

# Processes and patterns

The utilisation of knowledge in  
Dutch road safety policy



Charlotte Bax

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## PROCESSES AND PATTERNS

The utilisation of knowledge in Dutch road safety policy

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# **1. Knowledge use in road safety policy**

## **1.1. Introduction**

In more than ten years of research, my experience in Dutch road safety has often filled me with wonder, a wonder concerning two related issues. The first is the existence of interesting and scientifically sound research, while the outcomes thereof apparently are not used by policy-makers. Reports that delight scientists, are not always greeted with equal enthusiasm by policy-makers. Sometimes, there are practical reasons for this, sometimes political reasons, and sometimes, to scientists, there is no fathomable reason at all for disregarding or rejecting scientific studies. The second issue is that policy-makers present genuine policy problems, which they encounter on a daily basis and try to formulate the knowledge demands behind these, but scientists are not always capable of meeting these knowledge needs. Again, there are practical reasons for this, and sometimes it is scientifically impossible to find a solution. Occasionally, however, there appears to be no valid reason for neglecting these policy questions, even for scientists themselves.

The two groups, it seems, have different worldviews and perceive their roles differently. Policy-makers often see a world that is complex, full of exceptions and unable to be compartmentalised. They have an idealised image of science, expect knowledge to be custom made, and do not always understand technical scientific knowledge that does not match their experience. They reproach scientists for their 'ivory tower' behaviour in not giving their knowledge needs sufficient priority. Scientists, on the other hand, often generalise, schematise, and reduce complexities, in order to present averages and certainties. They see their role as objective fact-finders rather than decision makers, yet at the same time, are frustrated when policy-makers do not adopt their recommendations.

Is it possible to bring these two worlds closer together, to diminish the distrust that is sometimes expressed and to show what both worlds have to offer each other? It is from these observations, certainly somewhat caricatured here, that my curiosity about the subject of this thesis originates.



## 1.2. Some key concepts

From the short introduction above, it can be deduced that this is a thesis in administrative sciences in the field of road safety and, more specifically, focussing on the use of (scientific) knowledge in this particular field. Two kinds of readers are likely to be interested in this study: readers familiar with the road safety field and those familiar with administrative sciences. These two groups will only partly overlap. That means that some readers may not be familiar with concepts in this study, or may have a different understanding of the meaning of these concepts. This section, therefore, gives a brief definition of some of the basic concepts used throughout this study. Some of these concepts will be defined in greater detail in *Chapter 2*.

The most important concepts used in the previous section are 'science', 'knowledge', 'policy', 'use', 'road safety' and 'two worlds'. Science is a concept that could cause confusion in readers. In some traditions, science is only used as a synonym for the study of the natural world or in physics and for fundamental science. Studies in other disciplines are referred to as research, as are applied sciences. In other traditions, the word 'science' indicates both studies in natural sciences, in social sciences and in the humanities, and includes both fundamental and applied sciences (Kroes, 1996, p. 13-30). In this thesis, the word will be used in the latter sense. The word research is used to indicate specific studies, the word science to indicate the activity in general. A similar distinction is used for the words researcher and scientist. *Section 1.5* elaborates on the philosophical discussion on the nature of science and *Chapter 2* on the distinction between fundamental and applied sciences.

Policy, or more specifically public policy, is defined by Dunn (1981, p. 46/47) as "long series of more or less related choices made by governmental bodies and officials". Policies are formulated in specific issue areas, in this case road safety. While the actual policy processes focus on achieving policy ends by certain means, for example a decrease in the number of road deaths by implementing road safety measures, Dunn stresses that policies do not stand alone. They are embedded in a policy environment, the specific context of each issue area, in which events occur and policy stakeholders, individuals or groups with a stake or interest in the specific policy, try to influence policy. Furthermore, policy is often based on scientific information. The relationships between these components, the public policies, policy stakeholders, knowledge organizations and the policy environment form an institutional pattern named policy system by Dunn. *Chapter 2* elaborates on

the analytical concept of institutional patterns, while *Chapter 4* analyses the institutional patterns in road safety.

Although the term 'road safety' is not defined officially in the literature, there are several organisations that do define road traffic accidents. The definitions of the European Union (SafetyNet, 2009), the World Health Organization (Peden et al., 2004, p. 201; World Health Organization, 2010, p. 4) and the Dutch Public Prosecution Service (College van procureurs-generaal, 2009) display many similarities, although they differ on details, as the following table illustrates. The United Nations (United Nations Economic Commission for Europe, 1995) and IRTAD (Brühning & Berns, 1998) provide similar definitions.

Source	What	Where	Consequence	With
EU	An accident	which occurred or originated on a way or street open to public traffic	which resulted in one or more persons being killed or injured and	in which at least one moving vehicle was involved.
Dutch Public Prosecution Service	An incident	which occurred on a road open to public traffic	and which resulted in damage and/or death or injury of road users	which is related to traffic, not including an incident exclusively involving pedestrians
WHO	A collision	on a public or private road	that resulted in at least one person being injured or killed	involving at least one vehicle in motion

**Table 1.1.** Definitions of a road traffic accident.

All of the definitions mention the (public) road, the occurrence of (personal) damage and the involvement of a vehicle. This excludes air, rail and waterway accidents and accidents involving people not on roads. The definition also excludes accidents on roads not related to traffic, such as crime, violence or illness. In this thesis, the definition of the Dutch Public Prosecution Service is used.

To sketch an outline of the road safety problem for readers not acquainted with this field, it might be helpful to mention that road traffic accidents are

one of the worlds' main causes of death and injuries. Clearly the over 1.2 million road deaths per year worldwide in 2004 (Peden et al., 2004, p. ix), 34,500 in the EU in 2009 (European Union, 2009) and 640 in the Netherlands in 2010 (Minister van Infrastructuur en Milieu, 2011) indicate the need for scientific knowledge regarding the causes of accidents and possible preventive measures in road safety policies. Generally, causes and preventive measures are sought in human behaviour, road infrastructure and vehicle characteristics (SWOV, 2010). Publications other than this thesis provide an extensive overview of the causes of accidents and of preventive measures (CROW, 2009; Elvik et al., 2009b; European Union, 2009; SWOV, 2007a; Wegman & Aarts, 2006).

Three concepts are elaborated on in *Chapter 2*: knowledge, use and the two worlds of science and policy. For a clear understanding of the present chapter, it suffices to highlight a few points. The word 'knowledge' refers to various kinds of knowledge related to road safety in this chapter, including articles in scientific journals, research reports, fact sheets, statistics, conference papers et cetera. *Chapter 2* provides a more detailed definition and in the various chapters, the exact type of knowledge meant is stated. The same applies to the word 'use'. Different kinds of use are referred to in this chapter, ranging from reading an article to implementing road safety measures based on scientific recommendations. *Chapter 2* provides a classification of types of knowledge use. The *Chapters 4 to 8* each indicate the precise type of knowledge use relevant for that chapter. *Chapter 2* also elaborates on the 'two worlds' concept (Caplan, 1979). For the moment, it suffices to mention that my own observations in the knowledge and policy worlds have been that policy-makers and scientists regularly refer to themselves and the others as 'them and us' and voice their surprise about their different frames of reference.

### **1.3. Three examples of science and policy disparity: processes and patterns**

Over the years, I have collected several examples of knowledge provision that did not sufficiently address policy questions, and of scientifically sound research being ignored by policy-makers. Three examples which shed light on the use of knowledge in different circumstances are sketched below. They show that reasons for not using knowledge can be found in policy processes, but also in institutional patterns in which the knowledge and policy worlds are embedded.

### **1.3.1. National statistics are not sufficient for local policy**

Road safety is commonly measured in terms of road deaths and serious road injuries. In the Netherlands, these figures are presented yearly at national level (most recent figures: 640 road deaths in 2010 and more than 18,000 serious road injuries in 2009), per province and per municipality. The figures are provided by Statistics Netherlands (CBS) and by the Centre for Transport and Navigation (DVS) of the Ministry of Infrastructure and the Environment (hereafter: Ministry of Infrastructure).

The statistics, presented on various scale units with the municipal level as the lowest, are not always helpful. The city of Amsterdam, for instance, mentioned three major criticisms of road safety statistics in 2004 and 2005. Firstly, that national statistics were unreliable, due to under-registration. Secondly, that for detailed management it was important to establish on which road section the registered accident took place. Thirdly, that the number of road deaths and serious road injuries at a local level were too small to provide a basis for policymaking:

When a check of these figures was carried out, a considerable under-registration was discovered. However, AVV (*now DVS, CB*) is not willing to correct the figures. The City Council now uses the accident statistics of the police who made an exception in allowing this. Another criticism is the fact that for the last two years, the AVV attributes the accidents to the middle of the road sections. With this, it is impossible to distinguish clear black spots and accidents near an intersection are not clearly visible. We are considering watching and counting at intersections again ourselves. Amsterdam uses the total number of injured in policy plans, instead of road deaths and serious road injuries because these latter figures are too small for policymaking purposes.

*Conversation with Mr. Wolters, municipality of Amsterdam, 15 December 2006*

### **1.3.2. We do not want insight into road safety expenses**

Recent SWOV research (Goldenbeld et al., 2010; Jagtman, Wijnen & Bax, 2010) aimed to gain insight into the road safety expenses of provinces and municipalities. A questionnaire sent to two provinces and municipalities in a pilot study, revealed to the researchers that provinces and municipalities did not have information on road safety expenses available. They were unable to present an overview of the total spending on road safety in a particular year. Confronted with this, the researchers asked for the reasons for such omission, expecting to hear complaints of a practical nature such as administration problems, lack of time et cetera. Instead, most often they

found a striking disinterest in these statistics, since road safety measures were incorporated in the maintenance and reconstruction policy processes.

One municipality expressed this as follows:

"Statistics on road safety expenses in the municipal budget are not available. The reason is that many road safety measures are part of an integral policy. Most road safety measures are taken as a part of major reconstructions of roads so the cost of road safety measures is not calculated separately. Hence, it is not clear which part of the costs can be assigned to road safety and which to traffic flow, for example in the case of a roundabout. The alderman is more interested in presenting concrete road safety projects than in the financial figures for road safety. No-one in the municipal organisation ever asks for an overview of road safety expenses. Besides, the expenses can fluctuate greatly per year. Finally, standardised budgets per unit (for example per running metre) are often used for major maintenance projects. Minor road safety measures are included in these."

*Interview with Mr. Knippenberg and Mr. van Overbeeke, municipality of Bernheze, 8 June 2009*

### **1.3.3. "Draconian measures", that are scientifically sound**

In 2001, SWOV formulated proposals for a speedy reduction of road deaths (Wegman, 2001). A series of measures was presented which, in addition to the governmental draft-National Traffic and Transport Plan, would result in a reduction in the number of road deaths by 700, from 1100 in 2001 to 400 in 2010. One series of measures had been directed at novice drivers, containing two controversial measures: a ban on taking passengers and one on driving at night. SWOV calculated the benefits of this last measure at 40 fewer road deaths per year (Wegman, 2001, p. 83-84).

SWOV was aware that the measures were controversial, as reflected in a sentence in the introduction of the report (Wegman, 2001, p. 18):

"SWOV has not gone into the question of the extent to which 'laws and practical objections' stand between 'dreams and deeds'."

SWOV presented the report in the Committee of Transport, Public Works and Water Management of the Dutch House of Representatives.

The political reactions to these two measures were destructive. The then Minister of Transport, Ms Netelenbos, called the measures "draconian" (Bax, 2006, p. 38) and "at the very least premature" (Tweede Kamer, 2002, p. 6). In an interview with SWOV, she stated the following about the ban on driving at night for novice drivers:

"No politician will do it. I will not do it. I think it's nonsense, and the same applies to "they are not allowed to take passengers on board". These are ridiculous proposals."

*Interview with minister of Transport, Ms. Netelenbos, 28 February 2002*

There were other negative reactions to the proposals. The MP Ms Giskes from a liberal party, D66 stated (Tweede Kamer, 2002, p. 5):

"However, bans (...) are not very appealing and for this reason undesirable".

#### **1.3.4. Comparing the three examples**

The reasons for the non-use of knowledge in these examples can be approached from two levels of analysis: reasons linked to policy processes on the one hand, and those linked to the institutional setting of the road safety field, in particular to the relationship between knowledge-producing and policy-making institutions on the other. Various reasons for non-use related to the actual policy processes are mentioned in the examples. In general, the knowledge available does not conform to the needs in the policy processes. In the first example, the knowledge is not sufficiently detailed to be of use in policy processes. In the second, the policy process does not require the knowledge, because road safety is integrated into road maintenance policy. In the third example, the knowledge provided did not gain public support, and was therefore not used in the policy process.

The examples also highlight reasons that do not lie within the policy process itself, but in the institutional setting of the knowledge and policy field, the fixed patterns of interactions between knowledge and policy organisations in the road safety field. In the first example, the accident statistics were provided by national institutions, possibly not informed about the need of municipalities for detailed figures. In the second case, the knowledge was provided by an organisation aimed exclusively at researching road safety, and possibly not sufficiently recognising the trend of integrating road safety into traffic policy at a municipal level. The third case showed the different worlds that science and policy inhabit: a scientific world where scientific standards and cost-effectiveness are rated highly versus a political world oriented towards public support.

This thesis assumes that, for a full understanding, an analysis of knowledge use by examining both policy processes and institutional patterns is necessary. The following sections explain that some chapters in this thesis focus on analysing the institutional context and others on analysing policy processes, taking the institutional context into account.

## 1.4. Processes and patterns: research questions

Several differences between knowledge provided by science and that used in policymaking were presented in the examples above. The question is: why is knowledge sometimes not used? Although these examples suggest a non-use of knowledge, it must be investigated whether this, in fact, is the case. Therefore, the central research question of this thesis can be formulated as follows:

*What are the reasons for possible non-use of knowledge in Dutch road safety policy processes?*

To gain insight into this question, the present thesis investigates the use of knowledge in policymaking, possible barriers to and ways to improve knowledge utilisation. The central question can be thus unfolded into three sub-questions:

- *To what extent is knowledge used in Dutch road safety policy?*
- *Which barriers are there to knowledge use in Dutch road safety policy?*
- *How can knowledge use in this field be increased?*

As stated above, barriers both in policy processes and in the institutional setting are considered in this thesis. *Chapters 6 to 8* study the use of knowledge in provinces and municipalities in concrete road safety policy processes. They focus on the extent to which knowledge is used in policy and on barriers to knowledge use by examining various policymaking processes on road safety. Theories of knowledge utilisation are used to interpret these process-related barriers. However, the process-related barriers may not be the only barriers that hinder the use of knowledge in policy. Some authors (see for example Guba & Lincoln, 1994; Kroes, 1996; Rosenberg, 1995; Rosenberg, 2007) stress the importance of the institutional relations between knowledge institutions and policy organisations, and the changes over time in these relations. *Chapter 4* therefore, looks into the institutional setting of knowledge and policy institutions in the Dutch road safety field. Theories of institutionalisation and changes in institutions over time are used to describe and interpret the relations between knowledge and policy organisations.

## 1.5. Orientation in scientific approaches

As indicated above, this thesis approaches the topic of road safety from an administrative sciences perspective. For readers not familiar with this

perspective, this section explains the position of the thesis in a broader discussion on the philosophy of science.

Without embarking on an exhaustive discussion of the various philosophical schools (Parsons, 1997, p. 71 and further; Rosenberg, 1995, p. 24-25; Rutgers, 1993, p. 29 and 201-213; 2004, p. 206-214; Van Vucht Tijssen & Van Reijen, 1991), two mainstream ways of thinking about science can be distinguished. The rationalistic, also known as (post)positivistic or nomothetic paradigm to science has been dominant in science, especially in the natural sciences, but also in other disciplines, such as psychology. In this rationalistic paradigm, the existence of one cognisable reality with one frame of reference, one scientific method and one scientific language in which knowledge is communicated are common assumptions. The demonstration of laws or patterns through verification or falsification of causal relations or statistical probabilities is its most important basis. Opponents of this model, often indicated as supporters of the hermeneutic, *verstehende* or interpretative paradigm, to be found mainly in the humanities and the social sciences, state that the nomothetic explanation model is not appropriate to the study of social behaviour. In their view, social behaviour is a fundamentally different subject of study to nature. From this, they conclude that the humanities and the social sciences do not have a single, objective reality and they emphasise the constructed nature of social phenomena. In addition, they claim a strong relationship between everyday language in social behaviour and scientific language. Formal definition thus plays a less important role than it does in the rationalistic tradition. In the hermeneutic vision, social behaviour is partly due to the concepts and interpretations of the actors themselves. These concepts and interpretations thus partly define the collection of data for research. Scientists therefore should understand the observed actions in social reality and interpret the actions in the meaning and the social context of the actor, such as his conventions and assumptions about society (Parsons, 1997, p. 71 and further; Rosenberg, 1995, p. 24-25; Rutgers, 1993, p. 29 and 201-213; 2004, p. 206-214; Van Vucht Tijssen & Van Reijen, 1991).



The two main paradigms can be summarised as in *Table 1.2*.

Rationalistic paradigm	Hermeneutic paradigm
Causality	Intentionality
Deduction	Understanding, interpretation
Explanation and predictions	Detailed or 'thick' description
Testing	Exploring
Laws in regularly appearing phenomena	Analysis of the unique, the distinguishing

**Table 1.2.** Characteristics of the rationalistic and hermeneutic paradigm.

What is the Dutch administrative sciences position on these paradigms? Administrative sciences is a broad discipline, in which both supporters of the rationalistic (in the Netherlands for example Hoogerwerf, 1993) and of the hermeneutic (in the Netherlands for example Kreukels & Simonis, 1988) paradigm can be found. Lehning and Simonis (1987, p. 9-20; see also Van Braam, 1989, p. 71) relate the two scientific paradigms to two approaches in the Dutch administrative sciences. These are the actor approach, also called the subjective or policy analytical approach and the observer, context- or social science approach (Den Hoed & Salet, 1987; Van Doorn, 1988). The actor approach can be understood as research from the perspective of the policy actor. An example is the study of the instrumental behaviour of the government to investigate the relationship between the goal of policy and the means or policy instrument used. This approach has a neo-positivistic (rationalistic) interpretation of science. Causal relations, e.g. the effect of a policy, laws and emphasis on effectiveness, efficiency and applicability are important characteristics. This type of research seeks factors that advance or hinder the achievement of a certain goal.

The observer approach does not focus on policy itself, but studies policy as a social phenomenon, as an institutional arrangement. Policy is thus the product of an institutional constellation and, as such, embedded in a social and historical context. Not only effectiveness and efficiency considerations appear to be important in the choice for a policy, but also the balance of power, interests and cultural interpretations. In this approach, attention is drawn to plurality of values and meanings. A rational or objective paradigm is less suitable here, but an understanding or *verstehende* paradigm is.

The present thesis addresses both approaches in the administrative sciences. As the title of the thesis indicates, both knowledge use in policy processes and institutional patterns of knowledge providing and knowledge use are investigated. In *Chapters 6, 7 and 8* specific policy processes are examined. Factors that promote and hinder knowledge use from the perspective of the policy actors (province, municipality) are sought. These characteristics are associated with the actor approach in administrative sciences, and the underlying scientific paradigm can be typified as rationalistic. *Chapter 4*, however, is an institutional analysis of the road safety knowledge and policy field. The patterns in the knowledge and policy world are placed in and interpreted from a social and historical context and actors, interests, and balance of power are taken into account. These elements are characteristics of the observer approach and the chapter thus has a more hermeneutic underlying perspective. Readers may notice the difference in focus, approach and language here. *Chapter 9* attempts to bring the rationalistic, policy process orientated approach and the more hermeneutic, institutional orientated approach together.

## **1.6. Relevance of this thesis**

This thesis aims to be both scientifically and practically relevant. From an empirical point of view, research into knowledge use in road safety is relatively new territory. Reasons for using or not using road safety knowledge in policy processes have been under-explored so far. A better use of scientific knowledge may bring down the number of road deaths further. From a scientific point of view, this study is relevant because it combines research into process barriers from the knowledge utilisation literature with research into the influence of the institutional context of knowledge use. A connection between the institutional setting and the process of policymaking is made by combining an historical analysis in *Chapter 4* and empirical studies on traditional knowledge utilisation barriers in the *Chapters 6 to 8*, while the literature review in *Chapter 5* illustrates to what extent this combination represents a novel approach.

In practical terms, this thesis aims at providing tools for policy-makers and knowledge institutions that will help them improve the knowledge-policy interface. It includes suggestions for cooperative ventures, and for the presentation and circulation of knowledge needs among knowledge providers and knowledge users.

## 1.7. Outline

This thesis contains nine chapters and is set out as follows.

*Chapter 2* provides a theoretical framework, using theories on institutionalisation and knowledge utilisation to give insight into the relationship between knowledge providers and knowledge users. This chapter also gives an overview of studies that have investigated barriers to the use of knowledge in policymaking processes. In the empirical *Chapters 4 to 8*, these theories are used to analyse and interpret the results.

*Chapter 3* describes the methods used in the various empirical studies in the *Chapters 4 to 8* in general. Detailed methodological accounts are to be found in the respective chapters.

*Chapter 4* examines the institutional patterns of Dutch road safety policies and knowledge production in this field. It highlights consecutive episodes in knowledge-policy developments and the changes in interaction between the agencies involved. It also shows how institutional relations influence knowledge use in road safety policy and identifies some important institutional barriers. The historical institutional analysis runs from 1900, especially from 1945, up to the present.

*Chapter 5* presents an overview of existing studies on knowledge use with respect to road safety, both in and outside the Netherlands. Barriers to knowledge use are investigated at an institutional level and at a concrete policy processes level. Furthermore, in order to position the present endeavour historically the chapter examines how these two levels were connected in the past.

*Chapters 6 to 8* provide studies on knowledge use in policy processes and on process-related barriers that impede knowledge use. *Chapter 6* focuses on knowledge use and barriers to knowledge use in Dutch provinces, especially in the policymaking process regarding infrastructural measures on 80km/h-roads. *Chapter 7* tests the existence of some specific barriers to provincial knowledge use in an experimental setting. *Chapter 8* studies the use of knowledge and reasons for non-use in Dutch municipalities, especially in policymaking processes with regard to designing infrastructural measures for 60km/h-roads. These chapters analyse several concrete barriers to

knowledge use in policymaking processes, taking into account the impact of the institutional setting on knowledge use in provinces and municipalities.

*Chapter 9* brings together the theories and study results regarding institutional relations between science and policy, and process-related barriers to knowledge use in policymaking processes. It also suggests possible improvements at both institutional and process levels for a better understanding between knowledge and policy.

## **2. Theoretical account**

### **2.1. Introduction**

Given the research questions as formulated in *Chapter 1*, theories necessary to interpret the empirical research in later chapters are centred on one theme: the use of knowledge in policy-making. This chapter deals with theories originating in two distinguishable perspectives. To investigate the process of knowledge use in policy-making, theories about barriers to the use of knowledge in policy processes are described. To study the context of knowledge use, theories about the institutionalisation of the knowledge and policy field are examined.

The first section below (*Section 2.2*) focuses on the process perspective of knowledge use. It deals with the definition of knowledge and the different analytical models for analysing and assessing knowledge use in policy processes. It also discusses the knowledge utilisation literature, emphasising barriers to using knowledge in policy-making. *Section 2.3* examines the institutional perspective of knowledge use and the concept of institutionalisation, providing a descriptive framework for the institutional context of knowledge production and use. *Section 2.4* concludes with the relevance of these theories when reformulating the research question formulated in *Chapter 1*.

### **2.2. Analysis at process level: theories of knowledge utilisation**

This section defines knowledge and knowledge use and gives an overview of studies that have looked at barriers to knowledge use.

