

**The prolonged unsafety of main  
regional roads**  
Safety study

The Hague, 23 June 2005

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The Dutch Safety Board is the legal successor to the Dutch Transport Safety Board. The present investigation is initiated and partly carried out by the Transport Safety Board but published under the auspices of the Dutch Safety Board.

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## CONSIDERATION

### *Reason for a thematic investigation*

Sometimes the term 'death trap' appears in the media to refer to a road that has long been known as being dangerous. In 2001 the predecessor of the Dutch Safety Board, the Dutch Transport Safety Board (RvTV), published a report about such a road: the N-31 (Zurich -Harlingen). Following a serious accident (five fatalities), the Board investigated the road and concluded that, although the road administrator knew how the safety of the road could be considerably improved, the decision-making about a structural approach to the problem had been stagnant for years. In the summer of 2001, the Board also investigated another road, the N-(3)48 (Hoogeveen – Ommen), after a series of fatal accidents had occurred. Here again, the danger had existed for years and the decision-making processes were slow. The Board then decided not to investigate another particular road but to carry out a thematic investigation about the underlying causes of the general prolonged unsafety of main regional roads.

A preliminary investigation showed that, in all of these regions, there are roads that are known for their prolonged unsafety. Almost all of these unsafe roads are main regional roads: roads that are major traffic arteries within a region. The category of 'main regional roads' includes roads formally designated as trunk roads; moreover, it includes main regional roads that are formally not trunk roads but that either fill the same function (through traffic) or resemble a trunk road. Seven of these main regional roads were selected for this investigation. On these seven roads, an average of 23 deaths and 254 injuries occur each year. The statistics for the risk of danger on these roads are about two to four times as high as the average risk on trunk roads. Trunk roads have been chosen as standard because, as explained, the main roads investigated have the formally designated status of a trunk road, they closely resemble a trunk road, or they have the same function (through traffic)<sup>1</sup>.

Citing the accident statistics for the seven roads investigated is not intended to designate these seven roads as the 'top seven' most dangerous roads, but rather to show that they are clearly more dangerous than average. It is not necessary that so many people are killed or injured on these roads because it is known how the roads can be otherwise constructed to prevent at least some of the accidents. The Board wondered why no action was taken.

The analyses of the policy-making and decision-making processes surrounding these seven selected roads and of the policy, legal and governmental frameworks show that, in addition to the fact that making decisions about the infrastructure is by nature complex; there are a number of additional factors that contribute to the prolonged unsafety of the main regional roads. The most important underlying factor, according to the Board, is the division that exists between road administration on the one hand and responsibility for traffic safety policy on the other.

### *Road administration is concerned primarily with maintenance*

The division between administration and policy has resulted in the road administrators limiting themselves to the maintenance of the roads in question. It appeared that the administrators of the roads investigated were not systematically concerned with the relation between accidents the the characteristics of the road. And if an individual accident is investigated, the analysis is limited to possible maintenance flaws. The road administrators in question generally have no insight into the extent to which the road deviates from the prevailing guidelines (that were drawn up on the basis of the Sustainable Safety philosophy and are summarized in the Manual for Road Construction). Consequently, the 'state of art' knowledge regarding the safe design of roads is not applied to the existing roads. Moreover, on the roads that are managed by more than one road administrator (this was the case in three of the seven roads investigated), it appears that each manager maintains his own trajectory and that there is no collective and consistent view of the function and design of the road or of how this came into existence.

### *Road safety as part of general traffic and transport policy*

Policy related to road safety (thus more or less independent of road administration) is an integral part of the general traffic and transport policy that encompasses both traffic safety policy and infrastructure policy. Connected to this is the system of financing to decentralized governing bodies: government money earmarked for the regional infrastructure, traffic safety and, for

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<sup>1</sup> The new classification of types of roads according to function is explained in Annex five. The function of a trunk road is to facilitate 'through traffic'.

example, public transport is paid as a lump sum to the decentralized governing bodies (as set forth in the Brede Doel Uitkering, an act passed in 1995, which stipulates that these benefits will be paid to the provinces annually). As a result, at the level of policy-making, the safety of roads competes not only with other aspects of traffic safety but also with other objectives within the area of traffic and transport. It is very difficult for road safety to compete here because it is governed only by guidelines and not by mandatory standards such as, for example, the existing legal standards for air and water pollution.

*Factors taken into consideration in road administration are not transparent*

Because road administration is concerned primarily with maintenance and because of the difficult position of the policy regarding the safety of roads in comparison to other policy objectives, the factors considered when adjusting roads to increase safety are non-existent or only implicit. The Board found that there was a lack of transparency in the policy-making and decision-making processes of making safety adjustments. Consequently, the results of the decision-making processes are not optimal from the perspective of traffic safety nor, perhaps, from a broader perspective (but that was not investigated).

Taken together, all of the above means that a combination of various – independently justifiable – choices has resulted in a policy-making/decision-making process in which the considerations given to the safety of roads is insufficient or, at any rate, not sufficiently transparent. More specifically, the Board focuses on the following:

1. decentralization, which leads to the various authorities being free to choose the way in which they plan to achieve the general goals for traffic safety;
2. the related choice of not drawing up legal minimum requirements for the safety of the infrastructure;
3. the division present in every layer of government between policy related to the safety of the roads and the maintenance-oriented interests of road administration.

*Possibilities for improvement*

The Board finds it necessary to improve the position of safety in both policy-making and decision-making processes connected to the infrastructure of roads. They believe that there are two important possibilities for realizing improvements.

In the first place, a systematic approach to safety concerns should be introduced to road administrators (at the Department of Public Works and at the provincial level). The government justifiably expects companies who cause safety risks to create a systematic approach to safety concerns in order to be able to analyze and manage these risks (industry). Such a systematic approach to safety issues can also be expected of road administrators. This involves making concrete goals for future design and safety for all of the main regional roads that are based on the function and the risk inventory of these roads.

In the second place, the Minister of Transport, Public Works and Water Management should be more adamant in the demands it can make on the infrastructure and traffic safety. To improve the chances of safety in the decision-making process, the Board advocates the following:

- establishing minimal demands for the safe design of the infrastructure;
- making concern for safety an integral part of road administration.

Even though it now appears that the number of victims in 2004 will approximate the goals set for 2010 and that the Netherlands remains one of the safest countries in Europe with regard to traffic safety, the possibilities for improvement must be exploited as much as possible. SWOV's (Dutch Institute for Road Safety Institute) estimate that it is possible to reduce the number of traffic fatalities to about 350 per year is still valid. An important prerequisite for this is actually implementing the principles of Sustainable Safety that have already been agreed upon. It is the responsibility of both the national government (systematically responsible) and the road administrators to do everything in their power to actually prevent the preventable accidents/victims. The Board would like to add that there is sometimes too much emphasis on traffic fatalities; with regard to the injured, the situation could even be worse than the statistics show.

'Making every possible effort' is completely in line with the view expressed by the Minister of Transport, Public Works and Water Management. In the Department of Public Works' Views on Safety (2002), the first core element is described as follows: 'striving to permanently improve safety, for which intermediate goals and standards can be used as milestones. And even after the goals have been achieved, the measures that have a positive effect on safety may not be

neglected'. The recommendations made by the Board give body to these (collective) efforts to realize a permanent improvement in traffic safety.

### **Recommendation 1**

Road administrators (both national and provincial) are advised to take into account more explicitly the issue of safety in managing and maintaining the roads, for example by introducing a systematic approach to safety concerns. In this connection, the Minister is responsible for stimulating the systematic concern for traffic safety among road administrators.

An important aspect of the intended systematic approach to safety concerns is establishing a target for each main regional road, a target based on the generally accepted principles of Sustainable Safety and the resulting Manual for Road Design. If possible, this target should be established together with other road administrators. If it is not possible to meet the target within a reasonable period of time, the road administrator should make transparent the factors being considered and draw conclusions from this. One conclusion is that a road could be 'degraded', including the accompanying safety measures.

Other aspects of the intended systematic approach include monitoring and analysing accidents, that is, carrying out analyses and drawing conclusions from them. This is in keeping with the view of the Minister of Transport, Public Works and Water Management that safety administration and safety culture should be stimulated within all departments of the organization.

The Board sees the Minister's role as:

- facilitating safety administration, for example by ordering a centrally developed systematic approach to safety concerns on behalf of all road users;
- helping to anchor the concept of safety in the policy-making and decision-making processes involved in road design. This could involve a report on safety effects for new infrastructure in which an inventory of the effects of traffic safety could be voluntarily made in the framework of spatial planning. For existing infrastructure, audits of traffic safety could be done.

### **Recommendation 2**

The Minister of Transport, Public Works and Water Management – being responsible for the system of traffic safety – is recommended to subject the designs for infrastructure to minimum safety requirements. In this connection, the Minister should indicate which requirements from the Manual for Road Design should be designated as (legally) mandatory with regard to safety. Moreover, the Minister should couple these mandatory requirements to a form of independent supervision.

Mandatory requirements for regional roads with a maximum speed limit of 100 kilometres per hour could, for example, include a certain form of separating carriageways and constructing flyovers. Of course, a period of transition must be set for existing roads. But if adjustments to the road are not feasible within a certain reasonable period of time, the road should consequently be 'degraded'. Considerations about the financing of these adjustments should include the realization that such minimum safety demands would also have other positive effects, such as facilitating the flow of traffic.

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# 1 INTRODUCTION

In the summer of 2001, a series of fatal accidents on the N-48 /N-348 between Hoogeveen and Raalte led to a preliminary investigation by the Board. It soon appeared that the problems were similar to the problems previously encountered by the Board on the N-31: a road whose design conflicted with its function (for example, level junctions combined with a through-traffic function) and where the risk was structurally higher than on the average road with similar characteristics. Here again, the problem had existed for quite some time without decisions having been made. The Board was faced with two choices: either initiating an investigation of one or more accidents on one road (now the N-48) or making a thematic study of the causes underlying the fact that dangerous roads have continued to exist for a number of years. The Board chose the latter.

There are some roads in the Netherlands that have been unsafe for so long that they have become known as 'death traps'. How have these roads, some with this unsavoury designation, come into existence? At least two ingredients are necessary. In the first place, severe, often fatal accidents occur regularly. In the second place, little or nothing (or nothing that is visible) has been done for years (sometimes decades) to make the road structurally safer.

The Board wondered what the actual problem with these roads was. Are they indeed as dangerous as the term 'death traps' suggests? If so, does the road administrator know why they are so dangerous; and why then is so little done to solve the problem? Is it a lack of willingness to take action? Is it difficult to find a solution? Or is it simply a financial question?

This investigation focused on finding the (manageable) circumstances and backgrounds that enable the unsafety of the roads in question to continue to exist. The ultimate goal of the investigation is to formulate recommendations that will contribute to improving the conditions under which road administrators have to create safe(r) roads. As in all investigations carried out by the Board, the question of guilt or liability is expressly not taken into consideration.

## 1.1 RESEARCH DESIGN

The problem was first studied by means of interviews held with the Regional Offices for Traffic Safety. These interviews revealed that there are roads in every region that for years have been known to be dangerous. These are usually heavily travelled single carriageways outside of the urban areas; examples of such roads are the N-31 and the N-48. This refers to almost all of the roads that function as a 'main traffic artery' within a region. Foremost in the category of 'main traffic artery' are the roads formally designated as trunk roads. In addition, there are the main regional traffic arteries that either fulfil the same function (enabling through traffic) or that look like a trunk road even though they are not formally considered to be such.

In the new categorization drawn up by Sustainable Safety, three types of roads are differentiated: through-traffic, distributor and access roads. The previously existing categories based on the sort of traffic allowed and the speed limit cannot be directly translated into the 'new' categories based on function. All of the trunk roads have the function of through traffic; however, some non-trunk roads can also have this function. An example of this is the 'road that is closed to slow traffic'. However, even a 'road for all traffic' can have a through-traffic function in some cases.

From a large list of roads designated as dangerous, seven were selected for further investigation. These roads are listed in the table below.

