They only obtain that after declaring that they are healthy. From the age of 70 years, a medical examination is required. People who are prescribed medications that influence driving ability are warned about this by the pharmacists by means of a red (forbidden to drive) or yellow (warning: risk) sticker on the package. Within the framework of public information on health, attention is given to the possibilities of improving the physical condition. In the traffic (safety) policy, by contrast, a relation is rarely established with the usefulness of physical exercise.

Trip preparation

The importance of good trip preparation for road safety is rarely recognised or acknowledged. There is little or no empirical knowledge available about this aspect. It occasionally receives attention in public information on traffic in relation to holiday trips. It can be assumed that it does receive some attention within the framework of rehabilitation.

Perceptual faculties

The importance of adequate perceptual faculties is evident. No formal requirements on this point are set for pedestrians, cyclists and moped riders, but there are formal requirements for drivers of motor vehicles. In the driving test, a candidate must demonstrate that s/he can read a car number plate at a distance of 50 metres. In the medical examination for older drivers, the visual acuity is tested. Also at the events organised by the Platform for Elderly and Mobility (BROEM), the visual faculties are tested. In most cases, visual acuity problems are solved by (new) spectacles. No requirements are imposed on the quality of hearing, but people will take measures to improve that if they have reason to do so. The technical possibilities are improving all the time.

Empirical studies have now shown that visual acuity is not, in fact, the all-determining factor in perception. The ability to detect via peripheral vision is probably more important. This knowledge has scarcely if at all filtered through into the policy, and there are consequently no initiatives to devote attention to training in detection.

The diagnosis and prognosis of risky situations

Quite a number of studies have been conducted internationally on the quality of diagnosis and prognosis of risky situations. It has become clear that many factors play a role in this. The degree of complexity of the situation is one of those. The Sustainable Safety policy is (implicitly) aimed at simplifying traffic situations. This should have the effect of making the quality of diagnosis and prognosis less critical. The question is, however, whether that is actually being achieved in practice. It is quite generally known and accepted that there is room for improvement in the traffic insight of most groups of road users. In connection with this, traffic is a subject that receives attention in primary schools. Traffic is also part of the basic curriculum in secondary schools. In 2002 a study was conducted on the knowledge and insight of young people in secondary school, and this revealed with aspects should be given attention. However, traffic education in schools is still in its infancy; little is known as yet about its effectiveness, but it can be said with certainty that it is not very high. For other groups too there are training courses and workshops aimed at improving traffic insight. These are not, however, very popular. With a few exceptions, not many people feel the need to brush up their knowledge and insight. Exceptions are young people who wish to ride a moped, people who are about to learn to drive, and people who are in rehabilitation. They generally have a strong motivation to obtain the moped certificate or the theory test, or to be able to (again) function better in traffic. It can be stated that the curricula are not (yet) sufficiently essential and attractive to convince individuals that they should refresh their knowledge and insight.

Behavioural intentions

One of the most frequently used terms in public discussions is 'mentality'. Public opinion on this is that the traffic mentality is very bad, and that the government must do something about it quickly. Many studies have shown that the (subjective) chance of being caught is an important factor. A good deal of

³⁷ Key questions in this subsection are: what policy is there that gives people the incentive to improve their own traffic skills? What other possible incentives are there?

attention is now being given to this in the government policy. There is resistance among the general public to a higher level of enforcement, especially in the case of minor infringements. There is in fact a social dilemma: 'safety is improved if everyone keeps to the speed limit' versus 'what does it matter if I drive a bit too fast? Everyone does it.'

The chance of pedestrians and cyclists being caught in the event of infringements is (much) smaller than that of motor vehicle drivers/ riders. The police usually give them low priority; 'the general public' also considers such infringements extremely unimportant. It does not appear that enforcement of the traffic behaviour of pedestrians and cyclists will become an issue.

Decision-making routines

Little is known about the possibilities and opportunities for training in decision-making routines and, as far as we know, with the exception of rehabilitation, there is no policy in which attention is given to this topic.

The introduction of road categorisation within the framework of Sustainable Safety has simplified the right-of-way rules. The effects of this are still unknown.

Control over impulses

Very little is known about the extent to which poor control over impulses plays a part in road accidents. The question is also whether it is useful to pursue a policy on this point.

Action skill

A relatively large amount of empirical research has been conducted on children and young people. The equally large groups of elderly people and people with a disability have received much less research attention, and there are serious gaps in the knowledge about the level of action skill of these groups and the extent to which that results in accidents. Detailed knowledge on this is needed for the development of an approach in which the person is the measure of the things and in which the design of the 'hardware' (spatial environment and transport system) is attuned to the task competences of its users.

Many parents consider that traffic is increasingly becoming too dangerous for their children, and therefore accompany them to and from school. Because they are accompanied, especially if they are taken and collected by car, children miss an opportunity to acquire action skill. There is virtually no policy on this point.

Primary schools, compelled by circumstances, give very little attention to training the children in action skill. Training in practical traffic skills is virtually impossible due to the time it takes and the risks associated with it. Many schools do, however, with the support of the local authority, take part each year in the traffic test for Group 7 organised by the United Road Safety Organisations 3VO, which in most cases also includes a practical test. A few parents prepare their children for this by looking at the test route and cycling with them along it. Apart from this, little or no training is carried out by parents and carers, mainly because they do not see it as their task. Another reason is that they do not know what they could do or how they should do it.

For inexperienced drivers/ riders, the point system that was introduced in 2001 serves as an incentive to give attention to action skill, or more correctly: to ensure that they do not attract attention in a negative way. The system amounts to their punishment being more severe for serious traffic offences than for minor ones. The philosophy is that this system ensures that they are forced to be careful in their early years as a vehicle driver/ rider. Such behaviour then becomes routine, and should mean that they will continue to exhibit safe traffic behaviour later in their driving/ riding career.

Vehicle skill

Every new mode of travel has to be learned. After the basic skills have been mastered, refresher courses can be useful at fixed intervals. There are no institutionalised training courses for learning to walk, except in rehabilitation. A number of local authorities organise special cycling courses for immigrant women. A separate method has been developed for these. Some local authorities organise one or more practical moped courses each year, with or without the support of the Regional Road Safety Board (ROV) and with varying degrees of success. People who wish to learn to ride a motorcycle or drive a car or truck or drive with a trailer must go to a driving school.

In many municipalities, the Platform for Elderly and Mobility (BROEM) organises driving courses for elderly people. These courses give elderly people the opportunity to have their driving ability tested, to have their eyes tested and to brush up on their knowledge and skills.

Drivers who attract negative attention can be stopped by the police. They can be compelled to take a driving ability test, and in a small number of cases the driving licence is taken away.

5.5.1.2. Group/company

Traffic education in primary school

Traffic has been a compulsory subject in primary schools since the 1950s. Until the early 1990s it was a separate subject on the timetable. This is no longer the case, but traffic is still part of the key objectives of education. At most schools the lesson programme focuses on obtaining the traffic diploma in Group 7. In connection with this, the traffic lessons are often concentrated in Groups 6 and 7. The number of lesson hours now devoted to traffic is much smaller than before the system was changed. The amount of time and the quality of the teaching depends on the enthusiasm of the teacher concerned.

Calling in parents of (young) children

It is very rare that parents of young children are called upon to assist in traffic education. It is difficult, if not impossible, to persuade them to do this; the fact that more women now work is also such a strong counterforce that this has become a virtually hopeless endeavour.

Traffic education in secondary school

Traffic is also included in the Key Objectives of the basic curriculum of secondary education. A problem is that the teaching materials are still of restricted quality and fragmented across subjects; there are no good standard teaching methods available. The materials that are available are usually specific to the teacher, and do not have a professional image. The traffic education wheel is constantly being reinvented. The willingness of teachers to learn from one another seems to be limited.³⁸ The Regional Road Safety Boards (ROVs) have presented the case for raising the level of traffic education, but as yet have not succeeded in obtaining sufficient critical mass for a major leap forward in quality. A further problem is that the number of teachers who are familiar with traffic education is small, and there is still no generally accepted 'quality hallmark' available. The great competitive force of other important teaching objectives, and the small amount of pressure exerted by the traffic world, mean that traffic education is still in its infancy and it seems quite likely that the subject will again disappear from the lesson programme.

³⁸ This is a very human phenomenon. This limited willingness is due to the fact that there is very little time available. People do not allow themselves the time to learn from the experiences of others; once they have prepared their material, there is no time or willingness to pass on the experiences to others.

Influencing group norms of 12-18 year-olds

An important problem in traffic behaviour is that young people, especially boys, are led by group norms that conflict with safe behaviour. This is a 'genetic' problem, which has been recognised and acknowledged by policy-makers for a very long time. The group norms change constantly, which makes it very difficult, time after time, to get to grips with them.

Driving schools

In the Netherlands there is freedom of education. This constitutional rule limits the control that the government has and can have on the quality of the teaching programme. Over the years, numerous improvements have been introduced, but it is no longer the case that the Dutch system can compete well with that of other European countries such as Sweden, Belgium, France and Germany. New developments such as Plan 17 can introduce positive changes to this situation.

Training via associations

A rather unusual phenomenon is that associations are playing a role in teaching basic skills of sporty modes of travel, such as skates and mountain bikes. They have 'self-taught' instructors in their ranks who pass on the 'tricks of the trade'. This instruction considerably reduces the time that novices remain unskilled. As far as we know, there is no interference from the government.

Another example of traffic education via associations is provided by the (occasional) lectures given for elderly people's societies and women's associations, where traffic skills as a pedestrian, cyclist and car driver are reviewed.

Safety culture of transport companies

Safety Culture is in some circles presented as a magic spell for improving the traffic attitude of professional drivers. In large, especially American, companies excellent results have been achieved. In one-person companies, one cannot speak of 'safety culture'. A problem in the transport sector is that there is currently a tendency towards a decrease in scale, rather than an increase.

5.5.1.3. Social sector

Strong non-governmental organisations

Strong non-governmental organisations can ensure that the interests of vulnerable road users are well promoted. Given the weak negotiating position of the individual vulnerable groups in processes of change, there is every reason to give them attention. In practice, however, the quality of interest promotion is becoming worse rather than better. The Pedestrians Association, the children's road safety organisation Kinderen Voorrang and the general road safety organisation Veilig Verkeer Nederland have joined forces as the United Road Safety Organisations 3VO. Consequently those groups no longer have separate spokespeople. A problem with this is that the function previously fulfilled by those organisations in building up knowledge about the approach to the problems of these groups has largely been lost.

For cyclists, motorcyclists, people with a disability and elderly people there are still separate organisations to promote their interests. The Royal Dutch Touring Club ANWB promotes the mobility interests of its members (which are mainly car drivers and holiday-makers, including cyclists and motorcyclists). The United Road Safety Organisations 3VO has been set up to promote the road safety interests of all Dutch people, especially the vulnerable among them.

Rules with a view to safe mobility of vulnerable groups

The Ministry of Transport, Public Works and Water Management is responsible for formulating rules for the use of the traffic and transport system. In doing this, attention is also given to the interests of vulnerable groups. The national government has no direct executive tasks with respect to most vulnerable road users and can therefore not 'automatically' build up knowledge in this area within its own organisation. There is a good deal of knowledge about, insight into and affinity with the quality needs of motorised vehicle users. The same cannot be said about vulnerable road users. Those differences in knowledge, insight and affinity make it difficult to weigh issues in a balanced manner.

Vision and agreements about introduction of provisions

The Ministry of Transport, Public Works and Water Management has agreed with its partners the Interprovincial Consultations IPO, the Association of Netherlands Municipalities VNG and the Union of Water Control Authorities (Unie van Waterschappen) that the national policy (of the various authorities together) will henceforth be incorporated in the National Traffic and Transport Plan (NVVP). That agreement was laid down in the Traffic and Transport Planning Act (Planwet Verkeer en Vervoer). The NVVP will also contain a section setting out the policy of the Ministry. The draft 'Ministry part' of the NVVP was not passed by the Lower House of the Dutch parliament, and a new one now has to be produced. The core message of the new NVVP should be: mobility is fine, as long as you pay for it yourself. In the draft NVVP it was announced that a new policy regarding vulnerable road users is being developed. The present project is a step in that direction.

At various places in this report, arguments are offered in favour of Design for All. In practice, the basic principles of that are far from generally accepted. There are still serious knowledge gaps concerning the ergonomic quality needs of vulnerable road users. Many policy makers and policy implementers are also not convinced of the (economic and social) need for such an approach.

Knowledge and knowledge management regarding vulnerable road users

As regards the building up and management of knowledge regarding vulnerable road users, since a boom around 1980 there has been a constant reduction in policy attention and personal dedication. The Traffic Research Centre (Verkeerskundig Studiecentrum) has now closed, the Netherlands Organisation for Applied Scientific Research TNO has been privatised and receives very few assignments in this area, the Foundation for Scientific Research into Road Safety SWOV devotes in total around 2 fte to research into vulnerable road users (emphasis on elderly people), at the Technical University of Delft the research efforts in this area have been drastically reduced and even the AVV deploys no more than around 1.5 fte on a project basis on work concerning vulnerable groups. The Information and Technology Centre for Transport and Infrastructure CROW occasionally gives specific attention to vulnerable groups; in standard works such as the Handbook of Recommendations for Urban Traffic and Transport Provisions (Handboek Aanbevelingen Stedelijke Verkeers- en Vervoersvoorzieningen) the available knowledge regarding vulnerable road users is always used. At the local level, measures are taken to ensure or improve the safe mobility of vulnerable groups. However, experiences are rarely passed on to others. Local authorities do not see themselves as a knowledge institution and give little attention to storing the knowledge.

In addition to the well-known research institutes, non-governmental organisations also collect and manage knowledge. There too the trend is one of decreasing input. Organisations that previously played an important role in the building up and management of knowledge regarding vulnerable road users were the Pedestrian Association, the children's road safety organisation Kinderen Voorrang, the Cyclists' Union, the Royal Dutch Touring Club ANWB, organisations for disabled people, the rehabilitation sector and elderly people's organisations. The Pedestrian Association and Kinderen

Voorrang joined with the general road safety organisation Veilig Verkeer Nederland³⁹ to become the United Road Safety Organisations 3VO. The new organisation must necessarily build up its knowledge function more or less from nothing.

This fairly marginal total input is in glaring contrast to the financial and personnel input (several hundred fte's) that is employed on the safe mobility of motorised vehicle drivers. The knowledge collection regarding vulnerable road users is fragmented and is not managed in a co-ordinated way. The policy resolution in the National Traffic and Transport Plan (NVVP) concerning vulnerable road users gives one hope in this regard.

Adequate key objectives of traffic education

The Key Objectives in primary education and in the basic curriculum of secondary education are extremely global in character, and are not emphatically facilitated. Under pressure from other objectives, the subject Traffic is in danger of disappearing. The traffic sector does not add much weight to the scales in the discussion; education is seen as a responsibility of the Ministry of Education, Culture and Sciences, and not of Transport, Public Works and Water Management. The usefulness, necessity and effectiveness of traffic education can not (yet) be sufficiently demonstrated.

Availability of good teaching materials

In the 1980s the traffic teaching materials for primary schools were developed with money from the Ministry of Transport, Public Works and Water Management. Those materials are urgently in need of revision; given the spirit of our present times, it is not obvious that the Ministry of Transport, Public Works and Water Management will take the lead on this point.

Schools for special education have always developed their own educational materials tailored to their (special) pupils.

As mentioned above, the Regional Road Safety Boards (ROV's) have made efforts to have teaching materials for secondary education developed, to distribute these and to promote existing materials from, among others, the United Road Safety Organisations 3VO. The quality of the materials is variable, and is not yet sufficiently 'professional' to be used on a standard basis in education. Co-ordination of the efforts at the national level has not yet got off the ground.

Monitoring key objectives of traffic education

Research conducted the Foundation for Scientific Research into Road Safety SWOV has shown that too little is being done to realise the agreed key objectives of education. The Education Inspectorates give little or no attention to the quantity and quality of the schools' input on the point of traffic education.

Promoting health

The relation between promoting health and road safety is not established explicitly in the Netherlands.

Information to foreign visitors

The tourism sector is hardly if at all aware of the possibilities it has to encourage road safety in the Netherlands. The traffic sector equally, as far as we know, undertakes no initiatives on that point.⁴⁰

³⁹ Veilig Verkeer Nederland did not aim to collect and manage knowledge; it always obtained knowledge from other organisations.

⁴⁰ In London the highways management authority is very aware of the risks run by foreign pedestrians. In the centre of the city most zebra crossings have a text reminding people to look to the right.

5.5.2. Social and public context

5.5.2.1. People in the environment

The research work for filling in the Fact Sheets brought to light four policy objectives and measures that influence the safe mobility of vulnerable groups via the people in the environment:

- At the European level work is being done on the introduction of Daylight Running Lights. In the 1990s there was a public discussion of this in the Netherlands, led by the Foundation for Scientific Research into Road Safety SWOV. On dark days and in twilight situations, many cars already drive with their lights on. This makes them more visible, but makes it less easy to see pedestrians, cyclists and others who have no lights.
- As a result of public information on alcohol, it is no longer socially acceptable to drive under the influence of alcohol and drugs. This social pressure means that young people aged 18-25 do not automatically drive when under the influence. They make arrangements about who will drive.
- As from 2002, all drivers/ riders coming from the right have right-of-way. Within the built-up area, vehicle drivers expect to encounter cyclists and the rule is starting to have an effect. Outside the built-up area, cyclists are not expected and the right-of-way discipline seems to be less strong.
- Since 2002 the moped has had to travel on the roadway and not on the cycle path within the built-up area. Objectively the measure has been a success, but the opinions of vehicle drivers are less positive.
- In driving instruction, very little attention is devoted to reacting to the signals given by children.
- Babies and toddlers are almost always accompanied.

With respect to the issues mentioned in Subsection 5.4.2.1., the approach is as follows:

Understanding and compassion

In the 1950s the former Association for Road Safety (Verbond voor Veilig Verkeer) ran the still remembered campaign 'Be a gentleman in traffic' ('Wees een heer in het verkeer'). The effectiveness of this campaign was very restricted, due to the vagueness of the message, but the slogan is still widely supported. Campaigns with such a broad message are (correctly) no longer used. Non-governmental organisations do, however, run much more specific occasional campaigns calling for understanding and compassion, such as the 'National Playing on the Streets Day' and 'White Stick Day'.

When people have to appear in court for a traffic offence, the public prosecutor and the judge nearly always point out the consequences that the offence has for fellow road users. In (occasional) reports of these cases in the media, the arguments are generally taken up.

Ban bicycles on the pavement

Bicycles on the pavement and in pedestrian areas is a fairly common phenomenon. Small children are even encouraged to ride on the pavement instead of on the roadway. As regards the pedestrian areas, many local authorities pursue a policy of toleration. On busier chopping days, the policy (sometimes) take action.

Keep to traffic rules regarding pedestrians

The rules relating to free passage of pedestrians at pedestrian crossing points and regarding people with a disability are rarely if ever enforced. There is actually public support for the rules, but enforcers do not find the rules sufficiently important to enforce them. The impression exists that people are

simply not aware of the importance of the rules; in cases when the police do actually take action, they meet with low acceptance ('why don't you go and catch criminals').

Take account of moped riders and motorcyclists

The media (e.g. 'Blik op de weg', De Kampioen, and occasionally in the newspapers) report behaviour towards the motorcycle, and call for more account to be taken of motorcyclists. On this point, non-government organisations run occasional campaigns. With respect to the moped there is much less clemency. The (national) authorities have no policy on this issue.

5.5.2.2. Standards

Standards relating to traffic and traffic behaviour are laid down in legislation and regulations, guidelines and recommendations of respected institutes. In principle, deviation from laws and regulations is not permitted; guidelines may be infringed, provided that one has good arguments for doing so. Recommendations of respected institutes are based on consensus, but are not binding. The Traffic Rules and Signs Regulations (RVV 1990) lay down the traffic regulations for road users. The Administrative Provisions (Road Traffic) Decree (BABW) contains the provisions that apply for the various government bodies concerned with traffic. Standards and rules are also laid down in the Road Traffic Act (WVW) and in numerous guidelines and 'recommendations' for highways management authorities. The regulations are made more specific over time by means of case law. At the local level, there are general municipal byelaws (APV), which lay down, among other things, where and when and for how long trucks and caravans may park in a certain place, what requirements must be fulfilled by signboards, and to what extent displays can be located in the public space (municipal tax on encroachments on public land).

With respect to the 'standards' and safe mobility of vulnerable groups, the following issues are discussed in the Fact Sheets:

- In the Traffic Rules and Signs Regulations (RVV), the Administrative Provisions (Road Traffic) Decree (BABW) and the Road Traffic Act (WVW), attention is given to the safe mobility of pedestrians and cyclists. One of the most striking rules is that people who have difficulty with walking, or who are blind or partially sighted, must be given free passage.
- In the event of an accident between a car driver and a pedestrian or cyclist, the car driver is (almost) always financially liable for the material damage and the damage resulting from injury if the pedestrian concerned is under the age of 14 years. If the pedestrian is over the age 14 years, the car driver is liable for at least half the sum, unless the manoeuvre could not have been predicted.
- In 2002 the measures Right-of-Way for Drivers from the Right (BVR) and mopeds on the Road (BOR) were introduced.
- There is no 'type quality label' for bicycles. In 1990 many requirements imposed on the quality of the bicycle were removed from the legislation.
- A moped has to be permitted to use the road by the Department of Road Transport (RDW). It is not prohibited to purchase a tuned-up (modified) moped, but it is prohibited to use it.
- Special vehicles powered by an engine must be approved by the Department of Road Transport (RDW). The four-wheeled moped is classed as a moped. Motorised autopeds are not permitted to use the road.
- The blind-spot mirror for trucks has become compulsory.

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- People aged 70 and over who hold a driving licence are required to show that they are still capable of driving.

With respect to the quality issues concerning 'standards' listed under 5.4.2.2., the following approach is taken:

Capability to use traffic and transport system

Legal requirements are imposed on vehicle skill only for driving/ riding a motor vehicle. The requirements have become higher over the years, due to the increasing complexity of traffic. No requirements are set for the task competence of pedestrians; informal requirements are set for the task competence of cyclists. Regulations concerning the task competence of moped riders appear to be in a transitional stage. They are already required to hold a theory certificate and there is growing pressure to set requirements for practical skill. Obviously, if such requirements are set, requirements will simultaneously be imposed on the physical and mental condition of the riders.

Rules of behaviour for road users

Under the heading 'rules of behaviour for road users', Subsection 5.4.2.2. presents a number of issues that are important for the safe mobility of vulnerable road users.

Within the framework of the Sustainable Safety Start-Up Programme, highways management authorities have (provisionally) categorised their road network. In principle, not all roads that are not main roads are classed as residential areas. In residential areas within the built-up area, there is a maximum speed limit of 30 km/h; outside the built-up area the maximum speed limit is 60 km/h. The transition has not yet been completed.

The basic principle in the reclassification of the road network is that motorised traffic should behave as a guest. Due to the many measures that have been introduced by local authorities to reduce speeds, that is actually being realised in practice. In most residential areas, pedestrians and cyclists can cross the road without hindrance. The case is not so simple on main roads. Parking in the immediate vicinity of crossing points will remain a problem as long as there is no consensus about a ban on parking. It seems that such a consensus is still a long way off.

As regards obstacle-free pedestrian and cycle domains, there is rarely explicit policy, except for specific locations such as close to stations. On this point there are usually no regulations, except in the applicable general municipal byelaws (APV); the rule that the flow of traffic may not be hindered does not apply for pedestrians and cyclists.

There are regulations regarding the use of protective devices, but these are restricted to the use of seat belts and moped and motorcycle helmets. Rules of behaviour regarding the use of child seats are rudimentary and do not appear to be easily enforceable.

The traffic legislation lays down that a vehicle may not have any sharp projections. There is not, however, a ban on bull bars etc. The car industry is prepared to co-operate with a ban on bull bars, but cannot prevent people from 'decorating' their cars with them themselves.

Rules are imposed as regards the design of vans and trucks. The willingness to voluntarily introduce supplementary safety provisions to reduce the risks for (vulnerable) fellow road users is limited.

Management of the traffic and transport system

Rules for the management of the traffic and transport system are contained in the Administrative Provisions (Road Traffic) Decree (BABW) and instructions and guidelines connected with this. In comparison with the products of companies, a greater responsibility is placed on the shoulders of those who use the government product 'infrastructure'. Only in exceptional cases can road users sue

highways management authorities for dangerous situations, and then only when they can demonstrate that the highways management authority has been culpably in default, and this could not have been predicted. In comparison with other products, there is a very limited product liability.

Highways management authorities have a great deal of policy freedom and individual responsibility as regards the design, layout and furnishing of the infrastructure and the public space. There is little willingness to sacrifice elements of that policy freedom for a more 'legible' road environment and consistent management of the public space. For this, it is desirable that policy makers and designers should place themselves at the service of the users.

Among policy makers and designers⁴¹ there are two global principal schools. The first school emphasises the importance of the uniqueness of the situation (there is a problem in a certain place and that must be efficiently solved). The second school focuses mainly on generic situations and emphasises the need for uniformity, especially in critical (complex) situations. The followers of the first school attach value to guidelines; in practice, it turns out to be (in the Netherlands) more worthy, and to result in more reward and appreciation than the approach aimed at uniformity (which is seen as centralist, sub-optimal, non-creative, too troublesome). In the Netherlands, compared with other countries, a great deal of latitude has traditionally been given for 'own' solutions, and the quality of the solution depends mainly on the learning process that the designer and the decision-maker have themselves experienced ('inventing one's own wheel').

The present policy culture forms an obstacle for an effective infrastructural approach to the problems of people with functional limitations:

- We do not do what we have agreed with each other
- We give preference to a trial-and-error approach rather than 'process control'. This means that we have to learn anew every time how to handle every new situation
- Society is organised in sectors and is not oriented on an integrated approach (cross-fertilisation takes place only to a limited extent; synergy advantages are insufficiently utilised). This sectoral organisation fits in with the negotiation culture. Working in an integrated manner takes too much time and trouble, and produces too few visible results.
- We consider the solution of individual problems to be more important than offering basic values.

It will be extremely difficult to change this culture. It is probably more effective to aim at the education and retraining of the infrastructure designers, so that can decide for themselves how they should cope with deviations from the average person. Dissemination of knowledge about the still unknown WALCYNG Quality Scheme should be a part of this.

Another aspect of the management of the traffic system is the enforcement of traffic rules that are favourable for vulnerable road users. In practice, as already stated, this receives virtually no priority. There is a great deal of resistance in the private sector against issues such as keeping large trucks out of residential areas. The question is therefore whether something like this is (politically) feasible.

5.5.2.3. Social values

In the research work conducted in order to fill in the Fact Sheets, the following developments concerning 'social values' in relation to the safe mobility of vulnerable groups came to the fore:

- It is generally accepted that babies and toddlers have to be protected. It is also clear, witness the success of the Playing on the Streets Day, that people will stand up for the safety of children.
- In the Netherlands the bicycle is an accepted mode of travel, in contrast to many other countries.

⁴¹ This also applies for other developers of measures, such as developers of traffic lessons, public information folders etc.

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- The moped is far from popular with those who do not ride a moped. That position is becoming worse, not better.
 - Pedestrians' and cyclists' problems are not an important issue in road safety research, despite the large number of casualties.
 - It is not yet generally accepted that vulnerable road users require protection, a privileged position, and that in the event of an accident they are not liable, or bear reduced liability. Guilt and liability are still very closely related to one another.
 - The group 18-25 year-olds is the main target group for advertising and programming of the mass media. Elderly people are slowly but surely being 'discovered' and are losing their dull image.
 - In the past an explicit policy has been pursued with respect to people with a disability. This policy is being diluted, as a result of the more 'business-like' and individualistic spirit of the times.
 - New types of vehicles are in principle given at least the benefit of the doubt. innovations can count on free publicity.
 - The public opinion that 'everything should be possible' is changing.
 - It is considered normal that public transport should be supplied for large events, reducing people's reliance on cars for these.
 - The social position of people with a disability is far from enviable. Campaigns are being run to try and influence the attitude to people with a disability.
 - 'Ageing in place' has become a general principle. The situation of elderly people, including that within road safety, is receiving growing attention from the government.