#### **2.2.1. Definitions of knowledge**

Prior to reviewing the various types of knowledge utilisation and conditions for knowledge use, it is important to define the word knowledge. It is remarkable that knowledge is often not defined explicitly in the literature on knowledge utilisation (Landry, Amara & Lamari, 2001b; Lester, 1993; Oh & Rich, 1996). Moreover, the publications that do define knowledge often use very broad ones.

Edelenbos (2000) has compiled the following list:

- Data: loose, unstructured data
- Information: data ordered in a way that makes sense
- Knowledge: information consolidated in a person or organisation
- Wisdom: a combination of knowledge, experience and intuition

This fits in closely with the distinction made by Knott and Wildavsky (1980, 548): "By information we understand data arrayed to make a difference as to whether a decision is made and what shape it takes. Knowledge specifies the relationship between variables and consequences; information relates to variables to effects but the relationship remains hypothetical, untested by the results of actual decision. Knowledge is, therefore, a definitive statement of what will happen; information is an educated guess".

What these two definitions have in common is that they both refer to knowledge as something structured or ordered in a sensible way and as something more or less fixed. Therefore, in this thesis, a combination of these definitions will be used by defining knowledge as structured, carefully considered information.

Some authors distinguish types of knowledge. Veenman (2008, p. 21), for example, differentiates between hard and soft knowledge. The former refers to more technical knowledge, the latter to ideas, concepts and discourses. A more common distinction is the difference between scientific knowledge and lay knowledge. Scientific knowledge can be defined as knowledge derived from empirical scientific research. What is classified as such, is determined by the scientific world using concepts as Popper's falsifiability (Gieryn, 1995; Kroes, 1996, p. 13-30), and a peer review system to demarcate the boundary between science and non-science. In this definition, lay knowledge can be defined as all knowledge that is not scientific, since it does not comply with methodological standards.

A third distinction can be made, namely between pure scientific knowledge and applied scientific knowledge. Several authors define pure science as science restricted to theoretical or abstract aspects, not aimed at practical demands, and applied science as an application of science, used in practice or to solve practical problems (Gieryn, 1983; Merton, 1949; Sabey, 1991). Applied science can be distinguished from pure science by the fact that the former is linked to a specific environment. Pure science describes basic objects, relations and causes, whereas applied science customises this

knowledge for a certain knowledge field and stresses the practical application of the knowledge. Several authors, however, stress that the demarcation is not as strict as described above (Gieryn, 1983; Merton, 1949; Sabey, 1991). Pure scientific knowledge consists of peer reviewed articles in scientific journals. Applied scientific knowledge less often consists of peer reviewed articles, but often of 'grey' literature, i.e. reports, working papers, congress contributions and fact sheets from research organisations, research committees or research groups.

With respect to the use of knowledge, most studies into process barriers do not make clear whether they investigate barriers to the use of fundamental scientific knowledge or applied scientific knowledge. Only Oh and Rich (1996) mention this distinction in their article, indicating that it could make a difference in knowledge use and in type of barriers that might be relevant. However, none of the studies excludes applied scientific knowledge, or other types of knowledge, from their barrier typologies, which makes it plausible that the barriers can also be relevant to the use of applied scientific knowledge.

This thesis investigates the use of knowledge in road safety policy in the *Chapters 4 to 8*. The mere fact that the *use* of knowledge is studied implies that the thesis considers applied scientific knowledge. In addition, *Chapter 8* studies both applied scientific knowledge and lay knowledge.

### **2.2.2. Definitions of knowledge use**

Contrary to the definition of knowledge, the definition of knowledge use has been widely discussed in the knowledge utilisation literature. Various authors have created classifications of knowledge use, reflecting the different views on knowledge of producers and users. This section gives an overview of definitions of the term 'knowledge use' and continues with a classification of knowledge use.

#### **Knowledge use: definitions**

'Knowledge use' can be defined and assessed in two ways: as an outcome and as a process (Rich, 1997). In the first case, the actual influence of knowledge on the outcome of the policy process is looked at. In the latter case, the outcome of the process is not relevant to the definition of use, only the fact that knowledge has a function in the policy process.

To assess the extent to which knowledge is actually used in a policy process, Knott and Wildavsky (1980) have distinguished an ascending ladder with seven levels on which knowledge can be used. Knowledge can merely be received by decision makers ('reception', the report lands on the desk), or it can be read and understood ('cognition'). Knowledge can also be cited in policy reports ('reference'). As soon as decision makers make an effort to adopt knowledge in their policy, it is called 'effort'. Knott and Wildavsky use the word 'adoption' to indicate the influence of knowledge on the policy outcomes. Finally, 'implementation' is seen as influenced policy that is actually executed. The word 'impact' is used to denote whether the executed policy has shown the desired effects. The table below illustrates this ladder.

Stage	Name	Description
1	Reception	Practitioners and professionals concerned have received the research results
2	Cognition	The research reports are read and understood by the practitioners and professionals concerned
3	Reference	The work is cited as a reference in the reports, studies and strategies of action developed by practitioners and professionals
4	Effort	Efforts are made to adopt the results of the research by practitioners and professionals
5	Adoption	The research results are adopted within the choices and decisions of practitioners and professionals
6	Implementation	The policy that has adopted the research findings is implemented
7	Impact	The policy that has adopted the research findings shows the desired effects

**Table 2.1.** Stages of the ladder of knowledge utilisation based on Landry et al. (2001a), Lester (1993) and Knott and Wildavsky (1980).

Rich (1997) favours this process perspective on knowledge use, distinguishing three moments of knowledge utilisation: on picking up the information, on processing the information and on applying it in a policy-making process. These three moments are distinguishable forms of knowledge use.



The *Chapters 4 to 8* investigate the various stages of the ladder of knowledge use in concrete road safety policy processes in Dutch provinces and municipalities.

### **Different types of knowledge use**

Various authors (see for a recent overview: Blake & Ottoson, 2009; and further Engels, Hisschemöller & Von Moltke, 2006; Hisschemöller et al., 1998; Hoppe, 2003; Weiss, 1977) have distinguished classifications of different types of knowledge use in policy processes. Four main types of knowledge use can be derived from these studies. Firstly, knowledge can be used instrumentally, with scientists as problem solvers. Producers deliver their research data routinely; policy-makers use knowledge for making concrete, often small-scale, decisions and as legitimisation of established policy plans. Secondly, knowledge can be used conceptually by signalling new or unsolved policy problems. Scientists influence the policy agenda and 'enlighten' politicians hereby. In such cases scientists are idea producers or problem spotters. Thirdly, knowledge can be used strategically, to legitimise the opinions of policy-makers and politicians. Knowledge producers can then be described as ammunition suppliers or advocates. Knowledge is used selectively by policy-makers and its only goal is the legitimisation of political statements. Fourthly and lastly, knowledge can be used to resolve policy conflicts, with knowledge producers in the role of mediator. Policy issues causing conflicts can be depoliticised by turning a political question into a technical one. Observing policy issues in a more general and abstract way and taking into account long-term perspectives helps scientists to play a mediatory role.

These four types of knowledge use in policy processes can be related to another typology, one that characterises policy problems along two axes (Hisschemöller & Hoppe, 1995; Hoppe, 2002a). Hoppe distinguishes four types of policy problems, classified on two dimensions. Firstly, the consensus about the norms and values concerning policy problems can be strong or weak. Secondly, the knowledge necessary to solve the problem can be certain or uncertain. Hoppe does not explicitly define certain and uncertain knowledge, but it can be assumed that certain knowledge can be described as scientifically tested knowledge, and uncertain knowledge as not (yet) scientifically tested knowledge. This results in four groups of problems, as the table below presents.

	Certain knowledge	Uncertain knowledge
Consensus about values	Structured problems	Moderately structured problems/goals
No consensus about values	Moderately structured problems/means	Unstructured problems

**Table 2.2.** Four types of policy problems (based on Hoppe, 2002a).

Structured problems are typified by a consensus about norms and values, and their solution requires certain knowledge. Unstructured problems are the opposite, with no consensus about norms and values, and uncertain knowledge available to solve them. In moderately structured problems, there can be consensus about the values and goals, but not about knowledge and means. Conversely, there can be disagreement about values and goals, but agreement about the knowledge and means of solving the problem.

Several authors (Engels, Hisschemöller & Von Moltke, 2006; Hisschemöller et al., 1998; Hisschemöller & Hoppe, 1995; In 't Veld, 2000) have made a connection between the types of problems and the kind of knowledge use, as shown in the table below. They claim that every type of policy problem requires a specific type of knowledge use and provides scientists with a specific role.

	Certain knowledge	Uncertain knowledge
Consensus about values	Structured problems: knowledge can be used instrumentally, scientists are problem solvers	Moderately structured problems/goals: knowledge can be used strategically, scientists are ammunition suppliers
No consensus about values	Moderately structured problems/means: knowledge can be used to reconcile, scientists are mediators	Unstructured problems: knowledge can be used conceptually, scientists are idea producers

**Table 2.3.** Relationship between types of problems and kinds of knowledge use (based on Engels, Hisschemöller & Von Moltke, 2006; Hisschemöller & Hoppe, 1995).

The authors link instrumental knowledge use to structured problems. These problems have a clear goal, a limited knowledge supply, political consensus and one responsible actor. In this case, scientific knowledge can be used

almost linearly to solve a technical problem. A strategic use of knowledge is linked to moderately structured problems with agreement about their goals, but not about the effect and efficiency of the means. Hoppe calls these problems 'moderately structured/goals'. Therefore, the political contribution is substantial and scientific knowledge is used strategically. A third type of knowledge use is a pacifying use of knowledge. In moderately structured problems, where there is disagreement about the ethical component of the problem ('moderately structured problems/means', according to Hoppe), scientific knowledge can resolve conflicts. The input of knowledge depoliticises the issue by stressing the technical complexity of the problem. Lastly, Hisschemöller et al. distinguish conceptual knowledge use. When a problem is unstructured, there is much uncertainty and/or disagreement about values and knowledge of the problem. Scientific knowledge can help to structure these problems.

These distinctions are sufficiently operationalised to be applicable to Dutch road safety policy processes. The various empirical chapters investigate which forms of knowledge use are present in the road safety policy field and which role(s) science plays. Furthermore, *Chapter 9* characterises road safety along the lines of the four types of policy problem discussed above.

### **2.2.3. Barriers to knowledge use**

A large body of publications focuses on the process of knowledge use and non-use. Most of these publications concentrate on ways of improving the use of knowledge in policy. Their overall premise is the rationalistic idea that use of knowledge in policy processes is important for improving the policy. Some authors focus on the process side of knowledge use and have investigated empirically the specific conditions that have hindered or stimulated knowledge use in concrete policy processes (Irwin, 1995; Kasemir et al., 2000; Kasemir et al., 2003; Van Tatenhove & Leroy, 2003). Others express a vision on how patterns of relationships between science and policy hinder or stimulate knowledge use, thus emphasizing the institutional side of knowledge use (Huberman, 1994; Landry, Amara & Lamari, 2001b; Weiss & Bucuvalas, 1980).

An inventory of the most frequently researched conditions for knowledge use was made. Although a classification is always more or less an arbitrary choice, the inventory revealed that the conditions fell into four groups. The first two groups focus on concrete policy processes, the other two on institutional influences. The first group consists of dissemination conditions;

explaining the usefulness of knowledge to policy-makers would increase the use. The second group of conditions tries to link the knowledge to the needs of the knowledge users to improve the knowledge use. A third group suggests that the co-production of knowledge by both the knowledge producers and knowledge users will increase use. The last group focuses on contextual or institutional conditions that increase or decrease the use of scientific knowledge by policy-makers. The following four sub-sections discuss these four groups of knowledge use barriers more extensively.

### **Dissemination conditions**

This group of barriers stresses the dissemination of scientific knowledge during the policy process. The assumption here is that scientific knowledge is useful to policy-makers. If knowledge is not used, then it is not the knowledge that is to blame; the knowledge is simply not distributed or explained properly to policy-makers. The possibly somewhat naïve assumption is that policy-makers will be convinced of the usefulness of knowledge if more dissemination effort is made. Several authors stress that dissemination efforts are crucial to improving the use of knowledge in policy processes. Dissemination efforts could consist of communication and explanation but also of the popularisation of research. Both the strategy used and the amount of time spent determine the degree of use (Huberman, 1994; Landry, Amara & Lamari, 2001b; Weiss & Bucuvalas, 1980). Intermediaries can be mobilized during the policy process (Dunn, 1980).

### **The needs of users**

The needs of users during the policy process determine three criteria which knowledge should meet: the form the knowledge is to take, the content of the knowledge and the degree of confidence in the knowledge and the scientists.

The first criterion is that the form of the knowledge should correspond to the expectations of the users, in most cases policy-makers (Dunn, 1980; Huberman, 1994; Landry, Amara & Lamari, 2001b; Weiss & Bucuvalas, 1980). This concerns the presentation of the knowledge, for example, whether it is oral or written; report, website, database or presentation; the readability. It also means that the scientific information has to arrive on time in the policy process, while each stage of the policy cycle has its own knowledge demands. For example, the structuring of problem definitions demands information about the nature and the dimension of policy problems while the evaluation of policy requires knowledge about the effects of the policy (Dunn, 1981; Jasanoff, 1994; Landry, Amara & Lamari, 2001b).

Furthermore, the content of the knowledge has to pertain to the question of practice (Jasanoff, 1994). The relevance, usefulness and feasibility of implementing the knowledge are crucial here. Specific and applicable conclusions may promote an instrumental use of knowledge (Dunn, 1980; Landry, Amara & Lamari, 2001b; Weiss & Bucuvalas, 1980). Furthermore, the subject matter of the study should correspond to the information needs of the policy-maker (Huberman, 1994; Landry, Amara & Lamari, 2001b; Oh & Rich, 1996; Weiss & Bucuvalas, 1980). The knowledge will be used even more if it reflects the opinion of the policy-maker (Huberman, 1994).

The third criterion is that the quality of the knowledge provided, in terms of its methodological reliability, must be guaranteed. The premises of the research must be clear and testable in practice (Huberman, 1994; Jasanoff, 1994; Weiss & Bucuvalas, 1980). This provides a basis for trust between the knowledge user and the knowledge producer. Policy-makers will not use the outcomes of research if they do not have confidence in them. The main basis for trust, the reputation of the scientists (Huberman, 1994; Oh & Rich, 1996; Weiss & Bucuvalas, 1980) can be increased by means of external evaluators (Dunn, 1980), who assess the reputation of the researchers and to vouch for the outcomes of research.

Recently, a new body of literature has focussed on evidence based policy. This concept, introduced by the Blair Labour government in the United Kingdom in the late 1990's (Productivity Commission, 2010), emphasizes the need for scientific knowledge in policy. The Blair government, but increasingly also governments of other countries (on road safety: Bax, De Jong & Koppenjan, 2010; Chapelon & Lassarre, 2010; Hauer, 2007; Schulze & Kofßmann, 2010), stress that their policy should be based on rigorous evidence, in addition to political knowledge and stakeholder opinions. The literature on evidence-based policy has a strong focus on the improvement of the quality of research and knowledge. Furthermore, it shares an interest in barriers to knowledge use with the knowledge utilisation literature. This thesis does not use the term evidence-based policy explicitly throughout the following chapters, although aspects of the concept could be recognised in descriptions of road safety policy in the *Chapters 4 to 8*. A broader definition of knowledge use is employed, which includes, but is not limited to evidence-based policy. The thesis for examples takes not only rigorous evidence into account, but also the 'grey literature' and knowledge from lay persons in *Chapter 8*.

### **Unilateral or co-production of knowledge**

This group of barriers focuses on existing patterns in the relationships between scientists and policy-makers. Several authors suggest that the worlds of science and policy are too far apart and should intermingle to increase the use of scientific knowledge in policy processes. They have argued for more and more frequent interaction between science and policy. According to Jasanoff (1994), negotiations between scientists and practice are important for this intermingling. Both have to remain in separate worlds because the authority of science would otherwise be at risk. Nevertheless, they have to negotiate the subject of research, the methods, the premises in the research, et cetera (also Hoppe, 2003). Other authors also stress the necessity of informal contact between scientists and policy-makers (Huberman, 1994; Landry, Amara & Lamari, 2001b; Lester, 1993). On the basis of his empirical research, Edelenbos (2000) (following Jasanoff, 1994) recommends involving one or two experts in the policy-making process, organising the information supply as a process and forging a clearer link with the policy-making process. The main advantage of this is that it offers a direct test of science on practice, which can generate new ideas on both sides, thereby leading to a better quality of policy-making.

Gibbons and Nowotny (Gibbons et al., 1994; Nowotny, Scott & Gibbons, 2001) state that scientific knowledge should not only be valid and reliable, but also socially robust. This means that knowledge should be socially accepted, relevant to society, and tested and accepted by the users. Also Funtowicz and Ravetz (1993) argue for the democratisation of science; an interaction process between science, society and politics in order to produce accepted knowledge as a kind of an extended peer review. These views can be seen as forms of co-production of knowledge, a way in which users can be involved in producing knowledge. De Bruijn et al. refer to this accepted knowledge as 'negotiated knowledge'; a form of knowledge in which information is no longer seen as facts, but as the outcome of negotiations between stakeholders and scientists. Knowledge has been negotiated when it has been accepted by stakeholders and can withstand the critique of scientists simultaneously (De Bruijn & Ten Heuvelhof, 1999; De Bruijn, Ten Heuvelhof & In 't Veld, 1998). If the stakeholders agree about the content of the knowledge, but the scientists do not, it will result in negotiated nonsense.

Several authors have argued for co-production in the knowledge process, especially in environmental policy. Irwin (1995) and Kasemir et al. (2000; 2003) state that stakeholders in a policy process, including members of the

public, want to know how scientific conclusions have been reached and what methods have been used. Even more importantly, they want to be involved in the knowledge production (see also Edelenbos & Klijn, 2005; Edwards, 1999; Hage, Leroy & Petersen, 2010; Leroy, 2007; Van Tatenhove & Leroy, 2003). Involvement of stakeholders in policy processes and in scientific assessments is necessary to accomplish a more successful implementation of the policy. Furthermore, for many policy problems, science is unable to deal with uncertainty or develop a complete and comprehensive description of the subjects involved (Kasemir et al., 2003). The use of local knowledge and the participation of members of the public (called 'citizen science' by Irwin, 1995) can be an extra input in the scientific research process (Pellizzoni, 2001; 2003), not to solve the intrinsic uncertainty, but to accommodate and appropriate it.

### **Contextual factors**

Some authors have investigated the effect of contextual factors on the use of knowledge empirically. Several authors (Hisschemöller et al., 1998; Lester, 1993; Oh & Rich, 1996) stress that knowledge should be in line with the type of policy problem, referring to the mutual dependency of the type of policy problems, both structured and unstructured, and the strategic position of knowledge and scientists as presented in *Table 2.3 (Section 2.2.2)*. Structured problems, for example, demand more instrumental knowledge; unstructured problems require more conceptual knowledge. The authors also state that contextual factors can play an important role in the policy process. For example, the number of actors involved in the policy process can hinder or stimulate the use of knowledge. The same applies to the question of whether the policy-making is influenced mainly by the formal decision maker or also by other actors. In addition, political consensus or disagreement on the policy problem can influence knowledge use.

The above section shows that the use or non-use of knowledge in policy processes is determined not only by the course of a concrete policy process, but also by existing patterns in the relationships between science and policy in a certain policy field. While the knowledge utilisation perspective regards these as contextual factors, other theoretical perspectives, such as the governance perspective, view them from an institutional perspective and would speak of institutional patterns. The latter perspective is discussed in the section below, thereby elaborating on the contextual or institutional factors by defining institutionalism and describing the institutional context of

science and policy. To prevent misunderstandings, the term institutional rather than contextual factors is used henceforth.

Whether the four barrier groups mentioned above are present in road safety policy processes and what their respective share is, is examined in the remainder of this thesis. This may determine whether they are relevant to the present thesis on the use of knowledge in the Dutch road safety field. Most studies mentioned above investigate the situation in the United States of America. It is clear that the institutional context in the USA differs from the Dutch context, and that this could influence the relevance of the barriers in the Netherlands. The Dutch road safety institutional context, therefore, is described extensively in *Chapter 4* and institutional barriers are specified for the Dutch road safety context. Furthermore, none of the studies mentioned above have been specifically applied to road safety. Most have been conducted in policy fields such as health (e.g. Oh, 1997; Oh & Rich, 1996), environmental policies (e.g. In 't Veld, 2000; Michaels, 1993; Ten Heuvelhof & Nauta, 1997), welfare, education, hazardous waste management, economic development (combined in Lester, 1993) and water management (e.g. Boogerd, Groenewegen & Hisschemöller, 1997), or are literature reviews without a focus on a specific policy field (e.g. Lester & Wilds, 1990; Neilson, 2001; Rich, 1997; Webber, 1991). *Chapters 5 to 8* examine whether these four barrier groups are also seen in road safety policy.

## **2.3. Institutional analysis: science-policy interfaces**

### **2.3.1. Institutionalisation**

Institutionalisation refers to a process in which social acts find a place and settle in institutions (Giddens, 1984; Van Tatenhove, Arts & Leroy, 2000, 18; Van Tatenhove & Goverde, 2007, 19). Institutions form a fixed pattern of acts and behaviour shown by actors because 'that is how it's done' (Peper, 1972, 51). Several authors (Hall & Taylor, 1996; Peters, 2005) distinguish three main approaches to institutionalisation. Rational choice institutionalism attributes the rise and decline of institutional arrangements to the decisions of actors behaving rationally. Sociological or normative institutionalism sees institutions ultimately as norms and values consolidated in structures, procedures and rules. Historical institutionalism states that developments in institutions are based on past experiences. The first type focuses on the influence of individual actors, whereas the two other types focus more on structures. This thesis will emphasise the structure-centred types of



institutionalisation to describe the institutionalisation in road safety policy. Furthermore, Van Tatenhove and Goverde (2007) distinguish internal and external institutionalism when discussing policies and their institutionalisation. Internal institutionalisation refers to a relatively fixed content and organisation pattern within and among governmental bodies. External institutionalisation refers to relatively fixed patterns, concerning not only the national government, but also local and regional governments, social organisations, the private sector, interest groups, citizens and knowledge organisations. This thesis examines both forms of institutionalisation.

### **2.3.2. A framework for institutionalisation of policy**

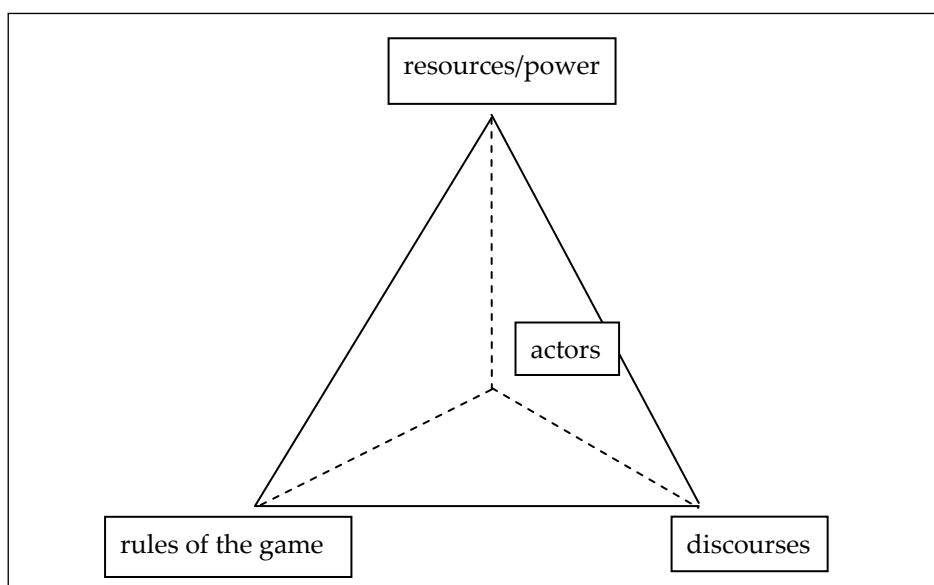
Institutionalisation, as described above, is a very broad concept. To recognize and describe institutionalisation in practice, in a concrete policy field like road safety, it is necessary to use a framework to operationalise this concept. The present study operationalises institutional patterns by means of the policy arrangement approach. This approach, developed at the Department of Political Sciences of the Environment at the Radboud University Nijmegen, emphasizes long-term developments and institutional relations in policy processes. It contains a series of concepts to describe stability and change in policy fields. It compels researchers to define clearly the subjects of their studies making it a particularly appropriate approach for this thesis.