Road	Connection	Type of road according to Sustainable Safety's categorization	Type of road according to RONA <sup>2</sup> categorization
N-48/ N348	Hoogeveen (A-28) - Raalte (N-35)	Regional through-traffic road	Trunk road (100 km)
N-273	Venlo (A-73) - Ittervoort		
(A-2)	Regional through-traffic road	Road for all traffic (80 km)	
N-57	Zwartewaal (N-15) - Middelburg	Partly through-traffic, partly distributor	Trunk road (100 km) + road restricted to motor cars + road for all traffic
N-366	Wildervank - Ter Apel	Regional through-traffic road	Trunk road (100 km)
N-260/ N-639	Ulvenhout - Baarle - Nassau	Distributor road	Road for all traffic (80 km)
N-31	Zurich – Harlingen	Regional through-traffic road	Trunk road (80 km)
N-201	Haarlem – Hilversum	Partly through-traffic, partly distributor	Trunk road (100 km) + road for all traffic (80 km)

This selection is not based on the seriousness of the problem but on the wish to investigate roads from all parts of the country and to have a good mix of roads administered by both the national government and the provinces. The chosen roads were selected from a longer list of dangerous roads in order to answer the question of why these sorts of roads remain dangerous and not why they are dangerous in the first place. This is not a list of the 'top seven' most dangerous roads in the Netherlands, although some of these roads would appear on such a list if it existed.

The investigation of these roads focuses on the role that safety plays in road administration and the policy-making and decision-making processes related to these roads. To this end, interviews were held with the administrators and/or safety experts of the organizational departments responsible for the administration and maintenance of the roads in question. In addition to information from the interviews, information was also gathered from policy documents relating to the planning of these roads.

## 1.2 OUTLINE OF THE REPORT

In chapter 2 answers are given to the questions of how dangerous the roads investigated actually are and how the policy-making and decision-forming processes with regard to these seven roads were developed. Chapter 3 contains evaluation guidelines used in analyzing and assessing the findings of the investigation. Chapter 4 presents an analysis of the underlying causes of the problems. The conclusions can be found in chapter 5 and recommendations in chapter 6.

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<sup>2</sup> RONA is the abbreviation for Richtlijnen Ontwerp Niet-Autosnelwegen (guidelines for the design of non-motorways), the 'old' but still valid guidelines



## 2 THE MAIN REGIONAL ROADS INVESTIGATED

Seven main regional roads were examined in the framework of this investigation. These roads are characterized by the fact that a relatively high number of serious accidents occur on them and that no structural changes have been made to them in a number of years. The first aspect, the unsafety of these roads, is central to section 2.1. The remaining sections of this chapter are concerned with the policy-making and decision-making processes per road. In section 2.2, the decision-making processes relating to the N-48 are described in detail to illustrate what was investigated; these processes are summarized for the other roads.

### 2.1 UNSAFETY OF THE ROADS INVESTIGATED

On average, there are 23 fatalities and 254 people injured annually on the seven roads investigated<sup>3</sup>.

In addition to the number of fatalities and persons injured, it is also relevant within the framework of this investigation to study the relative unsafety of the roads. The question is whether or not these roads are more dangerous than average. To answer this question, the number of victims has to be corrected for differences in intensity and road length. This can be done by expressing unsafety as a calculation of risk (the number of victims per one million vehicle kilometres). The average risk calculated for the seven roads studied varied between 0.2 and 0.4 victims per one million vehicle kilometres<sup>4</sup>. The calculated risk per road is given in Annex 3.

The risk on these roads is considerably higher than the average risk for similar roads. As indicated in the Basic Criteria in CROW's Manual for Road Design, the average risk (victims per one million vehicle kilometres) for trunk roads<sup>5</sup> was 0.10 in 1995 and 0.31 for roads closed to slow traffic (roads with an 80-kilometre speed limit). Four of the seven roads studied are through-traffic roads (the term used by Sustainable Safety for roads whose most important function is facilitating through traffic). The N-260/N-639 in North Brabant is a distributor road, as is part of the trajectory of the N201 in the province of Utrecht and part of the N-57 in Zeeland. In addition to their function of giving access to and from specific areas, these roads also have an important through-traffic function.

Because most of these roads have an important through-traffic function, it was decided to compare the risks described with the average risks for trunk roads. In their design, trunk roads are the closest to the design prescribed in the Manual for Road Design for through-traffic roads outside of the urban areas. A comparison showed that the average risk calculated for the roads investigated was three times higher than the average risk for trunk roads.

Another standard could be the reference values for risk calculations that are used by the Department of Public Works. This involves an average risk calculation (1995) and the target for the year 2010. The following reference values are used for trunk roads:

- average calculated risk 0.164<sup>6</sup>
- target calculated risk in 2010 is 0.09 (victims per one million vehicle kilometres)

All of the roads examined score poorly if these reference values are used. The risk of the roads investigated is often one to two times as high as the target for 2010<sup>7</sup>. If all of the roads studied met the target set, the number of victims would decrease by fifty per cent. Applying this to the seven roads studied means that there would be a minimum of 127 injuries and 11 fatalities fewer per year.

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<sup>3</sup> See Annex 3 for an overview and explanation of the number of victims and the calculated risk per road investigated.

<sup>4</sup> It must be noted that road administrators do not uniformly measure and record the safety of their roads, which makes it difficult to compare the roads.

<sup>5</sup> 'Trunk road' is the formal term used to indicate a road that falls in the Sustainable Safety's category of 'through-traffic roads'. No risk calculations are available for roads categorized according to Sustainable Safety. See Annex 5 for a comparison between the old and the new categories of roads.

<sup>6</sup> Source: Wegwijzer Wegbeheer, Department of Public Works, Division of Road Construction and Hydraulics, December 2003.

<sup>7</sup> It would be interesting to study what the underlying factors are for the differences in risk, but that would require an additional investigation. This question central to this present study is how the structural unsafety of certain roads is dealt with in policy-making and road administration.

## 2.2 THE N-(3)48<sup>8</sup> RAALTE - OMMEN AND OMMEN - HOOGEVEEN

Prior to 1993 the N-48 from Hoogeveen to Raalte (and then further to Deventer) was administered by the government. In 1993 it was decided to transfer the trajectory between Ommen and Raalte to the province of Overijssel because it was no longer considered to be a national major connecting road. Since the time of this decision, this trajectory (the N-348) has been administered by the province. At the time of transfer, it was agreed that, for a number of years, the government would help to pay for the maintenance of the road because there was overdue maintenance on the road. The government remained responsible for the northern section of the road, the trajectory Hoogeveen – Ommen. Because a provincial boundary cuts through this trajectory, its actual administration was put into the hands of two service districts belonging to the Department of Public Works: the service district Drenthe (the Regional Directorate of North Netherlands) and the roads service district of Zwolle (the Regional Directorate of East Netherlands)<sup>9</sup>.

Safety has been a problem on the N-48/N-348 for years. From 1993 to 2001 (9 years), 33 people died and 260 were injured on this total trajectory (Hoogeveen – Raalte; 40 km). The decision-making processes regarding this road go back quite a way. In 1985 an agreement was made between the Cabinet at that time and the northern provinces to transform the N-48 into true trunk road. This included removing all of the level crossings. This plan was further elaborated and finalized in April 1989 in a Study of National Road 48. When the plan was finally implemented in 1997, two level junctions were reconstructed into flyovers; up to this time, the implementation of the plan had cost approximately 3.75 million euros. But in 1998, the Department of Public Works cut the budget for any further reconstruction, this a result of a change in policy that favoured maintenance above improvement (the so-called target situation measures). As a result, further reconstruction of the N-48 came to a standstill and many of the level crossings still exist. When motivating this change of policy, the Board suggested that perhaps some construction could be financed with money budgeted for maintenance<sup>10</sup>.

In a space of just more than a year (June 2000 to July 2001), there were six fatal accidents on the N-(3)48 between Raalte and Hoogeveen in which 10 people died and four were seriously injured. That disaster year, in which the last three fatal accidents occurred within two weeks, caused public unrest. Shortly after this series of accidents, diverse regional newspapers (for example, the *Zwolsche Courant* and the *Apeldoornse Courant*) carried articles about the unsafety of this 'death trap'. An article in the *Zwolsche Courant* (18/07/2001) stated that a global investigation by SWOV of the accident statistics in the past three years showed that more than two times as many accidents occurred on the road as compared with the average on such roads. The investigation also showed that there were no specific black spots but that the accidents had been spaced rather regularly on the trajectory in question. Immediately after the summer holiday (2001), the Provincial Council of Overijssel met with the provincial committee for advice on road safety. The first temporary reactions of the various fractions can be globally summarized as follows: most parties supported the idea of lowering the maximum speed limit and/or more carefully enforcing the maximum speed limit. Most parties also agreed that something would soon have to be done, although some voiced the opinion that it would be better to first investigate the background of the accidents.

After this series of fatal accidents, more progress was made in the decision-making processes. The province of Drenthe met with the police and the road administrator, the Department of Public Works's service district in Drenthe. It was decided at this meeting that the last two fatal accidents did not necessitate taking immediate measures because it was impossible to point to any demonstrable problems that could have caused the accidents. It was decided to carry out a broader investigation of accidents on the trajectory in question and to wait for further discussions about

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<sup>8</sup> As explained above, the N-(3)48 has been described in more detail than the other roads investigated and is, as such, an illustrative case study.

<sup>9</sup> The N-48 between Hoogeveen and Ommen and the N-348 between Ommen and Raalte has been studied as one single road because the road user experiences it as one through road with no clear distinction between the two trajectories. The southern trajectory of the N-348 in the direction of Deventer is clearly separated from the northern section between Ommen and Raalte by a junction with traffic lights where motorists must turn to continue on the N-348. This section has not been included in this study.

<sup>10</sup> But in the past few years, an amount has been set aside for improvements so they can no longer be financed with money budgeted for needed maintenance.

categorizing roads and their essential characteristics. In addition, a date was set for a meeting with the province of Overijssel (September 2001).

As road administrator, the province of Overijssel called for a further investigation into the safety of the entire road, which would be used as the basis for planning improvements. In connection with this, it should be noted that, according to the then existing planning, the N-348 was scheduled for large-scale renovation only after 2010<sup>11</sup>. When plans for this investigation were announced, a spokesman for the province of Overijssel said that this action did not necessarily mean that the road would be reconstructed as a (sustainably safe) regional through-traffic road.

The investigation by the province, which was completed in August 2001, was limited to the trajectory Raalte - Ommen that was administered by the province. The report stated that it was not yet an option to make a sustainably safe reconstruction of the trajectory indicated as a through-traffic road because the procedure for dealing with the N-348 was not going to start until after 2010. The report proposed the following short-term measures:

- reducing the maximum speed limit to 80 kilometres per hour;
- extra police enforcement;
- a further investigation into reducing the number of vehicles crossing the road;
- a further investigation into improving the road verges;
- adding double axle markings in keeping with the design of regional distributor roads.

Lastly, the report indicated the need to consult further with the Department of Public Works, the administrator of the trajectory from Ommen to Hogeveen.

The Department of Public Works' service district in Drenthe also studied the safety of the trajectory of the N-48 that fell under its administration (Hogeveen – provincial border), this as a result of the above-mentioned meeting with the province of Drenthe. The short-term measures proposed were:

- giving road users clearer information about the maximum speed limit of 100 kilometres per hour;
- reducing the maximum speed limit to 70 kilometres per hour at junctions;
- further measures to be taken with regard to the junction with the Steenbergerweg.

It was decided not to reduce the maximum speed limit to 80 kilometres per hour because 'this did not agree with the targeted traffic approach corresponding to the function of the road'<sup>12</sup>. A physical separation between the carriageways was considered impossible because the road was not broad enough for this measure. Improving the road verges (for example, by strengthening them with a cement foundation) was considered too expensive. It should be noted that half of the trajectory was widened from 6.90 meters to 8.90 meters in the autumn of 2001, this in connection with the working conditions for road workers (see footnote 10). This widening should also lead to a reduction in the number of one-car accidents resulting from the motorist reacting incorrectly to landing in the verge. Lastly, some small-scale improvements to a level junction were made at the end of 2004 to improve safety; this included reducing the maximum speed limit here from 80 to 70 kilometres per hour.

