VULNERABLE ROAD USERS: NEW APPROACHES NEEDED?

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INTRODUCTION

In the Netherlands, central government is looking for new ways of improving road safety. More than half of the total number of victims in traffic are so called vulnerable road users: children, the elderly, the handicapped, pedestrians or users of a two wheeler. Despite that, vulnerable road users receive only limited research and policy attention, both nationally and internationally. As a result, insight into road safety problems and issues experienced by vulnerable road users is limited compared to motorised road users. On the other hand, the general public asks for social justice and the media regularly highlight the helplessness of vulnerable groups. Many politicians state that vulnerable road users should be better protected. Policy makers in the Civil Service argue that there is great potential for reaching road safety goals by giving adequate attention to vulnerable road users.

As a consequence, the Transport Research Centre (AVV) of the Ministry of Transport, Public Works and Water Management was asked to develop widely acceptable practical policy recommendations on traffic safety for vulnerable road users. The recommended measures should be effective and efficient and should cover all categories of vulnerable road users.

PRELIMINARY SURVEY

AVV primarily functions as a centre of excellence / knowledge broker. Most of the policy recommendations made by AVV are based on research by contracted third parties such as consultants and scientific research institutes. For this project AVV asked Goudappel Coffeng, a traffic & transportation consultancy firm, to do a preliminary study [see: Korsten c.s. 2001]. Based on a broad literature study, a quick scan on the internet and limited number of telephone interviews with known experts in the field, a report was drafted.

The survey resulted in a general image of available knowledge and expertise on vulnerable road users. The AVV research team concluded:

- policies on vulnerable road users need to be improved. Present-day policies are predominantly based on intuition and less on facts;
- there is inadequate insight in the actual nature and extent of the problems regarding vulnerable road users;
research regarding vulnerable road users is fragmented and it is unclear what gaps in knowledge there are;

- at present there is insufficient information for the development of a robust (effective, efficient and acceptable) policy program regarding vulnerable road users;

AVV has a better understanding of the issues and problems regarding vulnerable road users than do the consultants; unfortunately also the SWOV, a leading road safety institute, does not have much expertise in this field. In this case it was more efficient for AVV to conduct the research, especially since the experience is available in-house.

BACK TO BASICS

On the basis of these reflections, the first thing AVV did was to rethink the project. The reasons for the project, its context, aims and questions were documented in a Reference paper. A new research strategy was formulated, discussed with and agreed on by the policy makers of the Ministry of Transport.

Structuring the quest

In the new strategy some fundamental questions had to be answered:

- when is a person a vulnerable road user
- what options are there for solving problems
- how does one develop a good policy program.

For this an elementary planning model was used (see figure 1): first the problem is specified, secondly the factors contributing to the problem ('causes') are determined, then the causes you wish to address are decided on ('targets'). Based on the targets one can develop effective solutions. Finally the effectiveness and efficiency of the solutions have to be assessed ('evaluation'). The result will be an optimised policy program.

![Planning Model](https://via.placeholder.com/150)

For prospecting and classification of causes, targets and solutions the so called Pizza model, in essence nothing more than an elaborate form of a checklist, was used [Methorst, 2000]. The Pizza Model was developed for checking whether all possible options were considered in specific traffic safety policies or research designs. This is done by checking for content on the individual cells within the sectors and segments of the model (see figure 2). The model is founded on the principle that traffic and transportation are seen as a system. People travel from A to B. Goods get transported. For this vehicles may be used. The vehicles move over
roads. Roads are part of a road network and are situated within a physical environment. Traffic safety depends on the sum of qualities of the components Man, Vehicle, Physical and Social environment. There is interaction on three levels: the micro / meso / macro level. In the model the three levels are represented as layers around a core:

- The core: on the basic level of interaction the individual road user interacts with other road users (social environment), the physical environment (road) and his vehicle.

- The first layer: the social group (family, class, business unit or company) influences decisions made by the individual. Likewise the social environment is governed by norms regarding living by the (traffic) rules and more general social rules one uses in traffic. The physical environment (site, i.e. a crossroad) relates to the place in the road network (routes). Vehicles form part of transportation concepts (tram cars are Light Rail).