The policy arrangement approach contains three central concepts. The first concept is the policy arrangement itself. A policy arrangement describes a (temporal) stabilisation of content and organisation in a policy field (Leroy, Arts & Van Tatenhove, 2003). By studying the changes in the policy arrangement, the policy arrangement approach offers a framework for understanding day-to-day policy practices in the context of long time changes or stability.

A policy arrangement consists of four dimensions (Arts & Leroy, 2006b; Van Tatenhove, Arts & Leroy, 2000, 56). The first dimension describes the actors in the arrangement and the coalitions they form. These actors can be part of the government, the private sector or civil society. In the second dimension, the balance of power between the actors is mapped out, as is the division of the resources between the actors. Resources can consist of people, budgets, competences, knowledge et cetera. The third dimension of the policy arrangement concerns the rules of the game upon which actors have agreed. Formal and informal rules determine the interaction between and the

prospects of the actors in the policy arrangement and the way they take decisions. These three dimensions all cover organisational aspects. The fourth dimension describes the discourse in the arrangement and is therefore not an organisational but a content dimension. Policy discourses are the opinions and accounts of the actors involved, expressed in problem definitions, solutions, norms and values (Arts & Leroy, 2006b, p. 14; Leroy & Wiering, 2007). Two types of discourse are distinguished: the substantial and the governance discourse (Crabbé, 2008, p. 40; Liefferink, 2006, p. 58). A substantial discourse discusses the problem definition of the policy and possible solutions. The governance discourse focuses on how to organise the policy field, i.e. which actor is responsible for which part of the policy, what are the strategies to be deployed, and what are the instruments to be used.

Finally, these four dimensions cohere: if one dimension changes, it is likely (but yet to be tested empirically) that the others do as well. Moreover, the dimensions are equal in principle: the policy arrangement approach does not appoint a dominant dimension. Each policy arrangement may have a different dominant dimension which can only be determined by empirical research (Meijerink & Van Tatenhove, 2007). The figure below shows the coherence of the four dimensions.



**Figure 2.1.** Four dimensions of a policy arrangement (Liefferink, 2006, p. 48).

The second central concept in the policy arrangement approach is institutionalisation. As stated previously, institutionalisation refers to the settling of more or less fixed patterns of interaction and problem definitions

within policy processes (Arts & Leroy, 2006b, p.13). At the same time, institutionalisation shows that these patterns might be fixed for a short period, while shifting over longer periods. The policy arrangement approach does not look solely at day-to-day policy processes, but tries to understand them in the context of long-term processes of stability and change over time. It focuses especially on the construction, deconstruction and reconstruction of institutions.

Initially, the policy arrangement approach used a third central concept: political modernisation. This concept concentrates on the context of the policy arrangement. Political modernisation was used as an umbrella concept for the fact or the assumption (there is only limited empirical evidence for this concept) (Bogaert, 2004; Crabbé, 2008; Padt, 2007; Van der Zouwen, 2006) that different political and social trends influence policy. Europeanisation, decentralisation, globalisation, individualisation and marketisation are some examples of these comprehensive trends. These trends influence day-to-day policy processes, but the reverse is also true as day-to-day policy processes lay the foundations of these trends (Arts & Van Tatenhove, 2006, p. 21). In fact, these trends are linked to a substantial field of literature on governance, and can be summarised in the term 'shifts in governance'. Wiering and Crabbé (2006, p. 103-104) distinguish three types of shifts: multi-actor, multi-level and multi-sector governance. The phrase 'multi-actor governance' is used for situations whereby not only state institutions develop policy, but where market and society are also and increasingly involved in policies. 'Multi-level governance' indicates a shift from policy-making on one governmental level (usually the national level) to policies on multiple, international and subnational, governmental levels. The phrase 'multi-sector governance' is used to describe the growing interaction between the policy field and related policy fields. Policy fields, such as road safety, are increasingly becoming facets of broader, more encompassing policy fields and less and less separate domains or sectors.

*Chapter 4* uses the policy arrangement approach to describe the long-term policy developments in road safety and the changes in knowledge and its interaction with policy developments. Henceforth, the concept knowledge and policy arrangement is used since this, and not simply policy arrangement, is what the thesis is concerned with. *Chapter 4* shows the developments in the actors involved, their resources, discourses and the rules of the game, in a context of possible shifts in governance trends.

### **2.3.3. The institutional context of policy-making, knowledge use and knowledge production**

Having discussed the policy arrangement approach in the previous section, knowledge and policy arrangements will now be discussed. This section deals with the institutional context of knowledge use and production, which consists of two main components: the scientific and the political world. The first subsection discusses the differences between these two worlds and their boundaries, starting with the 'Two Communities' metaphor, which focuses on the differences between the two worlds. Then the concept of boundary work is discussed, showing that the boundaries between policy and science are not strict at all. The second subsection describes new forms of organisation in the changing institutional landscape of knowledge and policy, and provides two typologies to describe the relationship between science and policy. The new forms are represented by the concepts Mode 2, focussing on new forms of the organisation of knowledge production, and Fifth branch, stressing the increasing role of advisors and experts as knowledge providers in policy-making. Two typologies for the relationship between science and policy are provided by Hoppe and Landry et al. respectively.

#### **Two Communities**

Researchers and policy-makers are sometimes described as inhabiting two separate worlds. Caplan (1979; Merton, 1973) sees a substantial difference in culture and institutional arrangements in the world of policy-makers and that of researchers. The language as well as the interests and reward systems differ substantially in these two worlds. This vision is called the 'Two Communities' metaphor. Caplan has found empirical evidence for this vision, namely that contacts between scientists and policy-makers are rare. He also adds empirical grounds for the statement that this gap is responsible for the non-use of information in policy-making processes (Caplan, 1979). A good deal of knowledge utilisation literature has been based upon this metaphor or similar metaphors such as 'bridging the gap' (for example: Dunn, 1980). Leroy (2007) has summed up the differences between science and politics in slightly different terms with regard to ambition, ethical and quality standards, information needs and methods for quality control in a convenient table.

	Science	Politics
Looks for	Truth	Power
Is driven by	Non-normative conviction	Normative conviction
Wants information with	Depth, focus on causes	Speed, focus on remedies
Wants information	In detail	In outline
Looks specifically for	Causes	Solutions
Quality based on aim for	Validity	Acceptance
And on aim for	Reliability	Feasibility
Method for quality control	Peer review	Public support

**Table 2.4.** Differences between science and politics (based on Leroy, 2007).

A growing group of authors, however, states that these worlds have been getting closer to each other, both on an ethical standards and organisational level since the 1960s. Policies are increasingly influenced by scientific findings, while science is losing its value free image. These trends were caused by three, more or less simultaneous, developments, the first stressing the fading boundaries between science and policy, the other two stressing the loss of the moral and factual infallibility of science.

The first development was the fading of boundaries between science and state. After World War II, governments increasingly attempted to give policies a scientific foundation. Experts in advisory boards and planning bureaus were asked to contribute to policy-making, and thus have been able to influence policies considerably. On the other hand, scientific organisations, such as research organisations, and their research agendas have been strongly influenced by state interventions (Driessen, Leroy & Van Vierssen, 2010; Leroy, 2007). At times, science has been incorporated into state institutions, and sometimes, governments have directly or indirectly financed private institutions. The "military-industrial complex" (Eisenhower, 1968) is a phrase that indicates a pronounced intermingling of science, state and technology. The worlds of science and politics are no longer strictly separate, but have become increasingly interwoven.

The second development, describing the fallibility of science, is the awareness of the amorality of science. Since World War II, the idea of a value free science has diminished. Nowotny (1980) notes the development of the atomic bomb, Hoppe (1999; 2005) the Shoah, the Gulag, the nuclear race and

the ecological crisis as events that have shown the public that science can be used for terrible things and therefore cannot be seen as value free. There has been a developing awareness that moral choices have to be made in science also, and in that sense, the world of science has become less different from the world of policy than was previously thought.

The third development also stressed the fallibility of science. From the 1970s onwards, there has been a growing awareness of the limits of knowledge. Issues such as nuclear energy and environmental pollution have proved increasingly complex and knowledge increasingly uncertain. Science has been and is still unable to resolve several of these societal problems, mainly because of the great uncertainties in risk analyses. In their post-normal science approach, Funtowicz and Ravetz (1993) state that problems in the present world are very complex. Common risk analyses cannot deal with the incalculably small risks in combination with the very considerable consequences seen in the policy problems mentioned above. This continuously prevents science from providing useful answers. As a result, and combined with technological incidents like Chernobyl, both citizens and politicians have lost faith in the abilities of science and technology (Collins & Evans, 2002; Irwin, 1995; Nowotny, Scott & Gibbons, 2003; Wynne, 1996). It has led to the conviction that science does not provide a single truth, and therefore, scientific knowledge is not principally different from non-scientific knowledge but only different in degree.

Due to these three developments mentioned above, science is no longer regarded as a source of legitimisation for policy, let alone the only one. On the one hand, the scientification of politics is evident because the abundance of scientific knowledge forces politicians to take decisions about the scientific possibilities. On the other hand, politicians demand knowledge to solve problems and to legitimise their decisions, thereby leading to the politicisation of science (Weingart, 1999). Although facts are uncertain and values are not shared by all actors (Hessels & Van Lente, 2008), politicians still have to take decisions on policy problems. This calls for a new, post-normal, form of science (Funtowicz & Ravetz, 1993) and for new forms of knowledge production and quality control.

In contrast to Merton (1973) and Caplan (1979), Guston (2001) and others state that no fixed, but only permanently negotiated borders exist between the worlds of science and policy. In the new forms of knowledge production, the worlds of science and policy mingle and scientists and policy-makers

cross the boundaries into each other's worlds. This boundary work (Gieryn, 1983; Gieryn, 1995; Halffman, 2003, p. 70; Hoppe, 2007) is a constant negotiation between science and policy about the borders between them. Negotiations can include knowledge questions, scientific assumptions, sources used in research or the handling of uncertainty. In this boundary zone, citizens and interest groups come together and demand access to knowledge, and more openness and transparency in science (Hoppe & Halffman, 2004). An interaction process between researchers, society and politicians is needed to provide accepted but still uncertain knowledge and to take a socially accepted decision. It is desirable, therefore, that stakeholders participate in policy-making and quality control.

*Chapter 4* examines in detail these two worlds in road safety policy, their interaction and whether policy and science indeed refer to themselves as two different worlds. The historical developments in their relationships are shown as well as the institutional patterns formed throughout the years. The historical analysis forms the context for the process analyses in the *Chapters 6 to 8*.

## **New forms of the production of knowledge and its transfer to policy**

### *Mode 1 and 2*

Gibbons et al. (1994) state that there has been a change in knowledge production due to a changing research environment (Nowotny, Scott & Gibbons, 2003). In addition to the considerable societal changes mentioned above, such as the awareness of the limits of knowledge in terms of morality and truth finding, and the negotiable boundaries between science and policy, they point out three other changes in the environment of knowledge production. Firstly, these authors have noted a change in the governance research. Universities can no longer decide on their research topics by themselves. Instead, finance generating institutes such as ministries and the European Union, increasingly either determine the conditions for research programmes or formulate programmes themselves. Secondly, Gibbons and Nowotny see an increase in the commercialisation of research. Universities, for example, seek alternative funding alongside public funding, and enter the market of commercial research and consultancies. Thirdly, they see a shift in the quality control system within science. Quality control has changed from a professional collegial responsibility to a quality control based on organisational and managerial competences.

In answer to this, the production of knowledge has taken on new forms. Knowledge is no longer produced only by disciplinary, hierarchical programmes in universities (Mode 1), but more and more in temporary, horizontal networks of universal, governmental and private organisations, which produce applied and multidisciplinary knowledge (Mode 2).

Nowotny et al. (2001; 2003) define the ideal type of the Mode 2 knowledge organisation in terms of the following five characteristics:

1. Knowledge is generated "within a context of application" (Nowotny, Scott & Gibbons, 2003, p. 186), which means with the explicit goal of using the results practically. This type of knowledge production should decrease the well-known gap between science and practice.
2. Knowledge is produced in trans-disciplinarity whereby a range of theories and methods are used to investigate a problem. Trans-disciplinarity is broader than interdisciplinarity, because it does not stem from or is not limited to existing research fields, but includes non-scientists.
3. Knowledge is produced at many different sites and by a great variety of organisations.
4. Mode 2 knowledge is more reflexive than Mode 1 knowledge. This means that the research has become a dialogue between researchers and research subjects. The consequences of research outcomes therefore cannot be placed outside science, because scientists influence the choice of topics, the design and thereby the use of their knowledge.
5. Mode 2 knowledge uses different forms of quality control. Instead of peer review, Mode 2 uses multiple definitions of quality, depending on the users of the knowledge.

Hessels & Van Lente (2008) summarise the differences between Mode 1 and 2 in the table below:

<b>Mode 1</b>	<b>Mode 2</b>
Academic context	Context of application
Disciplinary	Trans-disciplinary
Homogeneity	Heterogeneity
Autonomy	Reflexivity/social accountability
Traditional quality control (peer review)	Novel quality control

**Table 2.5.** Characteristics of Mode 1 and Mode 2.



Gibbons and Nowotny suggest an historical shift from Mode 1 to Mode 2 that took place gradually. It has been this historical claim, foremost, that has attracted much criticism over the years, resulting in some cases to an adaptation of the concept (Hessels & Van Lente, 2008; Nowotny, Scott & Gibbons, 2003). Various authors (Etzkowitz & Leydesdorff, 2000; Pestre, 2003; Rip, 2000) have criticized this long-term historical perspective. On the basis of historical research they claim that Mode 2 is not a new phenomenon, but has always existed, and may have been a dominant school of science in the past.

Although the time span of the historical institutional analysis in *Chapter 4* of this thesis is shorter than in the studies mentioned previously, it does assess whether road safety policy research has undergone a change from Mode 1 to Mode 2. If this is so, to what extent and with which outcomes? The latter is important when considering what the effect of the existence of these Mode 2 research on knowledge use might be. Nowotny et al. (2001; 2003) suggest that the latter knowledge is more closely related to the practical needs of its users, because it is co-produced, and therefore there is more interaction between knowledge users and the research population. Ideally, this would lead to reducing the differences between science and policy and would therefore improve the conditions for the use of scientific knowledge in policy.

#### *Fifth Branch*

In her book *The Fifth Branch*, Jasanoff (1994) points out an increased mixing of science and policy, a development at odds with the Two Communities metaphor. She reports on a growing number of increasingly complex tasks for government agencies in the USA post 1970. In addition to the idea that science is not omniscient and often produces uncertain knowledge, this growth of complex tasks creates an increasing need for specialist knowledge in governmental agencies, a need that these agencies meet in two ways. Government agencies engage more in the production and interpretation of knowledge and, thereby cross the policy-science boundary. Furthermore, governmental agencies invite scientists to join advisory boards to advise the government on specific issues, and in so doing to cross the border from science into the policy world. This has resulted in multifarious cooperation between scientists and policy-makers, creating not a boundary line, but a vast boundary zone between science and policy.

Consequently, the boundaries between science and policy have faded. That means that scientists have been forced to move beyond their mere scientific insights, weigh subjective interests in their recommendations for the government and thus make choices that are political in nature. Policy-makers on the other hand can no longer take scientific knowledge for granted, but have to weigh up this knowledge, decide on the basis of imperfect knowledge and, should there be disagreement on knowledge in the scientific worlds, they have to decide for themselves which knowledge to trust and use. This creates a 'fifth branch' of advisors and experts, in addition to the civil service, this being the fourth branch. Jasanoff states that the recommendations of experts are administrative and political rather than scientific, as is generally claimed. Experts and advisors are thus, in terms of Gieryn (1983; 1995) and Guston (2001), boundary workers, working on the boundary between science and policy.

What might be the effect of this emergence of a fifth branch on the processes and patterns of knowledge use? Jasanoff does not deal with this issue specifically, though, based on her observations, some assumptions can be made. The fifth branch fills the gap between science and policy. It 'translates' scientific knowledge for policy-makers and conversely, shows scientists the knowledge needs of policy. This would bring scientific knowledge and policy needs closer together and thus increase the use of knowledge in policy-making. However, the emergence of a fifth branch is not solely beneficial. A price has to be paid in two respects. Firstly, moving a part of the political policy-making to scientific advisory boards might diminish the democratic legitimacy of these decisions. Secondly, permitting policy-makers to take the ultimate decision about valid and useful knowledge means that this knowledge is no longer subject to the standard scientific quality control systems as such peer reviews. This could diminish the scientific legitimacy of this knowledge.

This thesis examines whether the new forms of organising knowledge and policy, referred to in the aforementioned literature, are present in the field of Dutch road safety policy. *Chapter 4* investigates whether road safety policy contains Mode 2 research, represents a fifth branch and/or boundary work.

#### **2.3.4. Two typologies for the relationship between science and policy**

The theories in the previous sections describe the relationship between science and policy in a broad, non-operationalised way, which makes it difficult to apply them onto concrete policy fields. Besides these difficulties,

the theories only mention the institutional side of knowledge use, and do not take the process perspective on knowledge use into account.

Several attempts have been made to integrate the process and institutional perspectives by describing the relationship between science and policy. Two approaches are discussed below. The first, presented by Landry et al. (2001b), focuses on science and policy as two different worlds, and discusses their interactions including their attempts to optimise knowledge use. The second, presented by Hoppe (2005), concentrates on types of boundary work, and stresses the negotiations that take place between science and policy on tasks and responsibilities.

### **A typology for interaction between science and policy**

Since the nineteen seventies, several authors have attempted to develop a well-defined typology for the relationship between science and policy. One of the first authors who made a division was Weiss (1977), followed by other authors who extended this typology. Landry et al. (2001b) has provided a good summary of these. In the course of time, the concepts of Mode 2, boundary work and the fifth branch have been taken into account when transforming the typologies. A compilation of these typologies is given below.

Landry et al. (2001b) distinguish between four interactive models in the knowledge utilisation theory. The 'science push model' conceives of knowledge utilisation as the "delivery of objective facts" to policy-makers – "speaking truth to power" (Wildavsky, 1987). Researchers determine their research issues independently and policy-makers are simply the recipients of knowledge. Factors that can influence knowledge use in this model are the quality of the research, for example, validity, reliability, content attributes, and the type of research, for example, abstract or general, quantitative or qualitative, fundamental or applied. According to the 'demand pull model', the users, or policy-makers, play an active role by asking for specific knowledge, and utilisation is explained only in terms of the needs of decision makers (Rich, 1991; Rich, 1997; Weiss, 1979). This leads to a customer-contractor relationship between policy and science. In this model, the use of knowledge is determined by the degree to which the outcomes of research correspond to the organisational interest of knowledge users. A third approach, the 'dissemination model' (Landry, Amara & Lamari, 2001b; MacLean, 1996), was developed in reaction to these two models. It emphasises the necessity of communicating the knowledge. Useful

knowledge should be identified and disseminated to knowledge users. In this model, the type of research results and the dissemination efforts determine the knowledge use. However, the knowledge users are involved neither in the research nor in the identification of useful knowledge.

The above-mentioned models assume an organisational separation of science and policy in accordance with the Two Communities metaphor, with either market principles (in the first and second model) or communication (in the third model) as the vehicles of exchange between them. The fourth model, named the 'interaction model', integrates the three models mentioned above and counters the criticism of the dissemination model. It states that interaction between researchers and users will increase utilisation of knowledge produced by the researchers (Dunn, 1980; Huberman, 1990; Jasanoff, 1994) and that this communication process is not linear, but rather disorderly. Communication should take place in all of the different steps of knowledge production, dissemination and utilisation.

In short, this can be summarised in the table below:

Model	Characteristics
Science push model	Science delivers objective facts to policy-makers
Demand pull model	Policy-makers ask science for specific knowledge
Dissemination model	Science actively disseminates knowledge to policy
Interaction model	Science and policy interact during each stage of the knowledge production process

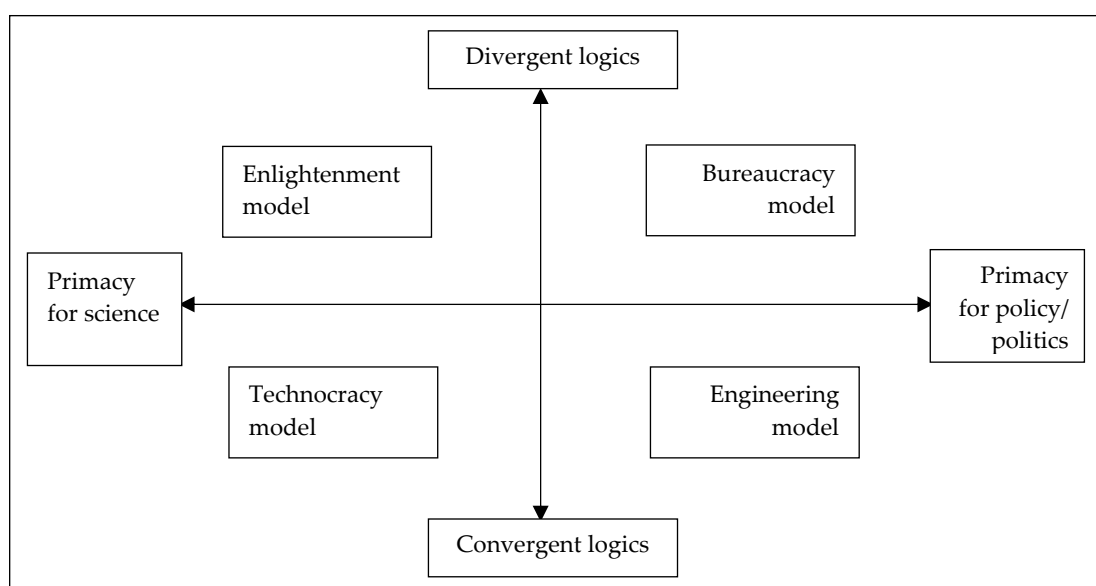
**Table 2.6.** Four models for interaction between science and policy.

*Chapter 4* investigates whether these four models describing the relationship between science and policy are recognisable in the various periods in road safety policy.

### **A typology for boundary work**

Hoppe (2002b; 2005) has developed another typology for the relationship between science and policy in order to further operationalise the concepts of boundary work. To distinguish types of boundary work, he uses two dimensions. The first dimension shows the primacy of science on the one side and the primacy of policy (or politics) on the other side. Types of boundary work can thus be ranged from types which let science dominate

over policy (the technocratic point of view) to types that let policy rule over science (the decisionist point of view). The second dimension contains opinions about the intermingling of science and politics. Hoppe (2005, p. 207) calls this the axis of "divergence or convergence between the operational codes of science and politics" and refers to the "two worlds or cultures or communities", a phrase that is reminiscent of Caplan's Two Communities metaphor. The divergence leg of the axis states that science and politics are two incompatible worlds with clear boundaries. The convergence leg states that the boundaries between science and politics are blurred, and, that while different, they serve similar functions in society.