Stirring up discussion on social values must be seen as a task of the non-governmental organisations and of political parties. The desirable social values, as listed in Subsection 5.4.2.3., are all to a greater or lesser extent the subject of discussion.

5.5.3. Spatial environment

In Section 5.4.3. it was noted that there are a number of possible quality levels with respect to provisions. This notion is certainly not generally accepted. In general, the decision is made from case to case what quality requirements provisions must fulfil. Very rarely might one speak of an integrated quality policy. Certainly for the most vulnerable groups, consistency in policy is an important aspect. The chain is as strong as its weakest link.

5.5.3.1. Physical environment (site)

Requirements that must be imposed on the design of provisions for motorised traffic (including the moped) are contained in the Road Design Handbook (Handboek Wegontwerp - formerly the Guidelines for the Design of Motorways (ROA) and Guidelines for the Design of Non-Motorways (RONA)). For non-motorised traffic there are no 'hard' guidelines for the design, layout and furnishing of the road. Guidelines are not laws, however, and deviations are permitted, provided that there are good reasons for them. In practice, quite a broad view is taken of that.(see above under standards regarding management of the traffic and transport system).

The Road Design Handbook (ROA and RONA) is periodically reviewed. In the most recent review of the guidelines, the possibilities of people with functional limitations did not play any explicit role. The

need for this is not yet generally recognised, but as previously noted, it is also clear that there is still scarcely any insight into the nature and scale of the quality needs of people with functional limitations, especially as regards ergonomic requirements that must be set for the processing of information, reaction speed and traffic skills.

The main line of thought seems to be that designs must be made for the average person (what actually does that look like?). However, the notion that space must be created for exceptions ('the new standard person') is growing. The extent to which space is offered to 'exceptions' is a (political) choice, and can vary from one situation to another.

There have been many publications about Sustainable Safety layout of streets and roads. For many years there has been the Handbook of Recommendations for Urban Traffic and Transport Provisions (Handboek Aanbevelingen Stedelijke Verkeers and Vervoervoorzieningen) which also contains traffic provisions for people with a disability; specific for pedestrian provisions there are the Handbook for Pedestrian Provisions and a number of recommendations from the Information and Technology Centre for Transport and Infrastructure CROW; for the bicycle there is 'Signing up for the Bicycle'. The CROW recently issued recommendations on child-friendly designs.

It must be noted that highways management authorities do not always conform to recommendations of the CROW and to agreements made between the national government and the umbrella organisations the Association of Netherlands Municipalities VNG, the Interprovincial Consultations and the Union of Water Control Authorities. An example of this is the way in which the recommendations in relation to the introduction of Moped on the Road (BOR) was handled. At the local level it was estimated that in many cases it would not be wise to allow mopeds to use the road, so the decision was made to still keep the cycle path open for mopeds in those places. Another example is how right-of-way for cyclists at roundabouts is handled. In this, the controversy has gone so far that a supplementary recommendation has been issued, in which the highways management authorities are given the opportunity to deviate in 'exceptional situations' from the recommendations. This undermines the uniformity of approach that is desirable in complex situations.

The Sustainable Safety approach appears to be turning out well for all regular modes of travel, especially for pedestrians (including children and people with a disability). For new modes of travel, however useful they may be, it will be a very long time before traffic situations have been adapted for their use.

As regards the issues stated in 5.4.3.1., the following remarks can be made about the present approach:

Provide means of orientation

Urban planners have traditionally given considerable attention to the identity of an area. As a standard supplement to that, streets are given street names and buildings are given house numbers. For 'ordinary' people there are generally enough orientation points to be found in a physical environment. For people with a visual impairment, however, that is not always the case.

Minimise complexity

In the design, maintenance and management of places, account is rarely taken of the time people need to make safe decisions. In many cases, unnecessarily complex designs are made. This is due to the resistance of many designers against a uniform approach. Usually people do not realise what risks unnecessary complexity entails for e.g. children or elderly people in situations where they have to

make the right behavioural decisions in a short time. Knowledge about this is often not present, or even not available at all. Designs and practical situations are rarely if ever tested on this point.

Increase contrast in critical situations, Stopping distance view 2.5 seconds, Visibility and legibility of signs, Prevent dazzle

These too are design requirements that are rarely explicitly imposed, and can thus easily escape attention. Critical situations are often not recognised as such, unless a remarkably large number of accidents occur.

Consistent use of colours

In the design world it is not generally known that colour blindness is a very common disorder, which can easily be taken into account. This especially relates to traffic light configurations, road signs and signposting. In the case of traffic light configurations, it is important that green is not used next to red. In the Traffic Light Guidelines no explicit attention is given to this. Mistakes do actually occur, and as far as we know, designs are not systematically checked on this point.

The Royal Dutch Touring Club ANWB signposts can be read easily by colour blind people. Some local signs in the highways management authority's house style can cause problems when red and green are combined in the same sign.

Sufficient width and height of roadway

With respect to the width of the roadway for the car within the built-up area, this rule is rarely violated. On motorways there is a trend towards narrower lanes. This is increasingly causing problems for elderly people.

As a rule, cycle paths are sufficiently wide according to applicable standards, although the question is whether this actually fulfils the rather greater ergonomic requirements of older cyclists and children. Cycle lands almost never fulfil such requirements.

Most of the problems on this point relate to footpaths and pavements. When there is little space available, the pedestrian space is the first to be sacrificed. An extra problem is formed by the presence of lampposts, road sign poles, street furniture and sprawling hedges, trees and shrubs, which reduce the user space actually available to less than the minimum requirement of 90 cm. Also when it comes to the free height, there are (too) many restrictions caused by signboards, awnings, overhanging greenery and low-placed road signs.

Clarity about user group of provision

In general, it is clear for whom a certain section of the road is intended. An important point here is the material and colour use, about which there is a reasonable degree of consensus. Exceptional situations can lead to confusion. Through bicycle routes that are not easily identifiable as a cycle path (sufficient width, signing or marking, red asphalt or tiles) in a residential area can be a source of conflicts.

Separate different types of traffic where speeds above 30 km/h are permitted

In the framework of the categorisation of roads, a distinction is now made between main roads and residential areas. Main roads (access roads) will be laid out as standard with separate cycle paths or clearly recognisable cycle lanes and pavements. Not all residential streets have yet been (re-)laid out as a 30 km/h street. Some of these former 50 km/h streets have such a spacious profile that it is still easy for people to drive at higher speeds, and they actually do so. It will certainly be another few years before this transitional situation is passed.

Adequate crossing situations, Measures promoting visibility of/for people crossing road

The possibility of crossing main roads at traffic lights is generally quite well arranged. For elderly people and people with a disability the available crossing time is often rather too short, and they feel that they are not offered enough certainty of reaching the other side without conflict and danger to life and limb. The possibility of crossing sections of main roads is less good. In practice, the interests of pedestrians and cyclists who wish to cross are considered subordinate to the flow interests of the motorised traffic. Many highways management authorities are not convinced of the need for good positioning, design and furnishing.

Comfortable provisions

In recent years there have been many improvements in the comfort of cycle paths. The more comfortable asphalt is being used increasingly frequently as the surfacing material. Influenced by the benchmarking activities of the Cyclists' Union, many local authorities have put in good work in this field. Situations remain, however, where the quality of the road surface is poor and the bends too tight to be taken at 'normal' speed.

The comfort of pedestrians is much lower on the local authorities' lists of priorities. In shopping areas the pedestrian is pampered, but elsewhere the situation is much less favourable. It can even happen that a deliberate decision is made to use an extremely uncomfortable surfacing material such as gravel.⁴² The quality of the execution of work and the management leaves much to be desired, so that - unnecessary - hindrances are created for blind people and people who use a wheelchair.

Pedestrian provisions suitable for wheelchair and pushchair

In most municipalities, pavements are (almost) always standardly constructed at corners with a slope or lowered curb, so that wheelchair users and people with a pushchair or a rollator can easily cross the road. The many adapted crossing plateaus also make it easier for these 'pedestrians' to cross the road. There is not, however, any consistent approach on this point.

Forgiving traffic environment⁴³

Influenced by Sustainable Safety, highways management authorities give considerable attention to a forgiving road environment. Potentially risky situations are generally tackled energetically, partly due to pressure of signals from non-governmental organisations. Serious design faults do still occur,⁴⁴ but fortunately they are quite rare.

No ruts or cracks in the road surface

Most highways management authorities now know that ruts and cracks in the longitudinal direction are extremely uncomfortable for two-wheelers and can even be dangerous at higher speeds. Ruts occur temporarily on asphalt roads that are in the process of being resurfaced. They also occur unintentionally at bends on tiled cycle paths, when these give way due to a defect in the foundation.

⁴² Examples are the city councils of The Hague (Koningskade section) and Apeldoorn (Loolaan), which for aesthetic reasons chose gravel in the pedestrian domain. Pedestrians then deliberately walk on the cycle path, which was not in fact intended for them.

⁴³ An example of an unforgiving traffic environment is a cycle lane that is separated from the roadway by a (low) ridged marking line. If a cyclist rides over a separating line of this kind, it is very likely that s/he will fall off, and a car coming from behind will not be able to brake in time. In situations where traffic travels fast, and cars may leave the road, it is important that there should be no hard obstacles in the grass verge.

⁴⁴ E.g. stick-on strips for road-marking lines and zebra crossings that become dangerous when wet for cyclists, moped riders and motorcyclists.

Bicycle parks/ racks

Many bicycles are normally to be found in the neighbourhood of NS (Dutch Rail) stations. In most cases, there are now also good bicycle parks, which means that the problem of 'loose bicycles' has greatly reduced. Bicycle parks are also appearing close to shopping centres and shopping streets. In less intensively used areas, attention to parking bicycles is and will remain limited.

Measures during construction work

When work is being carried out on the roadway, the guidelines for protection in such situations are generally fulfilled. When work is being carried out on cycle paths and footpaths, however, rather less care is taken.

5.5.3.2. Network (route)

Connected network

For both the cycle and the pedestrian network, the quality in the Netherlands is much higher than in almost all other countries. That is not to say, however, that everything is perfect. For instance, many small municipalities have almost no pavements or footpaths; in some cases that is a deliberate policy: to keep the 'village-like character'.

In many municipalities, the missing links in the cycle network are known. In most cases there are also plans to fill in those missing links. The situation of long-distance paths outside the built-up area is rather less favourable. Due to the construction of large-scale (HSL, motorways, canals), connections are broken; the construction of an underpass or bridge is sometimes considered to be too troublesome or expensive.

Pedestrian provisions are not usually considered in terms of networks and routes. In practice there are (fortunately) not so many gaps in the network within a neighbourhood or district, simply because a pavement is constructed as a standard provision at the side of a street. The situation is different for routes to locations outside a neighbourhood or district. Good connections then are more the result of luck than planning.

Functionality of the network

More attention is usually given to the functionality of the cycle network than to that of the pedestrian network. On this point, there is much room for improvement. In many routes there are situations that cannot be used by the wheelchair or the electric scooter, so that they are forced to make detours (which are objectionably long for them).

A positive example are the Kindlint projects, which give explicit attention to ensuring that the routes can be used by children.

Recognisable route

Recognisability and means of orientation on a route are mainly important for blind and partially sighted people, and for people who are unfamiliar with the place. At virtually all stations guiding lines have been introduced for blind and partially sighted people; the routes to those stations, however, often lack the necessary provisions.

Signposts for cyclists and pedestrians are only used in special situations and on main (tourist) routes. Highways management authorities assume that people will be able to find their way. That is actually most often the case, but systematic attention to this point does not seem an unnecessary luxury.

Comfortable route, Attractive route

The comfort and attractiveness of a route as a whole, for both cyclists and pedestrians, are rarely given explicit attention. Only in special projects, such as a route from a multi-storey car park to the city centre, is attention emphatically given. It must be noted, however, that local authorities place resting points and benches on important walking routes, without anything being structurally said about these in memoranda and so on.

5.5.3.3. Spatial structure

Research has shown that new towns are significantly safer than old towns that have simply grown. From this one can conclude that in practice spatial planning has in general had a positive influence on road safety. The network in these towns has a hierarchy that fits in with contemporary ideas about a safe network structure. Since the late 1980s there have been several publications about the relation between spatial planning and road safety. In those publications, (substantive) building blocks are offered for good integration of prevention of road accidents in spatial planning. Those recommendations have scarcely if at all been taken up by the spatial planning world. The study 'A step towards the Mobility Test - spatial planning in relation to road safety' ('Opstap naar de mobiliteitstoets – RO in relatie tot de verkeersveiligheid' showed that the stumbling block is not knowledge, but rather its embedding. The knowledge that is important for the prevention of accidents, including the knowledge about vulnerable groups, does in fact already exist, but it is not available in practice within the planning process. Within the framework of the development of the Mobility Test, attempts are being made to introduce changes to this situation.

As regards the issues mentioned in 5.4.3.3, the following points can be noted:

Large residential areas

Within the framework of the realisation of Sustainable Safety, the plea is often made for making residential areas as large as possible. In practice, most local authorities are seen to be hesitant about reducing their road network in a drastic manner. This is partly out of fear of unfavourable public opinion. As a result, slow traffic routes relatively often have to cross main roads.

Proximity of essential facilities, Strategic positioning of functions

In theory, virtually everyone agrees that proximity of facilities and strategic positioning of functions are important issues. Practical situations, however, are more difficult. In the case of expansion plans, it is reasonably possible to include this issue as a requirement in a schedule of requirements. In the case of refurbishment plans, the possibilities are much more restricted. Furthermore, due to the wide distribution of the residential locations of groups for which proximity would be benefit, it turns out to be difficult to strictly fulfil this requirement. Because the Netherlands is densely populated and facilities are relatively accessible on foot and by bicycle, essential facilities are (still) sufficiently accessible for most people.

Separate problems are the mergers of schools and gradual reduction in occupancy of homes. Both of these result in an increase in the size of the area that is covered by the facilities, so that children have to cover greater distances and encounter difficult situations more often. When schools merge, it is essential to give attention to cycle routes.

An important cause of the reduction in occupancy of homes is the ageing population. With the ageing of the population, the number of vulnerable people is increasing. The increase in scale (= increase in size of the area covered by facilities) that is also occurring in service provision, it is becoming more

difficult to guarantee the increasingly necessary proximity of essential functions. Within spatial planning, there is still virtually no awareness of this.

Compact City layout

The Netherlands was for many years a Mecca of compact city planning. In recent years, however, the Compact City vision has come under pressure. There is growing pressure to be permitted to build outside the existing built-up area.

User-friendly layout

A user-friendly layout involves not only the functionality at the moment, but also the user-friendliness in the future. Design for All, that is to say, a public space that can be used, accessed and entered by children and people with a disability, is still not normal practice. In practice, (evidently) not all designers know what they should do.

Categorisation of roads

It has already been mentioned a number of times: within the framework of the successful Sustainable Safety Start-Up Programme, there has been a categorisation of roads. In connection with this, access roads and flow roads have been designated as priority roads. For most roads it is now clear what function they have. For the road user, however, that does not necessarily mean that this function is immediately identifiable. The adaptation to the 'essential characteristics' in many places still remains to be done.

Keep vehicles off the street scene

There are many practical objections to keeping vehicles off the street scene. One of these is that people want to have their car in front of their door, and that it is therefore seems to be an unnatural requirement. Another objection is that keeping the car off the street scene, without seriously damaging the ease of using it, costs a great deal of money. In existing situations it costs more to park cars in multi-storey car parks or on parking lots than it does to let the old situation continue. On the other hand, however, the pressure of parking above an ownership level of around 95% suddenly become acute, and support will naturally arise for alternative solutions.⁴⁵ In some cities (Amsterdam, The Hague, Utrecht, Delft) this is already occurring. The solution is becoming increasingly easy to raise for discussion.

Cycle parking facilities

Virtually all post-war residences have a storeroom or a shed where bicycles can be parked. It is important that those storerooms and sheds are easy to access in terms of both location and entry. That is in fact traditionally the case. In some new construction projects economies are being made on this point, such that the bicycle can no longer be parked securely; in such cases, the use of the bicycle can be endangered.

⁴⁵ In the Spanish city San Sebastian, car ownership doubled in the space of 10 years. The pressure of parking became so high that the access roads jammed up; the city council found a solution by excavating the side streets and constructing underground car parks; ground level has been laid out as car-free pedestrian space. The parking spaces are being sold at project cost (€ 15.000 per space!); there is more demand than supply. The people of the city are very pleased with the solution.

Balanced input of design disciplines

It is not automatic that all design disciplines will have a balanced input in the planning process. In practice, the urban planning sector takes the lead, and there is no question of a balanced input from all disciplines.

Use of Mobility Test

The Mobility Test is not yet available.

Participation of stakeholders

In refurbishment plans, participation of stakeholders is fairly self-evident. A new development is the participation of children in the designing. There are already several promising examples of this. In the case of expansion plans, it is much less customary and the possibilities are also much more restricted.

5.5.4. Transport system

5.5.4.1. Vehicle

Collective transport

Within the framework of the Services for the Disabled Act (WVG), local authorities contract out the transport services for disabled people. A study conducted by Delft Technical University has shown that the requirements imposed for this are too low, as a result of limited expertise of the local authorities in this area. This means that the ease of boarding many vehicles for disabled people leaves much to be desired. Standard taxis and minibuses cannot meet the requirements of easy-boarding that must be set.

Transport of (school)children has also been found to be badly organised in general, and not checked as regards safety aspects.

Bicycle

Bicycles are not tested for safety. No requirements are imposed for being permitted onto the road. The technical state of bicycles leaves much to be desired. At many primary schools, annual bicycle checks are held in the context of the practical traffic test. For that occasion, many bicycles are repaired. In secondary education the situation is less favourable: the bicycles are used more intensively, there is a great deal of vandalism, and there is little checking of them.

In large cities the chance of theft and vandalism of a bicycle is so great that people deliberately leave their bicycle in a bad state. In a number of municipalities, projects have now been set up to reduce the number of bicycle thefts.

Side and rear reflectors are compulsory. The checking of this has slowly but surely become diluted.

Moped (faster and slower)

All mopeds (faster and slower) must have a Department of Road Transport (RDW) type quality label. mopeds new from the factory fulfil increasingly high safety requirements. However mopeds (faster and slower) are often badly maintained. The technical state of mopeds that have been in use for some time leaves much to be desired. A common, and as yet fairly uncontrollable problem is that the

engines are tuned-up (modified). The modification sets are freely available. A covenant with the moped trade about restricting their availability has not had much effect. Work is currently being done on the introduction of registration places for the moped, which will increase the chance of being caught.

Motorcycle

Motorcycles usually have a special place in their owner's heart. The technical state of motorcycles is therefore rarely a problem. They do, however, often make too much noise.

Car

High requirements are set for the safety of new cars. Sharp projections are not permitted. Bull bars are not (yet) prohibited, are rarely supplied as standard with new cars, but are added by the owners as accessories. The present windtunnel models of cars are less dangerous for pedestrians and cyclists than their predecessors. The European Commission wants cars to have pedestrian-friendly fronts. The industry is working on this with some reluctance.

Cars that are adapted for use by people with a physical disability are checked/ approved for technical and safety aspects by the Department of Road Transport RDW. The quality of protective devices, such as child seats, is tested by the Netherlands Organisation for Applied Scientific Research TNO and monitored by the RDW. Tests conducted by the Royal Dutch Touring Club ANWB and the Consumers' Association have revealed that many child seats are of poor quality. An even greater problem is the poor attachment of child seats inside the car. That is not checked.

The Euro Ncap tests and the publicity about these appears to have had a strong positive influence on car manufacturers. The fear of negative publicity due to a poor test appears to have been a powerful motive to introduce improvements.

The Periodic Motor Vehicle Test (APK) has ensured that the very worst cars are no longer on the road. Vehicle checks take place occasionally. The police have an instinct for eye-catching (old, defective) cars. Nevertheless, the actual chance of being caught is almost negligible.

Daylight Running Lights (DRL) make it easier to detect oncoming traffic. When DRL are introduced on a general basis, cars will be easier to see and road users without a light will be relatively less easy to see. No empirical studies are available on this matter.

Special vehicles

Special vehicles fitted with a motor have to fulfil the RDW requirements for using the road. From the legal point of view, special vehicles are usually equated with the moped. Four-wheeled mopeds and electric scooters have to fulfil requirements regarding the maximum speed, but virtually no requirements are set for their construction. Four-wheeled mopeds look like small cars, but are also considerably less safe for their occupants.

In recent years, new vehicle types have been introduced with increasing frequency. Recent introductions include e.g. squads and electric autopedes. Road safety is in general not benefited by these new vehicles.

Trucks and vans

Just like cars, trucks and vans must fulfil high RDW safety requirements. As of 2003, it is compulsory for trucks to be fitted with blind-spot mirrors. This reduces the chance of running over cyclists or pedestrians at a bend. The problem of 'front underrun' has not yet been solved.

It is not compulsory for vans to be fitted with blind-spot mirrors.

5.5.4.2. Transport concept

Growing attention can be detected in the vehicle sector for a specific range focused on elderly people. Thus, low-mounting bicycles, electric scooters and four-wheeled mopeds have been introduced. There also seems to be a thriving market for handy accessories, such as (blind-spot) mirrors, provided that these do not have the image of being designed for people with a disability.

Collective transport

The Netherlands performs worse than other countries with respect to the easy-boarding transport systems.

Bicycle

No quality requirements are set for the bicycle. There is no (political) willingness for this.

Moped (faster and slower)

No distinction is made in policies between the true slower moped and the scooter models that can travel much faster than 25 km/h. The measure Mopeds on the Road (applicable to faster mopeds) is therefore less effective for the safety of cyclists than it could be.

There is (cautious) discussion about the moped as a transport concept; this is due to the large scale on which the slower moped is misused.

Motorcycle

From time to time, non-governmental organisations run campaigns to improve the safety of the motorcycle. Visibility is the most important issue in these.

Car

As a transport concept, the car has risen above every discussion. Influencing car use is no longer fashionable. Influencing car ownership seems not to be open for discussion.

Cars are becoming on average increasingly large and heavy. For the safety of pedestrians and riders of two-wheelers, that is a negative development, because it has a detrimental effect on the seriousness of the consequences of an accident.

Special vehicles

The national government only gives attention to a special vehicle if it receives a relatively large number of negative signals concerning that vehicle. There is no question of deliberate promotion, or attempting to restrain ownership or use.

5.5.4.3. Mobility needs

A policy of openly directing mobility is out of favour. The 'old' Structural Plan for Traffic and Transport II (Structuurschema Verkeer and Vervoer II - SVV2), which made great efforts to reduce car use, is still in operation, but enjoys declining support. The belief that society can be shaped is not as strong. The direction of policy is determined now by the relation between the social costs and the benefits. More effort is being put into the principle 's/he who pollutes has to pay'. In that framework, the true costs connected with a trip are charged to that modality. It is increasingly considered that people who use motorised vehicles should pay all the costs of their mobility, thus also the external costs (costs of using the space, environmental costs, costs of road accidents and compensatory measures). Public

transport must also cover its costs more. Pedestrians, cyclists and riders of mopeds (faster and slower) cost the community relatively little and do not (yet?) have to pay separately for their mobility. Cross-subsidies (e.g. car users pay for public transport) are labelled undesirable. The fact that little money is involved in the mobility of vulnerable groups offers an explanation for their low place on the political agenda.

In the (government) policy, the interest of walking as a part of the trip is underestimated. The role of public transport as a logical complement of walking is declining. Due to the urban parking policies, average walking distances are becoming longer. This (gradual) change is not flanked by active pedestrian policies.

In a number of municipalities, there is a (cautious) development in the direction of free public transport, following the example of the Belgian municipality Hasselt.⁴⁶

The present approach regarding the issues listed in 5.4.4.3. is as follows:

Discourage car use for taking/collecting children

Discouraging car use for taking and collecting schoolchildren regularly creates chaotic situations in schools.⁴⁷ Complaints are made about this to schools, local authorities and non-governmental organisations. Here and there, cautious attempts are made to persuade car-using parents and carers to change their minds, but it is a very sensitive subject. In some places measures are being taken to reduce the chaos, e.g. providing a Kiss-and-Ride lane.

Encourage choice of school close to home

Parents are free to choose the school that their children attend. The government therefore does not see it as its task to act in a directing manner in this regard.

Discourage moped use

The position of the moped is under great discussion, due to the dangers and nuisance it causes. It is not explicitly said that the use of the moped must be discouraged. However, measures that can have that effect de facto can count on support. Plan 17,⁴⁸ which is in the pipeline, can result in reduced moped use; that is good for road safety. It is, however, nothing more than a plan.

Restrained marketing of motorcycle and four-wheeled moped

The use of the motorcycle is neither recommended nor discouraged. The problem with traffic jams and tail-backs works somewhat in favour of increasing motorcycle use.

The purchase of the four-wheeled moped is in many cases covered from Services for the Disabled Act (WVG) funds. That money is at the disposal of the local authority. In most cases the policy for disabled people is separate from the other traffic and transport policy of the local authority.

⁴⁶ In the late 1990s, the municipality of Hasselt was faced with a choice: invest in a ring road for motorised traffic, or offer free public transport. Offering free public transport seemed to be more cost effective than constructing new infrastructure. The municipality chose free public transport.

⁴⁷ 10 – 15 % of primary school children are taken to school by car. In the countries surrounding the Netherlands, the percentages are even higher.

⁴⁸ The plan entails that 17-year-olds may drive a car with accompaniment and under strict conditions. At the same time, a new category classification will apply for motorised two-wheelers, for which a driving licence will then be needed.

Promote bicycle use

Under the SVV2 policy, the use of the bicycle was emphatically encouraged. That is formally still the case, but the favourable tax measures in that respect have now been abolished. Moreover the subsidy sources that made it possible for local authorities to make extra investments for the bicycle have more or less dried up. The national government does, however, still contribute to dissemination of knowledge and the substantive support of local and regional highways management authorities via the Cycle Council (Fietsberaad).

Offer transport alternatives

People who do not have a car at their disposal can in principle fall back on public transport. That does not, however, especially outside the cities, offer sufficient consolation. For a long time there has been the 65+ card, which allows elderly people to use public transport for a reduced fare. For students there is the student public transport pass, which can be valid for weekdays or weekends. The continued use of this pass is currently under discussion.

Introduction of a dial-a-bus, the train taxi, and other demand-responsive forms of collective transport have improved the range on offer, and have largely been able to make up for the declining function of regular public transport as a safety net for those with few transport options.

Transport concepts that offer new possibilities for people with a disability may be eligible to receive Services for the Disabled Act (WVG) payments. That applies for both collective and individual forms. As regards special vehicles, it can be stated that if a certain special vehicle falls within the regime of the WVG, that offers chances for the users. Thus, the electric scooter, electric wheelchair, but also the four-wheeled moped come within the reach.

There is, however, no active policy regarding criteria for existing or new transport concepts. In principle, the regulations of the EC are followed. If a certain transport concept has existed for some time and its use has achieved some scale, there often arise interest organisations for it: associations of skaters, autopedes etc.

Take services to the home

'Meals-on-Wheels' is a well-known example of services to the home. In virtually all municipalities a service of this kind is available for elderly people and people with a disability. It can still happen that the doctor goes on home visits (although that is now under pressure). New forms of services to the home are internet-related services of the banks and of local authorities; also again increasing slightly in popularity are home deliveries of groceries.