In September 2001, a meeting was held with the provinces in question, road administrators and the police so that diverse reactions and opinions could be exchanged. It was clear that the Department of Public Works' service district in Drenthe, with the agreement of the province of Drenthe, intended to maintain a maximum speed limit of 100 kilometres per hour on its trajectory. The roads service district in Zwolle shared this intention, arguing that this trajectory has no junctions at grade (although there are some crossings) and that the number of accidents was lower than at other trajectories along this road.

It was decided to meet in two separate groups to discuss the trajectory Raalte - Ommen and the trajectory Ommen - Hogeveen; these two groups would come together again at a meeting in October.

At this second meeting in October, the measures proposed for both trajectories were presented. The most important conclusions for the trajectory administered by the Department of Public Works were:

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<sup>11</sup> At this moment, this planning has not been altered.

<sup>12</sup> 'Traffic safety on the N48', December 2002, page 19 (internal report Department of Public Works).

- maintaining 100 kilometres per hour with a single axle marking;
- widening the road surface to 8.90 meters (especially because of consideration given to working conditions)<sup>13</sup>;
- overtaking would not be prohibited trajectory in Drenthe; Overijssel would consider this question further<sup>14</sup>;
- parking areas would be closed and an attempt would be made to reconstruct or close level junctions/crossing.

The following measures were proposed for the trajectory Raalte - Ommen:

- 80 kilometre an hour with double axle markings;
- closing parking areas
- adding facilities for fauna
- a further investigation of the Lemelerveld junction

It was decided to write a mutual draft memorandum that would contain the measures listed above.

Not all of the above -listed measures have been implemented. The road surface in the trajectory in Drenthe has been only partially broadened and a number of level junctions/crossings have not been closed. There is mention of plans to close some crossings and to close two level junctions in favour of one flyover, but no definite decisions have been made about implementing that last plan.

The Provincial Executive of the province of Overijssel did not adopt all of the measures as had been proposed by the work group. The proposal to reduce the maximum speed limit to 80 kilometres per hour was not adopted, the most important arguments being accessibility, preventing cut-through traffic and the wish to comply with the maximum speed limit on the 'national' part of the road. It was decided not to construct facilities for fauna because of the unexpected high costs involved and doubts about the effects of such facilities. Lastly, it was decided not to begin earlier with a study of reconstructing the road into a sustainably safe road for through traffic. At that moment, priority was given to an earlier plan to reconstruct another provincial through-traffic road (N-340), and it was felt that carrying out both projects simultaneously would not be feasible.

In conclusion, it can be said that the decision-making processes concerning what should be done to the N-(3)48 have gone on for almost twenty years. The deaths of six people in two weeks' time gave an impulse to these processes, but, in the end, little remains of all that was proposed except for some short-term measures. There is no structural approach to the problem. The province of Overijssel has long-term plans to reconstruct the N-348 (after 2010), but it is not known how these plans will develop. In the trajectory in Drenthe, plans are being made to close two level junctions. Despite the fact that two of the three road administrators involved are service districts belonging to the Department of Public Works, there is no shared view among them regarding future designs for the road.

### 2.3 THE N-31 ZURICH - HARLINGEN

The major lines in the decision-making processes relating to improvements to the N-31 (administered by the Department of Public Works, service district Friesland) were discussed in the report by the Dutch Transport Safety Board (RvTV) about a head-on collision on this road. In short, in the early 1980s a start was made to double the width of the N-31, the most important connection between North Netherlands and the Randstad; during construction, priority was given to doubling the width of the N-32 rather than working on the N-31, since this was now considered more important to regional interests. This resulted in the second half of the planned expansion to the N-31 being postponed in favour of doubling the width of the N-32. As a result, two single-carriageway trajectories remained: between Zurich and Midlum and between Leeuwarden and Drachten.

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<sup>13</sup> The CROW guidelines for Work Under Construction, 96a and 96b, stipulate a minimum width of the road if work is being done on one carriageway while the other carriageway remains open to traffic. Such a manner of working is not permissible if the road is narrower than 8.90 meters.

<sup>14</sup> It has meanwhile been decided not to prohibit overtaking because accident statistics do not suggest that this would help and because motorists would still make undesired manoeuvres to overtake even if there were a prohibition.

The impasse was partially the result of a difference in opinion between the province of Friesland and the road administrator, the Department of Public Works. The latter felt it unnecessary to double the width of the road because of the low intensity of use and they wanted to make it a sustainable safety through-traffic road of the second category. The province was always opposed to this. After the serious accident (investigated by the RvTV) in July 1999, the province of Friesland again made an attempt to encourage a widening of the trajectory Zurich – Midlum. This resulted in a promise by the Minister of Transport, Public Works and Water Management that a doubling of the width of the N-31 would be included in the Multi-year Programme for Infrastructure and Transport (MIT). The Marked-Out Road-E.I.A. procedure has meanwhile begun and the width of the road should be doubled by 2008. A small part of the trajectory will remain a single carriageway (through Harlingen) because it would be too expensive to widen the road there. In the Trajectory Memorandum/E.I.A. (2003), it is stated that this project is being done solely for reasons of traffic safety. As a result of this widening of the N-31 between Zurich and Harlingen, the government's financing of the A7 near Sneek was postponed until after 2010.

#### 2.4 THE N-273 VENLO - ITTERVOORT

The N-273 (road administrator the Department of Public Works, service district Venlo), also called the Napoleon road, is by far the most dangerous road in the Netherlands and is known as such. One of the immediate causes is because this trajectory is often used as a connection between the A-73 and the A-2. For decades, all parties have agreed that there is a 'missing link' here in the network of motorways, and for years there has been talk of planning the construction of the southern trajectory of the A-73 between Venlo / N-73 and the A-2. The decision-making processes were halted by the fact that the preferred trajectory cut through a nature reserve, and the N-273 has continued to remain an extremely dangerous road. The expected construction of the motorway probably explains why so little was done to increase safety until the municipal authorities lost patience in 1995, the year that eleven people lost their lives on this road. Then in a concerted action and with funds from the Department of Public Works, a project plan was begun that involves a large number of small-scale adjustments and measures relating to the N-273 and the N-271 (that runs parallel to the N-273 and is also used as a connecting route). These measures include reconstructing junctions and crossings, creating physical curves in the carriageways as the road approaches the borders of urban areas (to reduce speed) and adding lit axle markings in sharp curves. The first findings point to a substantial improvement in safety as a result of the measures taken.

#### 2.5 THE N-57 ZWARTEWAAL - MIDDELBURG

The N-57, also called the dams route, was built across the Delta works in the 1970s. It was first intended as a motorway, but, when final plans were made for the Eastern Scheldt storm surge barrier, this idea was abandoned for financial reasons and it was decided to build a single-carriageway road on this dam. Between the dams, the road runs along the local road network (that existed before the dams were built), and this has resulted in very diverse road situations. For example, one trajectory consists of separated carriageways with a green area between them, whereas, at other trajectories, the carriageways are separated by a line on the road surface. The maximum speed limit also varies.

Various small-scale changes have been made to the road in the past few years. Moreover, the trajectory Middelburg – Vrouwenpolder (across Walcheren) is going to be reconstructed. But no unanimous long-term view has been formulated by the road administrators involved (three service districts of the Department of Public Works) with regard to the future design of the entire N-57.

#### 2.6 THE N-366 WILDERVANK - TER APEL

The N-366, a main regional road through the south-eastern part of the province of Groningen, has for years been regarded by the inhabitants of this area as the most dangerous road in the province. This danger results from the relatively high driving speed, junctions at grade and no separation between carriageways. All parties involved (provincial and municipal) agree that this road must become a true trunk road with flyovers. Physically separating the carriageways was not included in the final sketch because, according to the road administrator, the province of Groningen, the length of the road makes this too costly. The road administrator also believes that overtaking another vehicle should still be possible. The decision-making processes have reached an impasse because flyovers are momentarily too expensive and because temporary solutions (such

as constructing roundabouts) are not considered desirable since they would mean that the road had been degraded.

## 2.7 THE N-639 / N-260 ULVENHOUT – BAARLE-NASSAU

The N-639/260 (road administrator the province of Noord Brabant) is an important connecting route through southern and northern Brabant to the Belgian border. Most of this road was considered very dangerous, but it was thoroughly reconstructed in the past decade so that it has become much safer (the N-639). However, the final part of the road (from Baarle-Nassau to the Belgian border: the N-260) is still very dangerous. It is a narrow road bordered by many trees. For various reasons, decision-making about this part of the road never gets off the ground. One of these reasons is that the decisions are coupled to plans for a ring road around Baarle-Nassau, plans that have been being made for quite some time. Further, decisions have also been obstructed by the complicated administrative structure (partly Belgian and partly Dutch). This was one of the reasons that earlier plans to cut down the trees along the road failed. The province recently constructed a separate cycle track next to the road and agreement has also been reached with the Belgian authorities about the function and design of the entire trajectory to Turnhout. These changes are momentarily in a planning-study phase.

## 2.8 THE N-201 HAARLEM - HILVERSUM

The N-201 is an important connecting route through the provinces of Noord-Holland and Utrecht and is administered by these two provinces. The road is also often used for (lorry) transport to Aalsmeer and Schiphol, which causes tremendous accessibility problems between Hoofddorp and Schiphol – Aalsmeer. The road was also unsafe, but for the public this problem was overshadowed by the problem of accessibility. This latter problem was the main incentive behind the recently established plans to reconstruct the busiest part of the N-201 (Hoofddorp – Aalsmeer - Uithoorn). The biggest advantage for traffic safety is that through traffic will be led around Aalsmeer and Uithoorn rather than going through the city centres. Nevertheless, safety remains a problem, especially in the province of Utrecht. There a large amount of through (lorry) traffic uses the road, which is designed as a distributor road (level junctions, even access roads). The province of Utrecht has chosen to consider its part of the road as a distributor road and is striving to design the road in accordance with the standards for distributor roads set forth in the Manual for Road Design<sup>15</sup>. The province is also considering separations between driving directions and flyovers with bicycle traffic. But the feasibility of this is uncertain. Physically separating the carriageways is difficult to realize because the road crosses a nature reserve (the Vinkeveense lakes), making it difficult to widen the road because of legislation relating to nature and the environment. Moreover, improving the road could attract extra (lorry) traffic, which the province of Utrecht considers undesirable.

## 2.9 CONCLUSIONS

As is evident from the above descriptions of the policy-making and decision-making involved in the seven roads investigated, the situation for each of the roads is different. Despite these differences, however, there are number of problems common to all situations that hinder policy-making and decision-making. These problems can be summarized as follows:

### *Complex decision-making*

Making decisions about constructing and making changes to infrastructure is a complex and time-consuming process. In addition to the fact that a number of road administrators are often involved, attention must also be given to the procedures and conditions relating to spatial planning, nature and the environment. This means that other authorities and citizens are given a say in decisions relating to safety measures for the roads in question.

### *Decentralized responsibilities*

Decisions about changes to some roads were hindered because the parties involved, each with their own responsibilities, could not agree on a final situation, the planning or the financing. This was the case with the N-48 (Raalte - Hoogeveen) and the N-57 (Zwartewaal- Middelburg). By decentralized responsibilities is meant not only the responsibilities of the decentralized authorities

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<sup>15</sup> This topic will be discussed again in chapter three.

but also the responsibilities of the regional departments of the Department of Public Works (regional directorates and service divisions).

*No unanimous standards for road design*

The prolonged uncertainty about the characteristics that should be considered essential for main regional roads also contributed to the delay. The decision-making about these essential characteristics for types of roads cost much more time than had originally been envisioned. A decision has meanwhile been made about so-called 'essential characteristics of recognizability' (see section 3.3.2). Various parties, such as some of the service divisions of the Department of Public Works who administer the N-57 (Zwartewaal - Middelburg), indicated that making definite decisions about changes to the road had been postponed while waiting for an agreement about the essential characteristics of sustainably safe roads.

*Lack of priority and money*

Both the national government and the provincial authorities in their role as road administrators are aware of the fact that a fully sustainably safe road is ideal for traffic safety. Reconstruction of the N-48 has been planned since 1985 but its execution was halted when the priority shifted from (safety) adjustments to maintenance. It is expensive to make a main road sustainably safe. Lack of money also plays a role and affects the choice of priorities.