**Figure 2.2.** Four models of boundary work (based on Hoppe, 2005).

The four quadrants created by the intersection of the two axes comprise four models.

1. The enlightenment model presupposes the primacy of science and emphasizes the divergence between science and policy. Scientists operate independently out of pure curiosity. Knowledge is rarely used quickly. In a process known as knowledge creep (Weiss, 1980), scientific knowledge slowly trickles down into the policy process by influencing the thinking of policy-makers, even though policy-makers often do not understand the finer details of the scientific knowledge. Scientists do not feel responsible for the use of their knowledge; this is the sole responsibility of politicians.
2. The technocracy model stresses both the primacy of science over politics, and the convergence between the science and politics worlds.

Their societal functions are the same and policy-makers have a good understanding of scientific knowledge. Therefore, knowledge can be more easily translated into policies. Taking this to the extreme, scientists can take the place of politicians to achieve a maximum de-politicisation of policy-making.

3. The bureaucratic model presupposes the primacy of politics over science and at the same time stresses the divergence between politics and science. In this model administrators use scientific knowledge according to their own understanding of it, and that is not necessarily the scientists' understanding. It is the administrator's task to gain an objective insight and not to trust scientific findings blindly, and to make a selection of the knowledge to use in policy. In this model, state institutions are often used for the production of knowledge.
4. The engineering model also stresses the primacy of politics over science, but here science is not incorporated into state institutions. In this model, politicians prescribe their knowledge needs to science and design research projects or use existing knowledge to solve policy problems together with scientists. The policy-makers have a good understanding of the scientific possibilities and therefore can steer the research agenda effectively.

What might be the relevance of these four models to knowledge use? The type of knowledge use and the degree to which it is used can be considered in the answer to this question.

With regard to the first issue, a connection between the four models and the extent to which knowledge is used in policy is plausible. The closer the worlds of science and policy, the more knowledge is likely to be used. This means that the models whereby science and policy have a convergent logic probably have a higher knowledge use than the models whereby science and policy have a divergent logic. Thus, knowledge is likely to be used more in the technocratic and engineering models than in the enlightenment model in which science and policy are far apart, and dissemination does not take place.

With regard to the second issue, Hoppe's four models do not seem to provide information about the type (instrumental, strategic, pacifying, conceptual) of knowledge use. Although it would seem plausible that the enlightenment model would have less or no instrumental knowledge because of the absence of dissemination efforts, instrumental use can take place in all other three

models. Strategic, pacifying and conceptual knowledge use do not seem to be restricted to one of the models. All in all, although the four models of Hoppe can be used to describe the knowledge-policy arrangement in a given policy field, they can predict the amount and type of knowledge use to a far lesser extent.

Since the two typologies of Landry et al. and Hoppe describe institutional settings within all kinds of knowledge organisations, it is plausible that the typologies can also be used to describe the institutional setting of the road safety field, wherein organisations for applied scientific knowledge play an important role. Therefore, the remainder of this thesis researches whether the new forms of organising knowledge and policy are identifiable in road safety policy. *Chapter 4* investigates whether road safety policy contains Mode 2 organisations, a fifth branch and/or boundary work. It also examines whether road safety policy and its scientific underpinning fit into the types of the knowledge-policy typologies from Landry and Hoppe and whether its types develop over time.

## **2.4. Research questions theoretically informed**

In *Chapter 1*, the general research question for this thesis was formulated as follows:

*What are the reasons for possible non-use of knowledge in Dutch road safety policy processes?*

This question was unfolded in three sub-questions:

- *To what extent is knowledge used in Dutch road safety policy?*
- *Which barriers are there to knowledge use in Dutch road safety policy?*
- *How can knowledge use be increased?*

The theories presented in this chapter help to answer these research questions. To answer the first question and the sub-questions, two paths will be taken.

The first path sets out the institutional point of view. *Chapter 4* gives an overview of the institutionalised patterns in knowledge and policy in road safety in the Netherlands. The present state of the knowledge and policy arrangement is described, as are the developments in the knowledge and policy arrangement over the years. The chapter analyses whether

institutionalised patterns in the relationships between knowledge providers and knowledge users can be determined; whether developments showing an intermingling of science and policy are present and whether the boundary between science and policy can be defined as a fixed line or as a boundary zone wherein policy and science negotiate the role division. The chapter will show whether Mode 2 organisations can be observed in the road safety field, whether the fifth branch is of considerable influence and whether the relationship between the road safety policy and the road safety knowledge organisations can be described in terms of Hoppe's and Landry et al.'s typologies. Changes over time in the relationship between the knowledge and the policy actors can point to shifts in governance, possibly showing evidence of multi-actor, multi-level and multi-sector developments. *Chapter 4* thus sketches the relevant institutional setting in the road safety policy field for the *Chapters 5 to 8*. Furthermore, the institutional patterns in the road safety knowledge and policy arrangement could reveal barriers for knowledge use in policy.

The second path focuses on the process point of view. *Chapter 5* gives an overview of the existing literature on use of road safety knowledge in the Netherlands and internationally. The chapter will examine which of the four groups of process-founded barriers (*dissemination conditions, the needs of users, unilateral or co-production of knowledge or institutional factors*) are present in this literature and what kind of knowledge use (instrumental, conceptual, strategic or pacifying) can be seen. *Chapters 6 to 8* provide case studies on processes of knowledge use. The classifications discussed in this chapter are used to describe the amount and type of knowledge use in the case studies. In each case, several process-related barriers are studied, both exploratory and in an experimental setting. The information brought together in these chapters and in *Chapter 4*, helps to answer the research questions and to integrate the process related and institutional point of view in the concluding *Chapter 9*.



### **3. Methodological account**

This chapter discusses the large variety of methods and techniques used in this thesis. It does so in general terms, as specific techniques used in particular chapters are accounted for in the respective chapters themselves. The first section discusses this deliberate choice for a variety of research methods. The second section considers the research methods used. The third section explains the selection of the cases studied in *Chapters 6, 7 and 8*. The final section reflects on the research techniques used in the respective empirical studies reported on in the *Chapters 4 to 8*.

#### **3.1. A deliberate quest for a diversity of research methods**

The main research question posed in this thesis and the three sub-questions were presented in *Chapter 1*. They are concerned with the degree to which knowledge is used in Dutch road safety policy, barriers for possible non-use, and options for improvement.

These research questions call for the understanding of both policy processes and institutional patterns. The scope of the research questions enables a viewing of the subject from different angles, using a variety of methods. As the subject of the thesis is a well-defined and rather specific field, this creates an opportunity to explore the subject in depth and in great detail from several perspectives.

Using different research methods makes it possible to view the subject from various angles and to shed light on several aspects of knowledge use. This can be considered a kind of methodological triangulation. Wester (1995) defines triangulation as "combining various methods strategically to simultaneously highlight and relate more facets of reality". Triangulation enables a check on research findings by repeating them with different techniques. This is especially useful under circumstances in which it is not possible to replicate the exact observations in a study, due to either the small number of cases or to historically unique events. As such, triangulation acts as a kind of quality control, as it improves the internal validity of a study. Yin (1994) distinguishes several types of triangulation, such as triangulation of data sources, of investigators, of theories and of methods. This thesis uses a triangulation of research methods, but also, as is discussed in the sections

below, triangulation of techniques. Both forms of triangulation should increase the internal validity of the research.

The selected research methods are discussed in the following section. These include an historical review, a systematic literature review, multiple case studies and an experimental setting.

## **3.2. Selected research methods**

### **3.2.1. Historical review**

In *Chapter 4* a review in historical perspective has been chosen as a research method to describe the institutional developments in road safety over the last century, with special emphasis on the period 1945-2010. This chapter can be considered an historical review, since it summarises knowledge of one phenomenon over a long time period. This phenomenon comprises the study of the road safety field, its past, its development and, in particular, its relationship to knowledge producers and the use of that knowledge for road safety. The study does not go into detail, but summarises the main knowledge in order to discuss the knowledge and policy field. The review goes beyond a mere literature review as it uses a number of interviews and many primary and secondary historical sources, such as policy documents, parliamentary debates, reports of the different agencies involved and overview studies. Viewed in this way, it has more in common with historical studies.

An historical study cannot be considered a separate method (Schmidt, 1993, p. 58 and 70-71) (although Elton, 2002 speaks of a "historical method", p. 59); rather it uses methods from social sciences. However, historical studies do have some common rationales that distinguish history from other sciences. Historians often struggle to define their branch of science, and do so broadly as "concerned with all those human sayings, thoughts, deeds and sufferings which occurred in the past and have left present deposits; and it deals with them from the point of view of happening, change and the particular" (Elton, 2002, p. 11).

Some shared characteristics can be derived from this definition. Firstly, historians agree about the fact that history is about studying objects in the past, contrary to many social sciences, that want their studies to be as up to date as possible. Secondly, historians use primary and secondary sources to

describe history varying from earthenware pots to diaries. Thirdly, many historians agree that historical studies should not only mention historical facts, but also try to analyse or interpret these facts within a larger conceptual framework (Schmidt, 1993, p. 55 and 58). Historians do this by focussing on events or a chain of events and on understanding change, rather than on describing the state of things (Elton, 2002, p. 10). Moreover, historical studies tend to use probable explanations over causal relationships. Historical studies often investigate unique events (Elton, 2002, p. 10; Jordanova, 2000, p. 55), in which there is more than one cause underlying the consequences. It is not always possible to retrieve all these potential causes, or the relationship between them. Historical studies often try to 'understand' the outcome of previous events in an hermeneutic way (Lorenz, 1990). Of course, this hermeneutic understanding limits the possibility of generalising the conclusions to other circumstances or time spans, and thereby its external validity. Yet an historical study helps us understand the influence of history and of choices in the past on possibilities for the present. The school of historical institutionalism mentioned in *Chapter 2* calls this history-matters-perspective 'path dependency' (Hall & Taylor, 1996).

The historical review in *Chapter 4* fulfils the criteria of an historical study as mentioned above. It studies the history of the road safety field and uses various types of primary and secondary sources to do so. More importantly, it analyses the chain of events in the road safety field and focuses on changes over time in policy and knowledge production and the relationships between them, and interprets them in the conceptual framework of *Chapter 2*.

Criteria for a reliable historical review have been identified by Jordanova, (2000, from p. 172) who describes three skills important for historians. Firstly, technical skills, such as the ability to use appropriate techniques to interpret sources are required. For studies in Roman history, for example, these skills could include a knowledge of Latin. To study the history of Dutch road safety, the researcher must have knowledge of that field and of the Dutch and English language since sources are embedded in that field and are nowadays all in Dutch or English. Secondly, Jordanova refers to source-based skills, such as identifying relevant sources and reading them accurately. To conduct the present study, knowledge about how to find sources from governmental and other archives was essential. It is important too to bear in mind the time of writing as well as the writer of the source. Interviewing can complement data gathering in an historical review and demands good interviewing skills. Thirdly, Jordanova focuses attention on

interpretation skills. These include using the sources to build a plausible argumentation, showing the significance of the sources and considering dissenting argumentations. The argumentation could be based on an analytical framework. In the present study, this analytical framework is given in *Chapter 2*.

### **3.2.2. Literature review**

A literature review is carried out on the topic of knowledge use in road safety policies in *Chapter 5*. A literature study is defined here as a systematic study within scientific literature, which lists, identifies and analyses the available scientific literature on a well-specified topic, both substantially and methodologically. Generally, two types of literature reviews can be distinguished: systematic reviews and narrative reviews (Bryman, 2001, p. 8-111). A systematic review meets a number of criteria to make the review as replicable, scientific and transparent as possible. A narrative review on the other hand, gives a more subjective picture of the literature and has a more explorative nature. In some fields (such as medicine, Bryman, 2001, p. 85 and 94), the distinction drawn between these two forms is strict. However, in other fields, such as in the social sciences, this distinction is not made so clearly. In the social sciences, narrative reviews can incorporate elements of the systematic approach. The review in *Chapter 5* is also a narrative review with a number of elements of a systematic review.

A systematic literature review should have a clear purpose and well-defined inclusion and exclusion criteria. It should also strive for completeness in the literature search. The review in this thesis fulfils these requirements. However, a systematic review also calls for a strict selection of the literature, by only including high-quality research and tries to produce a synthesis of the literature by integrating all results, for example into summarising tables. This thesis does not fulfil these last two requirements. It does not maintain a strict literature selection. Since the number of studies on this specific topic (knowledge use in road safety policy) was very small, so-called 'grey literature', such as conference papers and research organisation reports, were included together with peer-review articles. Furthermore, the literature was too diverse to integrate into summarising tables, and therefore a textual summary of the results of the studies included was given. The research question, nature and quality of the studies are too diverse to make a true synthesis. Despite this limitation, it is possible to identify common features in the selected studies.

The goal of the literature review is twofold. The review tries to acquire an overview of research on the topic of knowledge use in road safety that is as complete as possible so as to be able to position the outcomes of this study in the existing literature. In addition, this overview serves as an intermediary between studies of other authors and the empirical *Chapters 6, 7 and 8*, either by pointing out knowledge gaps in research or by identifying topics for which an easy and/or interesting comparison could be made in these chapters. *Chapter 5* explicitly identifies these knowledge gaps or interesting possibilities for comparisons and points out how these influenced the *Chapters 6, 7 and 8*. The literature review has an explorative character due to the aims of the chapter.

### **3.2.3. Multiple case studies**

In *Chapters 6 and 8*, two multiple case studies were carried out to collect and analyse empirical data on knowledge use in Dutch provincial and municipal road safety policy. This created an opportunity to conduct in-depth research as well as to research multiple cases. According to Yin (1994, p. 13), a case study is “an empirical inquiry that investigates a contemporary phenomenon within its real-life context, especially when the boundaries between phenomenon and context are not clearly evident”. A case study researches something in the present, which distinguishes it from historical studies. Contrary to experiments, it studies something in a real-life context. And, contrary to surveys, case studies take into account all contextual conditions, as they might be relevant for the case.

Yin also mentions criteria for a sound case study (Yin, 1994, p. 32 and further). In the design of a case study, the external validity must be ensured, for example by using multiple cases as in this thesis, or by using theories as a criterion for choosing a case study. To increase internal validity, multiple sources of evidence are used (triangulation) to prevent subjective data collection, and preliminary results are reviewed by key informants. Furthermore, a case study protocol and database should be used to enable replication of the same case by another researcher. Lastly, internal validity can be enhanced by analysing the data in a systematic and reproducible way.

Case studies are especially useful for explorative research. Multiple case studies are used here to explore in depth the knowledge use in provincial and municipal road safety policy processes. The strength of a case study is also its weakness: in-depth studies are very time consuming, putting a limit on the number of cases that can be studied. Furthermore, case studies have

the same shortcoming as historical analyses: they only provide plausible causes, and external validation of causes is very limited (Swanborn, 2000). So, although the internal validity is strong, external validity can be a problem (Dul & Hak, 2008; Yin, 1994).

The use of multiple instead of single case studies improves the external validity. However, even then, one has to define very precisely to which population the results can be transferred. In the provincial studies, it was possible to investigate all of the Dutch provinces (see *Chapter 6*). This effectively overcomes the external validity problem for generalising the outcomes to the Dutch provincial context. In *Chapter 8* this was not possible, obviously, due to the large number of municipalities in the Netherlands. In that study, different precautions are made to select municipalities from a well-defined population. Herewith, the characteristics of the cases were as much alike as possible, which makes it possible to generalise the results to a population with the same features.

#### **3.2.4. Experimental setting**

An experimental setting was chosen to validate the outcomes of the multiple case studies on provincial road safety policy in *Chapter 7*. A 'true' experiment is a study in which the researchers control the research conditions and give a stimulus to a person or a group of people to measure their response (Meerling, 1989, p. 230 and further). The design of an experiment should enable unambiguous conclusions and the comparison between the stimulus and non-stimulus situation should be statistically tested. To make sure that the stimulus is the only intervening element, as many variables as possible must be controlled, for example by assigning respondents at random to the conditions. This study attempted to design the experimental setting as systematically as possible. However, a large number of variables had to be taken into account when designing the stimulus (a road safety policy question). Therefore, complete control of all possible variables could not be achieved. Furthermore, the number of respondents was too low to conduct serious statistical testing. So although the experimental setting cannot be counted as a true experiment, as many experimental requirements as possible were taken into account. The research design chosen was a 'within-subjects-design', an experimental design in which each respondent is given two versions of the three simulation cases. A 'learning' effect is prevented by varying the order of the simulation cases between respondents.

Apart from the possibility of validating causes of behaviour, another advantage of an experiment is the opportunity to influence the research situation by systematically varying the stimulus and context. Furthermore, it is possible to measure the response of the subjects immediately, thus preventing memory biasing the outcomes. The disadvantage of experiments is their limited external validity; experimental results cannot always be applied to other environments (Swanborn, 1987, p. 245). In *Chapter 7* this is balanced to some extent by the fact that, although a limited number of subjects were studied, these subjects represented nearly all provinces in the Netherlands. Furthermore, a reality check for the questions in the experiment was carried out by the respondents.

### 3.2.5. Overview

The main characteristics of the various methods used in the following chapters are summarised in the table below:

Chapter	Method	Main characteristics
Chapter 4	Historical review	Investigates the past, using primary and secondary sources, probable explanations, and hopes to understand the influence of history
Chapter 5	Literature review	Systematic overview, explorative nature, guidance for empirical studies
Chapters 6 and 8	Multiple case studies	In-depth, comparison possible, explorative nature, plausible causes, weak external validity
Chapter 7	Experimental setting	Validating causes, control over research situation, immediate measurement of response, little external validity

**Table 3.1.** Characteristics of methods used in this thesis.

### 3.3. Further rationales for the chapters

This section gives a further justification for the selection of the empirical studies in *Chapters 4 to 8*. To a certain extent, these chapters are based on previous research (Bax, 2007; Bax & Jagtman, 2008; 2009; Bax et al., 2004; Bax et al., 2007; Bax et al., 2008; Bax, Pröpper & Litjens, 2003). While this may reflect some arbitrariness, these previous studies clearly have a common rationale: to identify barriers to knowledge use in road safety policies, each study from two different perspectives. Therefore, they can be said to complement each other.

The *Chapters 6, 7 and 8* all concentrate on the present situation (2005-2008) and on concrete policy processes in road safety. In this, they tend to underexpose the institutional setting of knowledge production, knowledge use and policy-making in road safety. They do, however, belong to the same institutional environment – and therefore are constrained by that context. For that reason, in *Chapter 4* it was decided to conduct an institutional analysis of the road safety policy field that focuses on the history of road safety, including the organisation of its knowledge production. *Chapter 5* takes the two perspectives on timing (present and history) into account as well as the concrete policy-making processes and institutionalisation processes in the road safety policy field.

Although all three studies reported on in the *Chapters 6, 7 and 8* focus on the local and regional governmental level, they offer different perspectives on it. *Chapters 6 and 7* study the twelve provinces while *Chapter 8* deals with fourteen municipalities. The reason for this focus on the local and regional level is that provinces and municipalities play an increasingly important role in Dutch road safety policies. Although the framework for road safety policy is set on a national level, over time, provinces have become the directors of the gradually decentralised road safety policies. Municipalities are important, because they own the largest stretches of road in kilometres. In addition to the provincial and city-regional level, this is the level of actual implementation of infrastructural road safety measures.

The chapters also complement each other with regard to the issue of whether road safety should be seen as a separate, sectoral, policy field or as a topic that has to be integrated in other policies. In two empirical studies (*Chapter 7 and 8*), public authorities were interviewed about how they weighed up road safety against other interests to achieve an integral traffic policy. In contrast, *Chapter 6* questions public authorities about road safety as a sectoral subject.

Furthermore, the chapters complement each other with respect to different types of knowledge. Whereas the two provincial cases focus on knowledge about costs and the effects of road safety measures, the municipal case concentrates on knowledge of other governmental and non-governmental actors in the policy process about their own interests. This diversity reflects a continuum between fundamental scientific knowledge on the one hand, and applied policy oriented knowledge on the other hand, a contrast elaborated upon in *Chapter 1 and 2*.



### **3.4. Research techniques**

In the various chapters, a number of different techniques are used to collect data. The choice of technique stems from the general research method selected, constrained by practical circumstances. The thesis strived for an as diverse as possible range of methods and techniques, to apply the triangulation concept as mentioned above. Techniques used in the various chapters are document analysis (*Chapters 4, 5, 6 and 8*), semi-structured interviews (*Chapters 4, 6, 7 and 8*), telephone surveys (*Chapters 6 and 8*) and visual inspection (*Chapter 8*). The choice and the details of each technique are comprehensively discussed and accounted for in the respective chapters.

## **4. An historical institutional analysis of road safety policy and knowledge**

### **4.1. Introduction**

The present chapter gives an historical description and analysis of road safety policy, road safety knowledge and the relationship between them from 1900 onwards. Road safety knowledge and policy are described in analytical concepts as discussed in *Chapter 2*, including the four dimensions of the policy arrangement approach, the concepts Modes 1 and 2, the fifth branch, the typologies developed by Landry et al. and Hoppe, and the Knott and Wildavsky ladder of knowledge utilisation.

*Chapter 4* serves two purposes: it outlines the institutional context and changes in the road safety knowledge and the policy field within that context. In addition, the chapter has a purpose within the broader framework of this thesis. The description of the present knowledge-policy arrangement serves as a background to *Chapters 5 to 8* in which the use of knowledge in policy processes is investigated and barriers to knowledge use are discussed.

The research questions for this chapter can be formulated as follows:

- *Which developments can be observed in the institutionalisation of Dutch road safety knowledge and policy, and in their relations?*
- *How can these developments be characterised using the concepts described in Chapter 2?*

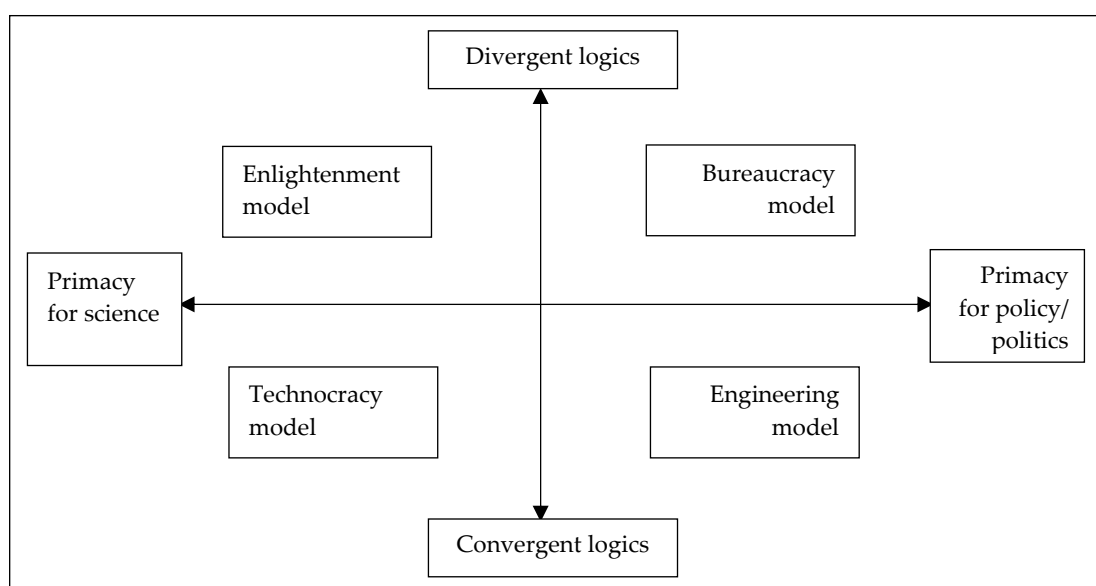
### **4.2. Concepts and methods**

#### **4.2.1. Analytical concepts used in this chapter**

This chapter uses concepts concerning institutionalisation to describe the patterns in the relationship between knowledge and policy. The following concepts were discussed in greater detail in *Chapter 2*. The knowledge-policy arrangement is described in terms of the policy arrangement approach, using concepts such as actors, resources, discourses and rules. Two kinds of discourses are distinguished. Substantial discourses discuss problem definitions and solutions for policy issues. Governance discourses focus on

the organisation of policy and knowledge. The present chapter also describes road safety as a policy problem in terms of structured, unstructured and semi-structured (with consensus on means or on goals) problems.