5.5.5. Conclusions regarding the present approach

The present approach to the problems of vulnerable road users can be characterised as follows:

Basic provisions for pedestrians and cyclists do not need to be discussed

In the Netherlands, compared with other countries, there is a fairly good pedestrian and cycle network. Pavements are constructed more or less as a standard. For the bicycle there is a fairly complete network, especially in comparison with other countries.

Mainly reactive: incident oriented

Like most other policy areas, the approach is primarily reactive: measures are only taken if some kind of emergency arises (alarm system). There is virtually no proactive or preventive policy.

Measure oriented

In practice, a high value is attached to dynamism. Many feel that a problem analysis only has the effect of slowing things down, and all the more if they feel that they already know the cause of the problems. The step from detecting the problem to analysis of the causes is omitted.

Location (site) oriented instead of structure oriented

Problems of vulnerable groups manifest at concrete sites. It is there that the problems are solved. The problems are only rarely placed in a wider context, such as the routes covered.

Humanitarian: children, disabled people

The approach to problems of vulnerable groups is largely inspired by humanitarian reasons. The size of the actual social damage does not (yet) play any significant role. People usually estimate in that regard that things will turn out quite well. In practice, the humanitarian argument is found to be very powerful, albeit that the attention is usually of a temporary nature.

Oops.....: 'reparation' measures

Many measures taken for the benefit of vulnerable groups are actually reparation measures. In many cases, it is also assumed that vulnerable road users do not need very much that is special: "after all, they travel by simple modes".

A clear example is provided by crossing places for slow traffic on access roads. A road is designated as an 'access' road because of its desired traffic function. Then it turns out that it is difficult to cross. Measures are subsequently taken at places that least disturb the flow of the traffic.

Effectiveness and yields?

Evaluation of measures is rare. This means that very little is known about the effectiveness of measures. As a result of the limited attention to problem analysis, many assessment mistakes are made. Measures can therefore miss their target. For instance, pedestrian crossings are often located in places that do not lie on the pedestrian route, but rather at intersections. Pedestrians take the shortest route and therefore cross the street elsewhere.

Liability? Guilty!

In questions of liability, guilt has traditionally played an important role. Thus, the automatic liability of car drivers in the event of an accident for which they are not guilty in any legal way is seen by many people as a (serious) injustice. The proposition that as a car driver one constitutes a greater risk for vulnerable groups than vice versa, and that the car driver has a greater responsibility, is for many people too abstract. The government (especially the legislator and the legal powers) is ahead of the citizens in this respect. In decisions at the local level, on the other hand, public opinion still plays an important role: there the legislator cannot easily get around the question of guilt. Thus, there is a certain reticence to tackle dangerous situations in which violations are committed by cyclists or pedestrians.

Words but not deeds

As regards the approach to the problems, there appears to be a difference between word, perception and deed when it comes to putting in money and manpower for vulnerable road users. This is (understandably) a thorn in the side of interest organisations.

Responsible for one's own safety

Many people think that road users are primarily responsible for their own safety, even when traffic situations are not optimum. They miss the fact that some people cannot (anymore) actually be responsible for that.

5.5.6. Approach in other countries

AVV has an International Knowledge Bank. One of the topics that are covered under the issue road safety is 'Vulnerable Road Users'. The International Knowledge Bank includes a number of texts about the OECD and ECMT, the European Union, Belgium, Germany, and the United Kingdom. The texts below are quotations from the Knowledge Bank (the position in March 2003), omitting the literature and internet references.

Vision of the OECD and ECMT

Recent trends in road accidents have induced the Council of Ministers to set up specific quantitative targets for road safety, such as the reduction by 50% of the number of deaths in road accidents for all ECMT Member countries over the next 10 years. Between 1997 and 1999 the ECMT issued three reports and three resolutions on safety in road traffic for vulnerable users, namely cyclists, pedestrians and users of two-wheeled motorised vehicles (mopeds and motorcycles).

These studies form part of a wider area of review which, in addition to road safety itself, takes into account the demographic trend in ECMT countries - population ageing - and the highly topical issues of mobility, land use planning, the environment and public health.

The measures recommended (whether general or specific to each user category) show that much remains to be done to ensure the safety of vulnerable users. The aim is not to promote a single model, but to develop strategies tailored to the specific features of each country.

Policy of the European Union

In the European Transport Policy for 2010: Time to Decide, the European Commission states that it has the intention to further develop and promote road safety within the EU Member States. In that document it affirms that it wishes to make life safer for cyclists and pedestrians. It is noted that safety standards in the design of the front of a car could save 2,000 lives per year. Voluntary introduction of such a standard is currently under discussion with the industry. Apart from this, no separate policy is pursued within the European Commission aimed at vulnerable road users.

A number of research projects of KP5 support the policy of the European Commission relating to road safety. The subjects within this theme are extremely diverse and encompass both vehicle technology and behaviour. These research projects are part of the Competitive and Sustainable Growth programme. WALCYNG and PROMISING are studies within KP5 and aim at improving the road safety of vulnerable road users.

Belgium

The intention of the federal government to promote road safety can be found in the policy document on mobility and public works 2000-2004. This policy document primarily notes the responsibility of cities and regions to realise road safety. The policy is aimed at further reducing the number of road accidents in Belgium. In the past, too little attention has been given to alternative means of transport, and too little money invested in them. That applies for public transport and other forms of collective

transport, and also for the 'softest' modes travel: walking and cycling. The policy must also put its weight behind those forms of travel.

Pedestrians and cyclists must also be able to count on infrastructure and facilities that are adapted to their capabilities and limitations. Their vulnerable position in relation to motorised traffic merits special attention. In the Flemish-speaking part, 14% of road accident casualties are cyclists, and 7% are pedestrians. Moreover, for pedestrians who are involved in an accident, the chance of surviving that accident is half that of motorised vehicle drivers. The safety of pedestrians and cyclists must therefore be increased by means of adapted infrastructure and regulations that offer them better protection. The number of accidents involving pedestrians and cyclists must fall, cycling and walking must become more comfortable, and this must ultimately result in people cycling or walking more.

Germany

The German road safety policy is laid down in the document Programme for More Safety in Road Traffic (Program für mehr Sicherheit im Straßenverkehr), adopted in 2001. One of the key themes within this policy is the improvement of safety for vulnerable road users. By this, the German government means children, elderly people, cyclists, pedestrians and motorcyclists. Within this theme, the German government mentions a number of specific objectives. Firstly, to improve the safety of areas where many children and people aged 65+ walk. In these, consideration must be given to introducing 30 km/h zones. Secondly, buses for the transportation of (school)children must have better protection. This could include making seatbelts compulsory and tightening the rules regarding the resting times of drivers. Thirdly, the cyclist could be better protected by, among other things, constructing cycle paths and making it compulsory to have a bicycle light powered by batteries on new bicycles. In addition, consideration was also given to making it compulsory to wear a helmet. However, given that cyclists are not enthusiastic about this, and the enforcement would become highly complex, this was not feasible. The German government did, however, emphasise that the policy will encourage the voluntary use of a helmet. Fourthly, more attention will be given to motorcycle training, and car drivers will be informed more about the limitations of a motorcycle in traffic. Finally, the policy aims at improving the safety of public transport, especially for elderly people and children, attention being given mainly the dangers of boarding and exiting vehicles.

The German Road Safety Council (Deutscher Verkehrssicherheitsrat - DVR) in particular is very active in the area of road safety for vulnerable road users and has set up various programmes.

United Kingdom

The British government's policy on road safety is laid down by the Department for Transport. In the policy documents Transport 2010, The Ten-year Plan and Integrated Transport White Paper: A New Deal for Transport, Better for Everyone, the British government sets its targets for the future with respect to road safety. A major role in this is played by the safety of vulnerable road users.

In the Road Safety Strategy of the Department for Transport explicit attention is given to improving the safety of vulnerable road users. The strategy of the Department for Transport is to improve the conditions for vulnerable road users and to encourage them to protect themselves. Thus, the Local Transport Plan (LTP) is seen as the most important instrument for improving the road safety of pedestrians and cyclists. During urban planning, local authorities must also look at how they can encourage people to walk and cycle more, and what safety measures they can offer these people. Local authorities must work together in this with the police, residents and interest groups. There are many initiatives that are also mentioned in the document. For instance, various pilot projects have been launched aimed at the layout of 'Home Zones', that is to say, special regulations for designated residential areas.

A specific target that is also mentioned in the Road Safety Strategy is to halve the number of fatal road accidents involving children by 2010, in comparison with 1998. Although children will also benefit from the measures taken by the government aimed at vulnerable road users, some measures will clearly have a more than average effect on the safety of children. Here one must think of, among other things, decreasing the quantity of traffic on the roads. Local authorities play an important role in educating children in the area of road safety (Local Responsibilities for Road Safety). Both the police and various interest groups such as Child Accident Prevention Trust (CAPT) and the Royal Society for the Prevention of Accidents (RoSPA) are also involved in the improvement of the road safety of children.

The Department of Transport, Local Government and Regions has summarised all the relevant research questions in DTLR 2001 Science and Innovation Strategy. The site of the Department for Transport; Road Safety also contains a comprehensive list of research on vulnerable road users.

5.6. Developments in the social positions

The attention given to the various vulnerable groups of road users differs from case to case. Factors in this are the mass of the group, the seriousness and scope of their problems and also their position of power within relevant bodies. In this last respect, personal characteristics of their representatives play an (unpredictable) role. Influenced by the spirit of the times, the position of a group can change. Thus, for instance, the attitude in the 1960s and 1970s was more strongly focused on solidarity than it is now, and one may expect that the attention given to provisions for children will be less in an ageing society than it would be in a society with many children. The direction that society is taking now is uncertain.

Subsection 5.5.2.3. on present social values touched globally on how 'society' thinks about certain groups. In the following, mainly on the basis of the information from the Fact Sheets, rather more extensive consideration is given to the developments in the position of the various vulnerable groups in traffic, in the collection and management of knowledge, in negotiating processes and in the government policy.

5.6.1. Position in traffic

People look kindly upon children, and that is also evident in traffic, insofar as they have the opportunity. Within residential areas it is possible, but beyond those the criterion is the 'big people's world', and their interests can easily be suppressed. Influenced by the demographic changes, their position will become worse rather than better.

The ageing population and the decreasing number of young people will mean that the number of vulnerable road users will increase substantially; there will be more elderly people and hence more people with functional limitations. The proportion of elderly people in the population will increase over the coming years. The maximum will be reached in 2040. At that time there will be about twice as many old people as there are now. In addition to the 'ageing' effect, there will also be 'double ageing': the group of very elderly (80+) will show the largest relative increase. While the elderly may now be

the exception in traffic, they will be the norm around 2020. That will create a completely different situation on the road than there is now.

There has always been a certain compassion for people who are less fortunate, but that does not have the highest priority in people's behaviour towards one another. It may be expected that in the future some improvement will be seen in this.

The position of homeless people and addicts in traffic is rarely if ever mentioned in the literature. The impression of public opinion is that people would rather see the back of them. If they create a nuisance, they should just be sent away.

Opinions about immigrants are rather more sensitive, but do lie somewhat in the same direction. It is not to be expected that change will take place in this.

Because of the expected growth in driving licence possession, car ownership and use and freight transport, the roads will become busier and the proportion of trucks and vans in the traffic will increase. The consequence of that will be that the contrasts between vulnerable and less vulnerable road users will become greater. This will be most evident on main roads within the built-up area.

As regards the position of the different modalities in traffic, one can observe that there is in fact a 'natural' pecking order:

Pedestrian

The fate of the ordinary is that people give it no attention. Pedestrians are a fairly inconspicuous part of the inventory of the environment, not something to really take into account. That is not unwillingness, but the result of a normal psychological phenomenon. People have to focus their attention on unusual, anomalous matters, because they can give problems. People would become mentally overloaded if they also had to give their attention to the ordinary things. Within residential areas the pedestrian is generally treated with respect; that is less the case when it comes to crossing main roads. Outside the built-up area, pedestrians do not fit into the pattern of expectations, and they run excessive risks.

Addicts and homeless people are at the lowest level of society and have little or no influence over their own social circumstances. They are at the bottom of the pecking order in traffic.

Pedestrian who requires an aid, person with a disability

Increasing quantities of traffic increase the problem for people with a visual or auditory impairment. The fact that cars are becoming quieter (let alone the increasing use of electric vehicles) has serious consequences for people with a visual impairment.

Cyclist

In the Netherlands, cycling is an accepted mode of travel, although people do not feel especially enthusiastic about it. What was said about the pedestrian, also applies to the cyclist to a slightly lesser degree. It is clear that as a driver or a vehicle you have to take account of the cyclist, but it is not really heartfelt. The cyclist does not constitute a threat for motorised traffic. That is something which also does not strengthen the position.

Moped (slower) rider

Misuse of the slower moped by young people has put it in a less positive light. These mopeds do not have a shining image. Not everyone would wish to be seen on one. In traffic the (true) slower moped is treated like a cyclist.

Moped (faster) rider

The faster moped is just about tolerated, but that's about all. For pedestrians and cyclists, the rider of the faster moped constitutes a threat that has to be taken into account; for the motorised traffic s/he is more a nuisance.

Motorcyclist

The position of the motorcyclist is ambivalent. On the one hand, the motorcycle is associated with a youthful dream and freedom, on the other it is perceived as a bothersome, irritating, slippery and elusive phenomenon. On motorways, it is primarily the latter view that applies, and the position of the motorcyclist is not very enviable.

Cars, vans and trucks

The car is the measure in traffic. For large and heavy cars, people have rather more respect than for the small ones. Trucks and coaches are at the top of the pecking order.

5.6.2. Position in knowledge collection and knowledge management

At the start of the Vulnerable Road Users project it became clear that the insight into the problems and the possibilities of tackling them is limited. This was discussed above in Section 4.2 on Knowledge, knowledge structure and experts, and in Subsection 5.5.1.3. Social sector, knowledge and knowledge management regarding vulnerable road users was again discussed. The reader is referred to those places.

It is clear that knowledge about vulnerable road users is fragmented; due to the low priority or status, the portfolio is easily passed from hand to hand. There is no 'watchdog' to monitor the quality of knowledge, policy an approach. There is no continuity in the collection of knowledge. It is not to be expected that knowledge in this area will be acquired on a large scale at local or regional level. Moreover, given the increasing market orientation of universities and research institutes, it not likely that these bodies will spontaneously and at their own expense take upon themselves the role of obtaining this knowledge. Of consultancy firms, it is in no way whatsoever to be expected. Interest organisations do not primarily focus on knowledge, but on emotion. They use knowledge to generate emotion or engagement; that emotion must then translate itself into policy attention.

5.6.3. Negotiating position in processes of change

In Subsection 5.5.1.3. Social sector, the present situation with respect to the non-governmental field was described. This indicated that the lobby for cars and car use is very well organised, and the various vulnerable groups are less so. There are no organisations that separately support the safe mobility interests of pedestrians, of children, of moped riders, of homeless people and addicts and of immigrants. This will reduce the attention given to the traffic interests of the groups concerned. It also means that there is very little incentive for acquisition of knowledge about problems of the group. It is more or less up to chance whether an issue comes onto and remains on the political and policy agenda.

In negotiating situations, representatives of vulnerable road users have to face stiff competition. The private sector, public transport, the car lobby and freight transport are very well organised, are in a financial position to call upon expertise, are highly skilled in negotiating and have a lot to offer in negotiating situations. Vulnerable groups are usually badly organised and are often not in a position to recruit enough people with the right level of expertise on the matter and negotiating skill.

Factors that are important for the negotiating position are the size of the target group and the social weight that the problems already have. The effectiveness in negotiating processes depends on the personal capacities of the negotiators, in which expertise, negotiating skill and the image of the organisation, among other things, play a part. In practice, the size of the interest organisation is also important. This demonstrates the amount of social support. A large organisation can also more often oblige when the (local) government asks it for some kind of an input.

With respect to the negotiating position of the various groups, the following points can be noted:

Pedestrian

Pedestrians are at the bottom of the pecking order in traffic. Attention for their problems is therefore not automatic. Everyone is a pedestrian, but also a cyclist, car driver or public transport user. Those other modes of travel have greater appeal.

Sustainable Safety is creating a strict separation between traffic area and residential area. Residential areas are more strongly associated with walking than with traffic. For the (re-) layout of residential areas this represents a considerable improvement in the position of the pedestrian. In negotiations about the crossing of main roads, on the other hand, the position is becoming less strong.

For much of the time that a person spends as a pedestrian in traffic, s/he is on the way to or from another mode of transport. Spatial policy used to support car use. This means that most destinations are no longer located within walking distance. Both developments reduce the realisation that everyone is a pedestrian. In other countries, especially the United Kingdom, there is an active, powerful and stimulating pedestrian movement, which encourages knowledge building and management, and the implementation of concrete policy, by keeping the issue on the agenda. There too, incidentally, there is a further difference between a 'pedestrian' and a 'hiker'. The latter is held in greater esteem.

Pedestrians who need aids for walking

The number of people who need aids for walking will increase considerably over the next few decades. This will also increase their political power and improve their negotiating position. Organisations for people with a disability and elderly people are represented in virtually all municipalities.

Cyclist

The interests of cyclists are very well represented by a number of organisations. The Cyclists' Union, which also has many local sections, focuses specifically on the cyclist. The interests of the cyclist as a tourist are represented by the Royal Dutch Touring Club ANWB. The United Road Safety Organisations 3VO also devote a great deal of attention to the safety interests of the cyclist.

Moped (slower) rider

The interests of riders of slower mopeds are not separately promoted. The size of the group is small. It may be expected that the slower moped will not become much more popular. Many people who ride slower mopeds do so because they do not have a driving licence and/or car. Possession of a driving licence among elderly people increases every year (among people now in their 50s, the proportion

who hold a driving licence is very high; among those in their 60s the proportion is rather lower, especially among women). Consequently, in 10 years' time, the number of 'optionless' people will decrease and much potential slower moped use will be replaced by car use.

If the helmet also becomes compulsory for the slower moped, it may be expected that the number of users will substantially decline.

Moped (faster) rider

The RAI-BOVAG and the ANWB promote the interests of the moped rider, but only as a subsidiary activity. The weight of interest is limited and seems to be declining, for a variety of reasons. The position of the faster moped and the slower moped (scooter model) is under discussion. Consideration is being given to making it compulsory to wear a helmet for the slower moped (non-spartanet), increasing the age at which the faster moped can be ridden, making it compulsory to have a full driving licence (i.e. also a practical test), and introducing a different classification of the vehicle categories. A second reason for the decrease in interest is that the size of the group of 16-17 year-olds is decreasing slightly. This can only entail a slight reduction in the interest in the moped. If there are no changes in the requirements of riding ability or category classifications, the number of mopeds will fall by some 10 to 15% over the next 20 years.

Motorcyclist

There are a number of powerful and competent organisations that promote the interests of the motorcyclist: the Royal Dutch Motorcycling Association KNMV and the ANWB. Motorcycling evokes a picture of freedom. With the increasing quantities of traffic on the roads during the week, motorcycling offers an alternative perspective. Motorcycling is closely related to age classes. The proportion of the age group 25-55 years is decreasing. The changing age structure of the population is expected to lead to less use of the motorcycle.

Children

Representation of the interests of children is quite well organised. Various organisations have set themselves this task: 3VO, traffic parents, parent councils of schools, playground associations etc. There is still a great deal of attention for the safety of young children. Babies/ toddlers are becoming more important for ensuring a liveable future, and will be protected even more and for even longer. The downside of this is that children are going out independently at an increasingly later age. There is growing attention for the relation between spatial planning and traffic. The rise of Sustainable Safety and the attention given to 30 km/h and the relation with spatial policy mean that the situation has improved. A deterioration is that more distance is being taken from the designated residential area ('woonerf') concept. Instead of 'woonerf', people now refer to low-car, often with a 'woonerf'-like layout: no pavements, but everything at one level, with an important difference: in the 'woonerf' children of all ages have a better legal position than in the new low-car areas. In the Road Traffic Act WVV these are official 30 km/h areas and offer children on the street no legal protection. In a 'woonerf' a child can move around across the entire street width and the (motorised) traffic must give her/him free passage. In low-car areas, the motor vehicle is stronger in terms of its legal position.

Young people aged 12 – 15 years

There is, as far as we know, no recognised promotion of the interests of young people aged 12-15 years. Introduction of the bicycle helmet will result in fewer casualties, but possibly also fewer bicycles.

Young people aged 16 – 17 years

The traffic interests of 16-17-year-olds were for some time represented by the Team Alert, an initiative of Minister Netelenbos. Their interests always appeared quite positive. The group was at the centre of attention. Young people have for a long time been the focus for advertising messages. Their place is slowly but surely being taken over by people in their 30s to 50s. The function as guiding group is thus waning.

Among young people the percentage of immigrants is increasing. Immigrants have socially and politically a rather less strong position.

People with a disability

Due to the ageing population, the number of people with a serious disability will also increase. It is to be expected that this will also raise the 'sense of urgency'. In virtually all municipalities there are representatives of organisations for elderly people and people with a disability. This does not apply for people with mental handicaps: the position of this group is marginal and will neither improve or deteriorate.

Immigrants

It may be expected that in the future the group immigrants will decrease slightly. There is still a certain inflow of asylum seekers, marriages of partners from the country of origin and the attraction of the necessary workers from other countries, and also children of immigrants. The group will never become so large that this will become the norm group (perhaps here and there at the local level).

5.6.4. Position in government policy

The government's traffic and transport policy is laid down in documents, memoranda, contracts and covenants and in regulations. The framework is set by the Second Structural Plan for Traffic and Transport (SVV-II) and the Fourth Spatial Planning Memorandum– Extra (VINEX). The two documents will be followed by respectively the National Traffic and Transport Plan (National Verkeer- en Vervoer Plan - NVVP) and the Fifth Spatial Planning Memorandum.

In the national government's present traffic and transport policy (the SVV-II), prominent places are given to Sustainable Safety and the now completed Cycling Master Plan, and mention is made of special attention for people with a disability. In the first draft NVVP, which was sent back to the drawing board by the Lower House, it was stated that a policy relating to vulnerable road users will be developed. The present project, as mentioned, provides a first initiative for this. Policy concerning vulnerable road users will probably be an component of the road safety policy, but also has direct relations with the general mobility policy and the policies for elderly people and people with a disability.

The NVVP, unlike its predecessor the SVV-II, is not intended to be a national government document, but rather to integrate nationally the policy of all the administrative layers in this area. The basis for this is the Traffic and Transport Planning Act (Planwet Verkeer en Vervoer), which offers a hierarchical framework and the prospect of greater clarity concerning the division of tasks. NVVP policy regarding vulnerable road users must in that connection also be supported by regional and local authorities. That stage is not yet on the agenda.

The Dutch traffic and transport policy has traditionally been mainly focused on generic measures. There is little space set aside for a group-oriented approach. An exception was the specific policy

pursued in the SVV-II to promote cycling. In the spirit of the present times, it is not favourable to introduce policy tending towards a target group policy. A generic starting point, such as Design for All, which aims to offer safe mobility to a wider group than before, seems to be appropriate. In view of the strong developments such as ageing of the population and declining numbers of young people, there seems every reason to place more emphasis on this. The impression exists that support for this is growing.

Up to now very little attention has been given within the traffic and transport sector to hidden mobility needs that partly or even largely are not fulfilled as a result of traffic dangers. In the countries surrounding the Netherlands, such as the United Kingdom, there is growing concern about children who no longer go to school and other destinations independently, but are taken by their parents. This is not only from the point of view of road safety, but also in relation to public health, the urban environment and traffic management. People are also concerned that it takes so much effort to have more people use the bicycle.

The Netherlands is a cycling country. The bicycle fits in well with the Dutch (Calvinist) culture. Nevertheless, the bicycle was almost at the bottom of the pecking order of the traffic and in the attention of the policy makers. Influenced by the Cycling Master Plan and the effective lobbying of the Cyclists' Union, the bicycle and cycling policy made it onto the political agenda, and a great deal was done for the bicycle. Now, however, the attention is again starting to decline a little.

With respect to road safety, little is done for each of the specific groups. Generic measures have been and are being taken for safety, and from a completely different standpoint, namely mobility, measures are being taken to make cycling more direct and efficient. It is clear that the general policy being pursued, Sustainable Safety, has indeed had a positive influence on the safe mobility of vulnerable groups.

A broad policy regarding vulnerable groups must start from a difficult position. No-one as yet gives it priority. If it is already in someone's portfolio, then it is an issue that can easily be delegated.⁴⁹ Change may be introduced to this through the 'threatening' developments such as ageing of the population and declining numbers of young people, and perhaps the report of this project.

5.7. The degree to which the problem will increase/decrease and the consequences

A projection of the developments in road accidents during the period 2010 – 2020 has revealed that the ageing of the population and the decreasing number of young people and the anticipated increase in freight transport will be the most influential developments with respect to road accidents. Both developments have negative consequences for road safety.

⁴⁹ To illustrate: the role of commissioning the present project has changed hands three times in its 3-year existence; the predecessors of 3VO had 4 exclusive fte's working on knowledge development concerning vulnerable groups, now: none; in knowledge institutes and consultancy firms, studies on the problems of vulnerable groups are usually regarded as a field in which little honour can be gained, that is to say, the domain of junior employees.

People's horizons are still widening. As a result trip destinations are getting further away and the walking distance threshold is being exceeded more often. In the services sector, the scale is (still) increasing. This means that shops, banks and other services are on average further from the consumer. Companies are able to pass their transport costs on to the consumer, who can no longer reach a shop etc. on foot, but is forced to use a means of transport for that purpose. Walking will more often no longer be an option. Through further deconcentration of the home and of the places that people wish to visit, the number of criss-cross trips will increase. People wish to do that as efficiently as possible, and will therefore combine their trip objectives more often than in the past. Due to the ageing of the population and the declining number of young people, in the future (even) more women will have to work. The need to combine childcare, housekeeping and work will force women to manage their time very carefully. Children will be taken to and picked up from school, swimming lessons, piano lessons, etc. more often by car instead of on foot or by bicycle. Public safety also plays a part in this, however.

Public transport does not offer consolation for travel wishes. The cutbacks of unprofitable bus and train services and the long waiting times for train taxis mean that people who used to go on foot (to and from bus stop, train station) and then with public transport, will be more inclined to get their own motorised transport. The dependence on the car will increase.

In general it is expected that car ownership and car use will increase. This is due to the increasing possession of a driving licence among elderly people. The amount of space is limited, and that will mean that it will become increasingly difficult to find a parking place close to the destination. Greater distances will have to be covered on foot. Most of that walking can take place within - safe - residential areas, but the increase in the number of crossing movements over main roads will still require extra attention, partly because more of the people crossing will have difficulty with walking and will need more time to cross.

The increasing dependence on the car has a further detrimental consequence, namely a sharpening of the contrasts between car users and non-car users. Problems for non-car users also become more difficult to solve. More cars means on the one hand a dilution of the problems, but also that there will have to be more walking more often in the context of pre- and post-transport. The busier roads mean that crossing problems are more difficult to solve. If the use of space becomes diluted, it will become more difficult to keep the public space well maintained.

Pedestrians

Projections relating to the future trip behaviour of pedestrians have revealed that:

- The importance of walking as a separate mode of travel will substantially decline
- The importance of walking as part of a chain will strongly increase
- The number of pedestrians on the street will decrease and public safety will increasingly be a problem
- Maintaining the quality of the public space will be endangered
- The road safety of pedestrians may deteriorate, but will not necessarily do so
- Influenced by Sustainable Safety, concentration of motorised traffic will take place on main roads. The extent to which those main roads can be crossed will be threatened; especially children, elderly people and people with a disability will not always be equal to this, and will run an increased risk.

Pedestrian who requires an aid for walking

Due to measures in the framework of Sustainable Safety, trips within residential areas will become less threatening (cars drive less fast), but at times main roads will become an insurmountable obstacle, especially when crossing is only permitted at intersections, and relatively long detours have to be made to cross the road.

Influenced by the ageing of the population, the number of pedestrians who need aids for walking will increase.