- Outer area: groups are part of society; their functioning relates to social trends and options. Values stand for the relevance of the transport system, including road traffic safety. The road network connects the various kinds of land use and forms part of the land use itself. Transport concepts are influenced by the need for transport and travel.

The axes of the model are named with counterpart dimensions Human-Technology and Internal-External. Thus there is a ‘Human’ half, a technique-half, an internal half and an external half.

![The Pizza model](image-url)
Political context

Traditionally pedestrians, bicyclists, moped and motorcycle riders are considered vulnerable road users. In some instances special attention is given to children, the elderly and handicapped persons. In The Netherlands, as in many countries, vulnerable road users seem to be high on the political agenda. However, in many cases it is not clear what is meant by vulnerability. Furthermore in practice not much money is allocated to tackling the problems and very little research is done on the subject. When funds and resources are budgeted and allocated, other proposals generally tend to be more important, mainly due to the fact that they can better motivated with facts and figures and not merely with emotional or sentimental arguments. Due to inadequate motivation, the probability of projects related to vulnerable road users are rejected is high. This is why the AVV research team insisted that scientific research at facts and figures be developed and published.

At present vulnerable road users are not forgotten in policy programs. However, current policy characteristics are not particularly hopeful, since they appear to be:

- **reactive and focussed on incidents**: like most policy programs current vulnerable road users approaches are primarily reactive. In most cases measures are only taken if some sort of emergency arises. Proactive action is rare;

- **measure oriented**: policy makers want to appear to be energetic. Many feel that investigating problems and causes only delays in implementing solutions that they think proper action to a problem they already know. The step from 'problem' to analysis of the causes is frequently omitted;

- **site oriented**: problems of vulnerable road users manifest themselves at concrete sites like crossroads and pedestrian crossings. This is where the problems can be solved. Problems are seldom placed into a larger perspective, such as the route as an entity. Structure oriented policy programs do not come to mind;

- **humanitarian**: policy makers want to do good. Measures for children or the handicapped help to build a positive image. The amount of the societal damage of a problem does not seem to be an important issue.

- **Oohps....**: many measures favouring vulnerable road users are so called reparation-measures. In most cases policy makers assume that vulnerable groups do not need much since they travel by simple modes. A clear example are traffic lights. These are put in place to solve capacity and flow problems of motorised traffic. After solving these primary problems, the 'secondary' crossing problems of bicyclists and pedestrians are considered.

- **No monitoring of effectiveness/efficiency**: evaluation of policy actions is rare. Very little is known about the effectiveness of measures. As a result of limited attention to problem analysis many assessment mistakes are made. Thus measures miss their targets. For example: there are many zebra crossings that are not directly on the pedestrians’ walking routes, but at crossroads. Pedestrians however, take the shortest route and cross the street elsewhere.

- **wavering between risk-liability and 'guilty means liable'**: in the mind of the public and of politicians when taking measures, guilt is an important consideration. People tend to sympathise with the 'poor' car driver that injured the imprudent pedestrian when the driver did not break an important traffic rule. Most do not automatically take into
consideration that a car is dangerous for pedestrians and pedestrians rarely kill car drivers.

**Redefining ‘vulnerable road users’**

At the outset of the follow-up project the AVV project team concluded that using the usual categories of vulnerable road users would not be efficient for developing an effective policy for this category of road users. Reasons motivating this decision were:

- overlaps between groups (e.g. between the elderly and handicapped)
- using age as an indicator may be simple from a data management point of view, but does not offer a tool for assessing the necessary financial and manpower resources and the cost effectiveness of measures
- the group ‘elderly people’, often seen as a ‘vulnerable ‘group altogether, is very heterogeneous. A minority of persons over 65 are vulnerable. Age is not the relevant indicator. Illnesses, physical and mental condition are better indicators
- taking traffic roles as a starting point does not comply with the fundamental concepts of Sustainable Safety where man (and not machine) is central and the design standard; and
- the Dutch constitution does not allow age discrimination.