The knowledge-policy arrangement is interpreted first in Caplan's terms, (1979) in which science and policy are two worlds with separate values and practices. It is then described using the typologies put forward by Hoppe and Landry et al. Hoppe (2005) distinguishes four types of boundary work in science and policy. See also *Chapter 2* for an extensive presentation of the figure below.



**Figure 4.1.** Four models of boundary work (based on Hoppe, 2005).

Landry et al. (2001b) discuss four models for interaction between science and policy. Their characteristics can be summarised as follows:

- The science push model: science delivers objective facts to policy-makers
- The demand pull model: policy-makers ask science for specific knowledge
- The dissemination model: science actively disseminates knowledge among policy-makers
- The interaction model: science and policy interact during each stage of the knowledge production process

Lastly, the changes in the knowledge-policy arrangement over time are described in terms of shifts in governance, such as multi-actor, multi-level or multi-sector trends.

#### **4.2.2. Methodological account**

##### **Limitations**

There is a vast amount of literature on the topic of road safety from 1900 to the present day. Demarcation of the subject is therefore necessary. The present study has been demarcated in geographic scope and in time.

The first demarcation involves a geographic restriction. The analysis is restricted to the Netherlands and includes the influence of European legislation on the Netherlands. The availability of primary and secondary sources has been decisive here, as is the fact that this chapter sketches the institutional context for the *Chapters 5 to 8*, which investigate knowledge use in Dutch road safety policy. A second demarcation concerns the time span. The period chosen to study institutionalisation in road safety is from 1900 onwards. An important reason for this choice was the rise of the passenger car in traffic after 1900, leading to an increase in road traffic accidents. The year 1900 was thus a natural starting point for analyses.

The time span was subdivided into four units, based on four important developments:

- 1900 – 1945: This period shows the rise of the passenger car as a mode of transport and the consequent increase in the number of traffic fatalities. Road safety became a social phenomenon.
- 1945 – 1975: In this period policy and knowledge organisations emerged and road safety developed into a subject of policy and knowledge production.
- 1975 – 1995: This period represents the flourishing of institutionalisation at a national level; a strong, national, policy organisation and several more knowledge organisations arose, and patterns were established in their interactions.
- 1995 – 2010: In the fourth period, the competences and implementation of the road safety policy shifted from national to local governments.

It was decided not to describe each period at equal length. The period from 1900 to 1945 is described only briefly, while subsequent periods have been described more extensively because of the rapid increase in the number of accidents and the accompanying attention for road safety in that period.

Another reason for this choice was the greater availability of sources, including the registration of accidents in the latter periods.

## **Methods**

The most important research method in this historical study is document analysis. An exploratory phase involved a study of secondary sources such as previous historical analyses (Bogaarts, Haans & Weyers-de Ruiter, 2003; Quist, 1981) and jubilee publications of road safety organisations (CROW, 2007a; Mulder & Ederveen, 2002). Guided by these secondary sources, a number of primary sources were selected for investigation and for verification of the facts in the secondary sources. Also it was hoped that relevant details could be found to increase the reliability of the historical data. The sources used are included in the references.

Supplementary to the document analysis, four open interviews were held with key figures within policy and science. The following persons were interviewed:

- E. Asmussen, Director of SWOV 1962-1986; Professor Traffic Safety TU Delft 1982-1989
- P.B. van Gurp, Director Directorate-General Road Safety, Ministry of Transport, 1983-1990
- B. Quist, Head Division Road safety, Ministry of Transport, 1963-1974; Assistant-Director Directorate-General Road Safety, Ministry of Transport 1974-1980; Associated Professor TU Delft, 1980-1987
- F.C.M. Wegman, Director of SWOV 1999-at present; Professor Traffic Safety TU Delft 2009-at present

The interviews demonstrated, as they generally do, the limitations of human memory, especially in remembering decade old facts (Baddeley, 1999). The respondents tended to remember anecdotes and events which had made a deep impression, often due to the personal relationships involved. The exact dates of events were often lacking. This, and the emphasis on personal relationships, were the reasons for not using the interviews for collecting facts, but for obtaining an overall impression of a specific period. That was also why only four interviews were conducted. However, as the interviews were carried out at the beginning of the study, they proved very inspiring for directing the data collection and for the analysis and interpretation of the historical facts.

This thesis does not profess to present a detailed history of Dutch road safety. The limited availability of sources and time resulted in frequent

recourse to sources available within SWOV and its library. Although obviously, the SWOV library contains many more than its own publications, disproportionate attention to SWOV in certain parts of this text was unavoidable. This disproportionate attention may even have been increased by the fact that this thesis is being written by a SWOV employee. However, although the position of SWOV may be overexposed in relation to other organisations, the various sources including non-SWOV sources in this chapter refer to SWOV as an important knowledge organisation in the road safety field. Therefore, it can be claimed that the greater focus on SWOV is not only due to the origin of the writer or the main limitation to merely one library, but also a reasonably justified overexposure.

As stated in *Section 1.5* and *Chapter 3*, historical reviews tend to use a hermeneutic approach to 'understand' the influence history and the choices made in the past have on opportunities in the present. In so doing, they place relevant historical facts in a larger interpretative framework. This approach brings with it a different language to that used in a more rationalistic approach, since it claims a strong connection between everyday language in social behaviour and scientific language, with formal definitions playing a less important role. Readers will notice this language difference in the present chapter compared to subsequent chapters.

### **The graphs**

Each subsection in *Section 4.3* covers a period of time and is preceded by a graph. The graphs consist of two important indicators: the number of traffic fatalities and the expenditure on road safety by the Dutch Ministry of Transport, Public Works and Water Management (hereafter: the Ministry of Transport) which, combined, provide a general impression of the period. These indicators have been chosen deliberately as they roughly indicate the relative importance of the issue and of the policy response to it. Note that the Ministry of Transport is the predecessor of the Ministry of Infrastructure and that the change in name took place in October 2010. When referring to the time period before October 2010, the term Ministry of Transport is used in this chapter, while when referring to the present time, the term Ministry of Infrastructure is used.

The number of road traffic fatalities, derived from Statistics Netherlands (CBS), denotes the development of the policy issue. Official CBS statistics on road accidents date from 1926, but for unknown reasons, they are available only from 1934 onwards. Therefore, the figures from 1926 to 1934, were

derived from the thesis of Leerink (1938) who quoted the CBS statistics in this period. The figures from 1996 onwards are called the 'real' numbers of traffic fatalities. 'Real' numbers of traffic fatalities are statistics drawn up from a variety of sources where traffic fatalities are registered, but none of which are complete. Each year, CBS together with the Ministry of Infrastructure calculate the 'real' number of traffic fatalities based on CBS statistics, judicial data and police registrations (SWOV, 2010). Between 1996, when calculations for 'real' numbers were introduced, and 2010, the estimated 'real' number of traffic fatalities is higher than the policy registration by between 6 and 11%, with 10.7% as an average (Stipdonk, 2005).

The Ministry of Transport's road safety expenditure gives a rudimentary impression of road safety policy efforts. Only the Ministry of Transport's expenditure has been included, because local data were unavailable. On the national level, the Ministry of Transport is considered to be the responsible ministry for policy-making on road safety, although the Ministry of Interior and Kingdom relations and the Ministry of Justice both have large expenditures on enforcement of traffic rules. Other Ministries, such as the Ministry of Health, Welfare and Sport, spend considerably less on road safety. As Wijnen and Stroeker (2009) point out, expenses for road safety are somewhat scattered over the Ministry of Transport's Budget. Since this is not a thesis in economics, and the accounts of road safety expenditure are merely illustrative, only budget items clearly labelled as road safety were included in the overview. Furthermore, the budgets in Dutch guilders, before the introduction of the euro in 2002, have been converted to euros using the official, rounded off, exchange rate of 1 euro to 2,20 NLG, not using a discount rate to compensate for inflation. Because of changes in the budget system of the Ministry, the figures from 1975 onwards include the cost of personnel, whereas the figures previous to that year exclude these costs. Public expenditure on road safety has been registered as such only since 1949.

The choice of these two indicators does not suggest a direct link between policy efforts and the development of the policy issue, in this case the number of traffic fatalities. Although a connection is plausible, it is difficult to find empirical evidence to support it (Wegman et al., 2006; Wegman, Van Selm & Herweijer, 1991; Weijermars & Van Schagen, 2009). A connection in the reverse direction is also plausible: the development of the policy issue

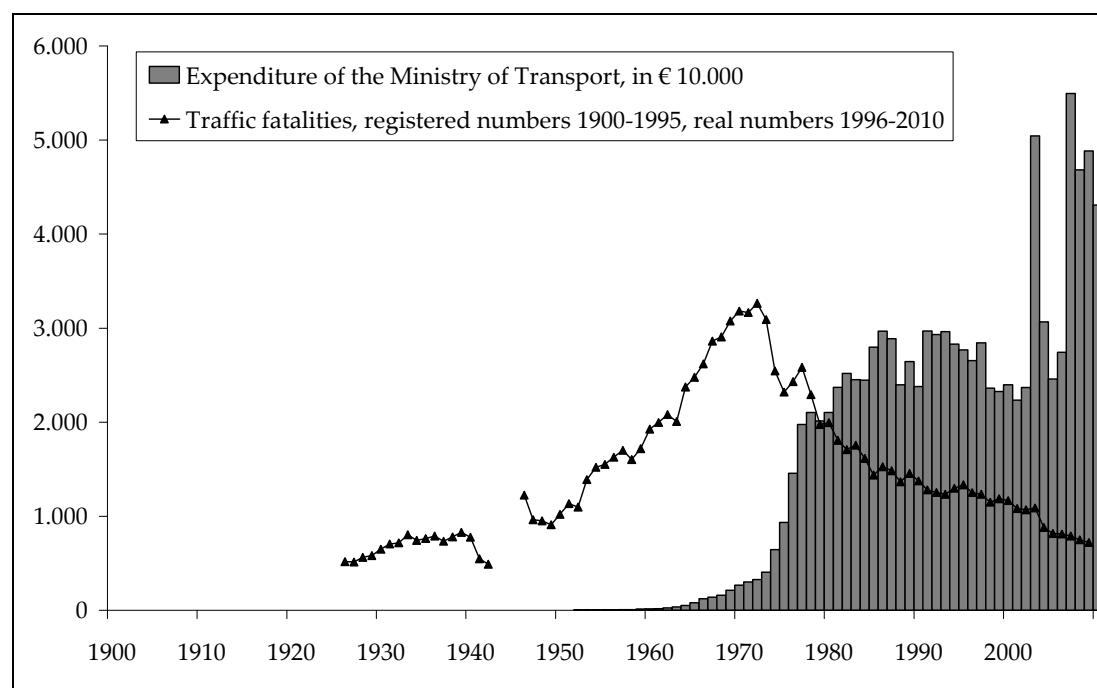
could influence policy efforts. However, here again quantitative empirical evidence is equally elusive.

### Reading guide

Section 4.3 below presents an historical description and analysis of the road safety knowledge and policy field from 1900 onwards. Four subsections discuss the four time periods, including a graph and an analysis of the content and organisation of the knowledge-policy arrangement. This historical analysis is followed by a description of the present relationship between knowledge and policy in Section 4.4. The chapter concludes in Section 4.5 on some typical institutional features of the road safety policy and knowledge field.

## 4.3. Historical institutional analysis 1900 – 2010

The graph below displays an overview of the traffic fatalities and the expenses of the Ministry of Transport for the entire period between 1900 and 2010.



**Figure 4.2.** Numbers of traffic fatalities and road safety expenditure of the Ministry of Transport between 1900 and 2010. Sources: Ministry of Transport, CBS and Leerink, 1938.

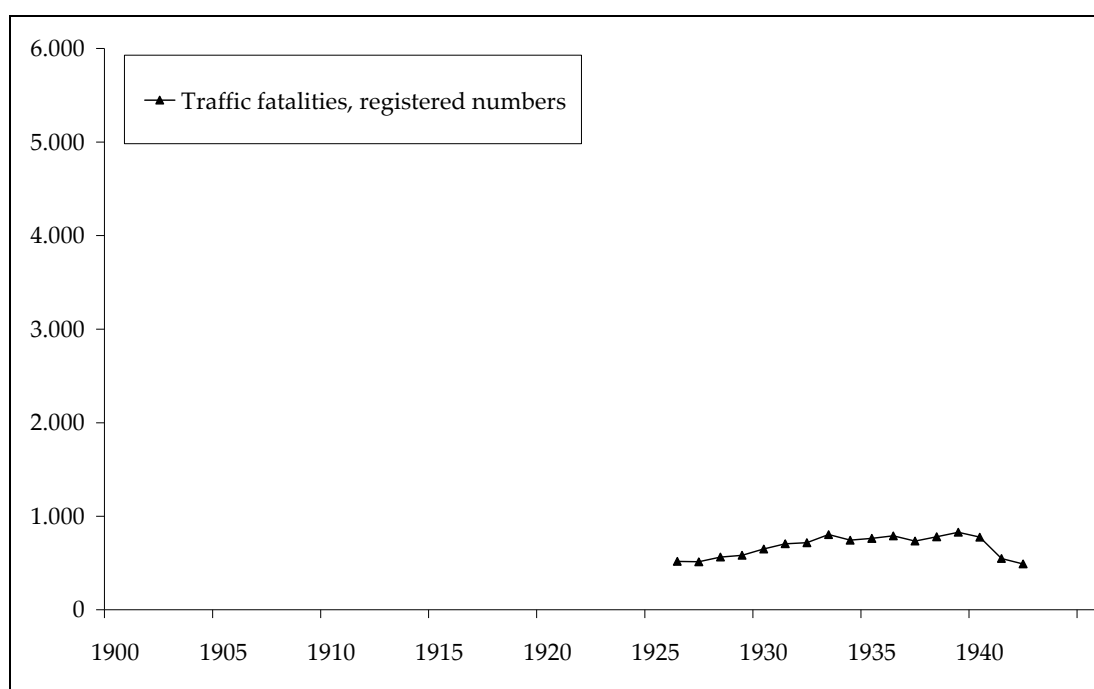
The graph shows a steep increase in the number of traffic fatalities up to approximately 1970, followed by a slower decrease. No accident statistics are



available for the period from 1942 to 1945, due to the Second World War. Government expenditure was marked as a separate entry from 1949 onward. The graph shows an increase in public expenditure between 1960 and 1980, followed by a period of stability, and a large, but fluctuating increase from 2000. In the subsequent sections, the relevant parts of this graph are resumed for each of the periods concerned.

### 4.3.1. 1900 to 1945: The introduction of car travel and road safety as social phenomena

#### Time line



**Figure 4.3.** Numbers of traffic fatalities between 1900 and 1945. Sources: CBS and Leerink, 1938.

The graph demonstrates that the number of traffic fatalities was registered from 1926 onwards. During the Second World War, the registration of traffic fatalities had stopped after 1942. No data on expenses were found in this period, which means that the Ministry of Transport either did not spend money on road safety or did not register these expenses separately.

#### Content of knowledge and policy

Several developments, in particular the emergence of the car as a mode of transport, imply the rise of road safety as a social phenomenon from

approximately 1900 onwards (Mom & Filarski, 2008, p. 55-81; Quist, 1981, p. 12). Cars enabled travel at higher speeds, which led to more and more serious accidents. The figures in the above graph indicate an increase in the number of fatalities from the middle of the 1920s onwards, from 518 in 1926 to 828 in 1939. Initially, the road safety problem was seen in terms of guilt and culpability, and car drivers in particular were blamed for it (OECD, 1997, p. 17; Wegman, 2009, p. 227-230). The Royal Dutch Touring Club ANWB, which grew out of regional Penny Farthing clubs in 1883 and represented cyclists rather than car drivers at that moment, may have played a role in this problem definition, but its origin is not entirely clear (Staal, 2005). Descriptions of drivers as 'wild, inconsiderate, and irresponsible' (Quist, 1981, p. 10) illustrate this. The focus on guilt and culpability (Quist, 1967, p. 1) is apparent in the fact that the two Dutch PhD theses on road safety in the late thirties were published by the Law Faculties of the Universities of Amsterdam and Leiden (Leerink, 1938; Sannes, 1939). When, from the 1920s and 1930s onwards, the number of cars on the road increased (Quist, 1981, p. 20) the government set speed limits and demanded a driving test (Tweede Kamer, 1924).

In this first period, it was not the government that put road safety on the agenda, but civil society organisations and mainly the ANWB. The national government stated that road safety was a local problem not requiring central coordination (Quist, 1981). It was not until after the ANWB had urged them to do so (Quist, 1981, p. 13), that the government first passed traffic regulations in the Motorcycle and Bicycle Law of 1905. This law comprised regulations on the maximum speed in urban areas, right of way at intersections, driving on the right-hand side of the road, and some vehicle requirements. The hosting of the First International Safety Conference by the Dutch Ministry of Transport in 1937 illustrates the increasing importance of road safety for policy-makers (S.N., 1937).

A literature study in national and international databases revealed that little scientific research was carried out in the Netherlands in this period. Leerink (1938) and Sannes (1939) may have been the only ones to carry out an extensive study on road safety in the Netherlands. Literature in other countries has given somewhat more attention to road safety. For instance, Hagenzieker et al. (forthcoming) counted 40 to 75 international publications in scientific journals in total between 1900 and 1945.

### **Organisation of knowledge and policy**

Several events indicate that organisations within the state, civil society and the knowledge field developed an increasing interest in road safety knowledge.

In the first half of the 20<sup>th</sup> century, a number of interest groups representing different groups of road users were founded. The ANWB, an interest group for cyclists at that time, and the Dutch Traffic Safety Association VVN (Verbond van Vereenigingen voor Veilig Verkeer, founded in 1932) represented groups of vulnerable road users, such as cyclists and pedestrians. KNAC, the Royal Dutch Automobile Club has represented drivers since 1898. The Association for the Protection of Pedestrians was founded in 1953.

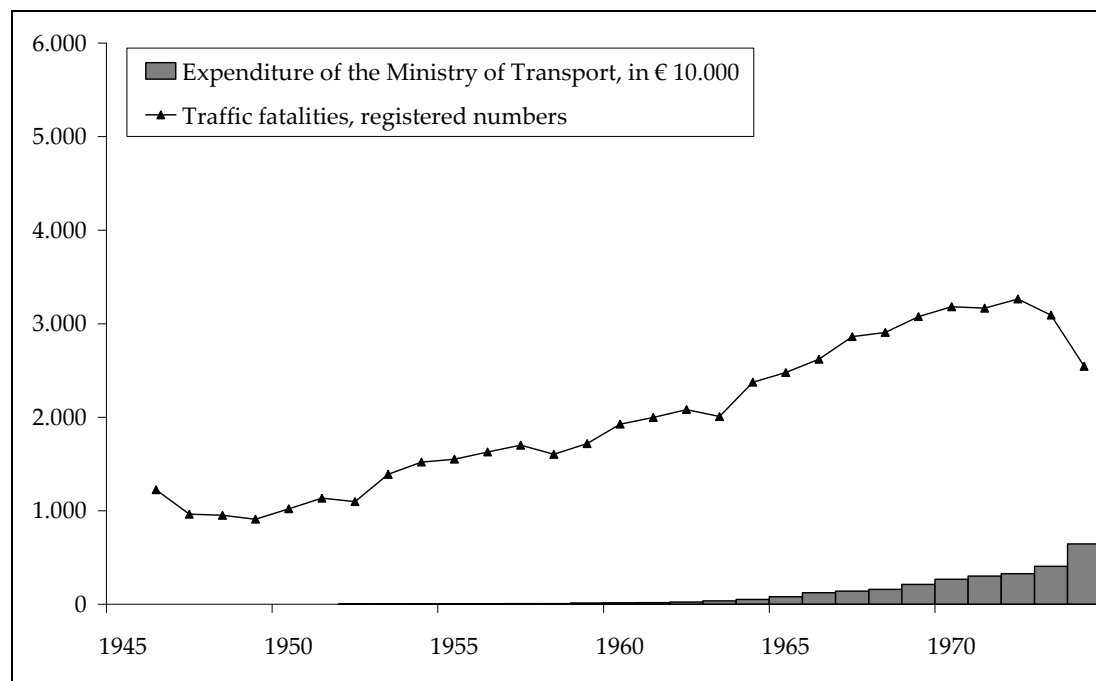
From 1926 onward, accidents became the subject of statistics. CBS has named road traffic accidents as a specific cause of death and has maintained separate road traffic accident statistics since 1926 (Leerink, 1938). Civil society organisations, such as ANWB and KNAC, initiated the first opportunity for professional knowledge exchange in the Netherlands Road Congress in 1920 (Quist, 1981), an annual congress promoting improvement in the road network.

The first indication of some organised policy was the establishment of an advisory board, on road and road safety policy in 1929 (Quist, 1981, p. 24). National, provincial and local governments together with several interest groups, amongst which ANWB and KNAC, sat on this board.

The Road Tax Law in 1927 (Tweede Kamer, 1926), introduced at the insistence of ANWB (Quist, 1981, p. 23), generated extra funds for roads and road safety. The law provided a legal basis for the financing, construction and maintenance of roads at a national level.

### 4.3.2. 1945 to 1975: Road safety as a policy field

#### Time line



**Figure 4.4.** Numbers of traffic fatalities and road safety expenditure of the Ministry of Transport between 1946 and 1975. Sources: Ministry of Transport and CBS.

The figure illustrates a rapid increase, indeed a tripling of traffic fatalities from 1949 to 1972 and the start of a decrease after 1972. The costs of road safety for the Ministry of Transport were registered separately from 1949 onwards: from very tiny at first –even not visible in *Figure 4.4*–, the budget gradually increases from the late 1950s onwards.

#### **Content of the knowledge-policy arrangement**

The Dutch Parliament was seriously worried about the steadily increasing number of traffic casualties from 1950 onwards (Tweede Kamer, 1951a), a worry that is illustrated by separate subheadings for road safety in the register of Parliamentary Documents starting in 1956. In 1963, 1964 and 1968 the subject was included in the Queen's Speech.

Two legal measures were taken in the early 1950s. The Road Traffic Regulations, containing traffic rules, vehicle requirements, and requirements and provisions for driving tests and driving licences were passed in 1950. A

year later, the provincial administration of vehicle registrations was centralised in a national system.

The road safety discourse changed towards the end of this period. While the question of guilt was initially the central topic, the emphasis shifted towards a more cause-oriented approach to road safety. This approach aimed at determining the cause of road traffic danger, first from a mono-causal perspective, after approximately 1970 to a multi-causal perspective (Asmussen, 1983; Haddon, 1972; Hakkert, 2008; Koornstra, 1986, p. 7; Kraay, 1989, p. 268). In 1951, for example, the Dutch Parliament requested an integral road safety memorandum (Tweede Kamer, 1951b). Parliament believed a substantial number of accidents to be caused by spatial aspects such as road features. The Minister of Transport considered it impossible to comply with Parliament's request, believing that drivers are responsible for their own safety. The many causes for the road traffic danger would transform the memorandum into a long list of separate measures to be implemented by different ministries (Tweede Kamer, 1960). It is remarkable that the Minister considered road safety too complex a problem for intervention, but de facto attributed road safety to a single cause: drivers.