*In short*, making decisions about the infrastructure is complex and time-consuming. Policy-making and /or decision-making processes concerning making dangerous main regional roads sustainably safe are even longer or are postponed indefinitely because:

- the road is sometimes administered by several administrators;
- for a long time there was uncertainty about the standards for road design, and the status of the new standards (Manual for Road Design) is still unclear;
- limited financial means leads to priorities being set.

It is once again emphasized that the problems sketched are not unique to the seven roads investigated. These roads are examples of a larger group of dangerous main regional roads.

### 3 ASSESSMENT FRAMEWORK

#### 3.1 PARTIES INVOLVED

The following parties are involved in the issue of safety on the roads investigated: the road administrators (the Department of Public Works and various provinces), the police and the Ministry of Transport, Public Works and Water Management.

The public roads in the Netherlands are administered by the national government, the provinces, municipalities and Water Boards. Major regional roads are usually administered by the national government and the provinces. The national government is the administrator of about 3,200 kilometres of roads, 722 kilometres of which are single carriageways<sup>16</sup>. It is not easy to determine how many kilometres of main regional roads fall under the administration of the provinces. In total, the provinces administer more than 6,000 kilometres of single carriageways, but it is not known how much of these can be designated as major roads as how much can be designated as part of the underlying road network. The administration of roads was reorganized in 1992 (Act to reorganize road administration). Since this time, the national government administers only those roads that are part of the main structure of the Dutch road network as set forth in the policy documents. All of the other 'underlying' roads are administered by the provinces or other decentralized authorities. One road may be administered in part by the national government and in part by the province (as, for example, the N-48/N-348), but that is more the exception than the rule.

##### *The Department of Public Works*

The Department of Public Works administers several of the roads described above: the N57, the N31, the N48 and the N-273. The Department of Public Works is divided into ten regional boards that, in turn, are divided into service divisions. Some service divisions are responsible only for road administration, others for both road and waterway administration. More than one regional board and service division may be involved in one road. The tasks and competences of the Department of Public Works are set forth in the Roads Act, which will be discussed in the following section.

##### *The provinces (Overijssel, Noord-Holland, Zuid-Holland, Utrecht, Noord-Brabant)*

The administration of provincial roads follows the provincial borders and differs per province. If a provincial road cuts across the provincial borders, it necessarily has more road administrators. The provinces are not only road administrators, but they are also responsible for carrying out policy concerning traffic safety.

##### *The police*

It is the task of the police to enforce the Road Traffic Act and the Road Traffic and Traffic Signals Regulations. It is relevant in this connection that the police also register accidents and draw up official reports.

##### *The Ministry of Transport, Public Works and Water Management*

The Ministry is responsible for policy relating to traffic safety concerning vehicles, the behaviour of road users and infrastructure. Within the Ministry, this task has been delegated to the Board of Roads and Traffic Safety of the Directorate-General of Passenger Transport. Certain aspects (such as the transport of dangerous material) also fall under the responsibility of the Directorate-General of Transport and Aviation. The Directorate-General of Water is responsible for coordinating the ministerial views on safety.

The Ministry's policy is characterized by the approach 'decentralize if possible, centralize if necessary'. At the national level, this means that policy is developed concerning:

- the targeted reduction of traffic victims;
- the driving licence and information;
- vehicle safety (a significant number of rules are set at the European level);

However, there is no policy concerning the safety of the infrastructure. This is the responsibility of the (decentralized) road administrators, that is, the regional divisions of the Department of Public Works and the decentralized authorities. Because the responsibility for reaching the targets set for traffic victims is also decentralized, there is a resulting mix of measures.

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<sup>16</sup> CBS (Central Bureau of Statistics) – Road statistics (2003).



### 3.2 ASSESSMENT FRAMEWORK

An assessment framework is essential to a study since, when evaluating a situation, it is necessary to explain how the situation was analyzed. The frame of reference describes the criteria and the principles that can provide insight into what could be improved and/or what additions are needed. The Board first evaluated the existing situations on the basis of:

- the legal framework;
- the Ministry of Transport, Public Works and Water Management's views on safety;
- guidelines and standards in the sector in question.

A final evaluation sometimes also included an additional frame of assessment by the Board.

#### *Legal framework*

The Roads Act, which dates from 31 July 1930, stipulates that 'the nation, the province, the municipality and the Water Board are required to maintain a road if that public body has declared the road public'. In addition, they have to ensure that 'the condition of road is good', but 'good' is not further defined. Moreover, information about the public road must be accurately determined and recorded (number, name, surface, length, width, art objects, etc.) The relevant legal text is given in Annex 6.

In the Public Works Act, which of course applies only to roads administered by the Department of Public Works, it is stated that, unless authorized by the Minister of Transport, Public Works and Water Management, it is prohibited to use works belonging to the Department of Public Works (including the roads) for purposes other than those for which they are intended.

#### *The Ministry of Transport, Public Works and Water Management's views on safety*

This Ministry has developed a general view on safety (Policy considerations on safety, June 2002) that consists of four core elements:

1. Striving to permanently improve safety, which involves setting interim goals and standards as milestones. Even after goals have been reached, measures that have a positive effect on safety may not, in principle, be ignored.
2. Making the measures and costs of these efforts transparent and presenting them as a political choice.
3. Being prepared for inevitable risks (absolute safety does not exist).
4. Creating (helping to create) and maintaining safety management and a culture of safety within organizations.

#### *Sector guidelines*

Although there are no legal standards for the design and layout of roads, there are guidelines that have been established by CROW, a knowledge centre in which road administrators work together with private parties. These guidelines were previously split into the categories of motorways and non-motorways (ROA and RONA), but they have been succeeded by the Manual for Road Design, an initiative of Sustainable Safety. Since the road administrators collectively declared the Sustainable Safety concept to be official policy in 1997 (by means of the agreement 'Start Programme Sustainable Safety'), the RONA guidelines needed to be replaced. Parallel to the discussions about the second phase of Sustainable Safety, the road administrators worked together to develop new guidelines for design and infrastructure based on the standards of Sustainable Safety. An important change was reducing the number of categories of roads to three: through-traffic roads, distributor roads and access roads. An ideal design based on the standards of Sustainable Safety has been developed for each of these categories, both within and outside of the urban area. This eventually led to CROW's Manual for Road Design in 2002. The Manual states, for example, that through-traffic roads should have flyovers and vehicle safety barriers separating the opposite carriageways. The level junctions of distributor roads should be built as roundabouts where possible, and these roads should also be constructed with (less massive) vehicle safety barriers.

The previous guidelines were not mandatory but were, according to CROW, often followed. The Manual is considered less binding than the guidelines. The Department of Public Works, for example, applies the Manual's standards to new roads but not to existing roads. The decentralized authorities have not made any agreements about the extent to which the Manual's standards should be applied to either new or existing roads. However, administrative agreements have been made about essential characteristics of recognizability. Because of these agreements, these characteristics (that concern only the road lineation) are mandatory for all road administrators. A fifteen-year period of transition has been established.

### 3.3 THE BOARD'S ASSESSMENT FRAMEWORK

Because the Roads Act does not offer much support in assessing the safety policies of road administrators, the Board has chosen to apply additional criteria to assess both the road administrator and the minister responsible for the system. These criteria are based on general principles of safety indicated by the present-day international standards for systems and organizations within which activities that carry a risk take place<sup>17</sup>.

The Board expects from a minister responsible for a system:

- that clear and measurable safety goals have been formulated and the responsibilities of the parties involved have been clearly established;
- that safety management and a culture of safety is stimulated in the organizations involved;
- that the level of safety is actively monitored and legislations and rules are enforced;
- that policies and legislations/rules are periodically evaluated and, if necessary, adjusted.

The Board expects the road administrator, on the basis of his ownership/administration to:

- clearly identify risks;
- know about the most recent standards in the sector that can help to minimize safety risks;
- take concrete actions based on inventories of risks;
- ensure that it is clear from the policy-making and decision-making processes which sector guidelines – in addition to legal regulations – are applied or which considerations were taken if it is decided to deviate from self-regulation.

This report considers the Manual for Road Design to be the 'state of the art' with respect to safe road design. The Board regards the Manual for Road Design as a product of self-regulation subject to the general rule of 'comply or explain'. This holds true for both new and existing roads. With regard to the latter, the Board is aware that adjustments will be costly and that not all of the necessary adjustments can be carried out immediately. Therefore, the Board believes that it can reasonably expect deviations from the Manual to be identified and considerations about dealing with these deviations to be transparent.

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<sup>17</sup> These general principles can, for example, be found in the ISO norms and the OHSAS safety guidelines.

## 4 ANALYSIS

The investigation showed that, for various reasons, it is difficult to finalize the decision-making processes concerning safety problems on the roads studied and that few if any measures have been taken to increase the safety of these roads in the long or short term. And this is despite the fact that the roads investigated have been known to be dangerous for years.

In section 2.9 it was concluded that the investigation of the seven roads revealed a number of underlying factors that have influenced the decision-making processes. The factors identified included the general complexity of making decisions about infrastructure, the spread of responsibilities among various road administrators, the standards for road design and layout and financing road administration and safety.

In this chapter the underlying factors will be further analyzed. The policy-making and decision-making processes will be dealt with first in section 4.1; then the factors that influenced these processes will be examined:

- organization of road administration (decentralized responsibilities and less than optimum cooperation) in section 4.2;
- standards for road design and layout in section 4.3;
- financing road administration and Sustainable Safety in section 4.4;
- goals for traffic safety in section 4.5.

### 4.1 POLICY-MAKING AND DECISION-MAKING IN ROAD ADMINISTRATION

*When formulating policy and making decisions about the safety aspects of road administration, the risks are often not systematically identified or – with regard to the new safety standards – transparently assessed.*

Safety is only partially anchored in policy/decision-making processes. Road administrators do not always systematically analyze traffic safety. As various examples in the previous chapter illustrate, a new impulse is sometimes given to formulating policy only as a result of the emotions surrounding a number of serious accidents. Fundamental changes to the N-273 (Venlo - Ittervoort) were made only after eleven people had died on this road in one year (1995). However, the example of the N-48/N-348 (Raalte – Ommen - Hoogeveen) shows that such emotions do not always result in structural changes being made.

#### 4.1.1 Provincial road administrators

The road administrator's primary responsibility – as stated in the Roads Act of 1930 – is to make available and maintain the road. This involves a technical focus, which can be found in both the structure and the culture of the provincial organization. However, the aspect of traffic safety is generally not found in the structure of the executive division. At the level of policy, traffic safety is often relegated to the division of traffic and transport. When analyzing the cause of accidents and the role of the infrastructure, road administrators often examine only the maintenance of the road (possible corrugation, holes in the road surface, etc.). It should be noted that, in general, the provincial road administrators studied do not investigate an individual accident, but rather they base their investigations on the combined accident statistics from the Transport Research Centre. In most cases, the road administrator has a limited budget for solving the worst safety bottlenecks, which is based on a 'black spot' analysis: the locations where the most accidents occur are dealt with first. This can be regarded as a cost-effective approach. Larger investments (such as reconstruction into a sustainably safe trunk road) follow a much different path. They first have to somehow be placed on the agenda of the Provincial Council, which may, for example, happen based on arguments of accessibility (such as the case with the N-201, Haarlem - Hilversum). If decisions were made on the basis of traffic safety, this was because of the social and administrative concern arising from one or more serious accidents (such as was the case with the N-639, Chaam - Baarle-Nassau).

The design of the road as a whole is not judged on aspects of safety but is considered a given. This is underlined by the fact that the provincial road administrators studied often had no clear idea of the points where the design of the existing road diverged from the guidelines. They consider the standards set forth in Sustainable Safety's Manual for Road Design to apply only to new roads and not to those already in existence. Consequently, the road administrators do not precisely know which points (such as the size of the cross section, carriageway separation, obstacle-free areas, etc.) of the existing road meet the safety standards set by the Manual for Road Design for the road category in question.

This lack of knowledge is not what the Board considers good road administration (see the assessment framework in chapter 3). The road administrators, as owners/managers of the roads, are largely responsible for safety on and around the road and, as a result, they are 'obliged' to do everything that is reasonable to minimize the risks for the road user. It is reasonable to expect that they systematically identify the risks, that road administrators know about the most recent standards in the sector and that they make regular and transparent decisions about the moment at which the adjustments needed to meet these standards will be carried out.