Due to increases in scale and centralisation of facilities and services (shops, banks, physical care) the average distances will increase. The problems will therefore also increase.

The massive introduction of mobile phones helps in the emancipation of people for whom being in traffic is less easy. The fear of being left helpless on the trip is reduced by this.

Cyclists

The bicycle will still be important for the mobility of Dutch people. The traffic situations have constantly improved and will improve yet further due to the further implementation of Sustainable Safety. Due to the ageing of the population, the bicycle will become less attractive for a larger part of the population, but there will not be any substantial decrease in bicycle use. The bicycle will remain an attractive alternative for short trips, especially if the Short Trip Policy is continued and the bicycle situations continue to improve, influenced by instruments such as Local Transport Performance (VPL) and benchmarking by the Cyclists' Union. In view of the trends brought about during the Cycling Master Plan, this will not have a negative influence, and more a positive influence, on the number of accidents.

More elderly people in traffic on the bicycle will not lead to a clear increase in the number of accidents, but could lead to a greater proportion of (very) serious casualties due to their physical vulnerability (fragility). Continuation of the Sustainable Safety approach is an effective resource, but it could have an even better effect for cyclists if a functional system of flow, access and residential area provisions are created for them, with adequate solutions for conflict situations with motorised traffic and mopeds.

Moped (slower) riders

The problems with the slower moped will decrease. The introduction of a moped driving licence, introduction of compulsory wearing of a helmet for the scooter model of slower mopeds will make the slower moped a less popular modality. After all, the introduction of compulsory wearing of a helmet for the faster moped in the 1970s was for many a reason to no longer use the moped. It is expected that this will also happen if there is reorganisation of the slower mopeds through the distinction spartamoped – scooter-model moped. Moreover, the above changes in driving licence possession and car ownership will also have their effect.

Moped (faster) riders

Stricter requirements of driving ability and making a helmet compulsory, also for the slower moped (scooter model) will have a positive effect on road safety.

Motorcyclists

It is to be expected that the number of motorcyclists will decrease, partly as a result of the population ageing. This makes it probable that the number of accidents involving motorcyclists will also decrease.

Special vehicles

Concerning the future developments regarding special vehicles, no general pronouncements can be made. It may be expected that special vehicles that have a safety net function for the mobility of

people with functional limitations, such as the electric scooter and the four-wheeled moped will increase in number. That is probably not good news for road safety.

Pre-school children

the number of children will decline slightly. Their share in the population will also become smaller, but the question is whether this will also have consequences for the priority that their safety will have in the policy ('children are the future'). The expectations are:

- because of a smaller number of babies and toddlers, the problems will decrease in scale
- through more use of protection and protective devices, the number of road injuries and deaths in group will decrease
- the number of double-income families can perhaps have an influence both directly and indirectly (social norm) on the extent to which pre-school children are allowed outside 'independently', or are only permitted to be in 'supervised situations'.

Primary school children - infant, lower junior and upper junior

There is a development going on whereby young children are taken and collected more; independent mobility is decreasing. The reasons for this are the strong increase in car traffic, the dispersal of facilities and public safety (fewer 'eyes' on the street; this is changing the social norm and more possibilities will arise to keep children occupied at home or in clubs. As for pre-school children, it can be noted that the number of double-income families perhaps has an influence on the extent to which primary school children still play outside.

Special education needs

If (re)integration (including learning to use modern means of communication) is seriously tackled, the position of certain groups of children can improve. On the other hand, the gap in a knowledge society will grow, especially with children who have mental problems (operating telephone, computer, increasing number of information carriers). Trends in the position of children with special education needs are connected with medical and technical developments, and acceptance of certain choice (e.g. whether or not to actually continue the pregnancy if a child is predicted to have a handicap).

Secondary school children 12-15 years

The number of young people in the group 12-15 will decrease slightly. There is no clear picture with respect to the developments in the nature and scale of the road accidents of the group. To illustrate: introduction of bicycle helmet will lead to fewer casualties, but possibly also fewer bicycles.

Young people aged 16 and 17 years

Young people in the age group 16 –17 will, in addition to their studies, increasingly take an active part in the work process. This leads to more trips, but also to more responsibilities. the problems of road safety of young people have already decreased due to protective measures, but relatively it remains an at-risk group. The expectation is that this will not change.

Young people aged 18-25 years

Through demographic developments, the size of the group (both relative and absolute) will decrease. The risk of the group per trip, per time unit, per kilometre will not decrease. At the collective level, the problem will reduce: fewer young people leads to fewer risks, for themselves and for others.

People with function loss

Due to the ageing population and the 'pass-on' effect of the consequences of serious accidents, the problems will increase in scale. The sharper contrasts in traffic will mean that their mobility will be placed under greater pressure.

People with reduced stamina

The number of people with reduced stamina will increase, on the one hand as a result of the ageing population and on the other due to the declining condition of the population (assuming that the Netherlands will undergo the same development as the USA). Increasing scale of services (banks, shops, medical facilities) has major consequences for people with reduced stamina. It requires more effort for them to travel; they become more dependent on assistance/ accompaniment; the number of trips will therefore decrease. The risks of independent trips over greater distances can expand to a socially unacceptable level.

Among the consequences of Sustainable Safety is that people can travel more easily within the residential areas. In cases in which the necessary provisions lie within the residential area, this has a favourable effect on safety and mobility.

People with reduced sensory perception

The number of people who have problems in traffic as a result of a visual or auditory impairment will increase dramatically over the next 20 years. It is likely that the number will double.

People with reduced mental capabilities

With increasing complexity of traffic, reduced mental capabilities have more serious consequences: people can react to the risks that occur (even) less well. Because people are becoming older, in thirty years' time the number of Alzheimer patients will have doubled. Not only will the number of Alzheimer patients increase, but also other forms of brain damage, such as cerebro-vascular accident (CVA). Due to improving medical technology, people stay alive for longer. In addition, there are also groups such as whiplash patients.

People with motor impairment

Influenced by the ageing population, the number of people with motor impairments will also drastically increase. As in the case of other people with functional limitations, they will have a great deal of trouble as a result of the consequences of increases in scale in services. The developments regarding Sustainable Safety can compensate for that to a certain extent.

Immigrant Dutch people

The inflow of immigrants to the Netherlands seems to have passed its peak. The proportion of first-generation immigrants in the population will not increase substantially. The differing road safety problems of the group, which are already not strong, will neither increase nor decrease.

Addicts homeless people

Concerning developments regarding addicts and homeless people, no specific details are known.

Elderly people

Elderly people walk more than other age groups. Although it is to be expected that in the future elderly people will use the car more often, it may also be expected that for reasons of health, among other things, they will take time to travel on foot.

The average level of education of the elderly will be significantly higher than that of the present generation. The future generation will be more vocal and will demand a larger share of political power. Even if traffic becomes calmer and more balanced, the increasing number of more 'fragile' elderly people will lead to more traffic accidents with serious consequences, unless there is a fundamental reconsideration of the traffic and transport system to ensure that the mobility needs of the elderly are met by a safe, accessible and sustainable method of transport.

The current generation of people aged 50 and under are used to a high degree of mobility. They will wish to continue this mobility as they get older. At present, the car is the most suitable for this. As a result, the roads will get busier, even at times when it is now quiet.

On average, the elderly of the future will be healthier and in better physical condition than in the past. Their standard of living will be higher. They will continue to be active for longer than the current generation of elderly people.

At present people mostly retire or take early retirement at 62 or 63 years of age. It is expected that the retirement age will gradually increase. In 2015 some of those aged 65-70 will continue to work. This will result in significant mobility, including car use.

By around 2020 about the same number of elderly women as men will hold driving licences. More of them will also own a car. This will lead to a further increase in car use compared with the present situation.

The elderly are expected to continue living on their own for as long as possible ('ageing in place'). This also means that their mobility should be maintained for as long as possible. Accessibility in terms of location and entry of the provisions, and the standard of the provisions, must be attuned to this. Good pedestrian provisions are crucial in this; in general the present level of quality is not sufficient.

Elderly people will increasingly opt to live outside highly urbanised areas, away from high crime rates and a high cost of living. The need for mobility, especially car use, in low density areas is greater (criss-cross trips).

Mobility needs and choices will change over time. The distance travelled will increase and car use will increase. Trips will be more criss-cross as friends and family also live in suburbs and outlying areas. Public transport cannot meet this need.

Cars will increasingly be adapted to the needs of and wishes of older drivers. Compared with the present cars they will be easier and safer to drive (as they are better suited to the ergonomic requirements of older drivers).

Walking, as part of a trip, will become significantly more important. It is expected that 30-40% of the time the elderly spend in traffic will be spent walking.

Older drivers have a relatively high risk of becoming an accident victim, but this is expected to fall in future. However, this reduction will not offset the expected increase in car use. Consequently, the number of casualties among elderly drivers will increase significantly in the next twenty or thirty years, and probably the total number of casualties as well.

People with a disability

Due to the ageing of the population the proportion of people with motor impairments will increase. If the proportion is now around 25% of the population, then in 2020 it will be 30% or more. The scale of the problems will therefore increase. Spatial developments such as economies of scale in the service sector will increase the risks of a trip and form a major obstacle to their mobility, because it takes them more effort to travel and they become more dependent on help/support. Sustainable safety can only partly ease this difficulty.

5.8. Important knowledge gaps

In the research into road safety, is it not so much the 'mainstream' that is important, but it is precisely the exceptions that deserve attention. After all, the majority of risky situations actually do not end badly. The exceptions determine the risks. Nevertheless, also as regards road safety, the attention up to now has been mainly focused on the 'mainstream', that is to say, the main themes, the 'average person', the general picture of accidents and the largest groups. Car users have been the main focus of interest, partly because they cause the greatest dangers in traffic. A great deal has been done with the results of that research and good results have been achieved. However, the limits of that approach seem to have been reached. The law of diminishing returns is setting in. For a further reduction in the number of accidents, a 'niche' approach is now required. The 'niches' have until now received only little research attention. That can be seen from the quality of information in the present project. Only a small proportion of the judgements are supported by empirical research; most of them are based on estimations of experts that have been validated (or still have to be validated) by testing the assertions against the opinions of other experts.

The most important gap in the knowledge concerns insight into the numerical size of the different (sub-) groups and the risks that they run in comparison with others. In this should always be included the extent to which the risk level is reduced through self-limitation of mobility, which demonstrably stands in the way of the people's social functioning. What is the social damage (costs of accident plus costs of after-care, sick leave, lost earnings, necessary provisions, rehabilitation and not to forget: accompaniment)? Without this knowledge, statements about effectiveness and the efficiency of measures are based on shifting sand, and the chance that such a measure will appear high on the lists of priorities is small and will *remain* small. Measures about which this can be demonstrated are given preference, and correctly.

For a good approach, it is necessary that there should be a good insight into the factors that lead to dangers and accidents (and the undesirable suppression of encountering dangers). Also on this point there are serious gaps. With respect to most of the groups, we do not know under what circumstances the accidents happen, simply because the accident records are not co-ordinated with characteristics of task competence. Let alone that we have information about what leads up to the accident. An important gap in the knowledge is that we do not know what is expected of people: what can a person actually do, and what can s/he do with difficulty and what can s/he not do? That is to say: what requirements are imposed, and in what circumstances, on people, and what margins are applicable? What requirements must be set for physical qualities and task competence, and what can you do for people who do not fulfil those requirements? To what extent does the perceived danger of traffic influence the extent to which a person will independently (without accompaniment of assistance) go into traffic?

In superficial discussions it is often presumed that people are themselves responsible for the mistakes they make. For many vulnerable groups, however, there are indications that while it is true that they did make those mistakes, one may not blame them for those mistakes because requirements were set for their task competence which they could not fulfil. There is no hard evidence. Do vulnerable groups make more mistakes in traffic or do they just run a higher risk (risky or at risk)? To what extent is a lack of traffic skill 'denied'? To what extent do personal aversions play a role in dangerous behaviour and risks that are taken?

In extension to those questions, it is also urgent to have knowledge about what proportion of the trips now take place with accompaniment and what proportion can be done independently. What developments can be identified in those? Why? What can we learn from them?

In this project an attempt has been made to establish clearly what programme of requirements should be set for safe mobility of vulnerable groups. Most of these 'requirements' need to be validated: is the assumption correct, and perhaps a different requirement should be set, how much weight does the requirement have? The tables in this report contain 'best professional judgement'. How much difference would it really make if such a requirement is not realised? What is the social return of measures, what is the cost-benefit ratio, what are the positive and negative side-effects?

There are indications that spatial developments are an extremely important factor. This judgement rests largely on logical thinking on the basis of incidental indications. There have been virtually no empirical studies on this matter. Such 'evidence' is, however, needed in order to bring about structural changes in the spatial policy.

Other questions of interest are:

- To what extent do road safety, public safety and public order play a role in weighing up trips and the consequences of that for road safety?
- For what reasons and in what situations is the decision made not to make a trip (including lack of accessibility to the destinations)?
- To what extent are the members of the various groups exposed to avoidable risks?
- What are the risks of increasing car dependence from both the qualitative and the quantitative point of view?
- To what extent are risky choices at the strategic level avoidable and open to direction?
- What influence do route choices have on risks in traffic and to what extent are there potentialities there for improved safety?
- How can task competence be tested validly and reliably so that people who are really a danger to themselves and others can be prevented from using the road?
- What requirements must be imposed on motorised traffic in relation to the growing group of vulnerable road users?
- What relation is there between the spatial distribution of essential facilities and the safety of vulnerable groups? To what extent is that distribution open to direction?
- What risks are associated with crossing the road? How safe are crossing provisions (is a zebra crossing safe or unsafe?)
- What adaptation are needed within the traffic system in order to deal with the consequences of increasing average fragility of the traffic population?
- What opportunities are offered by ICT regarding safe mobility of vulnerable groups?
- What is the effect of introducing Daylight Running Lights for non-motorised road users?
- What is sense and what is nonsense about the introduction of mirrors on the bicycle, moped and special vehicles?
- How should one deal with the falling learning curve of elderly people (in contrast to the rising learning curve of children)? What does that entail for the margins in the system?
- What are 'best practices' with respect to the different groups?
- To what extent can (demand-responsive) collective transport be an answer? Is direction of modal split sensible, feasible, cost effective/ socially acceptable?

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- To what extent do the available provisions really promote safety? How effective and efficient are the present measures?
 - To what extent do risky situations arise as a result of culture-specific misunderstandings and behaviours in traffic (including not being accustomed to traffic driving on the right)? Where? When? Are there remedies? What are they?

6. Conclusions and Recommendations

6.1. Results of the research

This research has shown that there is still considerable room for improvement with respect to the approach to the problems of vulnerable road users. The transport system fails on many points to fulfil the most basic demands that should be imposed on it. The concern at present is 'need to have', and nowhere near 'nice to have'.

The quality of the approach stands or falls with the knowledge that exists about it and the public support that it receives. At present, there are no organisations that regard themselves as responsible for obtaining, managing and disseminating specific and structural knowledge about the problems due to road accidents among vulnerable groups and the possibilities of tackling them. As a consequence, knowledge about these problems is deficient and fragmented (see also below). This does not form a good basis for an effective and efficient approach. This overview report now offers an initiative towards a knowledge base for an effective policy to promote the safe mobility of vulnerable road users. The broad frame of reference makes it possible to also develop policy in sub-areas without losing sight of relationships to other sub-areas, and to select measures from which several different groups may benefit.

With respect to the necessary basis of knowledge, it can be stated:

- The Vulnerable Road Users knowledge bank made available by this project must be further filled-in and expanded. Here, particular attention must be given to validation by means of empirical research of the estimates that have been made
- The knowledge must become firmly rooted and experiences must be (more) shared. This does not happen automatically: it has to be organised
- There must be active public monitoring of the situation and the approach to the problems in order to set agendas (political agenda, research agenda)

Public support for tackling the problems requires a critical mass of knowledge and insight, in both qualitative and quantitative respects. Not only is the quality of the knowledge currently below the critical-mass limit, but also the number of people to whom that knowledge is available

The main conclusions regarding the nature and scale of the *problems* that can be drawn from this study are:

- The problems are large-scale, underestimated and growing. Tackling them will become increasingly urgent
- The responsibility for the safe mobility of vulnerable groups will mainly have to rest on the shoulders of others: vulnerable road users cause little danger to others, but do themselves run serious risks (not risky, but at risk) which they very often cannot evade
- The situation for children, elderly people and people with a disability is likely to deteriorate; the main reasons for this are the growth of vehicular traffic in general and the increase (expected to be considerable) in freight transport

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- The road safety of vulnerable road users cannot be dissociated from mobility, its quality and public safety
 - For vulnerable road users, problems due to road accidents are much more dominant and far-reaching than for the 'average' road user

In this study it clearly emerged that the knowledge about *causal factors* is badly documented. However, it is possible to discern the following approximate picture of the main causes of the safety problems of vulnerable road users:

- The traffic and transport system is not made for them; both vehicle design and road design exhibit serious ergonomic problems
- In the event of these road users encountering other traffic, the mass and speed differences are too great
- There are incompatible goals on the part of those causing the problems (e.g. time = money versus socially-minded and responsible road behaviour)
- There is defective management of the traffic and transport system (not only the infrastructure and public space, but also as regards the regulations, traffic management etc.)

6.2. Basic principles with respect to a future policy

It is recommended that the following basic principles should be used in developing policy regarding vulnerable road users:

- The concern in the case of vulnerable road users is not only that the number of deaths and injuries should be reduced, but equally that their mobility options should be increased and the quality of these improved
- The Design for All principle: (elements in) the traffic system should be designed in such a way that they are manageable for just about everyone. This applies not only to the spatial environment and means of transport, but also to education, legislation, regulations and so on. The emphasis should be placed on generic measures; only when it is not possible to solve a problem with generic measures are specific measures needed for small groups. This ensures that stigmatisation remains limited
- When developing measures, it is much more effective and efficient in the long term to focus on structural measures and measures aimed at creating favourable conditions (the network, spatial planning, norms and values, transport demand; that is to say, the outside of the 'Pizza') than to focus on measures aimed at adapting (individual) people, vehicles and traffic situations. In other words: better to make in-depth investments than to do repair work
- The social, public and spatial environments merit the most attention. The capability of (vulnerable) people to change is extremely limited. One should not cherish high expectations concerning the effectiveness of education and public information for vulnerable groups
- Certainly for these problems, public support for measures is crucial. The safety and mobility of vulnerable groups cannot be improved without measures aimed at non-vulnerable people. Special attention must be given to setting agendas and creating a high profile for the Vulnerable Road Users policy. This must include ensuring that the arguments used are robust (irrefutable).

6.3. Steps to a more effective and efficient approach

6.3.1. Knowledge acquisition and management

As stated above, it is advisable that the knowledge made available by means of the fact sheets and this report should be validated. This requires supplementary (individual) discussions with experts both in the Netherlands and abroad. There have been recent developments in other countries from which we in the Netherlands can learn. In countries such as the United Kingdom, Germany, Sweden and Belgium, people are working hard on a better approach, but (as yet) not much has been published about this. Collaboration with experts from other countries will allow a more complete picture to be formed, and make it possible to learn more quickly from the experiences there. Collaboration is a matter of give and take. In order to enable exchange of knowledge and to reap the benefits of this, the products of this project will be published in both Dutch and English, and we will ask intensively and specifically for reactions within the international network of contacts.

In order to improve the assessment of possible ways to tackle the problems, it is necessary to hold discussions with people on the 'shop floor' (municipalities, consultancy firms, non-governmental organisations). To this end, AVV is already taking the necessary steps within the framework of this project. It appears at the moment that the validation, as far as that is possible, will be completed by mid 2004.

Knowledge about vulnerable road users must be permanently available and updated. It seems that as yet the AVV is not the most appropriate body for this. An investigation must be made to see which organisation is the most suitable. The AVV will issue a separate recommendation on this matter at a later stage of this project.

6.3.2. Target group choice

To inventorise the problems and evaluate the yield of policy, it is appropriate to employ a broad frame of reference, as chosen for this project. The question is, however, whether such a broad frame of reference is also desirable for the policy that is to be implemented. The broad frame of reference is more difficult to grasp and to 'sell'. In terms of nature and scale of the problems, the most important groups are pedestrians, cyclists, moped riders, primary school children, secondary school children and elderly people. It is recommended that at the national government level priority should be given to these groups.

6.3.3. Obtaining public support

Public support for the approach to the problems of vulnerable groups is not automatic. The government is recommended to encourage municipalities, provinces, Framework Act areas and non-governmental organisations to share the responsibility for the approach.

6.4. Advisable measures

6.4.1. National Transport Plan

The fact that a National Transport Plan (NVVP) has to be developed offers a good opportunity to make a new beginning with the policy development concerning vulnerable road users, especially pedestrians, cyclists, moped riders, primary school children, secondary school children and elderly people.⁵⁰ It is recommended that the National Transport Plan should include, as a minimum, the following points:

- Consultation with the partners about organisation of the planning process for spatial plans and the checking of the plans; Sustainable Safety phase 2; tightening/ adjusting regulations and guidelines; division of tasks in the areas of knowledge management and public support acquisition in relation to e.g. the Knowledge Platform Verdi (Traffic and Transport, Regional, Decentralised and Integrated)
- Continuous promotion of generic Sustainable Safety measures within the built-up area, which is the pre-eminent domain of vulnerable groups. The most important measures here are the creation and (re-)layout of residential areas as 30 km/h zones and provisions enabling pedestrians to cross main traffic arteries. Here, it is advisable to introduce uniformity of approach in complex situations
- Concentration of knowledge regarding vulnerable road users in one place (Vulnerable Road Users knowledge bank) and associated promotion of the establishment of a Vulnerable Road Users knowledge network (contacts in national/ local authorities and non-governmental organisations)
- Creation of a Vulnerable Road Users Forum, with the tasks of: exchanging and storing knowledge, detecting developments, producing outline policy proposals and obtaining public support for these
- Tightening of guidelines and recommendations for highways authorities on the basis of the available knowledge concerning the reduced task capabilities of specific groups

Inclusion of available knowledge about vulnerable road users in the education of traffic consultants, ergonomists, urban planners etc.

6.4.2. National government

With respect to the safe mobility of vulnerable road users, it is recommended that the national government should take the following responsibilities:

- To (continue to) create favourable conditions for the realisation of Sustainable Safety phase 2; to promote that priority is given to tackling the problems of vulnerable road users on main traffic arteries within the built-up area⁵¹
- Development of a long-term policy regarding pedestrians, cyclists and elderly people, giving special attention to the road safety consequences of population ageing and increasing car and freight traffic
- Continuation of policy development and implementation with respect to road safety education (primary school, secondary school) and moped riders
- Encouraging other national/ local authorities and non-governmental organisations to fulfil their responsibilities within the framework of the National Transport Plan (NVVP) and Provincial Transport Plans (PVVP's), and promoting expertise in the commissioning of work at the local level

⁵⁰ Giving special attention to people with a disability.

⁵¹ Here one finds the worst fulfilment of the three road safety principles: prevent unintended use; prevent major differences in speed, direction and mass; and prevent uncertainties and confusion.

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- Responsibility for knowledge management (collecting, making available and disseminating knowledge)⁵². It is recommended that a knowledge task force should be set up within the Ministry of Transport, Public Works and Water Management; this would take the necessary steps to fill in crucial knowledge gaps and make policy recommendations⁵³
 - Examination of general policy in terms of safety consequences, especially for vulnerable road users⁵⁴
 - Re-evaluation of regulations and enforcement of traffic legislation with a view to protection of vulnerable groups (e.g. emphasis on driving speeds within the built-up area, fines for failing to stop at zebra crossings, parking 'for a moment' on the footpath etc.)
 - Rewarding of activities in the non-governmental field which encourage regional and local authorities to tackle problems⁵⁵

Setting up a Vulnerable Road Users Forum, with the tasks of exchanging and storing knowledge, detecting developments, producing outline policy proposals and obtaining public support for these

6.4.3. Provinces, municipalities and non-governmental organisations

Regional and local authorities and non-governmental organisations play an extremely important role in enabling safe mobility of vulnerable road users. In the framework of the Planning Act, provinces are given the task of establishing the preconditions for the traffic and transport policy of municipalities in a Provincial Transport Plan (PVVP), which in principle comprises an elaboration of the agreements made in the National Transport Plan (NVVP). Translation of the results of this project into recommendations for measures at the regional and local levels and activities of non-governmental organisations is still to be carried out. This may be seen as one of the tasks of the aforementioned Vulnerable Road Users Forum.

⁵² Important issues in relation to this are:

- filling serious knowledge gaps, especially mobility data, data on susceptibility to accidents and the effectiveness of possible measures. There is some knowledge about vulnerable road users, but it is so unrobust that there would be a serious risk of damage if measures in this area were to be proposed. Actions here could include collaboration with the ongoing statistical survey Research into Travel Behaviour (OVG), Road Accident Records and Periodic Regional Research on Road Accidents (PROV)
- in-depth inventory and validation of the existing knowledge regarding quality needs profiles and gaps in those
- development of the notion of a 'design person' analogous to the 'design vehicle', to serve as a checking framework for road design. Quality needs profiles of people with reduced functionality must play a role here; one might perhaps consider working with the 'Older Driver Highway Design Handbook' produced in the USA
- steps to having the professional sector obtain knowledge about the possibilities of tackling the problems (education of the professional sector)

⁵³ In connection with the critical mass, a group of at least 4 to 5 people; this task force would (be able to) have its own identity, allowing it to apply pressure as appropriate, and to realise continuity of the knowledge acquisition and agenda setting. No-one does this; everyone considers it important, but not to the extent that they will do it themselves.

⁵⁴ Some general policy requires specific attention to road safety, e.g. the policy regarding elderly people (living alone for as long as possible entails a need for safe pedestrian routes to essential destinations), increases in scale of education (children are obliged to attend school, which creates the obligation to realise safe school routes).

⁵⁵ E.g. Benchmarking by the Cyclists' Union (Fietzersbond), Walcyng check by local sections of the United Road Safety Organisations (3VO) etc.

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Appendices

Appendix 1 Definitions

In practice it is found that misunderstandings can easily arise about key concepts that are used in this project. To prevent confusion, in this appendix a definition of the concepts - in alphabetical order - is offered.

Actors

Actors are people, institutions and organisations that play a role in the approach to the problems. With respect to these problems, two main groups can be distinguished.

Government (authorities):

= national, province, municipalities, water control authorities, police etc.

- the task of the authorities is to weigh the different individual interests against one another (that then becomes the collective interest).
- domain: formal and informal policy (>hardware, conditions)

Public sector:

= interest (non-governmental) organisations, citizens, companies

- in principle the public sector focuses on representing (collections of) individual interests. Although the public sector has a collective responsibility, it is not customary that one weighs one's own individual interests against those of other groups.
- tasks in the direction of the authorities and other groups in society: detecting, stimulating, mobilising
- domain: agreements and own behaviour (>software, use)

Importance of a problem

A problem is only a problem if it is labelled as such. In most cases there is a relation with the actual scale, but the perception of the problem turns out to be the decisive factor. Problem and problem acceptance are in general related to a number of social psychological mechanisms, in which the following factors play an important role (freely from Wildervanck, 1988):

Degree of voluntariness:

In the case of activities that are undertaken voluntarily, and hence of risks that are run voluntarily, people are prepared to accept more risk than in the case of involuntary activities and involuntary risks. In the case of essential trips to school or to the doctor, there is scarcely any degree of voluntariness. An example of clearly voluntary risks is participation in a rally. If children cannot go to school safely, or people cannot go to the doctor because the traffic is too dangerous for them, there is more a question of an important problem than if people voluntarily take risks during a recreational rally.

Own influence

If it is assumed that people themselves have an influence on the situation, more risk is accepted from that than if it is assessed that people have no influence on it. Children, for example, have limited traffic skill and therefore less influence on danger coming from outside.