The mono-causal approach also led to a need for more road safety knowledge in the national government and the ANWB (Mulder & Ederveen, 2002, p. 5). In response, the research organisation SWOV (Institute for Road Safety Research) was founded in 1962. The section below discusses its establishment in more detail. Soon after its founding, SWOV argued that road traffic accidents were complex incidents (Quist, 1967, p. 2) and supported the multi-causal approach. It proposed a new framework for analysing road safety, in which the traffic system consists of the components man, vehicle, and road. The SWOV analysis had an immediate effect on the Ministry of Transport's policy and was added as an appendix to the Road Safety Memorandum in 1967 (Ministerie van Verkeer en Waterstaat, 1967; SWOV, 1967).

### **The organisation of the knowledge-policy arrangement**

Parliamentary documents illustrate that the ANWB was the first to propose the foundation of a knowledge-policy organisation (Tweede Kamer, 1953). They set themselves the task of establishing an advisory body comprised of engineering, enforcement and education experts. The Dutch Parliament supported this proposal and in 1953 a Permanent Committee for Road Traffic Safety was founded (Tweede Kamer, 1953). This committee consisted of

representatives of seven different ministries, regional and local governments and interest groups (Eerste Kamer, 1956). The Permanent Committee coordinated safety policy. The broad representation in the Permanent Committee indicates that the road safety issue covered many different policy areas at that time, but also shows the early involvement of different stakeholders.

A number of ANWB activities demonstrate its initiatives in the road safety knowledge field. The ANWB has organised annual road safety oriented congresses such as the Netherlands Roads Congress (Wegencongres) since 1920 and the Traffic Engineering Congress (Verkeerstechnische Leergangen) since 1952. Furthermore, the ANWB has published traffic memoranda containing guidelines for traffic engineering since 1951 (Quist, 1981, p. 39).

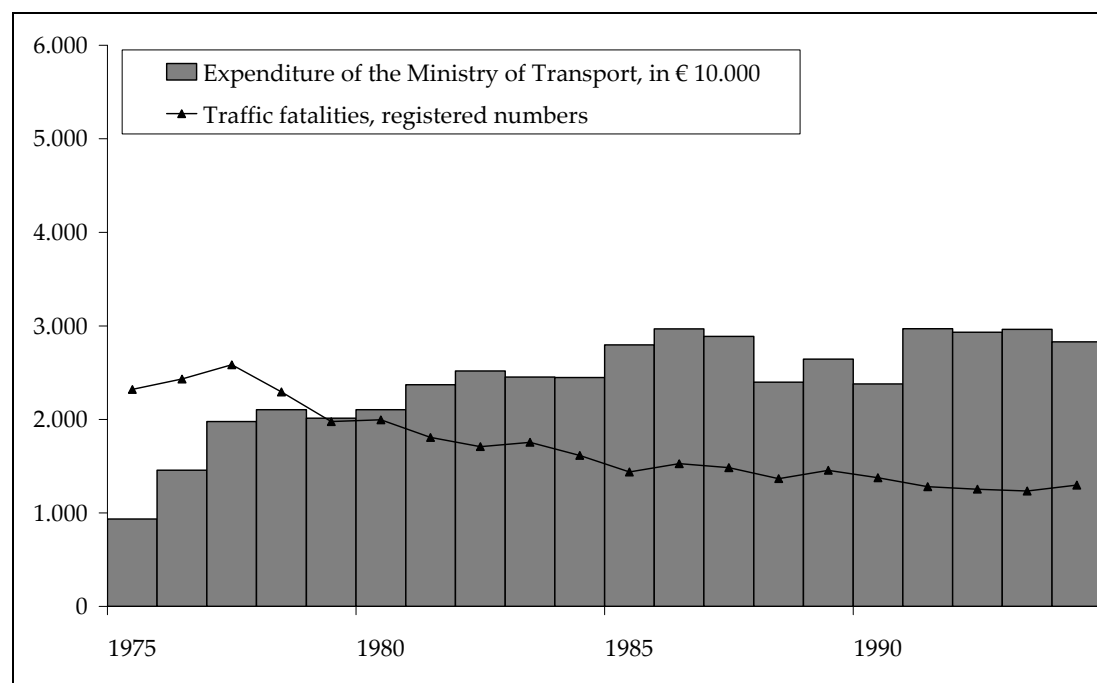
When the ANWB advocated the establishment of a separate study centre for road safety in 1960 (Mulder & Ederveen, 2002, p. 5), the Dutch Parliament adopted the proposal (Tweede Kamer, 1960). Also, although the Minister had dismissed the suggestion initially, he did decide to set up the SWOV in cooperation with the ANWB in 1962. The organisation was expected to coordinate and stimulate scientific road safety research (Tweede Kamer, 1962). In its early years, the organisation carried out research that provided a scientific basis for the Road Safety memorandum (Mulder & Ederveen, 2002).

In 1973, following years of campaigning by the Dutch labour party, PvdA, the Directorate-General for Road Safety (DVV) was established within the Ministry of Transport (Quist, 1981, p. 47). The Minister of Transport was appointed road safety policy coordinator. Two bodies coordinated the departments involved in road safety policy. These were the Central Committee for Road Safety (CCVV) for senior civil servants in the various ministries, and the Interdepartmental Steering Committee for Road Safety (ISVV) for junior civil servants. The Permanent Contact Group Road Safety (PCGV), an advisory body for regional and local governments and interest groups, was also established. This body replaced the previous Permanent Committee Road Traffic Safety, which was probably dissolved, although no confirmative sources could be found. A clearly increased budget can be observed from 1974 onwards (see *Figure 4.4* and next paragraph). Moreover, this development coincided with a considerable increase in policy production; in the early 1970s a large number of legal measures was introduced to improve road safety, for example the compulsory use of seat belts for drivers and helmets for moped riders (SWOV, 2009).

Several developments in the road safety knowledge field suggest that the SWOV struggled to define its precise role. At first, the Ministry of Transport had a clear need for knowledge as the basis for the Road Safety Memorandum (SWOV, 1967, p. 5). However, with its first analyses and a more scientific definition of road safety, SWOV appeared to be presenting itself as a professional and independent research organisation and not merely acquiescing to the demands of Parliament and the Ministry of Transport. During the late 1960s, in consultation with the Ministry of Transport, SWOV's role shifted from one conducting its own research to a knowledge broker's role, focussing on the coordination of knowledge production (Mulder & Ederveen, 2002, p. 17). In addition to SWOV, the Netherlands Organisation for Applied Scientific Research TNO in Delft, Soesterberg and Leiden amongst other places (founded in the mid-1960s), also studied road safety. In particular, TNO carried out research into injury prevention, and epidemiological research (De Haas, Bonte & De Haas-Posthuma, 1967; *Techniek in Nederland*, 2009).

#### 4.3.3. 1975-1995: The flourishing of institutionalisation at a national level

##### Time line



**Figure 4.5.** Numbers of traffic fatalities and road safety expenditure of the Ministry of Transport between 1975 and 1995. Sources: Ministry of Transport and CBS.

The figure shows a slow yet steady decrease of the number of traffic fatalities and a rise in the expenses of the Ministry of Transport up to the early eighties, after which the expenses show a slower rate of increase, and then more or less stabilise.

### **Content of the knowledge-policy arrangement**

A considerable increase in policy production in this period is illustrated by the large number of policy plans (Ministerie van Verkeer en Waterstaat, 1983; 1987; 1989; 1991; 1996b; Tweede Kamer, 1976). Several organisations, such as SWOV, the new Road Safety Board (founded in 1977) and (new) interest groups, developed and put forward a definition of the road safety problem. SWOV put road safety on the agenda as an increasingly less structured problem; the simple measures sufficient in the past, were no longer so in the seventies (Asmussen, 1983; SWOV, 1974; 1976). Road safety was no longer seen as mono-causal, but rather as multi-conditional, and thus required a system-oriented approach. The Ministry of Transport used this discourse refinement in the Policy Plan for Road Safety 1975 (Tweede Kamer, 1976) and in the Policy Plan for Road Safety 1983 (Ministerie van Verkeer en Waterstaat, 1983). The policy plans reflected a further elaborated system-oriented approach to road safety with structural measures, such as a safe infrastructure, expected to improve the entire traffic system. This system-oriented approach can be observed even more clearly in the Sustainable Safety concept developed by SWOV, in cooperation with other knowledge organisations such as TNO, the Traffic Research Centre VSC and the VU University Amsterdam, in 1992 (Koornstra et al., 1992). This approach states that not individual measures, but rather a coherent package of measures is required for an effective road safety policy. In addition, measures had to be preventive instead of curative. The Ministry of Transport included the Sustainable Safety vision in the Multi-year Road Safety Plan 3 (Ministerie van Verkeer en Waterstaat, 1991), even before the official publication of the Sustainable Safety vision.

Another organisation that brought about an important discourse refinement was the Road Safety Board (discussed more extensively below). In 1984, it proposed a quantitative target for road safety to make intended policy less noncommittal (Raad voor de Verkeersveiligheid, 1984). Furthermore, it argued for the objectification of policy-making by considering the cost-effectiveness of road safety measures. The Ministry of Transport followed up both suggestions by including quantitative targets in the Multi-year Road Safety Plan 1 (Ministerie van Verkeer en Waterstaat, 1987) and including an



addendum on the costs of accidents to the National Plan Road Safety 2 (Tweede Kamer, 1985, p. 153-162). The quantitative road safety targets were also mentioned in the Second Structure Scheme Traffic and Transport (SVV2) (Ministerie van Verkeer en Waterstaat, 1988).

In this period, from 1975 onwards, the Ministry of Transport focussed attention on the position of road safety in traffic and transport policy. The Policy Plan for Road Safety 1975 (Tweede Kamer, 1976) mentions explicitly the relationship between road safety policy and traffic and transport policy, and road safety is incorporated in the general traffic memorandum Structure Scheme Traffic and Transport (SVV1) (Tweede Kamer, 1977), although no practical integration with the traffic and transport policy was reported in the memorandum. Road safety was cited as a precondition for traffic and transport policy.

### **The organisation of the knowledge-policy arrangement**

From the 1970s onwards, the number of knowledge organisations involved in road safety increased rapidly. In 1977, the (provisional, until 1981) Road Safety Board was established, chaired by Pieter van Vollenhoven (Quist, 1981, p. 48). The Board replaced the Committee Road Traffic Safety, which had been founded in 1953 and had provided policy advice to the national government based on scientific research. In addition, several universities started road safety research. From 1978 onward, Delft University of Technology (Technische Hogeschool Delft, 1978) carried out research into road safety and in 1983 it appointed the SWOV's then managing director Eric Asmussen as extraordinary professor. In 1971, the University of Groningen established a chair in experimental psychology and traffic sciences and in 1977 founded the interdisciplinary research group for road safety VSC, focussing on education and public information (Michon, 1988; Mom & Filarski, 2008, p. 337). Leiden University has conducted research on enforcement of traffic rules since the mid1980s (Gundy & Verschuur, 1986). Furthermore, Twente University of Technology and Eindhoven University of Technology (Faculty of Mechanical Engineering) (Techniek in Nederland, 2009) have carried out road safety research since the early 1990s. The Netherlands Organisation for Applied Scientific Research TNO has carried out road safety research, often commissioned by SWOV, since the late 1960s and early 1970s. The private consultancy firm Traffic Test, specialising in road safety and in human behaviour in traffic, was established in 1985. Most knowledge organisations collaborated in various arrangements. SWOV and The Road Safety Board, for example, entered into an agreement in 1979 to

share knowledge (Mulder & Ederveen, 2002), the ANWB together with SWOV organised the National Road Safety Congress in 1978 (Wegman et al., 1979) and in 1992, several knowledge organisations, instigated by SWOV, developed the Sustainable Safety vision.

The relationship between SWOV and the Ministry of Transport changed over the years. The policy plan for 1975, (Tweede Kamer, 1976, p. 55 and 57) for example, assigned responsibility for the coordination of the knowledge requirements to the (relatively new) Directorate-General for Road Safety (DVV) instead of to SWOV. In addition, the Ministry of Transport had a programming meeting with SWOV to determine research relevant to policy support in 1982, and SWOV seconded some of its employees to DVV for a short period of time (Mulder & Ederveen, 2002, p.23). This would seem to put SWOV in more of a coordinating role rather than one of a provider of research (Asmussen, 1976, p. 42-43; Ministerie van Verkeer en Waterstaat, 1993, p. 10). In 1983 the Ministry of Transport asked SWOV explicitly to provide a basis for the Policy Plan for Road Safety, but, contrary to previous policy plans, only in as far as the quantitative part was concerned (Mulder & Ederveen, 2002, p. 28).

Furthermore, in subsequent years, the national government itself adopted the role of knowledge broker. This was partly due to a reorganisation of the Ministry of Transport in 1987. The DVV became part of the Directorate-General for Transport, Public Works and Water Management instead of an independent Directorate-General (Bogaarts, Haans & Weyers-de Ruiters, 2003, p. 21). The Directorate-General had its own knowledge division, the Centre for Traffic Knowledge which, together with the Centre for Traffic Accidents, was later incorporated into the Transport Research Centre AVV. This enabled the Ministry of Transport to provide its own knowledge, with DVV coordinating the research (Ministerie van Verkeer en Waterstaat, 1991, p. 39 and further). Between 1988 and 1990, the Ministry restricted the funding of and opportunities for SWOV (Mulder & Ederveen, 2002). According to the Ministry of Transport, SWOV needed to maintain more of a distance and to provide more applied knowledge. Moreover, SWOV was expected to obtain a large part of its financing from assignments.

The above description of the considerable growth in the number of knowledge organisations researching road safety indicates that the knowledge network had expanded. However, the policy network remained more or less stable, although some new interest groups were founded in this

period. The activities of the action group Stop Child Murder, established as early as 1972, and from 1993 onwards called the Council for Child Priority, and the Cyclist's Union founded in 1975, drew attention to vulnerable road users in the National Plan for Road Safety of 1983 (Mulder & Ederveen, 2002). In addition to these two action groups, the Association for Traffic Victims was founded in 1995 as a contact platform for fellow-sufferers.

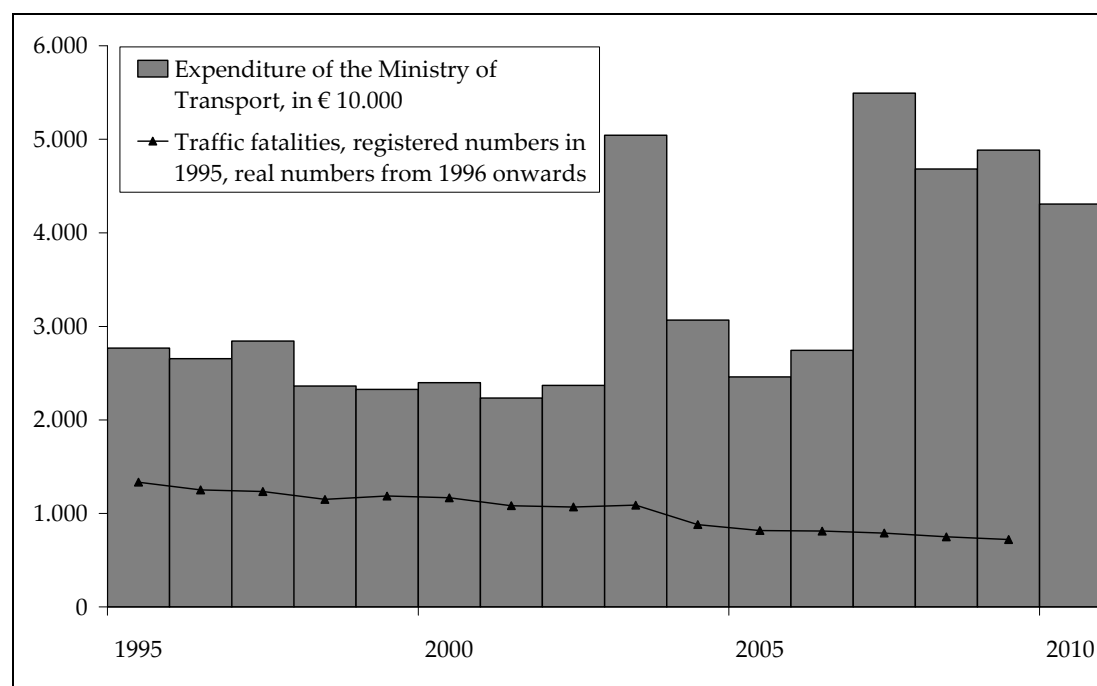
The Ministry's ideas about the implementation of policy changed in this period. The Ministry of Transport emphasised the involvement of other levels of government and interest groups in policy-making and implementation (Ministerie van Verkeer en Waterstaat, 1983, p. 5; 1991, p. 11 and further). Several governmental levels and private organisations, mainly members of the Permanent Contact Group Road Safety (PCGV), joined the realisation of the National Plan for Road Safety 1 (Ministerie van Verkeer en Waterstaat, 1983, p. 1 and 5). This PCGV became the Consultative Body Road Safety (OVV) in 1992, which was part of the Consultative Bodies of Traffic, Public Works and Water Management (OVW) (Bogaarts, Haans & Weyers-de Ruiters, 2003, p. 17). The Multi-year Road Safety Plans 1 and 2 (respectively Ministerie van Verkeer en Waterstaat, 1987, p. 5; Ministerie van Verkeer en Waterstaat, 1989, p. 8-11 and 35) indicated explicitly that policy must be implemented by all levels of government, interest groups, and trade and industry. The Ministry of Transport also included the same group of organisations, such as local governments, other ministries, VVN, ANWB, trade and industry, in the policy-making of the Multi-year Road Safety Programme 4 (Ministerie van Verkeer en Waterstaat, 1996b, p. 5).

The national government created conditions to enable the involvement of various actors in local policy-making. An example of this is the Regional Road Traffic Safety Authorities (ROVs) founded in each province in the Netherlands and focussing on road safety education, public information and enforcement (Ministerie van Verkeer en Waterstaat, 1987, p. 7). The ROVs consisted of delegates from the province, municipalities, police, the Public Prosecutor, VVN and on occasion, the Dutch Cyclists' Union. In addition, the Ministry developed a subsidy arrangement to make municipalities co-owner of the road safety problem (Ministerie van Verkeer en Waterstaat, 1987, p. 9-11). A subsidy was included in the MPV 1 (1987) as an elaboration of the quantitative target, of 25% fewer fatalities in 2000, set out in 1986. The subsidy arrangement, consisting of a starting premium and a result premium, was intended for municipalities who complied with this target. The operation turned out to be very successful with 98% of the municipalities

participating. It was, however, not possible to establish the effects of this subsidy on the road safety figures scientifically (Wegman, Van Selm & Herweijer, 1991).

#### 4.3.4. 1995-2010: The decentralisation of authority and implementation

##### Time line



**Figure 4.6.** Numbers of traffic fatalities and road safety expenditure of the Ministry of Transport between 1995 and 2010. Sources: Ministry of Transport and CBS.

The figure shows a slow but steady decrease in the number of traffic fatalities to about 750 over recent years. The number of traffic fatalities for the year 2010 was not yet available at the moment of writing. Up to 2002, the expenses of the Ministry of Transport on road safety remained stable, while in 2003 a sudden increase in expenses occurred. The budget did not reveal the exact reason of this increase, other than the fact that the increase was spent on subsidies to road safety organisations. The increase in expenses for road safety from 2007 onwards was caused by two changes. Firstly, the Ministry's Inspection expenses were booked onto the road safety budget from this year onwards, whereas they had been booked onto a separate budget previously. Secondly, education and information expenses increased.

### **Content of the knowledge-policy arrangement**

Several developments revealed that road safety as an integral part of traffic and transport policy had become more important during this period. Road safety for example was a prominent issue in the draft National Traffic and Transport Plan (Ministerie van Verkeer en Waterstaat, 2001) and in the Mobility Policy Document (Ministerie van Verkeer en Waterstaat, 2005b). The Ministry of Transport also extended the definition of road safety to safety in general by combining the road safety texts with texts on rail, tram, metro, marine transport, inland navigation, air traffic, tunnels, transport of dangerous substances and the protection of vital traffic and transport (safety issues) (Ministerie van Verkeer en Waterstaat, 2005b, p. 85 and further). Road safety seemed to have almost disappeared within this broad definition. A separate Strategic Plan Road Safety, which nevertheless designated integrality as one of the basic ideas of the plan and also looked at how road safety was tackled in other areas, was drawn up in 2008 (Ministerie van Verkeer en Waterstaat, 2008, p. 10, 40, 46 and further). As in previous national road safety plans, SWOV and other knowledge was used in the Strategic Plan, although this time with the help of Parliament. A month before the submission of the Strategic plan to Parliament, Parliament asked the Minister to adjust the quantitative target for road safety from a maximum of 580 to 500 road deaths in 2020, on the basis of SWOV research, claiming that this was possible within the given policy (Aarts et al., 2008; Tweede Kamer, 2008b). The Minister agreed and was supported by a study from the Ministry itself (Scheepers et al., 2008; Tweede Kamer, 2008a).

In 2005, SWOV published *Advancing Sustainable Safety: National Road Safety Outlook for 2005-2020* (Wegman & Aarts, 2006; Wegman & Aarts, 2005). This update of the Sustainable Safety vision attracted attention at a national (Aarts, 2005) and regional (Slinger, 2006) level. Although it is unknown whether this was its purpose, the publication probably helped to keep road safety (and Sustainable Safety in particular) on the agenda as a separate subject.

In the late 1990s, besides the usual system-oriented discussions, the topic of 'guilt' and accident proneness obtained renewed attention in the road safety discourse. This was expressed by an increasing number of publications on aggression in traffic. In the 1970s few Dutch research reports were published on this subject, compared with approximately 20 from the late 1990s onwards. The subject was mentioned in the draft National Traffic and Transport Plan, probably on the initiative of the ANWB that called for

attention to traffic ethics (Bax, 2001, p. 46 en 56; 2006, p. 29 en 50). This indicates a return to the doctrine of the driver as causal factor within the road safety system, but is also reminiscent of the discourse around the time of the Second World War when drivers were considered unsafe and aggressive. In more modern terms these drivers are called 'traffic louts'; a simple Google search renders 32.000 hits on this term (in Dutch: verkeershuffters, search on 31/01/2010), and there is even a website bearing that name.

### **Organisation of the knowledge-policy arrangement**

Within road safety policy, from the mid-1990s onwards, there has been serious interest in decentralisation, the transfer of road safety tasks and competencies to lower levels of governments, as the developments below illustrate. In 1994 the national and lower levels of government signed the Decentralisation Agreement (Ministerie van Verkeer en Waterstaat, Interprovinciaal Overleg IPO & Vereniging van Nederlandse Gemeenten VNG, 1994), in which the decentralisation of road safety policy was laid down. This agreement stipulates that national, regional and local governments share responsibility for road safety and provinces are primarily responsible for the coordination of road safety policy in their province by initiating administrative consultations. At about the same time, in 1996, the so-called VERDI Agreement (Ministerie van Verkeer en Waterstaat, 1996a) was signed. The VERDI Agreement defined the responsibilities of the various levels of government in traffic and transport policy and stressed the decentralisation trend. Another new decentralised rule was the introduction of the 'Mulder Law' (officially the Law on Legal Administrative Enforcement of Traffic Regulations, WAHV) in 1992. Municipalities could settle small traffic offences administratively by issuing an administrative fine. The revenue, however, went to the national government, yet it did give municipalities an instrument to set priorities in traffic enforcement. Finally, a covenant Start-up Programme Sustainable Safety (Ministerie van Verkeer en Waterstaat, 1997) was drawn up for the implementation of Sustainable Safety in 1996. In this covenant it was agreed that local governments would receive funds earmarked for specific Sustainable Safety measures. Although this Programme stimulated the implementation of road safety, the earmarking of funds still made this a fairly centralised policy. In general, all of these agreements, laws and covenants stressed the transfer of responsibilities for policy to provinces and city regions and for implementation to municipalities and regional water authorities, although it is questionable whether the Start-up Programme should be regarded as a form of decentralisation. Evaluations

of these agreements show that this decentralisation took some time to become effective (Berndsen et al., 1997; Terlouw et al., 2001).