#### 4.1.2 *The national government as road administrator*

The agreement made in 1997 in the framework of the Start Programme for Sustainable Safety that all roads would be categorized by 2000 also applied to the national government. Since there is no discussion about the status of motorways (by definition through-traffic roads), the discussion revolved around categorizing the national roads that are single carriageways.

In April 2001, the Department of Public Works published the memorandum 'Categorizing National Roads; an indicative description of function for the second phase of Sustainable Safety'. In this publication, a proposal based on several criteria was made for categorizing each road as a through-traffic road or a distributor road. Until today<sup>18</sup> nothing has been done with these proposals; no definite decisions have been taken. In November 2000, in the framework of the so-called tender for the period 2002-2006, the Department of Public Works asked the executive staff at the Ministry of Transport, Public Works and Water Management (the Directorate-General for Passenger Transport, DGP) 'if and how (which phases and priorities) and under which conditions the Directorate-General wished to begin reconstructing the non-motorways in the present-day national road network into a sustainably safe network'. The Directorate-General promised an answer to this question (in the Reaction from the Directorate-General to the tender, January 2001). In December 2003 (nearly three years later) the Department of Public Works had to admit that 'the Directorate-General had not yet responded to the Department's proposals. This means that categorizing the roads cannot be included in this generation's policy planning'.

In the above-named memorandum 'Categorizing National Roads' of April 2001, the national government had already abandoned the connection between categorization and the accompanying final situation. The following is stated in this memorandum:

*'During the study, there was mention of a 'final situation' and a 'phased implementation' of categorizing the national road network. However, it was decided in the course of this study project to abandon the final situation. Sustainable Safety's road categorization is a means of eventually setting tasks to achieve traffic safety. This way of achieving this goal will have to be determined case by case while taking essential characteristics and cost-effectiveness into consideration'.*

Both the Department of Public Works (and the Ministry) consider the Manual for Road Design primarily as a toolbox for constructing new roads; the standards do not seem to apply to existing roads.

It was concluded at the end of section 4.2.1 that provincial road administration did not conform to what the Board considers to be good road administration. This conclusion also applies to the (service divisions) of the Department of Public Works. Individual accidents are not investigated so that possible relations with the design of the road can be determined. Moreover, many service divisions are not aware of the points (such as the size of the cross section, carriageway division, obstacle-free areas, etc.) at which the existing road meets the safety standards laid down for the road category in question in the Manual for Road Design.

## 4.2 THE ORGANIZATION OF ROAD ADMINISTRATION

*The decentralized structure of road administration and the different means of financing may lead to problems in the decision-making processes relating to roads managed by more than one road administrator.*

Because of the decentralized structure of road administration, a road may be managed by a number of road administrators. Regional roads often cut across provincial borders and the borders between the services divisions of the Department of Public Works. This situation demands good cooperation.

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<sup>18</sup> Late 2004

The decentralized structure also has its disadvantages, one of which is that, if a road is managed by more than one administrator, there is not one body that is responsible and/or feels responsible for the road as a whole. This means that, if opinions differ, no one has to take the initiative to work towards a solution. No one can force a solution. This is also true of a national road that cuts through the administrative area of more than one regional board and/or service division. In addition, the responsibility for the safety of national roads is spread across various hierarchical layers at the Ministry, ranging from service divisions to the executive board of the Department of Public Works in addition to the executive core of the Ministry. The service divisions and regional boards of the Department of Public Works also have certain autonomy (decentralized authority) and can differ from one another. In general, it can be said that, in many cases, there is no one clear 'owner of the problem' of dangerous main regional roads.

In such cases, the decentralized structure of road administration leads to difficulties in coordinating and financing road work. Large-scale maintenance and adjustments to a road are usually planned and financed by the individual road administrator for that stretch of road that falls under his management. It often happens that the planning and financing of the various road administrators are out of sync, which can result in the same road changing as it passes from one administrative area to the next. An example of this is the difference in road widths on the N-48 / N-348 (Raalte – Ommen – Hoozeveen). Road administrators may also disagree about the future of the road with regard to its function, design and maximum speed limit. An example of this is the N-57 (Zwartewaal – Middelburg) with its differences in road design and maximum speed limits.

As various examples in this study have demonstrated, this situation is not conducive to a unanimous approach to problems. The decision-making processes concerning the N-48 / N-348 clearly illustrate this. The N-57 is another example where decisions are hindered because the road is managed by three service districts and two regional boards of the Department of Public Works.<sup>19</sup> A final example is the N-201, where both of the administrative provinces have different ideas about the function and the design of the road. Noord-Holland wants to have a through-traffic road, whereas Utrecht prefers a distributor road. Far-reaching plans for the trajectory under the administration of Noord-Holland have been made; the trajectory falling under Utrecht is not in line with these plans, and the province of Utrecht shows no intention of making adjustments.

There was often not a shared final idea about the desired function and design of a road if the road falls under more than one road administrator. But this is the desired goal from the standpoint of safety. That the same function and design applies to the entire road is important because the road users then know what they can expect. Being able to predict is one of the central concepts in the Sustainable Safety policy (see Annex 5).

#### 4.3 ROAD DESIGN AND LAYOUT

*There are no clear, legal and national standards for the design of the three categories of roads. As a result, policy-making and decision-making processes at the decentralized level concerning adjustments to increase the safety of the infrastructure lack direction. The decentralization of authority to the decentralized bodies and/or service divisions leads of itself to differences arising.*

##### 4.3.1 Legal framework

There is no legal framework concerning the design of roads. The Roads Act contains no stipulations about the design or safety of the road. General rules of liability from the Netherlands Civil Code do, of course, apply to road administrators, but this results in demands about careful road maintenance and not in concrete standards for road design. Legally, road administrators are completely free with regard to design and layout. The literal text of the core articles relating to the road administrator's responsibilities (Articles 15 through 18) can be found in Annex 6.

##### 4.3.2 Policy

The design of a road influences its safety. For example, the combination of intersections (junctions at grade) with through traffic (high speeds) is a safety problem that is common to all of the roads studied (see Annex 4 for a summary of the safety problems on the roads investigated). Other aspects connected to road design, such as obstacles in the verges and a physical barrier between carriageways, can greatly influence the safety of a road.

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<sup>19</sup>It was decided in 2005 to reorganize the road administration in the Zeeland Board, so that the number of service divisions involved in the N-57 will be reduced.

Policy concerning road design is decentralized and is the responsibility of the road administrators, who work on the basis of guidelines.

#### *Guidelines*

Although agreements within the sector have been and are being made, they are not mandatory.<sup>20</sup> Road administrators often use the so-called CROW guidelines when designing and administering a road. These guidelines are produced by study groups consisting of representatives of road administrators and they are facilitated by CROW.<sup>21</sup>

The CROW guidelines that partly applied to main regional roads were known as the RONA guidelines (Guidelines for the Design of Non-Motorways), which set forth the prescribed design for about a dozen categories of roads within and outside of the urban area. The RONA guidelines were (and are) often used by road administrators but, as already stated, they have no legal status. Road administrators may deviate from the guidelines if they can sufficiently motivate their decision to do so.

In order to create more unity within the decentralized structure of road administration, the philosophy of 'Sustainable Safety' was developed. This philosophy of traffic safety that was elaborated by the SWOV<sup>22</sup> takes as its point of departure human beings with their limitations. Sustainable solutions are those in which the desired (safe) behaviour is exacted and the mistakes that people inevitably make do not have serious consequences.<sup>23</sup>

This philosophy enjoys wide support, also among road administrators, which in 1997 led to the so-called Start Programme for Sustainable Safety. In this programme, the group of road administrators made agreements about a number of measures in the period until the year 2001. The focus of the programme was on the infrastructure; it was decided to first deal with the so-called residential areas by introducing 30-kilometre and 60-kilometre zones (respectively within and outside of the urban area). It was also agreed that, by the year 2000, all of the road administrators would have categorized the road network into through-traffic roads, distributor roads and access roads, this based on the new draft guidelines proposed by CROW.

There was little or no attention to the categories of distributor roads and through-traffic roads in the Start Programme for Sustainable Safety since this would be dealt with in the second phase. This has not (yet) happened. Road administrators are still quite free in their policies on the design of distributor roads and through-traffic roads. Of course, there are some guidelines; the RONA guidelines are still being followed. But these guidelines do not reflect the state of the art with regard to safe road design.

When the concept of Sustainable Safety was translated into new guidelines, it became clear that the gap between the ideal design and the existing design of many roads was so large that many road administrators (including the Department of Public Works) no longer wished to regard the new guidelines as guidelines. The road administrators then turned to a manual, a sort of toolbox containing tools that a road administrator can use when constructing a new road or making an existing road safer. This is why the Manual for Road Design is called a 'manual' rather than 'guidelines'. A manual allows for more freedom; deviations can be made without them having to be motivated. The Department of Public Works uses the RONA guidelines as the internal standard for the design of national roads (non-motorways). Other road administrators also do not consider the Manual for Road Design to be prescriptive for the existing road network; moreover, they have no insight into the points where the existing roads deviate from the Manual.

The decision to make a manual from the new guidelines meant that the road administrators then had more freedom in designing a road. The administrators were aware of the fact that this could lead to greater differences in the road situation and therefore to more uncertainty for road users. As a result, the need arose to make administrative agreements about the essential characteristics that roads in a given category had to have. The accent was first on 'essential safety characteristics', such as a physical carriageway division and flyovers for through-traffic roads

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<sup>20</sup> Except for issues relating to work safety.

<sup>21</sup> CROW was originally the acronym for the Centre for Regulations and Research in Engineering, Hydraulics, Road Construction and Traffic Technology. Now the acronym is used as the name of the organization.

<sup>22</sup> Institute for Road Safety Research

<sup>23</sup> See Annex 4 for a more extensive explanation of the philosophy of Sustainable Safety.

outside of the urban areas. However, in the course of the process, the CROW study group gave in to pressure from road administrators and dropped such characteristics.<sup>24</sup> The essential characteristics were limited to prescribing the lineations on the road so that the road users could see which category of road they were driving on and which speed limit they should accordingly use. That is why these characteristics were called 'characteristics of *recognizability*'. The reason behind this 'reduction' is the same as for the 'degradation' of the new guidelines to a manual: more ambitious agreements would only widen the gap between ideal design and the existing design, and there was too little money to close the gap. As a result, agreements were made about characteristics of recognizability, but not about safety characteristics.<sup>25</sup>

In fact, a differentiation had been made between the ideal design (the Manual for Road Design) and the minimum demands (essential characteristics of recognizability) as two extremes between which road administrators were free to choose their position. There is no obligation or pressure to work towards the ideal, nor any mention of the period of time in which this should be realized.

#### 4.3.3 *Supervision and compliance*

As has been explained above, neither the design nor the layout of a road is dictated by legal standards. There are guidelines in the sector, but a road administrator may choose to deviate from them (with or without explaining why).

Because there are no legal standards, there can be no sanctions. There is also no external supervision of compliance with CROW's guidelines. Internal supervision is done by road inspectors who 'look at' the road several times a week. This supervision occurs on both national and provincial roads and is mainly technical. In addition, the Department of Public Works has created an internal 'independent supervision function': three inspectors/auditors have been appointed at the Netherlands Traffic Centre (VCNL) to assess national roads on the basis of the ROA/RONA guidelines.<sup>26</sup>

#### 4.4 FINANCING ROAD ADMINISTRATION AND SUSTAINABLE SAFETY

*Investments in a safe infrastructure are costly but in many cases cost-effective. However, the road administrator usually does not reap the benefits from the investments.*

##### *Financing roads*

The way in which (adjustments to) main regional roads are financed is different for provincial roads and national roads.

*Provinces* are autonomous in drawing up their own budgets. Most of the budget for road administration comes from the Provincial Funds and from the province's own income from motor vehicle tax. Money needed for the maintenance of the provincial road network is supposed to come from other general provincial funds, this as a consequence of the decentralization to provinces and municipalities (transfer in 1993 from the Road Benefits Act (WUW) to the Act for Redistributing Road Administration).