The research team concluded that there are three indicators identifying groups of vulnerable road users, namely:

- the extent of external protection
- abilities, that is the extent to which people are able to function in risky situations
- fragility, that is the extent to which people can deal with outside forces.

Based on these indicators 21 distinctive groups of vulnerable road users were distinguished (table 1):

<table>
<thead>
<tr>
<th>Functional groups of vulnerable road users</th>
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<tbody>
<tr>
<td>1. Pedestrians</td>
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<td>2. Pedestrians Plus</td>
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<td>3. Bicyclist</td>
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<td>4. Slow moped drivers</td>
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<td>5. Moped drivers</td>
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<td>6. Motorcycle drivers</td>
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<td>7. Special vehicle drivers</td>
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<td>8. Pre school children</td>
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<td>9. Elementary school (4-8 yrs old)</td>
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<td>10. Elementary school (9-11 yrs)</td>
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<td>11. Special schools</td>
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<tr>
<td>12. Secondary school (12-15 yrs)</td>
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<tr>
<td>13. 16-17 years old</td>
</tr>
<tr>
<td>14. 18-25 years old</td>
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<tr>
<td>15. Handicap – lost function</td>
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<tr>
<td>16. Limited stamina</td>
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<td>17. Limited perception</td>
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<tr>
<td>18. Mentally handicapped</td>
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<tr>
<td>19. Motor handicapped</td>
</tr>
<tr>
<td>20. Foreigners</td>
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<tr>
<td>21. Addicted / homeless</td>
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</tbody>
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*Table 1  Categories of vulnerable road users*
RESEARCH QUESTIONS

With respect to the above groups the AVV team, in co-operation with the Ministerial policy makers, identified the following research questions:

- what useful indicators are available to describe the nature and extent of the problems of specific groups of vulnerable road users?
- what are the most important factors that lead to the various problems?
- which cause oriented measures can be taken?
- how do the measures score on effectiveness, efficiency and synergy on the middle to long term?
- what does a robust integral policy program look like?
- what policy recommendations can be given?

CONSULTING EXPERTS

It was agreed that policy recommendations should be based on available knowledge regarding current and future characteristics of the distinctive groups of vulnerable road users. Only parts of that insight can be found in literature and on the internet. The knowledge of experts seemed to be a much more important source. To tap this source, an extensive questionnaire was developed and two consultation rounds were planned. In the first consultation round per group experts were asked to complete the questionnaire. The plan was to use the resulting information for the for the development of Fact sheets or mini dossiers. In the second consultation (workshops) round the content of the Fact sheets could be refined.

In the Fact sheets / mini dossiers the following items were included:

1. Definition of the group
2. Nature and extent of the (road safety) problems of the group:
   - size of the group
   - mobility characteristics
   - number of victims
   - victim injury risks
3. Contributing mechanisms (causal factors)
   - User characteristics
   - Travel choices and motives
   - Characteristic route choice mechanisms
   - Characteristic road behaviour mechanisms
4. Quality needs profile

- Human factors (items: General information, Perception, Assessment of the situation, Decision taking, Execution of traffic role)
- Social environment (items: Traffic, Norms, Values)
- Spatial environment (items: Traffic situations [sites], Network, Land Use)
- Transport system (items: Vehicle, Transport concepts, Travel needs)

5. Current policies / measures

- Human factors (items: General information, Perception, Assessment of the situation, Decision taking, Execution of the traffic tasks)
- Social environment (items: Traffic, Norms, Values)
- Spatial environment (items: Traffic situations [sites], Network, Land Use)
- Transport system (items: Vehicle, Transport concepts, Travel needs)

6. Future developments (Position of the group in society, Increasing/decreasing of problem + consequences)

7. Knowledge gaps

The extensive questionnaire (same items as the Fact sheets but without Definition and Knowledge gaps) proved to be much too comprehensive for the respondents. Most experts felt overwhelmed and could not provide even a part of the requested information. The planned consultation rounds were not effective either. Within the given time frame it proved impossible to organise consultation sessions per group of vulnerable road users. Even combined sessions were hard to realise. At the combined sessions the topics to be covered became divers and lacked focus. Furthermore, the participants did not have all the required information at hand.