Another change in this period was the allocation of subsidies. Between 1997 and 2002 the Ministry of Transport awarded specific subsidies for the implementation of a number of specific (infrastructural) measures into the framework of Sustainable Safety. In 2005 these earmarked road safety funds were transferred and completely embedded in the Broad Goal-oriented Grant for traffic and transport (BDU) (Ministerie van Verkeer en Waterstaat, 2005a), a manifest incorporation of road safety into traffic and transport policy. The new financial arrangement gave provinces and city regions more policy discretion in their spending. Furthermore, the arrangement made provinces and city regions responsible for the possible passing on of subsidies to municipalities and regional water authorities and thus constituted a decentralisation of responsibilities.

In the previous period, the involvement of different actors in the making of road safety policy at national and provincial level had already been discussed and practiced. In 1998, this existing practice was formally laid down in the Traffic and Transport Planning Law (S.N., 1998). This law stipulated that in drawing up a traffic and transport plan (e.g. the National Traffic and Transport Plan and the Mobility Policy Document) local governments must be consulted in any case. What is more, the Planning Law suddenly drew attention to a long 'forgotten' road authority, the regional water authorities. The Ministry of Transport also consulted the public as well as the knowledge field (Bax, 2001; 2006). Also, the cooperation between the different layers of government, interest groups and market agencies was taken as a starting point in the implementation of the National Traffic and Transport Plan and the Mobility Policy Document (e.g. in the Strategic Plan Road Safety) (Ministerie van Verkeer en Waterstaat, 2005b, p. 89; 2006b, p. 19 and further; 2008, p. 8, 40-46, 61-62). A new actor involved in policy-making was Team Alert, a small group of young people brought together in 2000 on the initiative of the Minister of Transport. Team Alert represents the interests of young people in policy processes and initiates public information campaigns for this age group.

The European Union, too, has been engaged in road safety policy since 2001. In previous years, the EU focussed mainly on vehicle requirements and professional driving time legislation. In 2001, it set a quantitative task onto road safety. In the White Book (European Commission, 2001), the European

Commission expressed its ambition to reduce the number of casualties by 50% by 2010. The Commission emphasised that the member states were reluctant to introduce measures at communal level. It saw only opportunities for the exchange of best practices. Furthermore, research on road safety was stimulated, usually as part of research projects on traffic and transport. In 2003, the Action Programme (Commissie van de Europese Gemeenschappen, 2003) containing specific road safety measures was published.

Not only the granting of subsidies, but also the organisation of the knowledge field indicates that road safety was integrated into the broader traffic and transport policy. In 1997, the Road Safety Board was dissolved (S.N., 1997) and policy recommendations were assigned to the broader Advisory Council for Transport, Public Works and Water Management (Ministerie van Verkeer en Waterstaat, 1996b). In 1999, a new Transportation Safety Board was set up (S.N., 1999a). This Board not only investigated road traffic accidents, but also railway accidents, air accidents, and inland navigation accidents. In 2005 the name Transportation Safety Board was changed to the Dutch Safety Board and in addition to accidents, its field of activity was extended to disasters and to policy fields other than transport, such as construction, industry, health care, defence and crisis coordination (S.N., 2004). In addition, the Consultative Body Road Safety (OVV) was integrated into the Consultative Body Passenger Transport, which advised not only on road safety, but on passenger transport in general (S.N., 2005a).

The integration of the knowledge intermediaries into traffic and transport became visible somewhat later than in the road safety policy field. As the developments discussed below show, some knowledge intermediaries continued to focus on road safety as a separate issue. Two knowledge organisations, embedded in the traffic and transport field, were the knowledge platform CROW, for infrastructure, traffic, transport, and public space, founded in 1987 (CROW, 2007a, p. 7) and the knowledge platform VERDI (Ministerie van Verkeer en Waterstaat, 1996a), founded in 1997 for the implementation of the VERDI Agreement. Also in this period, there were two organisations that focussed on road safety: KEVER (Knowledge Infrastructure Road Safety), founded in 1996 (Methorst & Hofman, 2001, p. 4), and the Infopoint Sustainable Safety, founded in 1998.

KEVER and the Infopoint Sustainable Safety were a result of the Decentralisation Agreement. KEVER fulfilled the national government's facilitating role in knowledge dissemination and targeted municipalities and



provinces, for gathering and spreading (local) road safety knowledge. Evaluations showed that KEVER was not very well-known nor supported by the regional and local governments (Methorst & Hofman, 2001; Terlouw et al., 2001, p. 55). The Infopoint Sustainable Safety, on the contrary, served as a centre for queries for road safety professionals (Ministerie van Verkeer en Waterstaat, 1997) and was well-known by regional and local governments (Terlouw et al., 2001, p. 55).

However, soon afterwards these knowledge intermediaries were integrated into broader knowledge organisations. KEVER and the Infopoint Sustainable Safety were abandoned in 2000 (Methorst & Hofman, 2001, p. 1) and incorporated into the broader CROW in 2004 respectively (CROW, 2010). Also in 2004, the knowledge platform VERDI was given the new name KpVV (Transport Knowledge Resource Centre) (Weijermars & Van Schagen, 2009, p. 33) and joined CROW in 2009 (KpVV, 2010a).

As of the mid 1990s, the Ministry of Transport became increasingly critical of how the knowledge infrastructure tied in with policy. The knowledge infrastructure was organised at a national level whereas policy was decentralised to a considerable extent (Ministerie van Verkeer en Waterstaat, 1996b, p. 11 and 38). In 1996, the Multi-year Road Safety Programme 4 went as far as to describe this fragmentation in the knowledge infrastructure as a serious road safety bottleneck (Ministerie van Verkeer en Waterstaat, 1996b, p. 9 and 11). Among other things, this dissatisfaction was responsible for a repositioning of SWOV in the knowledge field and for new rules of play from 1999 onwards. The organisation downsized and no longer accepted commercial commissions because of EU regulation (S.N., 1999b). At the request of the Ministry of Transport the organisation focussed on fundamental, innovative and strategic research and on the dissemination of the information among professionals (Mulder & Ederveen, 2002, p. 37). However, the Ministry of Transport did not maintain this detached role and asked SWOV almost immediately, in 2000, to calculate the costs of the draft National Traffic and Transport Plan (Schoon, Wesemann & Roszbach, 2000).

#### **4.4. The present knowledge-policy arrangement**

This section discusses the present Dutch knowledge-policy arrangement. It provides a context for subsequent chapters on the use of knowledge, and presents possible barriers to knowledge use. The knowledge-policy arrangement is described using the four dimensions of the policy

arrangement approach: actors, rules, resources and discourse. The role of road safety knowledge providers and policy actors, as well as current discourses among knowledge and policy actors are discussed. The rules of interaction, the demands, possibilities and budgets of policy actors are also covered.

The information used in this section is derived from annual reports, websites and overview publications (such as Bogaarts, Haans & Weyers-de Ruitter, 2003; Heijkamp & Kraay, 2001) from the organisations discussed below. Although an information search of websites and reports was conducted into the nature and resources of each actor, these references were not included in the text for two reasons. The first reason is that the text in this section is not a literal reproduction of the sources, but an interpretation based on the referred sources and on research experience. Secondly, including the reference would affect the readability of the text, since at least one reference would appear in each sentence. Therefore, explicit references have been included in the text only when the source is not obvious.

#### **4.4.1. Actors**

Five main groups of actors involved in road safety can be distinguished: governments, knowledge organisations, interest groups, market agencies and the general public.

There are several levels of government responsible for road safety policies. Next to their role as policy-makers, national government, provinces, municipalities and some regional water authorities are also responsible for the construction and maintenance of roads within their boundaries. *Chapters 6 to 8* discuss provinces and municipalities in their role of road authority and investigate how they use knowledge in decisions about infrastructure. At different levels, government determines the frameworks for road safety policy. The European Union outlines the policy of its member states on some subjects, e.g. vehicle requirements and driving time legislation. The Dutch Ministry of Infrastructure determines national policy frameworks for traffic and transport policy and for road safety in particular, for example the target for 2020 being a maximum of 500 fatalities. Provinces and city regions are responsible for their own provincial and regional policy, but also have a directive role in municipal road safety policy and municipal coordination. One of their instruments employed in this directive role is the distribution of BDU among municipalities and regional water authorities. City regions themselves do not own roads. Municipalities make their own municipal

policy and can subsidise local road safety projects. This also applies to the six road owning regional water authorities.

Furthermore, the Ministry of Infrastructure is responsible for the financing of national campaigns and for granting driving licenses through the Dutch Driving Test Organisation (CBR). The Ministry of Security and Justice is responsible for enforcing traffic rules and imposing fines, among other things. The enforcement is carried out by the Bureau Traffic Enforcement of the Public Prosecution Service (BVOM), police enforcement being the responsibility of the Ministry of the Interior and Kingdom Relations.

Many different organisations develop and disseminate road safety knowledge. The Centre for Transport and Navigation (DVS) of the Ministry of Infrastructure carries out policy related road safety research. SWOV provides scientific road safety research on all sorts of road safety topics, for a large part on road user behaviour, infrastructure and accident statistics, and provides for the dissemination among road safety professionals. The Dutch Safety Board occasionally investigates traffic accidents and their causes. Universities carry out road safety studies from a psychological, behavioural or infrastructural perspective on a regular basis. Various sections of TNO conduct research into road safety with respect to infrastructure, vehicle technology and human behaviour.

Two organisations convert research into practice and disseminate knowledge. Together with local, provincial and national government, interest groups and consultancies, CROW develops, controls and disseminates practical guidelines for road safety measures on roads. KpVV, an independent division of CROW, is responsible for disseminating, amongst others, road safety knowledge to local governments. In addition to the above-mentioned knowledge organisations, several private consultancies work in the road safety field, although according to their websites, most are not aimed at road safety exclusively, but focus on traffic and transport-related policy in general.

The names of the various interest groups indicate clear specialisations. The best-known general road safety interest group is VVN, which, with its regional and local departments, organises public information campaigns, education and consultation with government at all levels. The ANWB supports road safety on a regular basis, mostly in consultative bodies at a national level. The Association for Traffic Victims promotes the interests of

people involved in a traffic accident and their families and is a platform for contact between fellow-sufferers. Improving road safety is one of its objectives and its Accident Causes Committee investigates traffic dangers. Team Alert represents the interests of young people and provides them with information. Occasionally, the Cyclist's Union, the union for the elderly ANBO and the transport interest groups TLN and EVO devote attention to road safety in relation to their own specific interests.

In the Netherlands, the main market agencies consist of owners of driving schools, transport businesses, bicycle and moped manufacturers and sellers, car sellers organised in BOVAG and RAI, and insurance companies organised in the Dutch Association of Insurers. At the EU level, car manufacturers, as well as manufacturers of traffic safety systems, such as navigation systems, advanced cruise control and alcolock devices, are part of the road safety field.

Finally, the general public is involved in road safety policy. They can influence policy through formal and informal opportunities for public comment. At a local level, they are sometimes organised in area or neighbourhood committees.

#### **4.4.2. Rules**

In the Traffic and Transport Planning Law, some explicit rules are laid down for interaction between the governments in the road safety field. This Law determines that the 'essential parts' of the National Traffic and Transport Plan must be included in the provincial and regional traffic and transport plans. For road safety, these are texts on road safety targets in particular (Ministerie van Verkeer en Waterstaat, 2005b, p. 20). The Provincial and Regional Traffic and Transport Plans can, in return, dictate binding conditions with respect to municipal traffic and transport policy. Furthermore, it is a statutory regulation (Roads Law (Wegenwet), S.N., 1930, art. 15) that each road authority is responsible for the maintenance of its own roads, which implies that the State cannot tell a province, nor can a province tell a municipality which measures are to be taken on provincial or municipal roads respectively.

The Mobility Policy Document (Ministerie van Verkeer en Waterstaat, 2005b) provides a rule of thumb for the relationship between the various government levels: local if possible, central if necessary. In principle, this represents a far-reaching decentralisation, although there are regularly

discussions about the issue of 'possible and necessary'. The Mobility Policy Document safety target for 2020 has been formulated quantitatively, but not reaching the target has no consequences, either at a national, or at a local level.

Finally, there are some rules for arranging fixed times for consultation in addition to the consultations mentioned in the Traffic and Transport Planning Law. Various interest groups confer on the Ministry of Infrastructure's policy in the Consultative Body Passenger Transport. Road safety is one of the issues. At a provincial level, the standard consultation structures differ between provinces. Some have a Regional Road Traffic Safety Authority, which mainly discusses education and enforcement. In addition to the province, VVN, the Department of Public Prosecutions, the police executive and municipalities are members of this authority. Other provinces have a broader Traffic and Transport Consultation with road safety as one of several subjects. Yet others meet to discuss the distribution of the BDU subsidies among sub-regions. The associations of Dutch provinces and city regions organise meetings about road safety for their members. The municipal level often has a traffic committee to discuss road and road safety problems with police, VVN and the Cyclists' Union. Governments are obliged by law to involve citizens in their policy-making. It is a legal requirement that traffic decisions be made public to enable objections and appeals to be lodged. Most governments try to prevent objections by informing or involving citizens before the policy-making process is closed.

Rules for interaction between knowledge organisations, on the contrary, seem to be lacking, or at the very least, are not formalised. For example, few rules exist for the demarcation between different organisations. However, there are general rules for subsidising the knowledge producing organisations (S.N., 1985; 1986; 1999b; 2005b), for instance those prohibiting the deployment of market activities for those organisations financed largely by subsidies (e.g. SWOV and KpVV). These subsidy conditions also grant the subsidiser (the national government for SWOV and TNO, and the regional and local governments for KVPP) a say in the research topics. In fact, the above formal and informal rules have resulted in a more or less spontaneous division of tasks and specialisations among the knowledge organisations.

#### **4.4.3. Resources**

Each government can use its own financial resources to realise road safety policy, and indeed this is done in practice. However, the actual amount of

spending involved is unclear. Funds for traffic and transport are passed from national to provincial and regional governments through the BDU. The provinces and city regions can distribute this subsidy among their municipalities. The subsidy, or a part of it, can be spent on road safety, but this is not compulsory. Furthermore, the Ministry of Infrastructure subsidises several road safety organisations, for example VVN, Team Alert, the Association for Traffic Victims, the Cyclist's Union and knowledge organisations such as SWOV and TNO. KpVV is financed through the BDU. The Dutch Safety Board is supported by the Ministry of the Interior and Kingdom Relations. CROW is funded entirely through externally financed projects and book sales. ANWB is also not subsidised and receives its funds from membership dues, commercial activities and semi-commercial activities such as placing road signs and maintaining them.

In addition to financial means, other resources, such as manpower and knowledge or expertise, are available to the actors. It is not easy to indicate how many people within the various levels of government work with road safety. At a national and provincial level some positions are exclusively aimed at road safety, but in addition there are many positions in which road safety is only part of the job. Exact numbers are therefore not available. It can generally be said that the national government has the largest number of posts requiring specialist expertise in road safety, approximately 60 fte (full-time equivalent) including the executive body Rijkswaterstaat, at a provincial level somewhat fewer, and very few to none at all at a municipal level and in regional water authorities. Road safety is mentioned in none of the organisation charts of the Ministry of Infrastructure, the provinces or city regions, indicating that road safety is not a separate division. The same is true of municipalities.

The sizes of the interest groups differ a great deal. The ANWB is by far the largest professional organisation with approximately 4000 fte, but the vast majority of these posts do not focus on road safety. As is the case at the various levels of government, road safety is not mentioned in its organisation chart. VVN has 70 employees and a large number of volunteers (4500). The Cyclist's Union has 30 employees and 1500 volunteers and, like the ANWB, does not focus on road safety alone. As far as could be detected, Team Alert and the Association for Traffic Victims consist exclusively of volunteers.

The knowledge organisations are not of equal size either. SWOV has approximately 60 employees who are concerned exclusively with road safety

research. Only a small number of those employed by the knowledge organisations TNO, KpVV, the Dutch Safety Board and CROW, and by several universities, work on road safety, and sometimes even then for only a part of their working hours. Road safety is not mentioned in the organisation charts of KpVV and CROW. The Dutch Safety Board has a separate division for road transport, whose remit is studying road accidents. Although TNO has a separate subdivision for Transport Safety that concentrates on freight transport, road safety is not specifically mentioned in its organisational chart.

The amount and kind of expertise each of the above organisations has available is difficult to express numerically. Generally, it can be assumed that the more employees within an organisation are occupied with road safety exclusively or for a substantial part of their time, the more expertise the organisation will have. Consequently, the national government will generally have more road safety expertise than a small municipality and SWOV will have more road safety expertise than KpVV. Not only the amount of expertise is important, but also the kind of expertise. An impression of the expertise of the different knowledge organisations was given above (see *Section 4.4.2 on Rules*).

#### **4.4.4. Discourses**

When reviewing road safety literature, three important debates can be distinguished. Two of these discuss the content of the policy, the substantial discourse. The third theme concerns the governance discourse, a debate about the division of the tasks and authorities among the different governments, the market and civil society. The three debates are concerned with:

1. Strategic interventions such as infrastructural, behavioural and vehicle measures, and their costs and effects.
2. The demarcation between road safety and other policy issues e.g. traffic flow and environment, and whether or not to use an integral approach in making a particular choice.
3. The organisation of the policy, such as the directive role of provinces.

These themes are also present in the recent national Strategic Plan Road Safety (2008) and the Mobility Policy Document (2005). The three most important pillars of the Strategic Plan are Sustainable Safety, an integral approach, and cooperation between the various levels of government and with civil society and the market (Ministerie van Verkeer en Waterstaat, 2008, p. 10). The Mobility Policy Document cites the 'integral approach' as the

most important strategy (Ministerie van Verkeer en Waterstaat, 2005b, p. 87). Mainly as a result of the Planning Law, the discourse is uniform within different levels of government: the provinces and city regions include the main ideas from the Mobility Policy Document and the Strategic Plan in their Provincial and Regional Traffic and Transport Plans respectively.

In the first debate, that on road safety strategies, there is consensus between the knowledge and policy worlds on the relative importance of issues. It appears there has always been wide consensus about using the term road safety to denote the safety of road traffic, and about the objective of the policy: the reduction of the number of fatalities and serious road injuries. The system-oriented approach dominates road safety measures, at least in policy documents, and is aimed at making the traffic system as a whole (road, vehicle, man) safer. However the moralising, expressed in terms such as 'traffic louts', 'own fault', 'own responsibility' and 'multiple offenders', surfaces frequently, in policy discourse rather than in road safety knowledge discourse. The consensus on the relative importance of issues does not only exist between the governmental layers, which is illustrated by the adoption of the discourse of the Mobility Policy Document in Provincial and Regional Road Safety Plans (for instance Provincie Gelderland, 2005, p. 10; Provincie Limburg, 2006, p. 5 and 2-1). It also seems to be present among government and knowledge organisations. This is illustrated by the fact that the Strategic Plan Road Safety 2008-2020 names Sustainable Safety explicitly as one of the three pillars of policy (Ministerie van Verkeer en Waterstaat, 2008, p. 10).

Contrary to the consensus described above, there is disagreement on important details, particularly with regard to implementation and the opportunities for custom-made solutions. Each actor has his own preferred discourse and strategy. Governments often consider infrastructural measures expensive and prefer to adapt measures to their own conditions (Bax & Jagtman, 2008; Boer, Grimmius & Schoenmakers, 2008; Mesken, Aarts & Vis, 2010, p. 16). Interest groups generally concentrate on measures such as public information and education. Members of the public generally dislike speed reducing measures such as speed humps and the noise from rumble strips (Bax et al., 2008). Knowledge organisations therefore, research all of these measures and often also study the costs and effects. Although both national and regional levels are interested in this approach, regional and local governments have their doubts about the validity of the effect estimates, especially for local purposes (Bax, Elvik & Veisten, 2009). These differences



in discourse between the provincial government, knowledge field and the general public are discussed in detail in *Chapters 6 and 7*.

The second debate, on the demarcation between road safety and other policy issues such as traffic flow and environment, has been conducted largely in the policy world, but not only among road safety actors. On the contrary, the debates take place in those other arenas where accessibility, environment, spatial planning and urban development are discussed. This has led to road safety increasingly being integrated into the subject of traffic and transport, within the discourse and policy at different government levels (see for instance Ministerie van Verkeer en Waterstaat, 2001; 2005b; Provincie Flevoland, 2006, p. 9; Provincie Gelderland, 2005; Provincie Groningen, 2005, p. 7). As yet, it is not clear whether or not this is advantageous to road safety. Unlike governments, knowledge organisations and interest groups often remain specialised in road safety, or, if they are more broadly oriented, consider road safety as a separate subject among their activities (see for instance the CROW, 2010 site; and the KpVV, 2010b site). To illustrate this, a search was carried out on the topic of integration of road safety into traffic and transport policy in the SWOV library. The search was conducted using variations on the word integration (integratie / integra\* / integreren / geïntegreerd) in combination with the words road safety and traffic (verkeersveiligheid and verkeer) in all search fields. This revealed very few studies. In *Chapter 7*, an experimental setting is used to observe how provinces conduct this debate about balancing road safety with other interests.

The third debate concentrates on which actors make and implement road safety policy. The recent shift in steering road safety policy-making from a national to a regional governmental level has introduced discussions about the exact interpretation of the directive role of the provinces (Mesken, Aarts & Vis, 2010). A number of issues arise, for example the extent to which provinces should or can design a typical provincial road safety policy and whether they should stick to national priorities. Furthermore, provinces and municipalities discuss the possibility and desirability of a directive versus a facilitating role for provinces towards municipalities. Part of this discussion, especially on the regional and local level, is how to involve actors in the policy-making process to gain their support and to minimise the inconveniences of road safety measures without losing out on the effect. *Chapter 8* investigates whether and how municipalities involve different interested parties such as neighbouring municipalities, emergency services,

public transport and people living and working in the area in their road safety policy-making.

## **4.5. Analysis and conclusions**

In this section, the historical analysis of road safety knowledge and policy, set out in the previous section, is followed by an analysis of the historical developments in the knowledge-policy arrangement. The chapter concludes with three possible institutional barriers to knowledge use in road safety policy.

### **4.5.1. Historical developments in the four dimensions of the knowledge-policy arrangement**

#### **Actors**

Three developments are discussed: developments in the number and in the kind of actors involved in different periods, and the diversity of knowledge organisations.

Development with regard to the number of actors involved is fairly linear; there is an increase over time, especially up to the year 2000, after which a small number of interest groups merged with one another, as did some knowledge organisations.