Increasing/decreasing

If it appears from figures or observation that a problem is decreasing, it is given a low priority. If it is estimated that it is increasing, it receives, also relatively, a higher place on the agenda. As a result of the ageing population, for instance, the group of vulnerable elderly people will increase.

Chronic/catastrophic

People appear to find frequent (chronic) smaller accidents less threatening than uncommon, very serious accidents. To illustrate: flying is considered frightening, walking is not.

Familiarity of the risk

Unknown is unloved. If it is not known what can go wrong and what the consequences are, then the anxiety increases (c.f. the resistance to nuclear energy)

The above factors together play an important role in the support that exists for tackling the problems of a (sub-)group. In this study, partly because of the social/public weight that is given to (own) responsibility and to preventive action, the first three factors will weigh more heavily in the considerations.

As regards the last two, which are both connected with insufficient knowledge or estimation of the true scale, the choice of using estimations that are validated as thoroughly as possible is more appropriate. The basic principle is that an injured person is an injured person, regardless of the injury occurred in a 'small' accident or in a major disaster. Furthermore, in places where there is a misunderstanding, this study is intended to remove that misunderstanding.

Basic figures

Basic figures regarding vulnerable road users comprise:

- size of the group in numbers of people
- exposure of the group
- number of accidents involving injury in which the group is involved
- number of road accident casualties in the group

Exposure

Exposure to traffic refers to the extent to which people are involved in traffic. Measures of exposure are:

- the number of trips per person per year
- the number of kilometres travelled per person per year
- the number of hours in traffic per person per year

Experts

Experts are people who are specifically engaged with the subject concerned and can serve as a source of information on the matter.

Knowledge management

For an effective approach to the problems, knowledge is needed. Knowledge transfer about presence, problems and size of a group of vulnerable road users requires a plan of action. The correct policy-makers (those who prepare policy, designers and administrators) must obtain a picture of this in order to include vulnerability of road users in their decision-making.

Knowledge is in people; the point is therefore *not* only whether or to what extent there is information (on paper, digital), but mainly the extent to which people have become totally familiar with that information. That knowledge must be in the right place, at the right moment and with the right people. As regards vulnerable road users, there is an absolute and a relative lack of knowledge. There is very little information and knowledge regarding the nature and scale of the problems.

When someone (whether that is a researcher, a policy-developer or an administrator) does not know a problem, it may not be expected that s/he will want to tackle that problem. If someone does not want to tackle a problem it is not relevant whether s/he does or does not have the competences, skills and resources for that. If someone can not tackle a problem, the extent to which they actually make the effort to do this is not relevant. In short: without knowledge, the problem is not tackled.⁵⁶

In the case of vulnerable road users, it can be stated that there is (still) a limited 'want' to tackle the problems. The approach is in general still in its infancy. With the help of knowledge management (how do we get knowledge to the right place, with the right person, at the right moment), we can encourage the better fulfilment of the basic conditions.

Assuming that the problems of vulnerable road users are relatively serious, in this project attention must therefore be given to how the acquired knowledge can be transferred to a wider group of policy preparers and administrators.

Quality levels

Three levels of quality can be distinguished:

- *Basic quality*: travelling from A to B is possible under generally accepted conditions (key word: *possible (acceptable)*)
- *Good quality*: travelling from A to B is possible without any discomfort arising (key word: *comfortable*)
- *Star quality level ('Super')*: travelling from A to B is comfortable and enjoyable (high experiential value; key word: *enjoyable*)

Vulnerability

The degree of vulnerability is determined in part by the persons' chance of being injured or killed in the event of an accident. People are vulnerable if they themselves do not constitute a threat for other road users *and* have a greater risk, compared with other people, of being injured in the event of an accident than *average*. This project involves only permanent factors that make people vulnerable. Momentary factors like tiredness, use of alcohol, an epileptic attack and so on are not included in the considerations.

Important characteristics are:

- *external protection*: a pedestrian has virtually no external protection, a truck driver has a very high degree of protection.
- *exposure*: the extent to which someone uses the road determines to a large extent the risk that s/he bears. Simple: if one does not use the road, one is not a vulnerable road user.
- *physical condition*: physical limitations (= functional limitations) determine in part the risk in traffic
- *fragility*: the extent to which one can take knocks (associated with physical condition) largely determines the seriousness of the consequences of an accident. Elderly people especially are have much less resilience than the average road user (fragility).

⁵⁶ Cf.. Policy cycle: know > want > can > do >> know etc.

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- *anticipatory capacity*: the extent to which one can anticipate traffic situations that cause danger determines the extent to which one can avoid problems. Through experience in traffic, the anticipatory capacity increases. Children especially are lacking in this.
 - *forgiving character of the traffic system*: the extent to which the traffic environment takes account of the vulnerability of some road users (e.g. anticipatory behaviour, soft verges, collision-friendly car bumpers, liability of fast traffic).

In connection with the above aspects, the following groups of vulnerable road users are distinguished *according to the degree of external protection, influenced by mode of travel*):

- pedestrians
- cyclists
- riders of (slower) mopeds
- riders of (faster) mopeds
- motorcyclists
- users of special (non-standard) vehicles (skates, autopeds, 4 wheel moped, electric scooter etc.)
- occupants and passengers

on the basis of individual characteristics (limited task competence in traffic):

- children
- young people
- people with a disability (functional limitation and function loss)
- special groups (e.g. immigrant Dutch people; addicts, homeless people etc.)

The matrix below provides an overview (vulnerable groups are marked with a cross; crosses in brackets indicate a relatively low frequency or relevance)⁵⁷.

⁵⁷ Elderly people are not included as a category in this list. The reason for this is that age is not an indicator of limitations. Such indicators are disorders, disability etc.

mode of travel ⇒ competen- ces ↓	Ped- estrian	Pedestrian plus (skate, autoped, electric scooter)	Cycl- ist	Slower moped rider (Spartamet, electr. bicycle)	Faster moped (incl. four- wheeled moped)	Motor -cycle	Car driver	Pass- enger	Special vehicles
Pre-school children	X	X						X	
Primary school - infant and lower junior	X	X	X					X	
Primary school - upper junior	X	X	X						
Special education needs	X	X	(X)						
Secondary school 12-15 yr	X	X	X						
16-17 yr	X	X	X	(X)	X				
18-25 yr	X	X	X	(X)	X	X	X		
Function loss	X	X						X	X
Reduced sensory perception	X	X	(X)	(X)					
Reduced mental capabilities	X	X	(X)					X	
Motor impairment	X	X	X	(X)				X	X
Immigrants	X	X	X	X	X	X			
Addicts, homeless etc.	X	X	X	(X)	(X)			X	

Latent causes of accidents

For industrial accidents, Groeneweg (1998) compiled a list of 'Basic Risk Factors' (BRF) on the basis of empirical data. That list comprises the following factors:

- Design – ergonomically bad design of tools or equipment (e.g. vehicles)
- Tools and equipment – bad quality, condition, suitability or availability of materials: tools, equipment and components
- Maintenance management – little or no adequate execution of maintenance tasks and repair
- Housekeeping – no or insufficient attention to keeping the shopfloor clean and cleaning up rubbish and waste
- Error Enforcing Conditions – inappropriate physical conditions (heat, cold, humidity, rain, wind etc.) that have a negative effect on human performance
- Procedures – insufficient quality or availability of procedures, guidelines, instructions and manuals (specifications, 'paperwork', use in practice)
- Training – no or insufficient skill or experience among the employees (not sufficiently skilled or insufficiently trained)

- Communication – no or ineffective communication between the different workplaces, departments of employees of the enterprise or with government authorities
- Incompatible goals – the situation in which the employees have to choose between optimum working methods according to the established rules on the one hand, and the striving after production, yield, political, social and individual goals on the other hand
- Organisation – deficiencies in the structure of the organisation, the ideas of the organisation, the organisation of processes or management strategies that result in inadequate or ineffective operations
- Defences – no or insufficient protection of people, materials and environment against the consequences of disturbances in the freedom of action (operational disturbances).

A few years later, Roelen et al. (2002) developed a similar categorisation for the aviation industry.

The key words in this are:

- Competence – insufficient knowledge, competences and skills, not only cognitive, but also physiological (health, fatigue)
- Availability – insufficient personnel, or personnel who are not given sufficient time to carry out the required tasks
- Commitment – insufficient attention to the work and insufficient care in relation to safety
- Hardware, Software and Man-Machine Interface design – insufficient quality of the hardware and the Man-Machine Interface (ergonomics)
- Communication and co-ordination – insufficient communication about execution of tasks, so that tasks are badly co-ordinated and not everyone knows who does what
- Procedures - insufficient quality or availability of procedures, guidelines, instructions and manuals (specifications, 'paperwork', use in practice)
- Plans – inadequate planning of activities in time: frequency of actions and by whom, incl. maintenance and inspection regime
- Conflict resolution – the absence of adequate mechanisms (such as supervision, monitoring, procedures, learning, group discussion) in order to handle potential conflicts or to counteract dangers
- Spares and tools – incorrect spare parts and tools
- Change management – insufficient reaction to changes of circumstances over time

The mechanisms that play a part in the accidents of vulnerable road users are not exactly the same as those of industrial processes or aviation accidents. However, there are numerous (possible) similarities. The list for vulnerable road users is as follows:

- *Technical state of infrastructure* – to what extent is the state of maintenance (drainage, unevenness, lines and marking, loose paving stones) such that it increases the risks for the target group (more than average)?
- *Technical state of vehicles or mobility aids* – is the state of maintenance (degree to which tyres, brakes, lights etc. are worn or damaged) such that safety is not endangered?
- *Obstacles and litter* – to what extent are the road use risks of the group increased by inadequate 'daily' maintenance (presence of loose obstacles such as dumped bicycles, advertising boards, litter etc.)?
- *Risk-increasing atmospheric conditions* – influence of temperature, sunlight, wind, precipitation
- *Time space* – are people given enough time to act safely?
- *Procedures and regulations* – are there sufficient good manners, agreements, (traffic) regulations?
- *Training* (knowledge, expertise and skills) – does the road user have enough knowledge of the traffic system, know how to deal with traffic, have enough experience to fulfil the required tasks safely within the available time space?

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- *Communication* – to what extent do road users, policy-makers and managers of components of the traffic system communicate with one another and among themselves; are there 'missing links' or cultural or other barriers that tend to increase the number of accidents?
 - *Incompatible goals* – are there incompatible goals (e.g. haste and driving at an appropriate speed)?
 - *Social environment and commitment to safe behaviour* – to what extent is someone inclined to behave safely?
 - *reacting to changes in traffic* – to what extent are people aware of changes in traffic, traffic regulations, values and norms in traffic etc.?

Road accident (serious)

For the road accident statistics, a road accident is defined as an accident on the public highway in which at least one moving vehicle is involved. One-sided accidents of pedestrians therefore do not fall under the definition used. This does, however, concern a substantial number of injuries (approx. 70,000 casualties per jaar, who need at least treatment in Accident and Emergency units). In this project, therefore, a road accident is taken to mean: all accidents involving serious injury or fatality that people can have while travelling in the public space.

Road accident (minor)

In this project, 'road accident' may also refer to accidents involving injury that occur during travel in the public space. These also include, in this case, one-sided accidents of pedestrians, which do not fall under the international definition of a road accident. For 'injured', the lower limit is: 'treated by a doctor or Accident and Emergency unit'.

Classification of groups

no.	Group
1	Pedestrian
2	Pedestrian Plus
3	Bicycle
4	Moped (slower)
5	Moped (faster)
6	Motorcycle
7	Special vehicles: skates, autoped, 4-wheeled moped
8	Pre-school children
9	Primary school – infant and lower junior
10	Primary school – upper junior
11	Special education needs
12	Secondary school – 12-15 yr
13	16-17 yr
14	18-25 yr
15	People with function loss
16	People with reduced stamina
17	People with reduced sensory perception
18	People with reduced mental capabilities
19	People with motor impairment
20	Immigrant residents and foreigners
21	Addicts and homeless
Umbrella groups	
22	Elderly people - general
23	People with a disability - general

Appendix 2 From 'Person-Vehicle-Environment' to Pizza model

Traffic can be conceived as a system. *People* travel from A to B. If they do not do this on foot, they use a *vehicle* for it. With that vehicle, they travel on roads. Those roads in turn are part of the spatial *environment*. The road network and the (immediate) environment are usually referred to with the concept *infrastructure*. When several vehicles make use of the road network, there have to be rules to ensure that this proceeds smoothly and safely. This means that the traffic has to be *organised*. The system components are thus:

- **Person**
In order to use the road in a certain role, one must have the knowledge needed for that role, insight, skills and attitudes
- **Vehicle**
The vehicle must be able to move and be steered or operated, that is to say, move in all directions and slow down and speed up. The vehicle must also offer protection to the occupants.
- **Environment**
The roads (*infrastructure*) must be made in such a way and the road environment must be laid out in such a way that people can reach their destination smoothly and safely, regardless of the role (pedestrian, cyclist, moped rider, car driver, public transport user etc.) in which they do that.
- **Organisation**
The traffic needs to be organised. There is a difference between (1) the official rules (the traffic regulations) and the monitoring of compliance with these (enforcement) and (2) the implicit code about how one should behave in traffic, or how it should be arranged and organised. In the latter case, this is the culture, norms and values that exist.

The level of road safety thus depends on the sum of the qualities of the components person, vehicle, environment and organisation. The 'Pizza model' shows that there are different levels in the interaction of the components and the possibilities of influence (measures, policy). In the model, those levels can be seen as 'layers':

core = micro level

At the lowest interaction level, the central elements are the individual road user, the vehicle, the physical environment and the people in the environment (other road users whom the individual road user has to deal with).

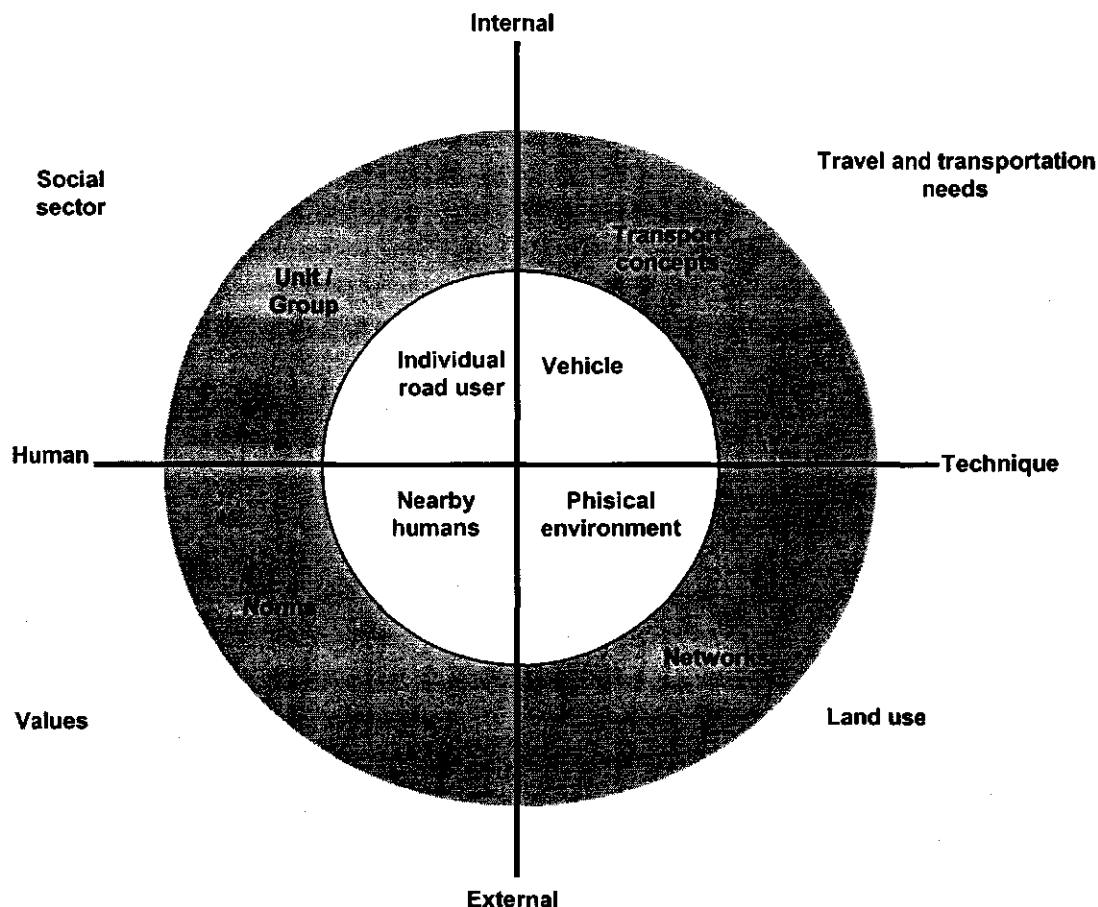
Road safety measures have already been taken for all those components. In the case of the person (road user and people in the environment) one might think of traffic education, e.g. teaching safe crossing routines to small children, and driving courses, such as the Platform for Elderly and Mobility BROEM courses for elderly people.

As regards the vehicle, one might think of active safety provisions, such as brakes, ABS and power steering and of passive safety provisions, such as seatbelts, air bags and crumple zones, knee protectors for skaters, and helmets for cyclists.

In the case of the physical environment (infrastructure) one can think of fly-over crossings, zebra crossings, separated cycle paths, roundabouts, special road surfaces, road signs on and alongside the road, the design of verges etc.

If one looks no further than the immediate cause of accidents, it seems obvious to aim the arrows mainly at the component 'person'. After all, in the vast majority of accidents people have not done something completely right (conscious or unconscious sub-optimal action). However, this is a short-

sighted view of the matter. Firstly, far from all accidents can be prevented by training, education and public information. Secondly, one should not look only at the immediate cause of an accident, but also at the underlying causes. The underlying causes are circumstances that encourage the making of mistakes. These circumstances are often connected with defective quality of vehicles, the road and road environment or the organisation of the traffic. Moreover, the different components of the system have a mutual influence upon each other.



Pizza Model

1st layer = meso level

The meso level is formed by the layer around the core. This concerns the influence that is exerted indirectly on the core.

Thus, the company (e.g. a bus company) for which one works, or the school, the family, the society for elderly people can exert influence on the quality of the individual *road users*. The safety policy in this case does not focus directly on the road user, but on the group to which one as an individual road user belongs. Often this will not relate so much to regulations, but stimuli from the government side intended to prompt the group concerned to itself do something about promoting road safety.

Policy at the meso level with respect to *vehicles* focuses on transport concepts: bicycles, mopeds, cars, vehicles for the disabled, light rail, vans, trains, passenger ships etc. This policy often touches the vehicle industry and transport organisations. The aim of the safety policy is to give the safety of

vehicles a prominent place in the development of all kinds of vehicles. Here too, the concern is not so much with legislation and regulations, but with increasing the role played by safety in the vehicle market and vehicle industry.

Next to *physical environment* at the meso level is the word 'networks'. In the core, the question is *how* infrastructure should be constructed from the standpoint of safety. The question at the meso level is *where* (e.g. in new construction districts, around schools, near industry parks etc.) from the standpoint of safety, roads can best be constructed. The key question here is often how, by offering attractive routes, one can prevent conflicts with other road users, especially conflicts between vulnerable groups and motorised traffic.

Next to *people in the environment* at the meso level is the word 'standards'. At the micro level, the concern is the interaction between road users. This interaction is determined by compliance with traffic regulations and more general rules of conduct that people use in traffic. The desire to behave safely in traffic is largely determined by the standards (norms) that one has. At the meso level, the concern is to bring about a safety culture on the road, in which taking account of vulnerable road users is an important factor. Publicity campaigns play a major role here.

outer layer = macro level

At the *macro level* the pizza slice of the individual road user relates to the social preconditions that allow the groups to do something about their own safety. This might be, for instance, the space that a school is given to dedicate to traffic education, the priority given by the police to the enforcement of traffic violations when, in particular, vulnerable groups are disadvantaged. Another example: if profit margins of companies are low, and people have to compete on price, then it can happen that the attention to safety can decline in companies offering passenger transport.

For the pizza slice of the vehicle, the outer area is 'mobility needs'. Road safety policy at this level focuses on influencing the number of trips (preferably fewer) and the choice of mode of travel (preferably the safest) and the volume of the mobility need. Fewer vehicles on the road results in great safety. On the other hand: to emphasise taking away the driving licence can mean that the (elderly) car driver concerned is forced to travel using a mode that is much more risky for them, such as the bicycle, or is 'forced' to use a rather unsafe four-wheeled moped.

The outermost part of the pizza slice *physical environment* is characterised by Spatial Planning. Here the safety policy focuses on the location of residential areas, schools and companies. The aim here is that it should not be possible for traffic flows to exist between those different locations, which would entail an increased risk, such as a main road between a residential area and a school. Thus, from the safety standpoint it is attractive to encourage elderly people to live in the proximity of the facilities that they use frequently.

The word 'values' refers to the importance attached by society to road safety in traffic and passenger transport. For example, how does the importance of road safety relate to issues such as health and justice. This heading also covers how high road safety stands on the political agenda.

Finally, terms are positioned next to the axes of this pizza model. Internal means that it concerns the individual road user or the vehicle. External means that it concerns the social and the physical environment. On the left is the word 'person' and on the right the word 'technology'. The top half of the pizza thus relates to the individual qualities and the lower half to the collective qualities. On the left half are the qualities of the person, both personal and social. On the right are the qualities of the 'hardware', the vehicle and the roads.

Traditionally the road safety policy has mainly aimed at the core of the pizza, or the concrete measures that can be realised within the relatively short term and that produce relatively fast results. The middle level concerns mainly measures that are more far-reaching, take substantially more

preparation, in the order of magnitude of 3 to 5 years, and usually do not result in demonstrable effects in the short term.

In the outermost layer, processes take place gradually but very slowly. It can sometimes take thirty years for a change to have noticeable effects.

The Vulnerable Road Users project does not focus primarily on short-term effects, but on the prospects offered by measures taken in the areas of the middle and outermost layers.

From: Handboek Verkeers en Vervoerskunde (VUGA / Elsevier).

Rob Methorst (with Willem Vlakveld) 6-9-2000

Appendix 3 Interim recommendations to DGP.

To

Ministry of Transport, Public Works and
Water Management
DG Passenger Transport
Attn. mevr. drs C.C.A. Klinkenberg
Postbus 20901
2500 EX Den Haag

Contact	Direct Dial
drs. R. Methorst	(010) 282 57 37
Date	Enclosure(s)
5 September 2002	-
Our ref.	Your ref.
-	-
Subject	Project code
Interim recommendations concerning	VV 2002.511
Vulnerable Road Users	

Dear Agnes,

As agreed, in this document I give you an impression of the results of the Vulnerable Road Users project up to present. This naturally represents an interim position, but a number of matters have by now become reasonably clear. For the record, I have set down all the relevant points again.

The context and questions of the project

In both the SVVII and the draft NVVP, it is stated that the national government is looking for methods to structurally reduce the number of road accidents. The accident data show that over half the total number of casualties may be termed vulnerable road users. The number of casualties among these groups must also be reduced. This will not happen of its own accord. It must be known what measures can reach that sub-objective. DGP has asked AVV to produce recommendations on this matter.

The approach

In 2001 the traffic and transport consultancy firm Goudappel Coffeng conducted a preliminary study on Vulnerable Road Users. On the basis of that report, we drew the following conclusions:

- the present policies on vulnerable road users need to be improved
- there is insufficient insight into the nature and scale of the problems of vulnerable road users
- the research in the area of vulnerable road users is fragmented and it is unclear what (important) gaps exist in the knowledge
- there is still insufficient information for the development of an effective and efficient programme of measures relating to vulnerable road users

-
- AVV itself has more knowledge on the problems than the consultants of our acquaintance; unfortunately, the knowledge of the SWOV is also limited in this area. It is therefore more efficient for AVV to conduct the research in-house than to contract it out.

On the basis of these reflections, it was decided to investigate more deeply what information is available among experts in this area. The first step was to write a Basic Document on Vulnerable Road Users, further describing and elaborating the reasons for the project, its context, aims and questions, and the relevant lines of thought.

It is important that the concept 'vulnerable road users' should be better defined. It is not so essential for detecting and identifying the problems, but it is essential for an effective approach. After all, it is then important to know clearly which people have which problems, how serious they are, what causes the problems and with what yields the problems can be tackled.

Three criteria were identified:

1. the degree of external protection
2. the extent to which someone has (limited) traffic skill, or 'task competence'
3. the degree of resilience (or fragility).

On the basis of these criteria, 21 different groups of vulnerable road users were distinguished, plus a further 2 'umbrella groups' (elderly people and people with a disability).

The basis for policy proposals should be the knowledge that is available concerning the safety characteristics of the different groups and trends in these. That knowledge could only partly be found in the accessible literature and on the internet. The knowledge in the heads of experts in this area seemed more important. In order to tap this knowledge, a questionnaire was developed and the plan conceived to conduct two rounds of consultations, and on the basis of these to compile 'Fact Sheets' about the different groups. The consultancy firm Korbee and Hovelynck were called in to provide support..

The questionnaire survey was not a success. Most of the experts felt interrogated and could not manage to supply even a part of the requested information. The planned consultation sessions were not very effective either. It was therefore decided to fill in the Fact Sheets (= mini-dossiers) as well or as badly as possible, to put them on the internet, and then to ask the experts to react to the content of 'their' Fact Sheet. For most of the Fact Sheets this did in fact produce additional information (some 30 responses from 12 people); however, our own detective work and estimations turned out to be necessary in order to reach any kind of satisfactory results.

Much of the contents of the Fact Sheets is thus based on our own estimations and tips from various people. It must be noted that in the coming months we will continue to supplement the Fact Sheets, the sources database and the list of experts on the basis of information that comes in 'automatically'. There is, however, only a limited amount of person-time available for this.

Verification of the information included and the extent to which this covers the actual knowledge available is advisable. It will, in view of the earlier experiences, be necessary to approach and interview individual experts personally for this. The aim is to have the information in the Fact Sheets fulfil 3-star certainty, that is to say: experts agree on the purport of the message.

Another possibility for verification is, as stated in the Basic Document, to set up a Vulnerable Road Users Forum (see also below, under recommendations).

The results

At the moment the following 'products' are available:

- *Fact Sheets*, stating for each group what the characteristics of the group are, what trends there are concerning the nature and scale of their problems, an overview of factors and mechanisms that contribute to the problems, quality needs profiles, present policy and future developments. The information in each field is rated with an indication of certainty of the information;
- *A sources database*, containing the consulted reports, statistics, articles etc.;
- *A list of experts* and their expertise;
- *The 'Basic Document'*, stating the reasons for the project, its context, aims and questions, and the relevant lines of thought;
- *This document*, containing conclusions and recommendations.

Conclusions and recommendations

On the basis of the available information, a number of conclusions can be drawn regarding the problems of vulnerable road users, the nature and scale of the road accidents in which they are involved, international policy in this matter, and possible measures. It is also possible to now make some recommendations for measures within the framework of the NVVP.

General conclusions with respect to problems of vulnerable road users:

- There is a 'magnifying glass' effect: complex situations that are difficult even for 'ordinary' people cause major or even insurmountable problems or risks for people with less than average competence;
- Particular groups have specific problems (e.g. blind people). If those specific problems are treated in isolation, there is a risk of stigmatisation and marginalisation of the group. This is not helpful to either the group or society as a whole.
- In most cases the problems of vulnerable road users go (much) further than only road safety; public safety and accessibility and mobility issues (social functioning) are also involved; the social costs of these are probably very high.
- The most important trend regarding vulnerability is the ageing of the population. The negative consequences for road safety will be enormous, if there is no change of policy.