For adjustments to the roads made in the framework of Sustainable Safety, extra money from the Infrastructure Funds is made available nationally via the Brede Doel Uitkering (BDU), an act passed in 1995 that stipulates that these benefits for traffic and transport will be paid to the provinces annually. The entire budget is divided among the provinces that, in turn, are responsible for further dividing the money between the provinces and the municipalities. For the period 2004 through 2007, the amount of EUR 27 million is available for Sustainable Safety projects; for the period 2007 through 2010, there will be approximately EUR 80 million available. It should be added here that these amounts are added to the BDU, so that the money can be used for measures covering the entire field of traffic and transport and not just for safety measures for the infrastructure. The BDU, which was initiated in 2003, has decentralized the responsibility for regional projects. Regional authorities are now responsible for the planning, decision-making, construction and exploitation of regional transportation facilities.

*National* roads are financed completely via the Infrastructure Funds. A distinction is made between constructing a road and administration/maintenance (including improvements). The item 'national

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<sup>24</sup> This information is from one of the interviews held.

<sup>25</sup> Of course, recognizability adds to safety, although only to a limited extent.

<sup>26</sup> No study was done on how this actually works.

roads' in the budget for the Infrastructure Funds was approximately EUR 1.7 billion in 2004. About 1 billion of this is intended for the construction of new roads, carriageways, etc. and about 600 million for administration and maintenance. Some of the national roads studied here have been marked for change; in some cases, a safety bottleneck will be tackled, but this is not true in other cases.<sup>27</sup>

The Department of Public Works, the executory body of the Ministry of Transport, Public Works and Water Management, is responsible for the administration and maintenance of national roads. The Ministry divides the budget earmarked for this purpose along three lines (the Department of Public Works then distributes these funds to the ten regional boards):

1. permanent maintenance ('daily administration')
2. variable maintenance ('large-scale maintenance')
3. improvements

The first two lines are necessary in order to keep the road in an acceptable condition. In the past, improvements with respect to, for example, traffic safety could also be financed with this money, but that is in principle no longer possible. Improvements (as this is referred to by the Department of Public Works) in the quality of life, traffic safety or transport of goods are financed via a separate budget. This budget is currently EUR 20 million per year. Since priority is now being given to the quality of life, there will be about EUR 5 million for improving traffic safety each year until the year 2007. An illustration: the cost of constructing one flyover is estimated to be between EUR 10 – 20 million. Compare this to the EUR 380 million extra that has been made available for 2004-2010 by the Road Widening Emergency Act for measures of exploitation, such as rush-hour carriageways (an average of more than EUR 54 million annually, ten times the budget for traffic safety). Although investments such as flyovers contribute both to safety and mobility, they are always considered safety measures in the budget calculations.

Sustainable Safety Phase 2 has submitted a claim to the Ministry of Transport, Public Works and Water Management for some of the ICES funds.<sup>28</sup> This claim amounts to EUR 2.3 billion, most of which is for the infrastructure. The CPB qualified the claim as 'robust' in 2002, meaning that the project, based on cautious assumptions about the effects, will show a positive costs/benefits balance.

The ICES claim placed the topic of traffic safety outside of the budget of the Ministry of Transport, Public Works and Water Management. When the ICES funds were withdrawn because of the national government's financial losses, traffic safety again had to be financed by the Ministry of Transport, Public Works and Water Management. Because it was impossible to include the desired changes to the infrastructure in the budget, they were abandoned. The characteristics of recognizability discussed previously will, however, be implemented; to reduce costs, this will be combined where possible with administration and maintenance.

#### *Cost effectiveness*

As explained in section 4.1.2 about the national government as road administrator, cost effectiveness is one of the criteria considered in the framework of Sustainable Safety. In 1999 the Social and Economic Council (SER) described the underlying mechanisms of financing traffic safety. Their study showed that the social benefits from the necessary investments would not return to the parties who had paid the costs. For example, reducing the number of accidents and victims would mean financial benefits for health care, industry (lower worker productivity) and damage to vehicles and road facilities. The decentralized road administrators and/or decentralized authorities do not directly benefit from savings in the first three areas listed. Cost-effective projects lack a mechanism to make an integrated calculation of the costs and benefits.

In the period in which money seemed readily available, the future of Sustainable Safety was unthreatened and it appeared that road administrators would commit themselves to agreements on essential safety characteristics. It may be deduced from this that, in principle, there is a willingness to cooperate. The unsafe main regional roads have especially suffered from the consequences of limited finances because changes to these roads are expensive. But these changes do not benefit

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<sup>27</sup> Remaining bottlenecks include the N-201 (trajectory A2 - Uithoorn) and the N-57 (trajectory Stellendam – De Punt).

<sup>28</sup> ICES: Interdepartmental Commission for Strengthening Economic Structure. This fund was mainly filled with revenues from natural gas. The name has meanwhile been changed to ICRE: Interdepartmental Commission for Spatial Economy.



safety only. Perhaps changes will be more readily made when the other benefits (such as enhanced traffic flow on through-traffic roads) are also considered in calculations of cost-effectiveness.

#### 4.5 TRAFFIC SAFETY GOALS

*Being responsible for the system, the Department of Public Works formulates goals in the framework of traffic safety that are related to reducing the number of traffic victims and it gives the decentralized authorities (who are also the road administrators) the freedom to choose how to realize these goals.*

##### *Goals*

The national government has the final responsibility for traffic safety. In a letter to the Lower House, the Minister of Transport, Public Works and Water Management said that traffic safety was a 'top priority'.<sup>29</sup> This is also the standpoint taken by the Cabinet in its Mobility Memorandum and translated into concrete goals about reducing the number of victims.

##### *Goals with regard to fatalities:*

- in 2010 reduced to 900;
- in 2020 reduced to 640.

##### *Goals with regard to persons injured:*

- in 2010 reduced to 17,000;
- in 2020 reduced to 13,500.

In 2003 there were 1,066 fatalities and 18,500 persons injured. In May 2005, the Minister told the Lower House that the number of fatalities had dropped by 19% to 881 in 2004; this is below the target of 900 fatalities set for 2010. The number of persons injured dropped by about 10%, but there is no exact information about this.

##### *Delegating responsibilities: centralized and decentralized*

The Cabinet set forth the major lines of the approach to reducing the number of traffic victims in its Mobility Memorandum and referred to this point again in the above-mentioned letter. The policy is strongly aimed at decentralization: 'decentralize if possible, centralize if necessary'. This means that the decentralized authorities are responsible for realizing the goals of traffic safety. To this end, national goals are translated into regional tasks, and every region must ensure that the same percentage of reduction is realized. The coordination of parties involved in these regional efforts is in the hands of the provinces.

According to the minister, this decentralization is in keeping with the powers that the decentralized authorities have with regard to spatial planning and traffic. It is further claimed that most accidents occur on the underlying road network (all roads except the main roads). In fact, the decentralized authorities have become the owner of the problem: they are responsible for the measures that will lead to a reduction of traffic victims. It should be noted here that the problem is of course much smaller for each separate decentralized authority than it is for all of the authorities or road administrators collectively. The problem is much less visible at the decentralized level.

*Centralized*<sup>30</sup> - that is, with the national government responsible for policy – measures are taken in the areas of information, education and enforcement that have to be decided at the central level. Examples are further reducing the use of 'driving under the influence' (alcohol, medicine and drugs), implementing traffic laws and rules of behaviour, testing driving skills and enforcing policies about speed limits.

*Decentralized* responsibility applies to the other measures in the areas of information, education and enforcement as well as for the infrastructure, this last being the 'third pillar' in addition to the driver and the vehicle. The national government takes a very cautious approach to the infrastructure. The minister has rejected mandatory standards for the infrastructure.<sup>31</sup> However, in the Mobility Memorandum the minister states that, after 2010, the most important contribution to reducing traffic victims will have to be the results of changes to the infrastructure:

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<sup>29</sup> TK 2003-2004 29398 number 15. Measures for traffic safety. Letter from the Minister of Transport, Public Works and Water Management dated 17-09-2004.

<sup>30</sup> The national government as responsible for the system.

<sup>31</sup> For example, in a response to the SER advice 99/13 about traffic safety.

*'Policy measures aimed at the infrastructure will have to lead to more than a 35% increase in traffic safety in the period up to 2010. This percentage will increase to 50% in the period 2010-2020. This has consequences for the means required'.*

The Mobility Memorandum says nothing further about making single carriageway national roads (not part of the underlying road network) sustainably safe. Moreover, nothing is said about whether a national contribution of EUR 80 million per year in the framework of Sustainable Safety is sufficient to realize the increase in safety of 35% in 2010 and 50% in 2020. It should be said again here that this amount of EUR 80 million is meant for the decentralized authorities and is not earmarked for investing in safer infrastructure. In addition, hardly any (visible) money, if any, has been reserved for safety adjustments to *national* roads.

It can be concluded that working with goals (reducing the number of victims and the contributions that the infrastructure must make) is an important part of the present policy on traffic safety. However, delegating these goals to the decentralized authorities leads to the problem being much less manifest for these individual authorities than for all of the authorities or road administrators collectively. It can also be concluded that aiming at general goals concerning victims does not explicitly stimulate road administrators to invest in the safety of roads even though this must account for 50% of the reduction as of 2010. Given the lack of nationally valid standards with regard to road design and the fact that there are no financial incentives to invest in the safety of the roads, it can be concluded that there are hardly any stimuli for road administrators to make explicit safety concerns in the area of road administration. This does not contribute to realizing the goals of traffic safety and the view on safety expressed by the Minister of Transport, Public Works and Water Management. One of the core concepts in this view is 'creating or helping to create and maintaining safety management and safety culture within organizations'. The Board believes that, in the framework of the minister's responsibility to the system, this also applies to the road administrators.

## 5 CONCLUSIONS

Based on the investigation, the following conclusions can be drawn about main regional roads that have long been unsafe:

### *Unsafety*

- On average, there are 23 fatalities and 254 persons injured per year on the seven roads investigated. The accident statistics for these roads are about two to four times as high as the average for trunk roads.<sup>32</sup>
- This does not mean that the seven roads are the 'top seven', but that they are more dangerous than the average trunk road.

### *Policy-making and decision-making*

- In policy-making and decision-making processes relating to road administration, the risks are often not systematically identified, and considerations with respect to the new safety standards are not transparent.
- Policy-making and/or decision-making processes about the infrastructure are complex and time-consuming, partly because of the relation to spatial planning, nature and the environment. This is especially true of the main regional roads studied where the road administrator often has to adjust his plans to meet the demands of other road administrators and/or authorities in addition to other interested parties.
- There is a separation between road administration on the one hand and the responsibility for traffic safety on the other. The safety of the roads plays a limited role in policy-making related to road design. Road administrators are not systematically concerned with safety; otherwise, the safety of an individual road would be a structural part of the decision-making process. In contrast to environmental issues, there are also no procedures or rules to anchor the issue of safety in policy-making processes. This does not conform to what the Board considers to be good road administration (see chapter 3).

### *The organization of road administration*

- The decentralized structure of road administration and the various possibilities for financing can lead to problems in decisions being made about roads that have more than one administrator.
- In the case of main regional roads that fall under the responsibility of more than one administrator, there is not always a shared view about the final situation or the intended situation with regard to the design of the road. Such a shared view leads to the design and the function of the road being consistent so that the road users know what they can expect.

### *Standards for road design and layout*

- There are no clear, legal and national standards about the design of the three categories of roads that have now been made. As a result, no direction is given to the policy-making and decision-making processes at the decentralized level about adjustments that could increase the safety of the infrastructure.
- The lack of clear, legal and national standards for road design makes it possible for road administrators to choose (and maintain) a design that is not the best one from the perspective of safety.
- A legal framework and national rules apply to the driver of the vehicle and the vehicle itself, but not to the infrastructure. This does not stimulate road administrators to choose a road design that is the best choice from a perspective of safety. This is even more problematic since the standards in that sector indicate what an optimal design is.