It was decided to complete the Fact sheets / mini dossiers in house using the available information gathered in the foregoing phases, put them on the internet and then ask the experts to react to ‘their’ Fact sheet. The information on the Fact sheets was provided with an indication of weight robustness based on a range of 1 to 5 stars rating system where 1 stands for ‘guess’ and 5 stands for ‘proven fact’. For most Fact sheets this action resulted in additional information (more than 35 reactions from 13 persons); however supplementary in-house research and assessment was needed for a somewhat satisfying result.

An important part of the content of the Fact sheets is based on personal assessments and on information provided by different individuals. In future, the Fact sheets, the Sources database and the list of experts will need to be completed. The included information must be validated and gaps in information and knowledge have to be assessed. A possible way of validating the information by forming a Vulnerable Road Users Forum.
DESIGN FOR ALL

The systematically classified information is to be used in a Design for All approach. In this vision, measures are not taken for the good of a specific group, but for the benefit of society as a whole. The plan is to cross-check information in the Fact sheet on joint causal factors, quality needs and current policies. In this way one can possibly identify measures that are beneficial for more than one group. The efficiency and acceptance of measures in a policy program can be improved in this way.

THE PRODUCTS

Currently the following ‘products’ are available:

- Fact sheets, in which information per vulnerable road users group is given on characteristics of the group, developments regarding the nature and extent of their problems, a summary of causal factors and mechanisms, quality needs profiles, current policies and relevant future developments. Each field is provided with an indication of robustness of the information (1 to 5 stars);
- a Sources database, incorporating references like reports, articles, statistics;
- a List of experts and their expertise
- a Reference paper in which reasons, context, goals, questions and research strategies are described

RECOMMENDATIONS TO DUTCH ROAD SAFETY POLICY MAKERS

Based on the available information a number of conclusions have been drawn regarding the problems of vulnerable road users, the nature and extent of road safety implications, international policy and thinkable measures.

General conclusions regarding vulnerable road users’ problems:

- a magnifying glass effect exists: complex situations that offer difficulties for ‘normal’ people having average competencies become big to insurmountable problems or safety risks for some vulnerable road users group;
- a compensation effect exists: when people judge road use too dangerous, they take less (independent) part in traffic. This has negative social and health effects;
- special groups (like the blind) have specific problems. When treated in isolation there is a risk of stigmatisation and marginalisation of the group. This is neither of help to the group nor society;
- in most cases problems of vulnerable road users exceed road safety effects; security and accessibility and mobility options are at stake; social costs are probably very high;
the by far most important trend regarding vulnerability is the ageing of the population. With unchanged policies and growing mobility of other groups, the negative consequences for road safety will increase.

Nature and extent of road safety consequences

With regard to the size of the group, the number of victims and the seriousness of accident risks of the different categories and age groups of road users, general conclusion can be drawn. The most extensive safety problems are one of bicyclists (highest number of victims), moped riders have the highest risk (number of victims per vehicle kilometer) and the consequences of accidents for motorcyclists (highest degree of injury). With respect to limited competences children under the age of 16 form the largest group;

Insight into the risks for subgroups like motorised bicycles (bicycle with small combustion or electric motor), and special vehicles (mopedmobil, scootmobile, skates) is all together lacking;

for an effective policy approach there is far too little knowledge on the risks resulting from limited competences. There is some fragmented insight in the size of groups, but hardly any on the number of accidents or victims and extent of the injuries, with exception of children (all groups up to 16 years of age).

Little or nothing is known about the involvement in accidents in relation to the competences of a person and the extent of mobility restrictions created by perceived road safety problems. It is exactly this information that is vital for the development of effective policy programs.

Compared to other road users, vulnerable road users make an even larger proportion of their trips within city limits. The number of long distance trips as a vulnerable road user is very limited; generally they switch modes to either car (as a passenger) or public transport is the most common mode of transport.