Nature and scale of road accidents:

- With respect to the general categories of modes of transport and age groups that have been distinguished, there is global insight into the size of the groups, the numbers of accidents and the seriousness of these in relation to exposure. The largest problem is that of cyclists (most casualties); the highest risk is run by riders of faster mopeds (casualties per km travelled) and the seriousness of the consequences of an accident is the worst for motorcyclists.
- The knowledge about the risks of subgroups, such as the slower moped and special (non-standard) modes of transport (four-wheeled moped, electric scooter, skates) is, however, extremely deficient;
- There is too little knowledge concerning the risks associated with limited competences for an effective approach to the problems. There is some (fragmented) insight into the size of the groups, but little or none into the numbers of accidents and their seriousness, with the exception of children (all groups up to 16 years).
- Little or nothing is known about susceptibility to accidents in relation to skills, and the extent to which mobility is limited by the fear of accidents. Precisely that information is crucial for the development of a programme of measures.

- Even more than for other groups, most of the trips made by vulnerable road users take place within the built-up area. The number of intercity, long-distance trips is small; the main modes of travel are as a car passenger and on public transport.
- There is a great deal of 'double vulnerability': people with limited competences must necessarily make use of unprotected modes of travel (walking cycling).

International policies:

In the countries surrounding the Netherlands, Germany, the United Kingdom and Belgium, the approach to road accidents of vulnerable road users is very high on the agenda (although attention there is given only to children, elderly people, people with a disability, pedestrians and cyclists). In the Dutch policy documents, that is not (yet) (explicitly) the case. In view of the nature and scale of the problems, there is good reason to change this: large numbers of casualties are involved, there is a high emotional charge (a sense of injustice, a feeling of helplessness) and internationally the Netherlands is not a partner in the discussion.

Basic principles with respect to a future policy:

Three basic principles can be used in the development of a future policy:

- The *Design for All* principle: design (elements in) the traffic system in such a way that they are manageable for just about everyone. This applies not only to the spatial environment and means of transport, but also to education, legislation, regulations and so on. The emphasis should be placed on generic measures; only when it is not possible to solve a problem with generic measures are specific measures needed for small groups. This ensures that stigmatisation remains limited.
- When developing measures, it is much more effective and efficient in the long term to focus on structural measures and measures aimed at creating favourable conditions (the network, spatial planning, norms and values, transport demand; that is to say, the outside of the 'Pizza') than to focus on measures aimed at adapting (individual) people, vehicles and traffic situations.
- Especially for these problems, public acceptance and support of measures is crucial. Special attention must be given to setting agendas and creating a high profile for Vulnerable Road Users policy. This must include ensuring that the arguments are robust (irrefutable).

Recommendations for measures within the framework of the NVVP:

- the generic Sustainable Safety measures within the built-up area merit continuous encouragement. The built-up area is the pre-eminent domain of vulnerable groups. The most important measures here are the creation and (re-)layout of residential areas as 30 km/h zones and provisions enabling pedestrians to cross main roads
- design (relatively simple to realise) regulations to improve ease of perception for colour-blind people (= 10% of the population!), quality and technical state of the bicycle (involved in 10% of bicycle accidents = approx. 10,000 road injuries)
- active promotion of the use of instruments that can be used immediately by regional and local authorities, such as a Mobility Test, the 'Walcyng' test, guidelines and recommendations for improving crossing situations
- reward of activities in the non-governmental field which encourage regional and local authorities to tackle problems, e.g. Benchmarking by Cyclists' Union, Walcyng test by local sections of 3VO etc.
- screening of existing traffic legislation and regulations for detrimental effects for vulnerable road users (the existing legislation is based on capabilities of the average person, not on those of people with limited protection or skills)
- filling in important knowledge gaps, especially mobility data, data on susceptibility to accidents and the effectiveness of possible measures. There is some knowledge about vulnerable road users, but

it is so uncertain that there would be a serious risk of damage if measures were proposed on that basis. A link-up could be made with ongoing statistical research OVG, Road Accident Recording and PROV research

- setting up a Vulnerable Road Users Forum, with the tasks of verifying the Fact Sheets, detecting developments, producing outline policy proposals and obtaining public support for these
- encouraging EC regulations with respect to bicycle and pedestrian friendly car fronts.

Yours sincerely,

drs. R. Methorst

Appendix 4 Tables of Cross-Section of Fact Sheets

Contents:

Table 4.1.	Mechanisms – Trip choices – specific aspects of situation
Table 4.2.	Mechanisms – Trip choices – specific aspects of action radius, time span
Table 4.3.	Mechanisms – Route choice
Table 4.4.	Mechanisms – Behaviour in traffic
Table 4.5.	Mechanisms – Behaviour in traffic of other traffic towards vulnerable groups
Table 4.6.	Quality needs profiles – Human qualities which could be improved
Table 4.7.	Quality needs profiles – Social and public context
Table 4.8.	Quality needs profiles – Spatial planning
Table 4.9.	Quality needs profiles – Transport system
Table 4.10	Present approach – Human qualities which could be improved
Table 4.11	Present approach – Social and public context
Table 4.12	Present approach – Spatial planning
Table 4.13	Present approach – Transport system
Table 4.14	Developments in the social position
Table 4.15	Degree to which the problems will increase/ decrease and the consequences

Table 4.1. Mechanisms - Trip choices – specific aspects of situation

Group	Specific aspects	Degree of limitation of freedom of choice
Pre-school children	Not given freedom in trip choices by parents/ carers; in public space only under supervision	No independent trips
Primary school -infant and lower junior	Own trip choices limited to immediate home environment; more distant trips always under supervision	Strongly limited
Primary school - upper junior	Own trip choices limited to own home neighbourhood; more distant trips always under supervision	Moderately limited
Special education needs	Own trip choices (even) more limited than 'ordinary' children; trips in principle always under supervision	Very limited
Secondary school 12-15 yr	Must usually, except for school-related trips, have permission from parents/ carers; non-everyday trips usually under supervision of parents/ carers	Slightly limited
16-17 yr	Raging hormones; usually need permission for independent non-everyday trips	Scarcely; no car.
18-25 yr	Great urge for freedom; have virtually no restraints regarding trip choices	None
Function loss	For most trips, accompaniment/ assistance is needed; lack self-confidence to venture onto unknown terrain	Very limited
Reduced sensory perception	Freedom of choice limited by extent to which people doubt their own ability and expect risky situations; decisions are fairly consciously made	(slightly) limited
Reduced mental capabilities	Usually live in protective situation: permission needed for non-everyday trips	Moderately to strongly limited, depends on severity
Motor impairment	Freedom of choice is limited by the extent to which people doubt their own ability and expect risky situations; decisions are fairly consciously made	slightly limited
Immigrants	In some cases there is a cultural restraint	Scarcely different; women sometimes strongly (esp. strict Moslem)
Addicts, homeless etc.	Live in own world; often have moderate to poor health and little or no traffic skill. Have little or no money; usually have no means of transport	Limited
Elderly	With increasing age, the bones become more brittle and injuries take longer to heal. Trip decisions are therefor made more carefully	Increasing with age
People with a disability	Freedom of choice is limited by the extent to which people doubt their own ability and expect risky situations; decisions are fairly consciously made	Depends on disability, slightly to strongly

Table 4.2. Mechanisms - Trip choices - specific aspects of action radius, time span

Group	Specific aspects of trip reasons	Options regarding modalities	Action radius (indication)	time in traffic (year)
Pedestrians	Pre- and post-transport, shopping, recreation and strolling dominant ; work-related trips seldom on foot; walking is not seen as travelling. Public safety is special consideration	-	District	100
Pedestrians Plus	Mainly 'essential' trips (doctor, groceries etc.) Public safety is special consideration	-	(Small) district	100
Cyclists	Dominant: shopping, work, education; public safety is special consideration	-	Town/ city	140
Moped riders - slower	In principle replaces bicycle	-	Region (ave. 3.5 km)	100
Moped riders - faster	Personal purposes. home-work and home-school dominant	-	Region	100
Motorcyclists	Dominant: recreational reasons; season-related	-	Country	50
Special vehicles	Dominant: recreational reasons, special purpose vehicles: replace walking and bicycle.	-	Depends on type	50
Pre-school children	No own trip reasons	-	Zero	100 hr
Primary school - infant and lower junior	Going to school and playing	Walking, bicycle, taken/ collected	100 - 250 m	200 hr
Primary school - upper junior	Going to school, playing and going to clubs	Walking, bicycle, taken/ collected	250 – 500 m	450 hr
Special education needs	Going to school, playing and (medical) care	Walking, (bicycle), taken/ collected	50 – 250 m	250 hr
Secondary school 12-15 yr	Going to school, playing, going to clubs / sport etc.	Walking, bicycle, public transport, taken/ collected	District	450 hr
16-17 yr	Going to school, being with peers dominant	Walking, bicycle, moped, public transport, taken/collected	District – town/city	450 hr
18-25 yr	Education / work related; entertainment very important	All	Almost unlimited	600 hr
Function loss	Medical and social reasons dominant; high threshold for unknown terrain	Walking, (public transport), taken/ collected	District	250 hr
Reduced stamina	Severity of disorder and availability of mode of transport important factors	Walking, special vehicles, (car, public transport)	District- and further	450 hr
Reduced sensory perception	Rather fewer work-related trips	Walking, (public transport) taken/ collected	District – town/city	350 hr
Reduced mental capabilities	Medical and social reasons dominant	Walking, taken/ collected	District	300 hr
motor impairment	Medical and social reasons dominant	Walking, special purpose, public transport, taken/ collected	District – town/city	400 hr
Immigrants	In principle no different reasons (except for some immigrant women)	All	Average	450 hr
addicts, homeless etc.	Live in own world; wander around a lot	Walking, public transport	District	450 hr
Elderly	Social reasons and shopping dominant	All (but car not always possible)	District – town/city	400 hr
People with a disability	Medical and social reasons dominant	'walking', public transport, taken/ collected	District – town/city	350 hr

Table 4.3 Mechanisms - Route choices

Group	Specific aspects of route choice reasons	Knowledge aspects	Physical aspects	Mental aspects
Pedestrians	Prefer shortest route and walking on the same side as destination	-	Motorways taboo	-
Pedestrians Plus	Prefer shortest route	-	Walking takes a lot of effort	-
Cyclists	Prefer shortest route	-	Route must be surfaced; motorways taboo	-
Moped riders - slower	-	-	As cyclists.	-
Moped riders - faster	-	-	As cyclists.	-
Motorcyclists	Prefer country roads	-	Virtually no limitations	-
Special vehicles	Too diverse group to judge	-	Route must be surfaced; motorways taboo	-
Pre-school children	Not able to choose route self	No knowledge of public space	Not able to choose route self	Not able to choose route self
Primary school - infant and lower junior	In own choices: play is dominant reason	Own neighbourhood	-	Still very limited mental map; play behaviour
Primary school - upper junior	In own choices: play is important reason	Own neighbourhood	-	Mental map still limited
Special education needs	Usually no free choice	Own neighbourhood, everyday routes	Accessible and easily passable	Need to avoid complex situations, mental map (very) limited.
Secondary school 12-15 yr	Initially input of parents/ carers; homes of friends a major reason; 'diary' becoming important	-	-	Good picture of network
16-17 yr	-	Good knowledge of the network	-	Aimed at speed (full diary)
18-25 yr	-	-	-	-
Function loss	Mostly limit selves to familiar routes	Usually very conscious route choice	Obstacles lead to detour	Person-specific
Reduced stamina	Depends on mode of travel	Usually very conscious route choice	Obstacles lead to detour	Person-specific
Reduced sensory perception	Important reasons are: orientation points, simple route, public safety, comfort	Knowledge of the route is crucial; takes effort to collect, so mainly familiar terrain	Orientation points, simple route, public safety	Person-specific
Reduced mental capabilities	Usually no own choice	-	Person-specific	Limited to 'automatic' choices
Motor impairment	Mainly familiar terrain	Usually very conscious route choice	Barriers soon insurmountable	Person-specific
Immigrants	-	-	-	-
addicts, homeless etc.	-	-	-	-
Elderly	Public safety is important	-	Somewhat sensitive to barriers	Person-specific
People with a disability	Mostly limit selves to familiar terrain	Usually very conscious route choice	Barriers soon insurmountable	Person-specific

Table 4.4.1. Mechanisms - Behaviour in traffic

Group	Context	Observation	Judging situation	Decision-making	Actions
Pedestrians	- Do not see self as traffic - highly heterogeneous group	- sometimes insufficient attention - parked cars obscure view	Except special groups, no specific aspects	Except special groups, no specific aspects	- Flexible, not limited by ergonomic characteristics of vehicle - actions unpredictable
Pedestrians Plus	Try to be careful	- give it a lot of time - often reduced sensory perceptions	- problematic - defensive attitude - public safety major role	- choose certain over uncertain	- safety conscious, defensive - anxious if ped. light (too) quickly red - hesitant
Cyclists	- very heterogeneous group - many limited traffic skill	- relatively high position is positive - racing bike poorer view - noise important	- depends on traffic skill - only concerned about self	- depends on lifestyle - can easily ignore rules	- very manoeuvrable, decide at last moment - actions unpredictable
Moped riders - slower	Spartamet etc.: over 25 yr Scooter: see moped riders - faster	- high position is positive	-	more predictable than average cyclist	- spartamet: safety conscious - scooter: too fast
Moped riders - faster	- moped certificate compulsory - mainly 16-17 yr	- all-round view; helmet limits angle of view - noise muffled or masked	- young moped riders: over-estimate self	-	- ride too fast - often ignore traffic rules - actions unpredictable
Motorcyclists	- sense of freedom	- all-round view, but limited by helmet - noise is masked	-	-	- manoeuvrable, weave in and out - many speed violations
Special vehicles	- very heterogeneous - mainly within built-up area / residential areas - partly not 'traffic'	- depends on vehicle - usually good position - masked by parked cars	- depends on vehicle and traffic skill	- depends on vehicle and traffic skill; esp. a problem with four-wheeled moped and electric scooter	- reasonably flexible - actions unpredictable - hesitate
Pre-school children	Are mainly transported Immigrant children sometimes unaccompanied	- attention very selective and momentary	- only gradually learn meaning of pavement-street difference - not able to estimate risks	- not able to make decisions adequately	- actions spontaneous - movements not controlled - very defensive, if conscious
Primary school - infant and lower junior	Knowledge of and insight into traffic still limited	- small, therefore less overview - peripheral perception and direction of sound still developing - selective perception	- easily distracted - many interpretation mistakes due to limited spatial insight - basic knowledge of rules, but not easy to handle rules - can not put self in other's position	- not primarily focused on traffic task - make conservative decisions about crossing road (compensation) - decision-making not yet rational	- mainly engaged in playing - boys per hr 2x as high risk - actions very defensive - keeping balance on bicycle is a problem
Primary school upper junior	Knowledge of insight into traffic still limited	- small, therefore less overview - field of vision still developing to age of 10 - selective perception	- easily distracted - many interpretation mistakes due to limited spatial insight - basic knowledge of rules, but not easy to handle rules - can not put self in other's position	- often 'lost' in playing - decision-making not yet rational - make conservative decisions about crossing road (compensation)	- mainly engaged in playing - boys per hr 2x as high risk - actions very defensive - keeping balance on bicycle is a problem
Special education needs	Very heterogeneous group	- as primary school children or less	- less than or equal to primary school children	less than or equal to primary school children	less than or equal to primary school children

Table 4.4.2. Mechanisms - Behaviour in traffic

Group	Context	Observation	Judging situation	Decision-making	Actions
Secondary school 12-15 yr	- not good knowledge of traffic rules - cycling speed and control increasing	- observation not good enough in complex situations - low processing speed	- attention often on other things - over-estimate self - estimation of danger inadequate	- exploring boundaries and deliberately break rules - only half are danger conscious - group pressure plays a role - girls more danger conscious	- causing danger has subordinate role - great willingness to take risks - many substandard bicycles
16-17 yr	- lack of vehicle skill on moped	- Interferences with riding task (walkman, telephone etc.) - use of alcohol, drugs	- under-estimation of risks	- little knowledge of and respect for rules - not very willing to feel empathy for other groups	- not much anticipation - great willingness to take risks - high speed, unexpected manoeuvres
18-25 yr	- limited car driving skill - healthy, very fast reactions	- not very aware of situation - often looking at the wrong things	- action scripts not yet fully developed - make wrong judgement relatively often	- men often impulsive and 'couldn't care less' - women more unsure and more socially-minded - willingness to take risks	- execution of actions is slow, due to lack of experience
Function loss	- cannot permit self risks - relatively often accompanied	- limited information about behaviour of others	- base judgement on less information: more likely to make mistakes	- 'hope for the best'	- take very few risks - complex situations insurmountable problem
Reduced stamina	Risks increase sharply with complexity of traffic	-	- processing information slows down with increasing age	-	- Trips are divided up - postpone risky actions
Reduced sensory perception	-	- esp. a problem for visually impaired	- judging takes more time and energy than average	- highly risk conscious - takes a lot of time	- defensive behaviour - searching, doubtful
Reduced mental capabilities	Relatively often accompanies	-	- processing information is (time-consuming) problem	- often not equal to complexity	- often not equal to complexity - unpredictable
Motor impairment	- Risks increase sharply with complexity of traffic - stiffness if a problem	- difficulties with turning round	- processing information slows down with increasing age	- often need more time	- usually risk-avoiding behaviour
Immigrants	Situation knowledge and vehicle knowledge (bicycle) can be problem	- people who are used to traffic on the left look the wrong way	- interpretation mistakes due to different frame of reference	- decisions based on wrong judgements	- inadequate response to traffic
addicts, homeless etc.	Often under influence of psychotropic substances	Psychotropic substances limit detection of dangerous situations	Dangerous situation is not always recognised	Decisiveness is limited	- 'unexpected' road crossing - unpredictable
Elderly	- fear of having an accident is great	- visual acuity and hearing decline - concentration, divided and selective attention deteriorate - speed of information processing declines	- with increasing age need more time, esp. in complex situations	- with increasing age need more time than actually given - conscious of limitations - clumsy decisions	- reduced agility limits reaction speed - sometimes uncertain behaviour - defensive traffic behaviour
People with a disability	- cannot permit self risks	- depends on disability	- depends on disability	- depends on disability	- depends on disability

Table 4.5. Mechanisms - Behaviour in traffic of other traffic towards vulnerable groups

Group	Context	Observation	Judging situation	Decision-making	Actions
Pedestrians	- Pedestrian is not regarded as traffic - impossible to see level of traffic skill	- pedestrian. is small, inconspicuous - parked cars obscure visibility of pedestrian. - field of vision decreases with increasing speed - pedestrian who wants to cross often not seen (in time)	- pedestrian is unpredictable - pedestrian is not dangerous - pedestrian will wait / move aside	- decision-making time in complex situations can be too short to still take account of pedestrian	- use is made of the pedestrian's flexibility - traffic at roundabouts unpredictable for pedestrian
Pedestrians Plus	As pedestrians	As pedestrians	As pedestrians	As pedestrians	people take right-of-way if hesitate
Cyclists		- cyclist is inconspicuous; is repressed in search strategy - often does not have light - children often obscured by other traffic	- Cyclist is not dangerous and demands no respect - behaviour of cyclist is unpredictable	decision-making time in complex situations can be too short to still take account of cyclist	- in residential areas: with respect - main roads and crossing: overlooked
Moped riders - slower	Spartanet =cyclists Scooter = fast mop.	As cyclists	As cyclists	As cyclists	As cyclists
Moped riders - faster	-	Due to place on road now more visible, but still often masked	As cyclists	As cyclists	As cyclists
Motorcyclists	- motorcycle not well-loved because of speed/ traffic-jam behaviour	- relatively inconspicuous, partly because of speed - daylight running lights	- due to daylight running lights = equal partner - over-estimation of manoeuvrability	-	- often not given enough space
Special vehicles	Relatively rare phenomena	- usually fairly inconspicuous and unexpected	- wrong judgement of speed - unpredictable behaviour a problem	-	Are often ignored
Pre-school children	-	- small-size, inconspicuous, often obscured by obstacles	- do not fit in pattern of expectations; completely unexpected outside residential streets	-	- Easily overlooked as individual
Primary school - infant and lower junior	-	- small-size, inconspicuous, often obscured by obstacles	- do not fit in pattern of expectations; completely unexpected outside residential streets	-	- Easily overlooked as individual
Primary school upper junior	-	- small-size, inconspicuous, often obscured by obstacles	- do not fit in pattern of expectations; unexpected outside residential streets	-	- Easily overlooked as individual
Special education needs	-	- small-size, inconspicuous, often obscured by obstacles	-	-	- Easily overlooked as individual
12-15 yr	-	-	-	-	-
16-17 yr	-	-	-	-	-
18-25 yr	-	-	-	-	-
Function loss	-	-	- White stick is not always recognised	-	-
Reduced stamina	Not recognisable as such	-	Are not recognised as such	-	-
Reduced sensory perception	Not recognisable as such	-	- White stick is not always recognised	-	-
Reduced mental capabilities	Not recognisable as such	-	Are not recognised as such	-	-
Motor impairment	Not recognisable as such	-	Are not always recognised as such	-	-
Immigrants	Often not recognisable as such	-	Are not recognised as such	-	-
addicts, homeless etc.	-	-	Are ignored	-	-
Elderly	-	-	Are not recognised as such	-	-
People with a disability	Often not recognisable as such	-	Are not recognised as such	-	-

Table 4.6.1. Quality needs profile - Human qualities which could be improved

Group	Context	Observation	Judging situation	Decision-making	Actions
Pedestrians	No requirements are set for using road as pedestrian	-	- knowledge of the applicable traffic rules for pedestrians sometimes absent	- knowledge of the applicable traffic rules for pedestrians can be a limitation	- Pedestrians must be visible for other traffic - communication with others
Pedestrians Plus	As pedestrians	?	As pedestrians	As pedestrians	As pedestrians
Cyclists	- No legal requirements set for use of bicycle - there are traffic rules regarding cyclist	?		- knowledge of rules for cyclist limited	- visibility - for traffic practice basic skills and knowledge of traffic rules required - communication with others
Moped riders - slower	- No legal requirements set for use of slower moped - there are rules regarding slower moped rider (= bicycle)	?		As cyclists	As cyclists
Moped riders - faster	- a moped certificate is required - there are rules regarding the faster moped rider	?	?	As cyclists	As cyclists
Motorcyclists	- A driving licence is required - there are rules of behaviour for motorcyclists				- Requirements for task competence are laid down in legislation. - supplementary riding skill courses
Special vehicles	- No legal requirements set, except for four-wheeled moped				As cyclists
Pre-school children	N/a	N/a	N/a	N/a	N/a
Primary school - infant and lower junior	Possibilities of teaching children better traffic skills are limited	N/a	Possibilities of improving judgement are very limited	Scarcely any possibilities of improvement	Young children can to a limited extent learn to apply safe routines
Primary school upper junior	- traffic education at school and example and training by parents are possible input	Improvement possibilities are minimal	Possibilities of improving judgement are limited; danger of over-estimating self	Children are not always rational; possibilities of improvement therefore limited	Children can to a limited extent learn to apply safe routines
Special education needs	- traffic education at school and example and training by parents are possible input	N/a	As primary school	As primary school	More limited possibilities than primary school
Secondary school 12-15 yr	- traffic education at school is an option	N/a	Improve judgement of own ability	Change attitude (risk)	Improve estimation of risks
16-17 yr	- point of action is obtaining moped certificate and probably Plan 17	- limit interferences with riding task	- improve estimation of risks	- improve knowledge and acceptance of traffic rules and manners	- improve vehicle skill with moped - train anticipation - reduce willingness to take risks - control speed behaviour
18-25 yr	- framework: obtaining driving licence	- improvement of perceptual cognitive process; recognition training courses	- improvement of estimation of danger, switching perspective	- Due to 'wildness' this is not an easily improvable quality - cf. BOB: also possible on other terrains	- do not aim for better vehicle control, because leads to over-estimating self

Table 4.6.2. Quality needs profile - Human qualities which could be improved

Group	Context	Observation	Judging situation	Decision-making	Actions
Function loss	- in context of rehabilitation there are possibilities of improving independence	To a certain extent it is possible to compensate for loss through other senses	Person-specific	Information processing can be speeded up by training in decision-making procedures	Optimisation of action skills
Reduced stamina	-	-	-	-	-
Reduced sensory perception	Skill training courses are offered in the context of rehabilitation	To a certain extent it is possible to compensate through other senses - use technical aids	- teach next possible judgement techniques	Information processing can be speeded up by training in decision-making procedures	- sometimes chance to act more effectively and efficiently through specific training
Reduced mental capabilities	- these people are often at the limits of their ability	N/a	N/a	N/a	Training of skills is sometimes an option; supervision remains necessary in many cases
Motor impairment	Skill training courses are offered in the context of rehabilitation	- use of mirrors and other devices to facilitate observation	Usually n/a	Usually n/a	Training of skills with aids
Immigrants	In the context of naturalisation courses, traffic insight and skills can also be trained	Training of observation techniques (esp. for people from countries where traffic drives on left)	Teach traffic rules and traffic manners	-	e.g. Cycling course (training balance, braking etc.)
addicts, homeless etc.	N/a	N/a	N/a	N/a	N/a
Elderly	Skills and learning possibilities decline with increasing	- use of aids to improve observation	training of skill in using aids	N/a	Defensive attitude in traffic is vital
People with a disability	Skill training courses are offered in the context of rehabilitation	- use of aids to improve observation - use of other senses	- training of skill in using aids and using signals from other senses	Information processing can be speeded up by training in decision-making procedures	-Defensive attitude in traffic is vital - through training it is sometimes possible to act more efficiently

Improve qualities of 'strong' road users:

- Car drivers and motorcyclists: anticipation, conscious communication and speed
- Trucks/coaches: always check blind spots before setting off; take account of blind spots when turning off.