### *Financing road administration and traffic safety*

- Investing in safe infrastructure is expensive but, in many cases, cost-effective. However, the road administrator usually does not reap the benefits from these investments.
- Making through-traffic roads and distributor roads sustainably safe is relatively expensive compared to doing the same for access roads. This attitude could change if calculations of cost-effectiveness included not only safety improvements but also other effects such as a better flow of traffic.
- As pointed out by the SER, many of the benefits and/or savings resulting from safer traffic are not seen in road administration but in other sectors such as health care and industry. The road

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<sup>32</sup> With respect to design, trunk roads can best be compared to the category of 'regional through-traffic roads' from the Manual for Road Design. See also section 2.1.

administrators cannot include these benefits in their calculations nor do they do so. They usually do not choose large-scale investments but, based on police information, small-scale measures at locations with a high concentration of accidents ('black spots').

- Financing road administration does not include any incentives to stimulate making roads safer.

#### *Traffic safety goals*

- Being responsible for the system as a whole, the national government formulates traffic safety goals concerning a reduction in the number of traffic victims and it gives the decentralized authorities (who are also the road administrators) the freedom to choose the ways in which these goals will be realized. At the same time, however, as is shown in the Mobility Memorandum, the infrastructure is expected to contribute greatly to realizing goals of traffic safety.
- It is unclear how the specific contribution by the infrastructure – increasing safety by 50% in the period 2010-2020 is going to be achieved and how this will be evaluated.

#### *General conclusion*

Decisions about the infrastructure are complex by nature. However, there are more factors that delay decisions being made about increasing road safety. The most important factors are the lack of a systematic concern with safety among road administrators, the lack of clear standards for road administration and road design and, in some cases, the lack of cooperation between road administrators as well as a lack of funds. There is a separation between responsibility for policy pertaining to traffic safety on the one hand and road administration on the other. The safety of roads plays a subordinate role in decision-making processes, and concern for safety is insufficiently anchored in road administration.

The Board concludes that the Minister of Transport, Public Works and Water Management, being responsible for the system of traffic safety, should formulate clear targets about the number of victims and about how the infrastructure can contribute to reducing these numbers. There is no clear framework for road administration, particularly with respect to safe road design (the standard for existing roads in both the short and the long term) As a result, the necessary preconditions for safety concern and safety awareness among road administrators are insufficiently stimulated, something that the Board believes to be the responsibility of a minister who is responsible for the system as a whole.

## 6 RECOMMENDATIONS

### Recommendation 1

*The Board recommends road administrators (both national and provincial) to give more explicit consideration to safety in the administration and maintenance of the roads, for example, by introducing a systematic approach to safety concerns. In this connection, the Board recommends that the Minister, being responsible for the total system of traffic safety, stimulate the recommended safety considerations among road administrators.*

An important aspect of the intended systematic approach to traffic safety is establishing a target for each main regional road. This target should be based on the generally accepted principles of Sustainable Safety and the resulting Manual for Road Design. If applicable, this target should be established in cooperation with other road administrators. If the target cannot feasibly be reached in a reasonable period of time, the road administrator should make transparent the considerations involved and draw conclusions from this. One conclusion could be that a road should be 'degraded' together with the accompanying safety measures.

Other aspects of the intended systematic approach to traffic safety include monitoring and analyzing accidents and/or carrying out analyses and drawing conclusions from them. This is in keeping with the safety policy set forth by the Minister of Transport, Public Works and Water Management in which safety management and a culture of safety are stimulated in all divisions of an organization.

The Board recommends that the Minister:

- encourages safety management, for example by calling for a centrally developed systematic approach to traffic concerns on behalf of road users;
- encourages aspects of safety being anchored in the policy-making and decision-making processes involved in road design. For new infrastructure, this could include a form of reporting on safety effects in which, in the framework of spatial planning, a voluntary inventory could be made of traffic safety effects. For existing infrastructure, traffic safety audits could be made.

### Recommendation 2

*The Board recommends that the Minister of Transport, Public Works and Water Management – being responsible for the total system of traffic safety – stipulate minimum safety requirements for designs for the infrastructure. In this connection, the Board recommends that the Minister state which requirements from the Manual for Road Design should be marked as (legally) mandatory. Moreover, the Board recommends that the Minister couple a form of independent monitoring to these mandatory requirements.*

Mandatory requirements for regional roads with a maximum speed limit of 100 kilometres per hour could, for example, include a certain form of separation between carriageways and flyovers. It is reasonable to set a period of transition for having these changes made. But if changes to the road are not feasible within a reasonable period of time, the road should be 'degraded'. With regard to financing the application of these required adjustments, it should be realized that such minimal safety demands also have other positive effects, such as facilitating the flow of traffic.

**ANNEXES**

## **ANNEX 1 JUSTIFICATION OF INVESTIGATION**

### **Legal Framework**

The Dutch Safety Board (prior to 1 February 2005 known as the Dutch Transport Safety Board) was established by law with the task of investigating and determining the causes or assumed causes of individual or categories of accidents and incidents. The express goal of such an investigation is to prevent future accidents or incidents and, depending on the findings, to make recommendations based on the findings.

### **Limiting (partial) areas of investigation**

In chapter 1 (Introduction), it was explained that the present investigation has as its starting point an earlier investigation into a serious accident on the N31. On the basis of the findings from that investigation, the Board chose to examine the background of unsafety on main regional roads. The investigation therefore focused on the following question: How is it possible that the unsafe situation on roads known as 'death traps' could continue to exist for so many years?

### **Structural factors**

During the investigation it was found that the following aspects hinder an effective approach to solving the problem of continued unsafety on main regional roads:

- the organizational structure of road administration
- policy and standards for the roads
- financing

### **Organization of the investigation**

The investigation was carried out by a project team of the Dutch Safety Board.

### **Research design**

The investigators started by interviewing the Regional Traffic Safety Authorities. They learned that, in each region, there are roads that are known as being dangerous. These are usually heavily used single carriageways outside of the urban area.

From a larger list of roads considered dangerous, seven roads were selected for further investigation. These were the N-31, the N-(3)48, the N-273, the N-57, the N-366, the N639/N-260 and the N-201 (see Annex 2 for more information on these roads). This selection was not based on the seriousness of the problem, but on the wish to investigate roads from all over the country and to have a good mixture of roads administered by the national government and/or the provinces. These roads have been taken as examples from the longer list of dangerous roads in order to answer the question of why these sorts of roads continue to be dangerous rather than why they are dangerous.

### **The final report of the Board**

Once the investigation had been completed, a draft of a final report was drawn up under the direction of the Road Traffic Section. The Road Traffic Section studied the investigation and the draft of the report three times and, based on comments from members of the Section, changes in the report were made. In November 2004 the last draft of the report was presented to the parties involved: road administrators and the Ministry of Transport, Public Works and Water Management. Reactions have been received from a great many of the parties involved. CROW and SWOV have also commented. The reactions received were incorporated into the draft report that was presented to the Board on 16 December.

Because the Dutch Transport Safety Board was dissolved and its tasks were transferred to the Dutch Safety Board on 1 February 2005, the report was finalized by the Dutch Safety Board.

The members of the Dutch Safety Board and the Road Traffic Section are listed below.

**THE DUTCH SAFETY BOARD AND THE ROAD TRAFFIC SECTION OF THE DUTCH TRANSPORT SAFETY BOARD (dissolved per 1-2-2005)**

**Board**

Chairman: Pieter van Vollenhoven  
F.W.C. Castricum  
J.A.M. Elias  
B.M. van Balen  
A.H. Brouwer-Korf  
D.M. Dragt  
J.A.M. Hendriks  
K. Nije  
U. Rosenthal  
F.R. Smeding  
D.J. Smeitink  
J.P. Visser  
G. Vrieze  
W.A. Wagenaar

**Road Traffic Section**

Chairman: F.W.C. Castricum  
K. Nije  
G. Blom  
R.E.C.M. van der Heijden  
M. Koornstra  
H. Plasse  
I. Spapé  
C. Wildervanck  
J.S.H.M. Wismans



## ANNEX 2 LIST OF ROADS INVESTIGATED

A national inventory<sup>33</sup> produced a list of roads that were known in their regions as being relatively dangerous. It was decided to further examine the policy-making and decision-making processes relating to seven of these roads. In order to make the selection as broad as possible, it was decided to choose a combination of regional roads and provincial roads spread throughout the country. The following seven roads were further investigated:

Road	Distance in km.	Connection	Road Administrator
N-48/ N34834	40	Hoogeveen (A-28) Raalte (N-35)	- Hoogeveen – provincial border: Dept. of Public Works – service district Drenthe - provincial border – Ommen: Dept. of Public Works – service district Zwolle - Ommen – Raalte: province of Overijssel
N-273	30	Venlo (A-73) Ittervoort (A-2)	- Dept. of Public Works – service district Venlo - Roads
N-57	66	Zwartewaal (N-15) Middelburg	- N-15 – Brouwersdam: Dept. of Public Works – service district Z-H-islands - Brouwersdam – Veersedam: Dept. of Public Works – service district Delta coast - Veersedam – Middelburg: Dept. of Public Works – service district Noord - en Midden Zeeland
N-366	36	Wildervank Ter Apel	- province of Groningen
N-260/ N-639	20	Ulvenhout Baarle-Nassau	- province of Noord-Brabant
N-31	10	Zurich – Harlingen	- Dept. of Public Works – service division Friesland
N-201	43	Haarlem Hilversum	- Heemstede – Uithoorn: province of Noord-Holland - Uithoorn – Vreeland: province of Utrecht - Vreeland – Hilversum: province of Noord-Holland

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<sup>33</sup> A series of interviews with the Regional Traffic Safety Authorities

<sup>34</sup> The N-48 between Hoogeveen and Ommen and the N-348 between Ommen and Raalte was investigated as one road because the road user experiences it as one through road with no clear transition between the two trajectories. The southern trajectory of the N-348 in the direction of Deventer is clearly separated from the northern trajectory between Ommen and Raalte by means of a junction with traffic lights where the motorist must turn to continue to follow the N-348; this part of the trajectory was not included in the study.

### ANNEX 3 ACCIDENT STATISTICS ON THE ROADS INVESTIGATED

An investigation of the seven roads known to be relatively dangerous showed that not only do serious accidents regularly occur on these roads, but that they are more dangerous than the average trunk road even when statistics are corrected for the high traffic intensity.

As an indication, the table below shows accident statistics and numbers of victims for the roads in question. The numbers of victims per year are calculated by dividing the total number of victims in the period given for each road by the total number of years. The information was taken from various investigative reports. The statistics are not directly comparable since various definitions and information about various periods were used.

Road investigated	Period	Risk (victims per million vehicle km.)	Length in km.	Victims average per year	Fatalities
N-48 / N-348	'93-'01	0.086 – 0.216 (estimated injuries per million vehicle km.)	40	32.6	3,7
N-273	'91-'00	0.400	30	75.4	4.5
N-57	'96-'01	0.015 – 0.502	77	53.3	4.2
N-366	'93-'96	unknown	36	31.8	3.3
N-260 /N-639	'93-'97	0.357	20	17.4	1.5 (estimate)
N-31	'93-'01	0.315	10	8.2	2
N-201	'93-'03	unknown	43	34.9	3.4
Total				253.6	22.6

*Table 1 Risk and victim statistics for the roads investigated*

In the final phase of this investigation, it was decided against updating this information since the investigation focused on aspects relating to organization and policy-making. Nevertheless, there is no difference in opinion about the risks on these roads and about the fact that preventative measures have not yet been taken.

EuroRap, a system of assigning 'stars' to roads, is being developed for use throughout Europe so that roads with high accident statistics can be identified.

## ANNEX 4 SAFETY PROBLEMS ON THE ROADS INVESTIGATED

In order to understand the decision-making processes relating to unsafe roads, it is necessary to know something about the safety problems of the roads investigated in this study. A global indication of the safety problems for each of the seven roads is listed below.

### N-48/ N348 Raalte - Ommen and Ommen - Hoogeveen

There are a number of predominant causes for accidents on the N48/ N-348:

- Losing control over the wheel / going off the road
  - A relatively high number of these accidents in a short trajectory with two curves and flyovers. The path of the road is difficult to see, motorists drive at high speeds and it is impossible to get out of the way (strength of verges, verges not sufficiently free of obstacles);
- Accidents with animals
  - Especially in wooded areas, which are spread along the entire trajectory;
- Not enough room between cars
  - At acceleration/deceleration lanes, crossing and junctions. Partially caused by large differences in speed;
- Overtaking and cutting
  - Road has long straight trajectories. Accidents at acceleration/deceleration lanes. Discontinuity in road in combination with high speeds makes overtaking difficult;
- Accidents at junctions
  - Many possibilities for cutting across road.