In many cases so called double vulnerability exists: people with limited competences are obliged to use vulnerable modes of transport (walking, cycling).

International policy situation

In Germany, the United Kingdom and Belgium vulnerable road users stand very high on the political agenda (in these countries vulnerable road users are children, the elderly, the handicapped, pedestrians and bicyclists). In Dutch policy papers that is not yet explicitly true. In view of the facts there is sufficient reason in the large numbers of victims and public awareness of emotional consequences (i.e. social justice and feeling of helplessness) to take this up in national policy.

Starting points for policy development

Regarding policy development on vulnerable road users four starting points can be used:

- not only the number of killed and injured amongst vulnerable road users must be reduced, but their mobility options and accessibility must also be improved
- the Design for All-principle: design the transport system in such a fashion that almost everyone can cope with the system. This does not only concern the physical environment
and vehicles, but also education, regulation and law enforcement and organisation of the approach. Emphasis should be placed on generic measures; only when it is not possible to solve a problem with generic measures specific measures for small groups are indicated. Stigmatisation remains limited in this way;

- In the long term structural measures and measures directed at optimal conditions are much more effective and efficient than measures directed at the adaptation of individual persons, vehicles and road situations (sites). In other words: investing in ergonomics and an adequate structure is better than repairing design mistakes.

- Public acceptance is crucial, especially for measures regarding vulnerable road users. Improvement of safety and mobility is not possible without repercussion for the non-vulnerable. Special attention is needed for agenda setting and visibility of vulnerable road users policy. The arguments for and against must be very robust (irrefutable).

**Policy recommendations**

- The generic Sustainable Road Safety measures within built up areas deserve permanent stimulation. The built up area is the ultimate domain of the vulnerable road user. Most important are the establishing and reconstruction of residential areas into 30 km/h zones and the crossings of arterials;

- Focus on the redesigning of regulations regarding perception of colour blind people (10% of the population!), parking near schools (a great source of risks for children) and the quality and technical state of the bicycle (concerns 10% of the bicycle accidents = 800 injured bicycle users);

- Re-evaluate enforcement of traffic rules concerning vulnerable road users (i.e. accent on traffic speed within city limits, actual enforcement for failing to stop for a zebra crossing or ‘just a minute’ parking on a sidewalk);

- Develop and execute education and information to specific groups on their option and rights;

- Actively stimulate the use of (new) instruments for regional and local authorities like the Mobility test (mobility effects of Land Use plans), the WALCYNG-test (quality for pedestrians and bicyclists), guidelines and recommendations regarding street crossings;

- Reward activities of Non Governmental Organisations concerning the stimulation of favourable policy development and execution by regional and local authorities i.e. Benchmarking, promotion of the WALCYN-test;

- Test current regulations on adverse effects for vulnerable road users (current traffic rules are made with the average person in mind, not an individual with limited abilities of protection);

- Fill gaps in knowledge, especially regarding mobility statistics, road user risks and effectiveness of measures. There is knowledge on vulnerable road users, but that insight is not robust enough. This can be detrimental to policy decisions;

- Establish a Vulnerable Road Users Forum, with tasks regarding exchanging and securing knowledge, highlighting relevant developments, developing generic policy propositions and raising public acceptance;

- Stimulate the introduction of EC regulation regarding pedestrian and bicycle friendly car fronts.
CONCLUSION

In The Netherlands the need for a new approach to vulnerable road users has arisen. A fundamental problem with this issue is the lack of systematic knowledge. AVV has developed some ideas to improve the situation. A first step is the publication of Fact sheets / mini dossiers containing available data and practical assessments. Policy makers and interest groups will have a better foundation for their work. Based on the information AVV now has drafted provisional policy recommendations. Most important is the establishment of a Vulnerable Road Users Forum, with tasks regarding exchanging and securing knowledge, highlighting relevant developments, developing generic propositions and raising public acceptance. The aim is to reach a critical mass for the improvement of the safety of vulnerable road users.

Rotterdam, 11 October 2002

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