Table 4.7.1 Quality needs profile – Social and public context

Group	Traffic	Standards	Social values
Pedestrians	<ul style="list-style-type: none"> - acceptance that pedestrians behave thoughtlessly - control speed of traffic 	<ul style="list-style-type: none"> - WALCYNG Quality Scheme is testing instrument for pedestrian provisions - regulations for vehicle and making and keeping pedestrians domain obstacle-free - minimum requirements for ease of crossing main roads - right-of-way for pedestrians in VRIs - no parking near GOPs and VOPs 	<ul style="list-style-type: none"> - recognise right to safe mobility - equality of pedestrian - other modalities - 'walking is healthy - requirements for other modes so that the pedestrian can enjoy road use
Pedestrians Plus	<ul style="list-style-type: none"> - protected crossings - ban bicycles on pavement - consciousness that within residential areas there are people with walking difficulties 	<ul style="list-style-type: none"> - Design for All basic principle for all traffic provisions - strict enforcement of rules regarding VOPs. Stopping for pedestrians must become normal again 	<ul style="list-style-type: none"> - attention for and tolerance towards people with walking difficulties - public support for limited distribution of functions (compact city)
Cyclists	<ul style="list-style-type: none"> - improved recognition of danger by vehicle drivers - control speed near crossing points and where cyclists share the roadway 	<ul style="list-style-type: none"> - regulations and strict enforcement of obstacle-free cyclists' domain - regulations for min. requirements for ease of crossing main roads - WALCYNG Quality Scheme is testing instrument - compulsory blind spot mirror and closed side panels - compulsory collision-friendly car fronts 	Improvement of status and image of the bicycle
Moped riders - slower	As cyclists	As cyclists	As cyclists
Moped riders - faster	As cyclists	As cyclists	As cyclists
Motorcyclists	Eliminate car drivers' lack of understanding of motorcyclists	<ul style="list-style-type: none"> - improvement of knowledge of authorities/ road managers regarding motorcyclists' problems - co-operation between manufacturers - road managers - motorcyclists' interest groups 	Improvement of motorcyclists' image
Special vehicles	Depends on type of vehicle	<ul style="list-style-type: none"> - Clear legal status in accordance with expectations of road users - Compel suppliers of new modalities to demonstrate that they entail no extra risks 	Depends on type of vehicle
Pre-school children	Within residential areas, children must be able to play safely on the street	<ul style="list-style-type: none"> - Near schools and playgrounds, strict enforcement of max. speed 30 km/h - enforcement of regulations on protective devices for small children 	public support for child-friendly layout
Primary school - infant and lower junior	<ul style="list-style-type: none"> - see children as equal partners in traffic - call in children for processes of change - consciousness of traffic risks near school entrances, stopping places for school transport etc. 	Child-friendly traffic rules	- Protection of vulnerable people as basic principle for human action
Primary school upper junior	As primary school - infant and lower junior	Child-friendly traffic rules	- Protection of vulnerable people as basic principle for human action
Special education needs	As primary school - infant and lower junior	Child-friendly traffic rules	- Protection of vulnerable people as basic principle for human action
Secondary school 12-15 yr	Take account of idiosyncrasies of pupils in early years of secondary school		
16-17 yr	<ul style="list-style-type: none"> - Eliminate double standards: legally forbidden but you can buy moped modification sets anywhere - high chance of being caught with modified moped 	Eliminate double standards: speed rules	Eliminate double standards: only in traffic is it not accepted that young people experiment

Table 4.7.2 Quality needs profile – Social and public context

Group	Traffic	Standards	Social values
18-25 yr	Offer very little space for violating rules of behaviour	Tighten requirement for road use: no tolerance of deviant behaviour	Accessibility of places of entertainment by public transport as basic principle (avoid use of own transport)
Function loss	<ul style="list-style-type: none"> -Tolerance for less well-trained and skilful road users - take account of people with a disability - consistent reaction to white stick, walking stick etc. 	<ul style="list-style-type: none"> - general familiarity with and strict enforcement of traffic rules regarding people with a disability - strict introduction/ implementation of signboard policy to prevent obstacles in public space - national rules regarding maintenance of pedestrian domain - skill requirements in relation to Design for All 	<ul style="list-style-type: none"> - Respect/solidarity; greater tolerance for people with a disability - Do not limit independent mobility any more than is strictly necessary; optimise accessibility (location and entry) - use and manage public space thoughtfully - report defects of pavement and crossing provisions to local authority
Reduced stamina	As function loss	As function loss	As function loss
Reduced sensory perception	As function loss	As function loss	As function loss
Reduced mental capabilities	As function loss	As function loss	As function loss
Motor impairment	As function loss	As function loss	As function loss
Immigrants	As function loss	Better compliance with traffic rules by everyone (= example effect)	Traffic as theme in naturalisation
Addicts, homeless etc.	As function loss	N/a	Do not abandon people with serious problems to their fate
Elderly	As function loss - correct, accessible, timely and affordable information about transport, route, departure and arrival times, pre- and post-transport	<ul style="list-style-type: none"> - Tailor traffic rules to Road Traffic Act on protection of vulnerable people - clear and functional standards regarding physical en mental requirements for road use 	<ul style="list-style-type: none"> - Set independent mobility of elderly as a standard above commercial interests of companies - Tolerance for car use by elderly - social cost-effective services and delivery of goods
People with a disability	As function loss	As function loss	As function loss

Table 4.8.1. Quality needs profile – Spatial Planning

Group	Traffic situations	Network	Spatial Planning
Pedestrians	<ul style="list-style-type: none"> - fulfil safety principles of Sustainable Safety - functionality: sufficiently wide and high roadway, easy to cross, walkable, can be used by pushchair and wheelchair; no height differences on the route - no obstructions of view near crossing - adequate provisions during construction work - no parking on pedestrian domain - sufficient crossing time for slow pedestrians 	<ul style="list-style-type: none"> - closed network that gives direct access to buildings and public spaces - links up with other networks (connected) - recognisability of routes and orientation points for people unfamiliar there - rest points for people with reduced stamina - effective and direct accessibility of facilities that attract the public - limit height differences in walking routes to an absolute minimum 	<ul style="list-style-type: none"> - Proximity of facilities and essential destinations - high density and mixed functions improve position of pedestrian in public space - keep cars (moving, parked) out of the public space by offering alternatives (e.g. parking garages) - integrate mobility policy, housing policy and economic policy, incl. road safety and public safety
Pedestrians Plus	As pedestrians	As pedestrians	As pedestrians <ul style="list-style-type: none"> - minimum distances between residential locations and essential destinations
Cyclists	<ul style="list-style-type: none"> - Forgiving traffic environment, esp. school routes, respond to behavioural limitations of children - no two-way cycle paths without special provisions - at crossing situation, no view restriction by obstacles, parked cars 	<ul style="list-style-type: none"> - network must invite to use - connected network - at critical points separated from traffic - connects with public transport network; cycle parks - safe recreational network - signposting only for recreational network 	<ul style="list-style-type: none"> - residential areas as large as possible - destinations accessible for people without other options - school environment low-traffic
Moped riders - slower	Forgiving traffic environment	As cyclists	- destinations accessible for people without other options
Moped riders - faster	clear, unambiguous, connected	?	No specific aspects
Motorcyclists	Limit intensities, speed, obstacles in verge, ruts	No specific aspects	No specific aspects
Special vehicles	Traffic situations can not by definition be attuned to requirements of non-standard vehicles	?	?
Pre-school children	<ul style="list-style-type: none"> - clear distinction pavement-street - protected play space near home - car-free, low-car or residential area 	<ul style="list-style-type: none"> - conflict-free walking network of paths to homes - connected network of paths to homes 	<ul style="list-style-type: none"> - playgrounds at short distance from home - attention to child-friendly layout of public space and (low-)traffic
Primary school - infant and lower junior	<ul style="list-style-type: none"> - see designs for children (CROW) - no parking near school exit (min. 100 metres) 	<ul style="list-style-type: none"> - short routes to school - free of conflicts with motorised traffic 	<ul style="list-style-type: none"> - schools and playgrounds accessible without crossing main roads - in district a basic package of schools, health centres, (electronic) community centres - requirements part of (compulsory) Mobility Test
Primary school upper junior	<ul style="list-style-type: none"> - see designs for children (CROW) - children's participation in designing public space for child-friendliness 	As primary school-infant and lower junior	As primary school-infant and lower junior
Special education needs	- depends on specific requirements	N/a: are taken and collected	As Primary school-infant and lower junior
Secondary school 12-15 yr	<ul style="list-style-type: none"> - low-traffic round the schools - minimum waiting times at main-road crossings - good, practicable cycle parks 	- high quality cycle network	<ul style="list-style-type: none"> - favourable location of sports grounds, music school etc. - (small) schools central in area served
16-17 yr	- good, practicable cycle parks	Mopeds on the Road	<ul style="list-style-type: none"> - own places for young people - (small) schools central in area served

Table 4.8.2. Quality needs profile – Spatial Planning

Group	Traffic situations	Network	Spatial Planning
18-25 yr	- good, practicable cycle parks	?	- schools central in area served - adequate parking for bicycle - places of entertainment in central location, accessible by public transport
Function loss	- minimise complexity of situation - see ASVV - see Accessibility Handbook - ease of crossing main roads - walking route at one level; height differences needed as marking for blind people - good separation of construction work	- simplicity of route and route recognition - connected system of guiding lines - connection to public transport - obstacle-free routes - chain is as strong as its weakest link: have entire route fulfil minimum requirements - resting points on the route	- distinction between residential area - main roads - restrict distances - prevent complex situations - large residential areas, function mixing and compactness - strategically placed residences; concentration (living together) in limited area. - basic package of provisions - spatial distribution and organisation of services must match better with wishes of people with a disability
Reduced stamina	- Limit complexity of situations - ease of crossing main roads: enough time	- enough rest points on route	- limit distances and confrontations with complex traffic (> compact city) - strict distinction residential area – traffic area
Reduced sensory perception	- signs consistent for colour-blind people - orientation points - acoustic signalling of VRTs - guiding lines and warning marking for blind people - consistent layout/uniform solutions - increase contrast in critical situations	- simple routes - guiding lines along main routes - route marking at bus- and train stations - introduce red colour of cycle paths for all cycle paths	As reduced stamina
Reduced mental capabilities	The simpler the better	?	As reduced stamina
Motor impairment	- The simpler the better - ease of crossing main roads; enough time	- pedestrian network entirely usable with wheelchair, stick, rollator, electric scooter	As reduced stamina
Immigrants	Sustainable Safety principles	Bus routes also identifiable for people unable to read	-limitation of increasing scale in shops, schools, services
addicts, homeless etc.	- simple situations close to shelters and drop-in centres	-	-
Elderly	- introduce predictability - a layout that allows people to determine their own time pressure - use existing principles, so that the elderly can make use of experiential knowledge and automatisms - limit complexity; aim at uniformity and homogeneity - stopping distance view minimum 2.5 sec. - good maintenance of paving for cycle and footpaths - enough crossing time - wider lines to allow for more swerving - visibility and legibility of signs - no surprises – consistent layout - more contrast during darkness - prevent dazzle - no experimental or fantasy measures like mini-roundabouts, diverted cycle paths etc.	- pedestrian network = functional, comfortable, connected, attractive, recognisable and easy to follow	- low intensities in residential areas - essential facilities (shop for daily groceries, health centre, bank, community centre) within walking distance; basic package within neighbourhood - mobility test compulsory - encourage elderly to live close to essential facilities - compact city fulfils needs - 10 principles: . mix land uses . take advantage of compact housing . create range of housing opportunities and choices . walkable neighbourhoods . foster distinctive, attractive communities . preserve open space etc. . strengthen connections . offer many transport options . predictable development . dialogue
People with a disability	As function loss	As function loss	As function loss

Table 4.9.1 Quality needs profile - Transport system

Group	Vehicle	Transport concepts	Mobility needs
Pedestrians	<ul style="list-style-type: none"> - collision-friendly vehicles - ban on bull bars - speed restriction within residential areas - optimum visibility and audibility where speeds over 30 km/h permitted 	<ul style="list-style-type: none"> - preference for collective modes of transport: reduce quantity of traffic - promote use of bicycle 	Replace routine needs by internet
Pedestrians Plus	Easy-entry of cars and public transport Easy-exit	<ul style="list-style-type: none"> - Easy-boarding transport systems - availability of on-call transport 	As pedestrians
Cyclists	<ul style="list-style-type: none"> - requirements for technical state of bicycle - develop practicable and attractive mirrors for elderly - improve conspicuousness of bicycle - enforce rules regarding visibility 	<ul style="list-style-type: none"> - requirements for user and for traffic situations - improve safety of bicycle: promotes independent mobility 	- promote use of bicycle
Moped riders - slower	As cyclists	As cyclists	- use of true slower moped (spartanet) is attractive
Moped riders - faster	<ul style="list-style-type: none"> - 'type quality mark' and conduct checks on this - eliminate modification (tuning-up) of moped - high safety standards from factory - introduce registration place for moped - restrict noise level - DRL 	- discussion about usefulness of faster moped as transport concept	- discourage use of faster moped
Motorcyclists	<ul style="list-style-type: none"> - 'Type quality mark' and conduct checks on this - restrict noise level - DRL 	-	Restraint with marketing of motorcycle
Special vehicles	?	- pursue a policy of permission to use road: supplier must show that use of special vehicle does not endanger road safety	The use of unsafe vehicles must be discouraged
Pre-school children	- safety of child seats	<ul style="list-style-type: none"> - easy-boarding public transport for pushchairs - design of cars for easier and safer transportation of babies and toddlers - minimise blind spot 	Dependent on parents/ carers
Primary school - infant and lower junior	<ul style="list-style-type: none"> - vehicles clearly visible - collision-friendliness - ban sharp objects and devices that increase injury, such as bull bars 	- strengthen possibilities for letting children walk/ cycle short distances	- restrict taking/ collecting of children
Primary school upper junior	As primary school - infant and lower junior	As primary school - infant and lower junior	As primary school - infant and lower junior
Special education needs	As primary school - infant and lower junior	<ul style="list-style-type: none"> - Adapted modes of travel for independent use by children with a disability - tailor-made transport 	N/a
Secondary school 12-15 yr	- good technical state of bicycle, esp. brakes and lights	- good and well-equipped bicycles	-
16-17 yr	<ul style="list-style-type: none"> - good technical state of bicycle, esp. brakes and lights - speed governor of moped strictly enforced 	<ul style="list-style-type: none"> - very soundly constructed bicycles, on which especially brakes and light are important - wide range of modes of transport - Plan 17? 	
18-25 yr	- good technical state of bicycle and moped	student public transport pass as alternative to individual transport by moped and car	Transport to/from places of entertainment

Table 4.9.2. Quality needs profile - Transport system

Group	Vehicle	Transport concepts	Mobility needs
Function loss	<ul style="list-style-type: none"> - reserved seats in public transport - no sharp corners in the interior of vehicles - safe provisions for wheelchair transport - easy-exit of vehicles for wheelchairs 	<ul style="list-style-type: none"> -protected or simple systems (may be individual, small-scale or large-scale) - for most people with a disability, individual transport is the best solution - chain management taxi - intercity train - taxi 	<ul style="list-style-type: none"> - mobility needs can be reduced by having services etc. come to the people with a disability in their homes. This creates space for essential trips.
Reduced stamina	-	- seating facilities are required	- Provision of aids, such as stick, electric scooter etc. within framework of WVG
Reduced sensory perception	-	-	-
Reduced mental capabilities	-	-	-
Motor impairment	<ul style="list-style-type: none"> - good mirrors on the bicycle - mirrors on car that eliminate blind spot 	<ul style="list-style-type: none"> - electric scooter replaces function of the bicycle (is not a balance vehicle) - wheelchair highly practicable 	<ul style="list-style-type: none"> - Provision of aids, such as stick, electric scooter etc. within framework of WVG
Immigrants	-	-	Promotion of safe modes of travel
Addicts, homeless etc.	-	-	-
Elderly	<ul style="list-style-type: none"> - good mirrors on bicycles - good technical state 	<ul style="list-style-type: none"> - good mirrors on bicycles - low crossbar (easy-mounting) of bicycle - attractive image of bicycle - cars: facilities to compensate for reduced suppleness, hearing, visual capacities in connection with reaction in emergency situations - improvement of collision safety of cars - easy-entry and easy-exit - easy to maintain - alternative transport concepts that reduce dependence on car (affordable, demand-responsive for criss-cross relations) - adequate travel information available during the trip 	<ul style="list-style-type: none"> - encouraging cycling can contribute to longer independent road use - encourage alternative to the car - elderly must know and value alternatives to the car before they themselves are no longer permitted to drive.
People with a disability	<ul style="list-style-type: none"> - good mirrors attached to the vehicles - promotion of practicable devices to improve all-round view - 	<ul style="list-style-type: none"> - recognisability of invalid vehicles - development and promotion of new methods to improve all-round view (e.g. mirror on spectacles) - for people who themselves can/may no longer drive: timely availability, affordable, easy-entry, easy-exit alternatives - alternatives to the bicycle - wheelchair still very useful 	<ul style="list-style-type: none"> - Provision of aids, such as stick, electric scooter etc. within framework of WVG - spatial distribution and organisation of services must match better the wishes of people with a disability

Table 4.10.1. Present approach - Human qualities which could be improved

Group	Context	Observation	Judging situation	Decision-making	Actions
Pedestrians	-	cars easier to observe due to introduction of Daylight Running Lights planned by EU.	-	-	The police give low priority to imposing sanctions for undesirable traffic behaviour
Pedestrians Plus	-	As pedestrians	-	-	In the context of rehabilitation people are trained in use of aids
Cyclists	- no legal requirements are imposed on the riding ability of cyclists	As pedestrians	- the Sustainable Safety approach has made it simpler in many cases to judge the situation	- due to simplification of right-of-way rules (cyclist has right-of-way from right) decisions can be made more adequately in critical situations	The police give low priority to imposing sanctions for undesirable traffic behaviour
Moped riders - slower	As cyclists	As cyclists and pedestrians	As cyclists	As cyclists	As cyclists
Moped riders - faster	- Moped certificate is compulsory - some insurance companies offer courses	-	-	-	Police impose sanctions for dangerous behaviour; they generally do not give it much priority
Motorcyclists	- insurance companies encourage additional training (Univé: offers 10% discount) - campaigns are conducted to use with daylight running lights - in training much attention given to vehicle control	-	-	-	Vehicle control is part of the test
Special vehicles	- there are courses to learn how to handle some special vehicles; passive role of government	-	-	-	-
Pre-school children	- there is a range of public information material for parents and carers concerning transportation of babies and toddlers	-	-	-	-
Primary school - infant and lower junior	- there are various teaching packages available; effectiveness is unknown - very little time at school is devoted to traffic lessons - possibility of practising in traffic is extremely limited due to busy traffic	-	-	- attention given at school to a limited extent to traffic rules and decision-making routines	-
Primary school upper junior	As Primary school - infant and lower junior	-	-	-	- national traffic test of 3VO: is taken by most Group 7 children
Special education needs	- As Primary school - infant and lower junior - independence is given relatively large amount of attention at the schools	-	-	-	-

Table 4.10.2. Present approach - Human qualities which could be improved

Group	Context	Observation	Judging situation	Decision-making	Actions
Secondary school 12-15 yr	- very little attention at school for traffic education	-	-	-	- sometimes the police hold specific enforcement campaigns close to a school
16-17 yr	- there are courses for cyclists and riders of faster mopeds - material covered in moped certificate is only theory - have a relatively high spending power, hence fast satisfaction of needs; deferment of needs has lower priority	-	-	-	As Secondary school
18-25 yr	- the quality of the driving test is controlled by the WRM - there is a certain range of courses	In driving lessons attention is given to observation	- In driving lessons attention is given to judging traffic situations	- In driving lessons attention is given to decisiveness	- the police take action against people who violate traffic regulations, but the chance of being caught is low - the penalties for young car drivers are more severe than those for other groups
Function loss	- in the context of rehabilitation attention is given to task competence	- for blind and visually impaired people, guiding lines have been introduced in many places - some VRIs have rattle-tickers	-	-	-
Reduced stamina	-	-	-	-	-
Reduced sensory perception	As function loss	-	-	-	-
Reduced mental capabilities	- these people are often at the limits of their ability - there are restrictions for road use	-	- in the context of the care centres, training is given in estimating risks	- in the context of the care centres, training is given in estimating risks	- in many cases supervision is necessary
Motor impairment	As function loss	-	-	-	-
Immigrants	- Cycling courses are organised for immigrant women	-	-	-	-
addicts, homeless etc.	- traffic not essential	-	-	-	-
Elderly	- there is a reasonable range of traffic courses for the elderly, e.g. BROEM	- is tested in context of periodic driving ability test - is tested in BROEM course	- attention is given in course	- public information about influence of alcohol and drugs - stickers on medications	- conspicuous drivers are stopped from driving by the police
People with a disability	- in the context of rehabilitation attention is given to task competence - there are no educational provisions for people with declining skills - the mobile phone offers people the chance to call for help, so that trips can be made that otherwise would be too risky	- educational material is available	-	-	-

Table 4.11.1 Present approach – Social and public context

Group	Traffic	Standards	Social values
Pedestrians	<ul style="list-style-type: none"> - at the European level work is being conducted on the introduction of DRL; this makes pedestrians less conspicuous; cars easier to see - At twilight many cars already have lights on - in traffic education and public information, attention is given to pedestrians. - ever-increasing priority within residential areas 	<ul style="list-style-type: none"> - attention given to pedestrians in the RVV, BABW and Road Traffic Act - a car driver does not always have to pay all the costs for pedestrian or cyclist aged 14 yr. and over; the EC supports this, the NL government does not - road safety problems of pedestrians not an important issue in research on road safety. 	<ul style="list-style-type: none"> - it has not yet been generally accepted that vulnerable road users are not liable when they are guilty of an accident. Guilt and liability are still closely connected - within residential area, safety of pedestrians must be taken into account
Pedestrians Plus	-	<ul style="list-style-type: none"> - The RVV and BABW lay down that people who have difficulty walking must be given free passage - further: as pedestrians 	<ul style="list-style-type: none"> - in the past explicit policy has been pursued regarding people with a disability; this policy is being diluted
Cyclists	<ul style="list-style-type: none"> - in urban traffic people expect to encounter cyclists; outside the built-up area that is less self-evident 	<ul style="list-style-type: none"> - In the RVV, BABW and Road Traffic Act attention is given to cyclists - a car driver does not always have to pay all the costs for pedestrian or cyclist aged 14 yr. and over; the EC supports this, the NL government does not - in 2002 the FVVV was introduced - there is no 'type quality mark' for bicycles; requirements were abolished as from 1990 - the blind spot mirror and closed side panels on trucks have been made compulsory - road safety problems of cyclists are, despite the large number of casualties, not an important in research on road safety 	<ul style="list-style-type: none"> - the bicycle is an accepted mode of travel in NL, unlike in many other countries
Moped riders - slower	<ul style="list-style-type: none"> - in urban traffic people expect to encounter cyclists and riders of slower mopeds; outside the built-up area that is less self-evident; especially because the slower moped is mainly used recreationally, that is a risk factor 	<ul style="list-style-type: none"> - as cyclists - road safety problems of riders of slower mopeds are not an important issue in research on road safety 	As cyclists
Moped riders - faster	<ul style="list-style-type: none"> - the position of the faster moped traffic has changed since the introduction of Mopeds on the Road 	<ul style="list-style-type: none"> - behavioural rules are laid down in RVV, BABW and Road Traffic Act - a faster moped has to be given permission to use the road by RDW - purchase of modification sets is not prohibited, but to use them is 	The faster moped is far from popular with people who do not have one
Motorcyclists	-	<ul style="list-style-type: none"> - behavioural rules are laid down in RVV, BABW and Road Traffic Act - a motorcycle has to be given permission to use the road by RDW 	-
Special vehicles	-	<ul style="list-style-type: none"> - motorised vehicles are only permitted if a RDW type quality mark has been issued - four-wheeled moped is regarded as faster moped, but is difficult to insure. 	<ul style="list-style-type: none"> - new types of vehicles are in principle given at least the benefit of the doubt; innovations can count on free publicity.
Pre-school children	<ul style="list-style-type: none"> - in driving lessons scarcely any attention is given to reacting to signs that could indicate the presence of children - babies and toddlers are virtually always supervised 	<ul style="list-style-type: none"> - behavioural rules regarding babies and toddlers are laid down in RVV, BABW and Road Traffic Act - babies and toddlers are never held liable for road accident damage, even if they are the cause 	<ul style="list-style-type: none"> - it is generally accepted that babies and toddlers have to be protected

Table 4.11.2 Present approach – Social and public context

Group	Traffic	Standards	Social values
Primary school - infant and lower junior	<ul style="list-style-type: none"> - in driving lessons scarcely any attention is given to reacting to signs that could indicate the presence of children - because their parents consider the traffic too dangerous for them, young children are usually supervised; children are increasingly taken and collected 	<ul style="list-style-type: none"> - children aged 14 and under are never held liable for road accident damage, even if they are guilty - the RVV, BABW and Road Traffic Act contain rules about behaviour towards children 	People in society stand up for the safety of children (cf. Playing on the Streets Day 3VO).
Primary school upper junior	As Primary school - infant and lower junior	As Primary school - infant and lower junior	As Primary school - infant and lower junior
Special education needs	<ul style="list-style-type: none"> - As Primary school - infant and lower junior - no special account is taken of this group in traffic; they are usually not actually identifiable as such 	As Primary school - infant and lower junior	As Primary school - infant and lower junior
Secondary school 12-15 yr	-	-	-
16-17 yr	- Adults often have little compassion with young people	-	-
18-25 yr	- attention for driving/ riding under the influence of alcohol and drugs has increased	- generic traffic regulations in RVV, BABW and Road Traffic Act	<ul style="list-style-type: none"> - 18-25 yr are the most important target groups for advertising - public opinion "everything must be possible" is changing - it is becoming normal that public transport should be provided for large parties; this means that no-one has to use the car.
Function loss	In driving lessons, limited attention is given to interaction with fellow road users with a disability	- regulations regarding the safety of people with a disability in RVV, BABW and Road Traffic Act + case law	<ul style="list-style-type: none"> - in the past explicit policy was pursued regarding people with a disability; this policy is being diluted - the social position of people with a disability is far from enviable - attitude to people with a disability is influenced by means of campaigns
Reduced stamina	-	-	-
Reduced sensory perception	-	-	-
Reduced mental capabilities	- the police take action against conspicuously aberrant	-	-
Motor impairment	-	-	-
Immigrants	-	-	-
addicts, homeless etc.	-	-	-
Elderly	-	- from the age of 70 and over, driving ability is tested. The driving licence can be cancelled on medical grounds	<ul style="list-style-type: none"> - ageing in place has become a general principle - the road safety of elderly people is receiving growing attention from the government
People with a disability	-	- the RVV, BABW and Road Traffic Act contain rules about behaviour regarding people with a disability	<ul style="list-style-type: none"> - in the past explicit policy was pursued regarding people with a disability; this policy is being diluted - the social position of people with a disability is far from enviable - attitude to people with a disability is influenced by means of campaigns

Table 4.12.1. Present approach – Spatial Planning

Group	Traffic situations	Network	Spatial Planning
Pedestrians	<ul style="list-style-type: none"> - Sustainable Safety is having good effects for pedestrians - there are various publications available for the design of provisions - ease of crossing main roads at VRI well organised; less good on road sections - at many places it is possible to cross at one level; however, there is no consistent policy - maintenance leaves much to be desired - in shopping areas the pedestrian is pampered - quality of execution leaves something to be desired 	<ul style="list-style-type: none"> - virtually all sites are accessible on foot - there are many weak places in the routes - accessible in terms of location does not also mean accessible in terms of entry - the Pedestrians Association carried out a great deal of research; the Association no longer exists - Categorisation: ease of crossing remains a problem - compared with other countries, the network is very extensive 	<ul style="list-style-type: none"> - no specific policy regarding pedestrians - pedestrian interests play a role in Mobility Test - new towns significantly safer than old towns/cities that have grown (however: population there also has different composition)
Pedestrians Plus	As pedestrians	As pedestrians; unacceptable detours sometimes needed	As pedestrians
Cyclists	<ul style="list-style-type: none"> - In Sustainable Safety there is not initially any attention given to the mobility and safety requirements of cyclists; with Signing up for the Bicycle there is a good basis - road managers often do not keep to guidelines and agreements with umbrella organisations - intersection solutions are often still susceptible to accidents - crossing main roads not always safe - a considerable proportion of VRIs have separate, conflict-free regulation for cyclists - no uniform approach to right-of-way on roundabouts - due to Sustainable Safety, much attention for forgiving environment 	<ul style="list-style-type: none"> - NL has a virtually complete cycle network - in large infrastructural works there is little attention for through cycle connections, so there are (too) often cases of barrier effects - consistency of approach leaves something to be desired - the messages of Signing up for the Bicycles are not yet being generally taken up 	<ul style="list-style-type: none"> - NL road network has largely been categorised; in most cases it has been established what the function of a road (section) is. A start has been made on the design associated with this, although this is now in danger of stalling - there is some knowledge about issues relating to bicycle safety, but this is not always with the planners. Relevant information is being included in the Mobility Test
Moped riders - slower	As cyclists	As cyclists	As cyclists
Moped riders - faster	At the end of 2000 Mopeds on the Road was introduced and traffic situations are being tackled	-	-
Motorcyclists	- the Civil Engineering Department is investigating the safety of motorcyclists on motorways; other road managers are not concerned with the problems	-	-
Special vehicles	- it will be a very long time before traffic situations are adapted to the requirements for use by new modes of travel, however useful they may be	- it will be a very long time before traffic situations are adapted to the requirements for use by new modes of travel, however useful they may be	- new modes of travel rarely play a role in Spatial Planning considerations
Pre-school children	<ul style="list-style-type: none"> - only in special cases are designs made specifically for young children - Sustainable Safety promotes the safety of young children 	-	- there is attention for children, but not specifically for toddlers.
Primary school - infant and lower junior	<ul style="list-style-type: none"> - apart from near schools (fences, 'brigades') and sometimes homes (playing fields, playing areas) there are in general no special measures for children - increasing land prices mean that playing space for children is decreasing 	- in Den Bosch example project Kindlint	-
Primary school upper junior	As Primary school - infant and lower junior	As Primary school - infant and lower junior	As Primary school - infant and lower junior
Special education needs	As Primary school - infant and lower junior	As Primary school - infant and lower junior	As Primary school - infant and lower junior