### N-273 Venlo - Ittervoort

Predominant types of accidents on the N273 are:

- - rear-end collisions: 30%
- - driving straight on at a junction: 20%
- - hitting a fixed object: 12%
- turning left against oncoming traffic: 9%
- - head-on collisions: 8%
- - other: 21%
- 
- 100%

The pattern of accidents on the N273 is concentrated in and near the residential areas, but there are also some notorious locations outside of these areas (the connection with N280 and A2, the curve at Ittervoort).

Most of the victims are involved in:

- accidents at junctions (not yielding, not allowing the other to drive straight on, driving though a red light);
- a driving error (going off the road, losing control of the wheel, taking a curve incorrectly).

The sort of persons involved in these accidents is unknown, although the road administrator believes that they are both people who live in the area and through traffic.

### N-57 Zwartewaal - Middelburg

According to the various service districts, the most predominant types of accident on the N-57 are:

1. head-on collisions;
2. driving errors (going off the road);
3. accidents at level crossings.

The peaks in accidents occurring at the weekend and in the summer months suggest that tourist traffic is involved in accidents relatively often. Traffic intensity in these periods is about 40% higher than annual average.

### N-366 Wildervank - Ter Apel

There are four predominant types of accidents on the N-366:

- driving errors (31% of all accidents);

- failing to yield (21%);
- rear-end collisions (17%);
- accidents involving animals (11%).

59% of the accidents happen on the carriageways, 41% at the level crossings (65% of the victims). A large number of the accidents at level crossings occur at three crossings (75% of the accidents involving failure to yield). These are all crossings with other provincial roads. The use of the side roads is relatively high and the T-crossings are very large. A very large number (more than half) of the accidents that occur on the carriageways consists of driving errors. In more than half of these, the motorist hits an obstacle along the road.

### **N-260/ N-639 Ulvenhout – Baarle-Nassau**

The provincial roads were thematically analyzed in the framework of the province's policy of spearpoints. It was decided to examine one-sided accidents, accidents with heavy freight transport and accidents at junctions with traffic lights/traffic information. On the trajectory N-639 / N-260, there were few accidents with heavy freight transport and no problems at the junctions with traffic lights/traffic information. But there were a great many one-sided accidents.

### **N-31 Zurich - Harlingen**

The predominant types of accidents named in a traffic safety study of 1997:

1. driving errors (going off the road);
2. head-on collisions;
3. accidents at level crossings (rear-end and side)

### **N-201 Haarlem - Hilversum**

The predominant types of accidents on the trajectory in Utrecht are rear-end collisions and accidents at points of access and exit. Most of the victims are involved in rear-end collisions that are caused by failure to yield. The number of head-on collisions on the eastern trajectory has diminished considerably since overtaking was prohibited. The road administrator believes that those involved in accidents are often people who are familiar with the road.

### **Conclusion**

The above information is not enough to allow for conclusions to be drawn with certainty. In general, it can be said that the specific problems of safety vary per road and that there is always a mixture of factors contributing to the unsafety of a road.

There are causes that belong specifically to each particular road and there are causes that belong to (almost) all of the roads.

The following road-specific causes illustrate the differences:

- N-57: the combination of newly constructed dams and the local roads on the islands resulted in a road with a great amount of variation. There are also peaks of tourist traffic (usually motorists unfamiliar with the area) on the road;
- N-31: a nearly invisible transition from a motorway to a single carriageway trunk road;
- N-(3)48: many level crossings, and game crossing the road;
- N-366: very long straight trajectories;
- N-260: trees very close to the roadside;
- N-273 / N-201: the combination of high intensity and going through urban areas.

In addition to the differences, there are also similarities. Accidents at level crossings and accidents caused by driving errors (one-sided accidents) are predominant types of accidents on all of the roads. Head-on collisions seem to be less frequent. It should be stated here, however, that head-on collisions produce a relatively higher number of fatalities so that their share in fatal accidents is higher than their share in the total number of accidents.

## ANNEX 5 THE PHILOSOPHY OF SUSTAINABLE SAFETY

(source: www.swov.nl)

In sustainably safe road traffic, the entire traffic and transportation system is tuned to the limitations and possibilities of road users. Everything is aimed at preventing accidents. And, if an accident occurs, everything is done to limit the consequences as much as possible. The *infrastructure* is so designed that confrontations involving large differences in direction, speed and mass are impossible and the road users know what behaviour is expected of them. *Vehicles* simplify the driving task and offer protection in the case of an accident. *Road users* are well instructed and informed; their behaviour is monitored regularly. The core of Sustainable Safety's approach is: work preventively rather than acting after the fact.

A sustainably safe road infrastructure must be so designed that it includes:

- *functionality*: Traffic spreads itself across the network as was intended;
- *homogeneity*: The differences in speed and mass between vehicles encountering each other are slight;
- *recognizability*: Traffic situations are to a large extent predictable; you very quickly know what your situation is with regard to behaviour expected from you and behaviour that you can expect from other road users.

These demands have been further elaborated into twelve main demands (CROW, 1997).

Demand according to CROW	Sort of demand
1. Creating residential areas that are interconnected as much as possible	General
2. The shortest part of the drive on relatively unsafe roads	Functionality
3. Making drives as short as possible	
4. Having the shortest and the safest routes coincide	
5. Avoid motorists having to search	Recognizability and predictability
6. Making categories of roads recognizable	
7. Limiting and making uniform the number of solutions to traffic problems	
8. Avoid collisions with oncoming vehicles	Homogeneity
9. Avoid collisions with crossing traffic	
10. Separate sorts of vehicles	
11. Reduce speed at potential points of collision	
12. Avoid obstacles along the road	

Table 1. Functional demands according to Crow (1997)

A road network has three functions:

- traffic flow: you must be able to drive from place of origin to place of destination – through-traffic roads;
- distribution: you must be able to drive into an area and leave it again – distributor roads;
- access: you must be able to drive onto the parcel of land belonging to an individual residence, shop or business – access roads.

At this moment, roads and streets often have more than one function, which can be a dangerous situation. In a sustainably safe road network, each road and each street has only one function. Together, these three categories of roads form a road network that is presented schematically in the illustration below:

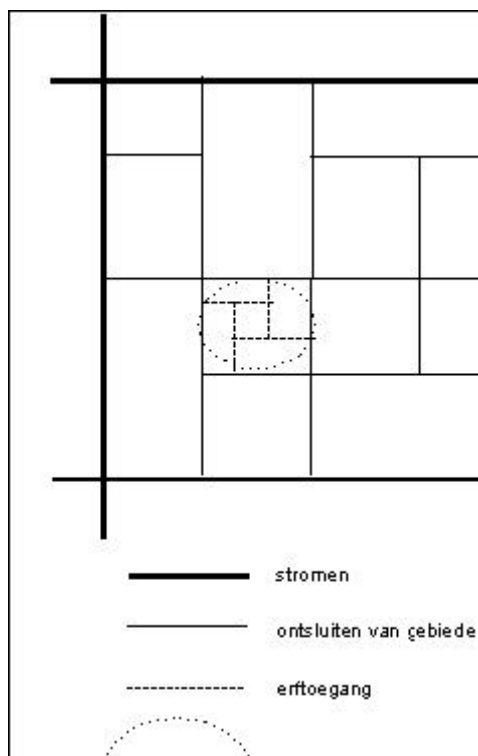


Figure 1: Schematic overview of the functions in a sustainably safe road network (stromen: through traffic; ontsluiten van gebieden: distributor road; erftoegang: access road)

Junctions enable an exchange of traffic from one road to another; roads are to enable through traffic (except for access roads, where traffic can also move from one road to another); through-traffic roads have flyovers rather than junctions (see Table 2).

According to the CROW demands, through-traffic roads, given their large-scale character, do not belong in the urban area.

Road category	Stretch of road	Junction or crossing	Type of area according to Start Programme of Sustainable Safety
through-traffic road	<i>flowing traffic</i>	<i>flowing traffic</i>	major road
distributor road	<i>flowing traffic</i>	<i>exchange</i>	
access road	<i>exchange</i>	<i>exchange</i>	urban area

Table 2. Purposes of stretches of road and junctions in the various categories of roads (CROW, 1997)

Moving from general to specific/concrete, we can see:

- the general functional demands (through-traffic, distribution, access) for the sustainably safe road infrastructure;
- supplementary operational demands for the stretches of road and junctions of each of the three categories of roads;
- concrete design.

For example, the operational demand that the barriers between carriageways on distributor roads must be difficult to drive across could lead to their being designed as a cement bar in the length of the carriageways.

The demands for the stretches of roads are shown in Table 3. The demands for the junctions are less detailed (CROW, 1997) and, because of a lack of design demands, not yet practically useful (see *Designing Categories/Types of Roads*, SWOV).

	Outside urban area	Outside urban area	Inside urban area	Inside urban area	Inside urban area
	Through-traffic road	Distributor road	Access road	Distributor road	Access road
Speed limit (km/hour)	120/100	80	60	70/50	30 or less
Road markings in length	Completely	Completely	Partially	Partially	None
Division of carriageways (carriageways x lanes)	2x1 or more	2x1	1x1	2x1 or more	1x1
Breakdown facilities	Breakdown lane	Road verge or parking area	None	Road verge or parking area	None
Separation between carriageways	Cannot be crossed	Difficult to cross	Does not apply	Difficult to cross	Does not apply
Hard surface, extent of flatness	Large	Large	Limited	Large	Limited
Access to property	No	No	Yes	No	Yes
Crossings	Flyovers	Flyovers	Yes	Flyovers	Yes
Parking	No	Parking area	On carriageway	Parking area	On carriageway
Stop for public transport	No	Recessed area	On carriageway	Recessed area	On carriageway
Obstacle distance	Large	Fair	Small	Fair	Small
Bicyclists on carriageway	No	No	Depends on situation	No	Yes
Moped riders on carriageway	No	No	Yes	Yes (except at 70 km/hr)	Yes
Slow-moving vehicles on carriageway	No	No	Yes	Yes (except at 70 km/hr)	Yes
Speed inhibitors	No	No	Yes	Sometimes	Yes
Lighting	According to sort of road	According to sort of road	According to sort of road	According to sort of road	According to sort of road

Table 3: Operational demands on roads of the various Sustainable Safety road categories (based on CROW, 1997)

In comparison, the table below lists the old types of roads (as defined in the RONA: Guidelines for Designing Non-Motorways) and the new types of roads (from the Manual for Road Design) side to side. Not all of the old types of roads can be placed in one new category. The table shows only those roads that could be categorized as a main regional road.

Manual: Types of Roads	RONA: Types of Roads
Regional through-traffic road	Trunk road
	Road restricted to motor cars
Regional distributor road	Road restricted to motor cars
	Road open to all traffic

## **ANNEX 6 THE ROADS ACT (EXCERPTS)**

### **Article 15**

**1.**

The national government, the province, the municipality and the Water Board is obliged to maintain a road if that public body has declared the road to be public.

**2.**

The national government, the province, the municipality and the Water Board is obliged to maintain a road and a culvert if that public body has maintained that road or that culvert for ten consecutive years, even if, at the beginning of the ten years, said road or culvert was not public.

**3.**

The maintenance as stipulated in the first and second paragraphs includes maintenance of the accompanying road verge or accompanying ditch, only, however, to the extent that maintenance of the road verge or ditch contributes to the preservation and use of the road and to the extent that, for whatever reason, this maintenance is not the responsibility of another party.

### **Article 16**

The municipality is responsible for maintaining the good condition of roads inside its area, except for roads maintained by the national government or the province, roads falling under Article 17 and roads for which another party collects a toll.

### **Article 17**

The Water Board is responsible for the good condition of the roads under its maintenance and roads that, because of its facilities or regulations, fall under its supervision.

### **Article 18**

The municipality and the Water Board are expected to have complied with that stated in Articles 16 and 17 :

I.

when a party other than the municipality or the Water Board is obliged to maintain the road and has fulfilled its obligation;

II.

in other cases when:

the road is well-maintained;

the nature of the width and length of the hard surface is similar to the nature of the width and length of the hard surface as indicated in the register in Article 27 .