Table 4.12.2. Present approach – Spatial Planning

Group	Traffic situations	Network	Spatial planning
Secondary school 12-15 yr	-	-	- Merger of schools and reduction of housing occupancy are resulting in an increase in the size of the areas served by schools and related services, so that children are having to cover greater distances and encountering difficult situations more often
16-17 yr	-	- Mopeds on the Roads leading to fewer accidents and casualties with mopeds	- as Secondary schools 12-15 yr
18-25 yr	- generic influence of Sustainable Safety	- generic influence of Sustainable Safety	-
Function loss	- ASVV contains guidelines for design - most walking routes provided with pavements lowered at certain points - enforcement of rules for using public space inadequate; causes unnecessary hindrances for blind people and wheelchair users - road managers often do not keep to guidelines and agreements with umbrella organisations	- virtually all stations now have guiding lines for blind and visually impaired people; the routes to those stations, however, lack provisions - in many routes there are situations that cannot be used for wheelchair, electric scooter etc.: unnecessary hindrances	-
Reduced stamina	-	- in many municipalities, important walking routes are provided with resting points and benches; however, this is often not laid down structurally in memoranda etc.	-
Reduced sensory perception	As function loss	As function loss	-
Reduced mental capabilities	-	-	-
Motor impairment	- most municipalities provide pavements within the built-up area with lowered pavements, so that rollators, wheelchairs, electric scooters etc. can cross at one level - Sustainable Safety has greatly simplified right-of-way rules, so there are fewer interpretation problems	in many municipalities, important walking routes are provided with resting points and benches; however, this is often not laid down structurally in memoranda etc.	-
Immigrants	-	-	-
addicts, homeless etc.	-	-	-
Elderly	- improved separation of residential areas and main roads - most municipalities, important walking routes are provided with resting points and benches; however, this is often not laid down structurally in memoranda etc. - Sustainable Safety has greatly simplified right-of-way rules, so there are fewer interpretation problems - situations are not specifically tested for practicability for elderly	in many municipalities, important walking routes are provided with resting points and benches; however, this is often not laid down structurally in memoranda etc.	- knowledge obtained regarding road safety and spatial planning is rarely applied
People with a disability	- ASVV - measures in framework of Sustainable Safety - see also under elderly	- As function loss + Elderly	- functional limitations play no significant role in spatial planning

Table 4.13.1 Present approach - Transport system

Group	Vehicle	Transport concepts	Mobility needs
Pedestrians	<ul style="list-style-type: none"> - the RDW tests that vehicles may have no sharp projections - windtunnel models are less unsafe than their predecessors - de EC want pedestrian-friendly car fronts; the industry is co-operating reluctantly - introduction of blind spot mirror - front-underrun problem still not acknowledged 	<ul style="list-style-type: none"> - cars are becoming increasingly large and heavy; this has a negative effect for pedestrians 	<ul style="list-style-type: none"> - the importance of walking as part of the trip is (strongly) underestimated - the role of public transport as the logical complement of walking is declining; the average walking distances to the station and stop are increasing - cautious developments in the direction of free public transport (Hasselt) - urban parking policy means that walking distances are increasing; this is not flanked by pedestrian policy (comfortable, safe routes)
Pedestrians Plus	<ul style="list-style-type: none"> - cars and public transport are difficult to enter for people who have difficulty with walking 	<ul style="list-style-type: none"> - NL is worse than other countries regarding easy-entry transport systems 	-
Cyclists	<ul style="list-style-type: none"> - technical state of bicycles leaves much to be desired - at many schools, annual bicycle checks are held 	-	<ul style="list-style-type: none"> - the government is promoting bicycle use; however, tax measures for that have been abolished
Moped riders - slower	<ul style="list-style-type: none"> - new slower moped must have type quality mark from RDW 	<ul style="list-style-type: none"> - the policy does not distinguish between real slower moped and the scooter models, which can travel much faster than 25 km/h 	-
Moped riders - faster	<ul style="list-style-type: none"> - faster mopeds new from the factory fulfil increasingly high safety requirements; the technical state of faster mopeds that have been in use for some time leaves something to be desired - introduction of registration system can increase chance of being caught 	<ul style="list-style-type: none"> - there is (cautious) discussion about the moped as a transport concept; this is due to the large scale on which it is misused 	<ul style="list-style-type: none"> - Plan 17 can result in less moped use; that is good for road safety. It is, however, nothing more than a plan.
Motorcyclists	<ul style="list-style-type: none"> - the technical state of motorcycles is generally good; however the noise production is often too high 	-	<ul style="list-style-type: none"> - the use of the motorcycle is neither encouraged nor discouraged - the problem of traffic jams and tail-backs encourages increasing use of the motorcycle
Special vehicles	-	<ul style="list-style-type: none"> - The government only has attention for a special vehicle if it receives a relatively large number of negative signals about it (alarm system) - when a certain transport concept has existed for some time and its use has reached a certain level, there often arise interest organisations for it - transport concepts that offer people with a disability new possibilities can be eligible for WVG reimbursement 	<ul style="list-style-type: none"> - when a certain special vehicle falls within the WVG regime, this offers chance for the users
Pre-school children	<ul style="list-style-type: none"> - many child seats are of poor quality; the attachment is a problem, and is not checked 	<ul style="list-style-type: none"> - child seats for cars have to be approved by TNO - requirements concerning transportation of babies and toddlers are contained in the RVV and Road Traffic legislation 	-
Primary school -infant and lower junior	<ul style="list-style-type: none"> - the transport of children is generally badly organised and is not checked - children's bicycles are not tested for safety 	<ul style="list-style-type: none"> - a project KANS (children go to school a different way) is being implemented 	-
Primary school upper junior	As Primary school -infant and lower junior	As Primary school -infant and lower junior	As Primary school -infant and lower junior
Special education needs	As Primary school -infant and lower junior	As Primary school -infant and lower junior	-
Secondary school 12-15 yr	<ul style="list-style-type: none"> - at many schools there is an annual bicycle check 	<ul style="list-style-type: none"> - the regular public transport is not improving and is becoming decreasingly an option 	-

Table 4.13.2. Present approach - Transport system

Group	Vehicle	Transport concept	Mobility needs
16-17 yr	- scarcely any attention is given to the quality of bicycles	-	-
18-25 yr	- vehicle checks take place every now and then - the APK has ensured that the very worst cars are no longer on the road	-	-
Function loss	-	In the context of the WVG provisions are being introduced for transport	-e.g. 'Meals on Wheels' and services to the home mean that people do not have to go out for shopping or services
Reduced stamina	- cars that are adapted to the needs of people with physical disabilities are checked for technical and safety aspects - for four-wheeled mopeds and electric scooters, requirements are set regarding the max. speed; scarcely any other requirements are set for them	- a policy of following is pursued (alarm system); there is no active policy regarding criteria for existing or new transport concepts. The regulations of the EC are observed	-
Reduced sensory perception	-	-	-
Reduced mental capabilities	-	-	-
Motor impairment	See Reduced stamina	See Reduced stamina	-
Immigrants	- the police have an intuition about conspicuous (old, defective) cars. Nevertheless, the actual chance of being caught is negligible.	-	-
Addicts, homeless etc.	-	-	- the present policy is to tolerate the presence of addicts and the homeless. If they cause a nuisance they are moved on and abandoned to their fate
Elderly	-	the vehicle sector is giving growing attention to a range specifically aimed at the elderly. For instance, low-cross-bar bicycles, electric scooters, four-wheeled mopeds have been introduced. There also seems to be a favourable market for handy accessories (blind-spot mirrors).	- for a long time there has been the 65+ card - introduction of dial-a-bus, train taxi and other demand-responsive forms of collective transport has improved the range on offer - elderly people with a disability can have transport arranged via the WVG
People with a disability	See Reduced stamina	See Reduced stamina	- see under Elderly; one's own adapted car is only rarely one of the options

Table 4.14.1. Developments in the social position

Group	Developments	
Pedestrians	<ul style="list-style-type: none"> - Pedestrians are at the bottom of the pecking order in traffic. Consideration of their problems, therefore, is by no means a matter of course. Everyone is a pedestrian, a cyclist, a car driver or a public transport passenger. These other modes of transport are more appealing. - Sustainable Safety: strong separation of traffic areas from residential area; keep more traffic on the main roads. This approach provides a positive impetus for the safety of travel on foot. - Parking is becoming more difficult: large distances must be covered on foot (through safer residential areas); in this context more attention needs to be devoted to the ability of crossing main roads. - People's horizons continue to widen. As a result trip destinations are getting further away and the walking distance threshold is exceeded more often. Walking will more often no longer be an option. - Elderly people do more walking than other age groups. Although it may be expected that in the future the elderly will more often make use of the car, it may also be assumed that for health reasons, among other things, they will take the time to walk to places. - Due to the ageing of the population and the falling number of young people, more women will have to work in the future. The need to combine child care, housekeeping and work forces women to manage their time very carefully. Children will be taken to and picked up from school, swimming lessons, piano lessons, etc. more often by car instead of on foot or by bicycle. - Due to the cancellation of unprofitable bus and train services and the long waiting times for train taxis, people who go on foot (to and from the bus stop/train station) and then by public transport, will be more inclined to switch to their own car. - Economies of scale are still being made in the service sector. As a result, shops, banks and other services are now, on average, further away from the consumer. Businesses are in a position to pass on their transport costs to the consumer, who is no longer able to reach a shop or other facility on foot, but must use a means of transport for this purpose. - The number of trips for multiple reasons is increasing (of necessity). As a result, trips on foot (as well as trips by bike) are being replaced by car trips. - Spatial policy supported car mobility. Because of this, most destinations are no longer within walking distance. The need for this increases in line with the ageing of the population. - There is no separate (powerful, clear, recognisable) pressure group anymore. As a consequence, pedestrians will receive less attention. There is also little impetus to find out about the problems of this group. It is therefore only by accident that the issue gets onto and stays on the political and policy agendas. In other countries, particularly the UK, there is a highly active, articulate and powerful pedestrians' pressure group, which promotes research and management and the implementation of detailed policy by keeping the issue on the agenda. 	
Pedestrians Plus	<ul style="list-style-type: none"> - Internet applications will make some of the trips less essential. Information can be obtained, orders can be placed and administrative tasks carried out using the internet. It is expected that in the future it will no longer be necessary to visit the bank, council or other government offices for certain procedures. This will leave more time and energy for other, more important, trips. - The widespread introduction of mobile telephony has helped to emancipate people who find it more difficult to deal with the traffic. It lessens the fear of becoming stranded somewhere. - The number of people who will need walking aids will increase considerably. As a result their political power will also increase and their social position will improve rather than worsen. 	
Cyclists	<ul style="list-style-type: none"> - The bike fits in well with the rather Calvinistic Dutch culture. - The Netherlands is a cycling country. Despite this, the bike is almost at the bottom of the pecking order in traffic and when it comes to policy-makers' attention. Under the influence of the Cycling Master Plan and effective lobbying by the Cyclists' Union, the bicycle and cycling policy has made it onto the political agenda and a lot has been done for bikes. However, attention has begun to slip again. The road safety problems of cyclists are not treated as a separate or important issue in road safety research. - In the road safety sector little thought is generally given to hidden mobility needs which are not met due, whether in part or to a greater extent, by lack of safety on the roads. This is an omission. In the countries surrounding us, such as the United Kingdom, you now see great concern being voiced about children who no longer travel to school and other destinations independently but are brought there by their parents. This is not only from the point of view of road safety considerations but also in relation to public health, the urban environment and traffic management. People are also concerned that it takes so much effort to allow more people to cycle. - Little is done for each of the specific groups in terms of safety. Generic safety measures are taken and measures are taken which make cycling more direct and more efficient. Cycling benefits as a result. - There is little policy aimed at this group. In general the policy pursued has had a positive effect. However, in terms of improving safety the bike is doing no better than other means of transport. 	

Table 4.14.2. Developments in the social position

Group	Developments	
Moped riders - slower	<ul style="list-style-type: none"> - Nothing special is done for this group in terms of safety. Generic safety measures are implemented which make cycling more direct and more efficient. Moped users benefit as a result. - There is little policy aimed this group. In general the policy pursued has had a positive effect. However, in terms of improving safety the slow moped (snorfiets) is doing no better than other means of transport. - Due to misuse by young people the slow moped has more recently acquired a less positive image. - Slow mopeds are not seen as stylish or fashionable. Neither does everyone want to be seen on one. In traffic the (true) slow moped is treated in the same way as a bicycle. - The slow moped is not expected to grow in popularity. Many of those who use slow mopeds do so because they do not have a driving licence and/or car. The number of older people holding a driving licence is growing every year (among the current over 50s the proportion is very high; among the over 60s the level is lower, particularly among women). In 10 years time therefore, the number of people without other options will decrease and a large proportion of potential slow moped use will be replaced by car use. 	
Moped riders - faster	<ul style="list-style-type: none"> - The position of the ordinary moped and the slow moped (scoter model) is under discussion. Consideration is being given to the introduction of mandatory helmet for the slow model (not the spartamot), increasing the age at which a moped may be ridden, making a full driving licence (including the practical test) mandatory and changing the classification of vehicle categories. - If the helmet is made mandatory for the slow moped too, it may be expected that the number of users will decline substantially. - The size of the 16-17 age group is getting smaller. As a result the level of interest in the moped could also decline. If there is no change in the requirements relating to driving standards or the age category definition, the number of mopeds will decline by about 10-16% over the next 20 years. 	
Motorcyclists	<ul style="list-style-type: none"> - The motorcycle conjures up an image of freedom. With the increasing traffic congestion of the roads every day, motorcycle offers an alternative. - Motorcycles are closely connected with certain age groups. The share of the 25-55 age group is declining. The changing age structure of the population is expected to contribute to less motorcycle use. 	
Special vehicles	- No conclusion possible.	
Pre-school children	<ul style="list-style-type: none"> - Babies and toddlers are becoming increasingly important in ensuring that we have a decent future and they should be protected more and for longer. - A small-scale pilot project was carried out in which parents and children were taught how to cross. - There is growing interest in the link between spatial planning and traffic, which includes the concept of the 'back seat generation'. For the youngest group of children, responsibility in all areas lies with parents/carers, while the necessary support can be given at the spatial planning level.. 	
Primary school - infant and lower junior	<ul style="list-style-type: none"> - There is still great concern about the safety of young children. - Conversely, children are only being allowed out on their own at an increasingly later age (research by the Dutch Pedestrians' Association and DETR etc. 	
Primary school - upper junior	- As Primary school - infant and lower junior	
Special education needs	- If integration or reintegration is seriously addressed (including learning to use modern communication methods), the position of certain groups of children can be improved. Conversely, this will increase the gap between the knowledge-based society and children with mental problems (operating a telephone, computer and the growing number of information carriers)	
Secondary school 12-15 yr	- Young people need to be taken more into consideration	
16-17 yr	- Active participation in the labour market alongside study appears to be on the increase. As a result more trips are made, with more responsibilities.	
18-25 yr	<ul style="list-style-type: none"> - Young people have for a long time set the standard for advertising. Their place is gradually being taken over by the 30 to 50 generation. Their role as a trendsetting group is therefore waning. - The percentage of immigrants among young people is growing. Immigrants have a weaker position politically and in society. 	
Function loss	- Due to the effects of the ageing population, the number of people with serious disabilities will increase. It is only to be expected that the sense of urgency will therefore also grow.	
Reduced stamina	- Due to the effects of the ageing population, concern about the problems of people with disabilities will increase, since this will affect a growing number of people, who together will have an increasingly stronger political voice.	

Table 4.14.3. Developments in the social positions

Group	Developments	
Reduced sensory perception	<ul style="list-style-type: none"> - Due to the effects of the ageing population, the number of people with serious disabilities will increase. It is only to be expected that the sense of urgency will therefore also grow. - Increasing traffic density is increasing the problem for those with visual and hearing disabilities. - Making cars quieter (quite apart from the growing use of electric vehicles) will have serious consequences for people with a visual impairment. - With regard to the care of those with hearing disabilities the following basic guidelines could be used in restructuring the care provided: <ul style="list-style-type: none"> —a shift from intramural to extra or transmural care; —a good distribution of care (regionalisation); —providing flexible care according to need type (type, intensity and duration) creating more variety of care; —offering more opportunities for multidisciplinary care for children, adults and the elderly with a hearing disability; —good coordination of general care facilities and other facilities intended for the hearing impaired, particularly special education at primary and secondary level. [20] 	
Reduced mental capabilities	- the position of this group is already marginal and will neither improve nor deteriorate.	
motor impairment	- Due to the effects of the ageing population, concern about the problems of people with motor impairments will increase, since this will affect a growing number of people, who together will have an increasingly stronger political voice.	
Immigrants	- It is expected that the immigrant group will continue to grow (due to asylum seekers, marriage to partners from native countries and the recruitment of the necessary labour force from other countries, as well as the children of immigrants). The group will not become so large, however, that it becomes the default group (perhaps only at local level in a few places).	
Addicts, homeless etc.	- Addicts and the homeless are on the bottom rung of society and have little or no influence over their own living conditions.	
Elderly	<ul style="list-style-type: none"> - The number of elderly, as a proportion of the population, will continue to increase. The maximum will be reached in 2040 when there will be about twice as many elderly people as there are now. - Apart from the normal ageing of the population, there will also be a 'double ageing' factor as the number of people over the age of 80 will show the largest relative increase. - The elderly may now be the exception in traffic, but they will be common around 2020, this will create a completely different situation on the road than now. 	
People with a disability	<ul style="list-style-type: none"> - Due to the ageing of the population, the number of people with serious disabilities will increase. It is to be expected that the sense of urgency will also increase, as this will affect an increasing number of people with a growing political voice.. - Due to the ageing of the population, the percentage of people with motor impairments will increase. If the percentage is currently about 25% of the population, then by 2020 it will be 30% or more. 	

Table 4.15.1. Degree to which the problem will increase/decrease and the consequences

Group	Developments
Pedestrians	<ul style="list-style-type: none"> - The importance of walking as a separate means of mobility is declining considerably. - The importance of walking as part of a chain is increasing greatly. - The number of pedestrians on the street will decline and safety on the streets will increasingly become a problem. - Maintaining the quality of public space is under threat. - The road safety of pedestrians could worsen, but it does not have to. - Due to the influence of Sustainable Safety motorised traffic will be concentrated on the main, arterial roads. The ability to cross these main roads could become a problem; children, the elderly and people with a disability may not always be able to cope with this and therefore are at greater risk.
Pedestrians Plus	<ul style="list-style-type: none"> - As a result of measures introduced due to Sustainable Safety trips within residential areas have become less hazardous (cars drive slower), but main roads continue to pose an insurmountable obstacle, particularly when crossing can only be made at cross-roads and relatively long detours have to be made to cross. - The ageing population means that the number of pedestrians requiring walking aids will increase. - Economies of scale and centralisation of facilities and services (e.g. shops, banks, care) will increase the average distances involved for these people. The problems will increase as a result.
Cyclists	<ul style="list-style-type: none"> - The short trips policy and instruments such as VPL (local transport performance), together with a continuation of cycling policy, supported by the benchmarking project of the Cyclists' Union, could lead to a greater share of cycling in the Netherlands. There is considerable potential in any event, despite, in international terms, the already high level of cycling. In view of the trend which has been brought about by the Cycling Master Plan, this will tend to have a positive effect on the overall safety situation. - More older people cycling in traffic will not lead to a definite increase in the number of accidents, but could result in a larger share of serious (or very serious) accidents because of their physical fragility. Continuing the Sustainable Safety approach is an effective means but could be even better if a functional system of through and access paths as well as designated areas were to be created for cyclists, which will include adequate solutions to deal with conflict situations involving motorised traffic.
Moped riders - slower	<ul style="list-style-type: none"> - The problems relating to the slow moped (snorfiets) will get less. First of all, because of the expected trends in relation to the moped driving licence and the introduction of the compulsory helmet which must be worn even by those on real slow mopeds and modified slow mopeds. For many people the introduction of the compulsory helmet for the ordinary (faster) moped was sufficient reason to stop using it. It is expected that this will also be the case with slow mopeds ('true' slow mopeds and modified ones). The changes outlined above relating to car ownership and the number of people holding driving licences will also have an impact.
Moped riders - faster	<ul style="list-style-type: none"> - Stricter standards in relation to driving skills and mandatory helmet use even for slow mopeds will have a positive effect on road safety.
Motorcyclists	<ul style="list-style-type: none"> - The number of accidents involving motorcyclists will probably decline at the same rate as the number of motorcycles.
Special vehicles	<ul style="list-style-type: none"> - No conclusion possible.
Pre-school children	<ul style="list-style-type: none"> - The situation has improved due to the introduction of Sustainable Safety with 30 km/h and the relationship with spatial planning. - The situation has worsened in that the pedestrian priority area (with speed restrictions) concept has been dropped. Instead of pedestrian priority areas the terms 'traffic-calmed' or 'limited traffic' are often used in relation to a residential type of layout: no pavements, everything on one level, with one major difference: in pedestrian priority areas children of all ages have a better legal position than in the new traffic-calmed areas. Officially, under the Road Traffic Act, these are simply 30 km/h areas which offer children on the street no legal protection. In a pedestrian priority area a child can play anywhere on the street and has priority over motorised traffic. In traffic-calmed areas a motorised vehicle has a stronger legal position. - The problem will become less due to the declining numbers in the babies and toddlers group. - The problem will become less due to the use of more protection and more protection methods. - The number of double-income families may well have an influence on the degree to which pre-school children actually still come outside, or are only allowed out under 'supervision'. This also affects the next group, primary school children. It must be assumed that the Committee on the Combination of Care and Paid Work, or the Equal Rights Committee have taken note of this.
Primary school -infant and lower junior	<ul style="list-style-type: none"> - For now the growing trend of taking and collecting young children will continue: decline in independent mobility. This is because road traffic will continue to grow strongly, and because the spread of facilities has not yet been brought to a halt. Safety on the streets is another important consideration (fewer 'eyes' on the street). - The number of double-income families may well have an impact on the degree to which pre-school children actually still come outside, or are only allowed out under 'supervision'. This also affects the next group, primary school children. It must be assumed that the Committee on the Combination of Care and Paid Work, or the Equal Rights Committee have taken note of this.
Primary school upper junior	<ul style="list-style-type: none"> - Due to increasing car ownership and use, the independent mobility of children will decrease. Safety on the streets is also an important item (fewer 'eyes' on the street).
Special education needs	<ul style="list-style-type: none"> - Unknown: depends on technical and medical developments, and acceptance of certain decision (e.g. bringing a child into the world which is known to have a disability).
Secondary school 12-15 yr	<ul style="list-style-type: none"> - No clear picture: e.g. introduction of a bicycle helmet will reduce the number of casualties but perhaps also the number of bikes.
16-17 yr	<ul style="list-style-type: none"> - Road safety among young people has already become less of a problem due to protective measures, but in relative terms this group continues to be at risk. This is not expected to change for the time being.
18-25 yr	<ul style="list-style-type: none"> - Due to demographic developments the relative and absolute size of the group is shrinking. The risk of the group per trip, per time unit, per kilometre is not declining. At a collective level the problem is getting smaller: fewer young people will lead to fewer risks, to themselves and others.

Table 4.15.2. Degree to which the problems will increase/decrease and the consequences

Group	Developments
Function loss	- The scale of the problem will increase.
Reduced stamina	<ul style="list-style-type: none"> - Economies of scale in the service sector (banks, shops and medical facilities) have a major impact on people with reduced stamina. It takes them more effort to travel, they become more dependent on help/support; and the number of trips will be reduced as a result. The risks attached to independent travel over larger distances could rise to a socially unacceptable level. - One of the results of the Sustainable Safety programme is that people can move about more easily within designated areas. If the facilities they require can be found within that area, this will have a positive effect on safety and mobility.
Reduced mental capabilities	- The number of people who will experience difficulties in traffic as a result of a visual or auditory disability will increase dramatically in the next 20 years. The number could well double.
Motor impairment	<ul style="list-style-type: none"> - As the complexity of traffic increases the consequences of having reduced mental capabilities will be more serious: this group cannot respond as well to the risks they face. [122] - As the population is ageing, in 30 years' time the number of people with Alzheimer's disease will have doubled and, during the De Wied lecture on 14 April 2000, Prof. Swaab of the University of Utrecht stated that this is just the start. - Not only will the number of people with Alzheimer's grow, but other forms of brain damage such as CVA will also increase. The continuing technological advances in medicine meant that more and more people are kept alive. There are also other groups, such as those suffering from the effects of whiplash.
Immigrants	<ul style="list-style-type: none"> - If nothing is done, the present trends will continue: <ul style="list-style-type: none"> -more people who are not fully aware of the rules -more people who do not see the point of observing the traffic regulations -more people who are unsafe e.g. on the bike, driving a car, playing on the street. Some of these are vulnerable road users; others cause problems in the traffic environment.
Addicts, homeless etc.	- Unknown.
Elderly	<ul style="list-style-type: none"> - The average level of education of the elderly will be significantly higher than that of the present generation. The next generation will be more vocal and will demand a larger share of political power. - Even if traffic becomes calmer and more balanced, the increasing number of more 'fragile' elderly people will lead to more traffic accidents with serious consequences, unless there is a fundamental reconsideration of the traffic and transport system to ensure that the mobility needs of the elderly are met by a safe, accessible and sustainable method of transport. [128] - The current generation of people aged 50 and under are used to high mobility. They will want to keep this mobility when they get older. At present, the car is the most suitable for this. As a result, the roads will get busier, even at times when it is now quiet. - On average, the elderly of the future will be healthier and in better physical condition than in the past. Their standard of living will be higher. They will continue to be active for longer than the current generation of elderly people. - At present, people mostly retire or take early retirement at 62 or 63 years of age. It is expected that the retirement age will gradually increase. In 2015 some of those aged 65-70 will continue to work. This will result in significant mobility, including car use. - By around 2020 about the same number of elderly women as men will hold a driving licence. More of them will also own a car. This will lead to a further increase in car use compared with the present situation. - The elderly are expected to continue living on their own for as long as possible ('ageing in place'). This also means that their mobility should be maintained for as long as possible. - The elderly will increasingly opt to live outside highly urbanised areas, away from high crime rates and a high cost of living. The need for mobility, especially car use, in low density areas is greater (criss-cross trips). - Mobility needs and choices will change over time. The distances travelled will increase and car use will increase. Trips will be more criss-cross as friends and family also live in suburbs and outlying areas. Public transport cannot meet this need (and is also being cut back). - Cars will increasingly be adapted to the needs and wishes of older drivers. Compared with the present cars they will be easier and safer to drive as they are better suited to the ergonomic requirements of older drivers. - Walking, as part of a trip, will become significantly more important. It is expected that 30-40% of the time the elderly spend in traffic will be spent walking. - Older drivers have a relatively high risk of becoming an accident victim, but this is expected to fall in future. However, this reduction will not offset the expected increase in car use. Consequently, the number of victims among older drivers will increase significantly in the next 20 or 30 years, and probably the total number of traffic victims as well. [171].
People with a disability	<ul style="list-style-type: none"> - The scale of the problem will increase. Economies of scale in the service sector (banks, shops and medical facilities) have a major impact on people with impaired mobility. It takes them more effort to travel, they become more dependent on help/support; and the number of trips will be reduced as a result. The risks attached to independent travel over large distances could rise to a socially unacceptable level. - One of the results of the Sustainable Safety programme is that people can move about more easily within designated areas. If the facilities they require can be found within that area, this will have a positive effect on safety and mobility.