Secondly, during each of the four periods, different actors played a prominent role. Besides the government, these were organisations from civil society and the knowledge field. In the first period, from 1900 to 1945, civil society organisations, the ANWB in particular, were responsible for the development of road safety knowledge and policy. The second period, particularly from 1965 to 1975, was characterised by the primacy of science and an extensive use of science in policy. Knowledge organisations such as SWOV and the Dutch Road Safety Board had a great deal of influence on policy. From 1975 to 1995, the Ministry of Transport determined the road safety agenda producing huge quantities of policy documents. In the fourth period, from 1995 to 2010, the regional and local governments have been the most prominent actors, with increased responsibilities and powers.

Thirdly, this chapter shows a great diversity in knowledge organisations. The position of a number of knowledge organisations requires further explanation. The Dutch Road Safety Board provided the government with

science-based policy advice. This type of organisation, in which governments ask scientists to advise them on specific issues by participating in advisory groups, is characterised by Jasanoff (1994) as 'Fifth branch' organisations. SWOV is an organisation that focuses on applicable scientific knowledge on road safety issues. It is a multi-disciplinary organisation employing, for example, psychologists and civil engineers as well as statisticians. Users, particularly the Ministry of Transport, test the usefulness of the knowledge regularly. With its focus on applicable knowledge, multi-disciplinarity and testing for usefulness, the organisation can be characterised to some extent as a Mode 2 organisation (Nowotny, Scott & Gibbons, 2001). However, SWOV operates only partly in the kind of horizontal network of private and government-related knowledge organisations that Nowotny et al. envisage. Due to the subsidy regulations, SWOV's agenda is partly determined by the Ministry of Transport. These characteristics are more in line with the demand-pull model designed by Landry et al. and with Hoppe's engineering model.

Finally, several universities, for example in Groningen, Delft, Twente and Eindhoven, carry out road safety research. Their academic context and their high degree of specialisation in specific disciplines of road safety research are clear features of Mode 1 organisations.

As far as the relationship between the knowledge organisations themselves is concerned, some conclusions can be drawn. The first conclusion is that the collaboration between knowledge organisations such as the ANWB, SWOV, TNO and the Road Safety Board in forming mutual agreements and in the organisation of congresses presupposes frequent contacts between them. Furthermore, the frequent involvement of these organisations in policy-making processes points to close contacts between knowledge institutions and policy-makers. Moreover, there appears to be an extensive use of knowledge in policy documents. Although it is impossible to investigate all of the steps on the Knott and Wildavsky (1980) ladder of knowledge use in the analysis, this requiring an extensive process analysis of specific policy processes, the reference to information in policy plans ('reference') is manifest. Examples abound:

- The use of a SWOV report in the first Road Safety Memorandum in 1967;
- The use of SWOV's definition of road safety as multi-conditional in the Policy Plans for Road Safety 1975 and 1983;

- The use of SWOV's quantitative basis for road safety measures in the Policy Plan for Road Safety in 1983;
- The call by the Road Safety Board to consider the cost-effectiveness of road safety measures, used in the National Plan Road Safety 2 in 1985;
- The use of quantitative targets recommended by the Road Safety Board in the Multi-year Road Safety Plan 1 in 1987;
- The use of the concept Sustainable Safety (developed by SWOV and others) in the Multi-year Road Safety Plan 3 in 1991;
- The use of cost-effectiveness data calculated by SWOV, of the Advancing Sustainable Safety vision and of the adaptation of the road safety target for 2020 in the Mobility Policy Document in 2006 and the Strategic Plan Road Safety in 2008.

Furthermore, the above-mentioned policy plans made occasional reference to reports from TNO, private consultancies such as McKinsey, Traffic Test and Berenschot, and to international organisations such as the World Health Organization (WHO) and the Organisation for Economic Co-operation and Development (OECD).

## **Rules**

Two types of rules can be observed. In the first place, there are rules for the participation of interest groups and regional and local governments in national policy-making. In the fifties and sixties, the early days of policy-making, participation was possible through the Permanent Committee Road Traffic Safety. In the seventies and eighties, participation occurred through the Permanent Contact Group Road Safety (PCGV), in the nineties through the Consultative Body Road Safety (OVV) and recently, since 2005, through the Consultative Body Passenger Transport (OPV). Through these bodies, the national government has involved interest groups in the making of road safety plans since the first National Plan Road Safety in 1983. Since the development of the concept National Traffic and Transport Plan in 2001, the involvement of interest groups has been further intensified, with market and civil society also involved in the policy.

The second type of rule that can be observed concerns financial rulings, initially, in relation to the national road safety budget. Since the mid-1980s, specific subsidies for regional and local governments were added, at first occasionally and connected to projects such as the Action -25%, but later on a more structural basis as part of the Bundled Goal-oriented Grant (GDU). From 2005 onwards, the financial rules changed drastically when earmarked funds were abolished and provinces and city regions received the traffic and

transport-oriented BDU, and road safety budgets were integrated into the traffic and transport budgets.

### **Resources**

Resources are defined as the availability of funding, manpower and knowledge. Two developments are discussed: the amount of resources and the allocation of resources among the actors.

The amount of resources for road safety has increased greatly since the 1960s. In this study, the national road safety budgets of the Ministry of Transport received the most attention (see *Figures 4.2-4.6*). It can be assumed justifiably that these budgets do not only reflect the amount of money spent on road safety, but are also an indication of the amount of energy, manpower, and policy efforts expended. Regarding the increase in road safety knowledge, a study of international publications on road safety in reputable journals shows an uninterrupted and steep increase in knowledge production, from approximately 50 publications in total in the period 1900-1945 to about 1500 annually in 2009 (Hagenzieker, Bijleveld & Commandeur, forthcoming).

The second development shows a shift in the allocation of these resources. From the 1980s, but particularly from 1995, the regional and local governments were given wider powers. Due to the Start-up Programme Sustainable Safety and later through the BDU, the regional and local governments gained access to an increased road safety budget. A shift in manpower on a decentralised level has not been investigated, but would seem to be evident. With the arrival of knowledge brokers such as KEVER, Infopoint Sustainable Safety and KVPP, decentralised and operational translations of centrally developed knowledge became available to regional and local governments.

### **Discourse**

Shifts in substantial discourses, with respect to policy content, and to governance discourses, and as to which actors are involved in making and implementing policy, are discussed below.

Over the decades, the substantial road safety discourse has shown a number of shifts (OECD, 1997). Discussions about road safety were no longer single cause-oriented but system-oriented. Prior to World War II, road traffic accidents were generally considered to be one's own fault, the consequence of carelessness and inattention, and the cause assumed to lie in human error

and in particular accident prone personalities. After 1950, this changed to a single cause oriented, and from 1970 a multi-causal and system approach towards traffic accidents, in which man, vehicle and road each play important roles (Koomstra, 1986, p. 7; Kraay, 1989, p. 268). The development of the Sustainable Safety vision can be seen as the climax of the system oriented approach. However, the 'own fault' theory and the accompanying 'accident-proneness' theory have never really disappeared.

The governance discourse, too, changed over time. In the first half of the 20th century, civil society, represented by the ANWB, put road safety on the agenda. A road safety policy scarcely existed until the mid 1960s. Then, the Ministry of Transport, on behalf of the national government, took the initiative in policy-making, using road safety concepts developed by, for example, SWOV and the Dutch Road Safety Board. Regional and local government, other ministries, civil society and the market were involved in this policy-making, but not in the implementation. From the mid 1980s, the implementation of road safety policy became one of the tasks of provinces and municipalities. This was set out in the Decentralisation Agreement in 1994, the Traffic and Transport Planning Law in 1998 and the BDU in 2005. These laws granted regional and local governments authority and budgets for decentralised road safety policy. Furthermore, the involvement of the market and civil society has increased from the late 1990s to the present. This approach is seen in the development of the Mobility Policy Document, the Road Safety Strategic Plan and the subsequent Action Programme. Market and interest groups have been involved in the development of policy, often in lengthy initial phases, and in the plans, the implementation of part of the policy is attributed to companies and associations.

#### **4.5.2. Historical developments further typified**

In previous chapters some observations have been made about the relation between knowledge and policy. Various theories describing these relations were expounded in *Chapter 2*. The present section analyses the relations between knowledge and policy organisations by characterising the consecutive periods with the help of the typologies by Landry et al. and Hoppe respectively. The typologies are not static labels, but heuristic instruments to indicate shifts, contradictions, strategic behaviour and institutional changes.

### **1900-1945**

In this period, very few activities in either road safety science or policy could be detected. Based on the absence of sources that indicate contact, it would appear that road safety science and policy operated separately (Kraay, 1989, p. 267). The typologies by Hoppe and Landry et al. therefore are not applicable to the characterisation of this period.

### **1945-1975**

This period is characterised by an increasing activity in science. Although the government requested knowledge for the various policy plans, it seemed to be the knowledge organisations themselves that determined the actual research subjects. However, policy and knowledge organisations did seem to share the same ideas about objectives and measures. This is indicated, for example, by the fact that SWOV's scientific ideas were adopted by policy in the first Road Safety Memorandum. These characteristics correspond to Hoppe's technocratic model, in which there is no significant discrepancy between the worlds of science and policy, and science plays the primary role. The characteristics also correspond to the science push model by Landry et al., as science fulfils the role of objective knowledge provider, and policy that of knowledge consumer.

### **1975-1995**

The situation sketched above appeared to continue in this period. By defining road safety as multi-conditional, calling for quantitative targets and the introduction of cost-effectiveness, and by developing the Sustainable Safety vision, SWOV and the Road Safety Board determined their own research agendas. These ideas were readily accepted in the national policy plans of 1975, 1983, 1985, 1987 and 1991. Furthermore, the knowledge field grew steadily and universities and consultancies also investigated road safety, resulting in the joint vision Sustainable Safety. These developments still contain characteristics of Hoppe's technocratic model or the science push model by Landry et al., as they indicate the primacy of science to determine research subjects and stress the convergence between science and politics through the easy incorporation of research findings into policy plans.

At the same time, the national government, it would seem, attempted to get to grips with the coordination of the knowledge production. To do so, the Policy Plan for Road Safety 1975 transferred the responsibility for the coordination of the knowledge production from SWOV to the Directorate-General for Road Safety DVV. From the 1990s onwards, the ministry had its

own knowledge department, the Transport Research Centre AVV. Knowledge organisations had to conduct research by assignment. These efforts on the part of the national government to obtain guidance and transfer knowledge tasks to a government body point towards Hoppe's bureaucratic model, as they show a primacy of politics over science. They also point towards the demand pull model by Landry et al., as the national government determined the research coordination. One characteristic of this period that does not fit into Hoppe's bureaucratic model, however, is the fact that the national government does not provide for all knowledge activities. Research is also performed by universities and consultancies. The government supervises all applied knowledge tasks, such as research specifically intended for policy processes and specialist knowledge not conducted by market agencies. Other knowledge tasks, for which independent research organisations existed, continued to be performed externally (Ministerie van Verkeer en Waterstaat, 1993, p. 13-14).

#### **1995-2010**

A remarkable observation in this period, and parallel to the decentralisation of policy responsibilities to regional and local governments, is the rise of knowledge intermediaries, organisations such as CROW, KEVER, Knowledge Platform Verdi, Infopoint Sustainable Safety and KpVV. These organisations aimed, and some continue to aim, at communicating and translating knowledge to policy-makers. These are known as dissemination activities. The organisations do not directly aim at involving policy-makers in the different phases of the research process or vice versa, but at identifying applicable knowledge and translating it into a practical policy context. The dissemination model by Landry et al. describes a similar situation.

In general, the Ministry of Transport was not satisfied with the knowledge-policy infrastructure, claiming that the decentralised policy no longer matched the national knowledge infrastructure (Ministerie van Verkeer en Waterstaat, 1996b). Furthermore, since road safety increasingly became integrated into the traffic and transport policy, there hardly seemed to be a separate road safety knowledge policy (Ministerie van Verkeer en Waterstaat, 2006b). Also the Strategic Plan Road Safety (Ministry of Transport, 2008) stressed the broadening of the road safety policy to other policies. The constellation has some of the characteristics of Hoppe's engineering model, such as the government's need for steering research and the absence of governmental bodies for knowledge production.



### 4.5.3. Historical developments described in governance trends

*Chapter 2* discussed three governance trends, i.e. changes in policy arrangements that took place in many policy fields in the last 15 years. This section investigates whether these multi-actor, multi-level and multi-sector trends have been observed in road safety too. Previous sections have shown evidence of all three main governance trends, although not equally in timing or size.

The historical overview showed the road safety policy field to be a multi-actor field from the start. Several interests groups such as the ANWB and VVN have been present in the road safety field since the first half of the 20th century, as have car and bicycle manufacturing and sales companies. Since the 1970's, the number and the variety of actors even increased.

The growing trend towards multi-level governance is visible in road safety through the greater role of the regional and local governments from the mid-1980's onwards and through the growing involvement of the EU from 2001 onwards. Until then, road safety policy was mainly made by the national government with regional and local governments playing a merely executive role. This gradually changed around the second half of the 1980's. Throughout the last 20 years, regional and local governments have become increasingly responsible for regional and local road safety policies.

Lastly, a very recent development in the road safety policy field is the multi-sector governance trend. This trend is illustrated in the recent integration of road safety into other policy fields such as the traffic and transport policy, a trend that continues to develop. Although road safety was spread out among different departments in the 1950's, it was seen as a separate policy field from the 1960's to the 1990's. However, in 2001 road safety was integrated into traffic and transport policy in the National Traffic and Transport Plan and this has not changed since. Even the Strategic Plan Road Safety 2008, although a single-sector document, stressed the importance of integrality. The following chapters will show whether this trend represents mere lip service towards integration in policy documents or whether the integration has consequences for policy in practice too.

Although these three trends seem to be present in the policy world, the same cannot be said for the knowledge world. The present chapter illustrated that knowledge organisations fall apart in several categories such as

organisations exclusively focussed on road safety and those with a broader orientation, but also consultancies versus not for profit organisations. However, a multi-actor trend cannot be found, since knowledge organisations, by definition, can only be typified as one kind of actor. Furthermore, multiple levels do not seem to be present as much as in the policy world. In comparison to the policy world, knowledge organisations have been more organised at, and oriented towards the national level. Although this trend has undergone slight changes recently (see for example: Mesken, Aarts & Vis, 2010), it is still mostly dissemination activities, as opposed to research activities, that are explicitly directed towards the local and regional level. Lastly, more than the policy world, the knowledge world is focussed on the road safety field as a single sector. Their websites (see for instance the sites CROW, 2010; KpVV, 2010b), but also their publications (see the library search on the word integration in *Section 4.4.4.*) reveal a limited interest in the integration of road safety into traffic and transport policy. This results in little knowledge production being tailored for use at regional and local governmental levels, and for sectors other than road safety.

The differences between the knowledge and the policy world with respect to these three governance trends can be characterised as three possible institutional barriers to knowledge use, as discussed in the section below.

#### **4.5.4. Institutional barriers for knowledge use in the present knowledge-policy arrangement**

Above, the historical developments in the knowledge-policy arrangement were examined by means of the analytical concepts mentioned in *Chapter 2*. Below, these concepts are used to analyse the present knowledge-policy arrangement. *Chapter 2* not only discussed concepts to describe the knowledge-policy arrangement, it also discussed institutional barriers to knowledge use in policy.

The historical overview and description of the present knowledge-policy arrangement indicate that, over the whole period and with regard to different aspects, knowledge and policy are well attuned to one another. Much of the knowledge is used in several ways in policy, and policy-makers seem to know how to communicate their knowledge needs to scientists and knowledge organisations and vice versa.

However, as both *Chapter 1* and the present chapter indicate, regularly situations occur in which knowledge is not used in policy and knowledge

desires are not met by knowledge organisations. Based on the historical analysis and the description of the present knowledge arrangement and the governance trends, there are three possible reasons for knowledge not always used in policy.

The first possible reason is linked to the multi-level governance trend in the policy world and the absence of this trend in the knowledge world. Policy and the implementation of road safety policy have been decentralised for a number of years, but knowledge production has not so much (see also Methorst & Hofman, 2001, p. 29; Rühl, 1995). The decentralisation of policy and implementation is apparent from texts in the Mobility Policy Document and the Strategic Plan Road Safety and from the financing of road safety in which, through the BDU, a large proportion of the funds ends up with regional and local governments. However, this decentralisation did not provide for the founding of decentralised knowledge organisations. This is illustrated by the fact that knowledge organisations focussing on road safety, such as SWOV, TNO and some universities function as 'national' organisations. There are, however, knowledge intermediaries such as KpVV and consultancies who translate knowledge into the regional or local situation. Not only is the knowledge organised on a national level, it has a national focus as well. This is the case for the costs and effects of road safety measures, for example. Often only national figures on costs and effects are available without attention to local variety (Janssen, 2005; Schoon, Wesemann & Roszbach, 2000; Wijnen, Mesken & Vis, 2010, p. 16-19). The decentralised level, however, has a need of decentralised knowledge. National figures cannot always be translated into provincial figures, not to mention municipal figures. In *Chapters 6 and 7*, this problem is elaborated on.

A second possible reason for a lack of knowledge use in policy is related to the multi-sector governance trend in the policy world and the relative absence of it in the knowledge world (see also Methorst & Hofman, 2001, p. 30). Several developments show that the policy world increasingly considers road safety as an integral part of traffic and transport policy. This can be observed, for example in the incorporation of road safety into the Mobility Policy Document, in the importance that the Strategic Plan Road Safety in spite of it being a single sector policy plan, attaches to the concept integrality, and in the integration of the funding of Sustainable Safety in the BDU. However, the knowledge world still has, for the most part, a sectoral orientation, whereby road safety is considered a separate policy sector. This is apparent from their websites and publications.

The third possible reason for the less than optimal relationship between knowledge and policy is not linked to governance trends, but to the Two Communities metaphor described by Caplan (1979). This is especially apparent in the discourse on road safety. Whereas the discourse is of a mainly technical nature in the field of knowledge, the discourse in the policy field has a more political nature (see also Elvik, 2010; Haight, 1994). The field of knowledge, for instance, uses mainly terms from the technical system approach of which Sustainable Safety is an example. The policy world also pays frequent heed to the guilt and punishment of traffic offenders, as observed in the recent discussions about the so-called 'traffic louts' (habitual traffic offenders). Furthermore, the knowledge organisations are, for example, interested in cost-benefit and cost-effect analyses (for instance ECORYS, 2004; SWOV, 2008b; Wijnen, Wesemann & Blaeij, 2009), but policy-makers have several objections to these. In addition to the doubts about effect analyses, these objections are also the consequence of an aversion to the monetisation of human lives and the desire to make their own political assessment instead of using apparently technical calculations (Bax, Elvik & Veisten, 2009). Finally, although knowledge organisations are regularly mindful of public support (for instance Brouwer, 2003), they sometimes propose measures that form technically a good solution to an unsafe traffic situation, but appear to lack public and-or political support. This lack of support causes policy-makers to decide not to introduce measures (in general: Goldenbeld, 2002; on ISA: Goldenbeld, 2004; on novice drivers: Wegman, 2001; in general: Zandvliet, 2009). *Chapter 5*, but also *Chapters 7 and 8* highlight these and other differences between political and scientific rationality.

These three reasons can be considered the interim hypotheses and conclusions which are to be further investigated in the following empirical chapters. *Chapters 6 to 8* discuss provinces and municipalities and may therefore establish whether there is indeed a discrepancy between national knowledge production and decentralised government policy. Some questions discussed in *Chapters 6 and 7*, but more specifically the research questions in *Chapter 8* are expected to provide insight into the existence of a discrepancy between sectoral knowledge (production) and integral policy. *Chapter 7* discusses the contrast between technical information such as cost-benefit analysis and the political discourse in the policy area by requiring provincial policy-makers to translate this technical information into recommendations for the representatives of the provincial government in an

experimental setting. The following chapters will show whether the analyses of the policy process in these empirical chapters also indicate institutional barriers similar to the three discussed above in addition to process barriers for knowledge use.

## **5. Knowledge use in road safety policies: a literature review**

### **5.1. Introduction**

Before investigating knowledge use and barriers to it on regional and local levels in the following chapters, the literature review in the present chapter examines existing studies on road safety knowledge use, on barriers to knowledge use and on the role of institutional factors therein. This review answers the research question from a national and international perspective. Furthermore, this chapter identifies gaps in the internationally available knowledge on (barriers to) knowledge use. These serve as a source of inspiration for the focus of the chapters that follow.

The literature review in this chapter considers barriers to knowledge use on the process and the institutional level of road safety policy, found in studies conducted within and outside the Netherlands. The analytical concepts set out in *Chapter 2* forms the basis for reviewing the literature. The studies in the present chapter were reviewed with two sub-questions in mind:

- *To what extent is knowledge used in road safety policy?*
- *Which barriers are there to knowledge use in policy?*

The first question, discussed in *Section 5.3*, is operationalised as follows: which parts of Knott and Wildavsky's (1980) ladder have been used? This section also discusses whether types of knowledge use, such as instrumental, strategic, conceptual or pacifying use have been distinguished. The second question is discussed in *Sections 5.4 and 5.5*. *Section 5.4* examines whether the studies mention some or all of the four groups of barriers, thus focussing on process related barriers. *Section 5.5* evaluates barriers for knowledge use from an institutional perspective.

### **5.2. Concepts and methods**

#### **5.2.1. Analytical concepts**

The following analytical concepts are used as a framework for the literature review in the present chapter. To investigate the extent to which the studies

address various levels of knowledge use, the studies reviewed in the present chapter are interpreted in terms of Knott and Wildavsky's ladder of knowledge use (1980). This ladder contains seven stages: reception, cognition, reference, effort, adoption, implementation and impact. Furthermore, this chapter examines whether the national and international literature reviewed here investigates the four groups of barriers to knowledge use as distinguished in *Chapter 2*:

1. Dissemination conditions
2. The needs of users
3. Unilateral or co-production of knowledge
4. Institutional factors

The first three barriers are process related and are discussed in *Section 5.4*, the last barrier describes institutional barriers and is discussed in *Section 5.5*.

### **5.2.2. Methods**

As stated in *Chapter 3*, this chapter aims at a narrative literature review with a number of elements of a systematic review. One of the elements of the latter is a well-defined list of inclusion and exclusion criteria.

A literature search was carried out by using the following terms.

- In Dutch: beleid, wetenschap, kennis, onderzoek, gebruik, in combinations with the word verkeersveiligheid
- In English: policy, science, knowledge, research, use, utilisation, in combination with the word road safety

After some exploration, it appeared most practical to search for the terms in the 'titles' field of the catalogues only. There were two reasons for this. Firstly, many publications did not have keywords, which means that these publications would not be found when searching with keywords. Secondly, many publications did not meet the inclusion criteria mentioned below when using the terms in the 'all words', 'keywords' or 'abstracts' fields.

Inclusion criteria for selecting publications were:

- The publication should refer to research publications or should be published by a research organisation or university.
- The publication should focus on the use of knowledge or contain empirical information about the relationship between knowledge and policy.

Publications that merely state opinions or focus exclusively on policy or knowledge organisations rather than on the relationship between them were excluded.

The sources used for the literature were the SWOV library, university libraries including Radboud University, Utrecht University and the meta-catalogue Picarta which contains references to most Dutch libraries. Furthermore, the international databases specialised in transport research, ITRD (International Transport Research Documentation) and TRIS (Transportation Research Information Services) were searched.

### **5.3. Studies on knowledge use**

#### **5.3.1. Dutch studies**

Few Dutch studies examine knowledge use in road safety policy exclusively. Some studies devote only a minor remark to knowledge use in Dutch road safety policy processes, noting the lack of use of a specific knowledge form, such as books, circulars, courses or personal contacts (Wijnolst, 1995). Others focus on knowledge needs rather than examining the actual use of existing knowledge (Brouwer & Mulder, 1997) or evaluate the functioning of a knowledge organisation (Methorst & Hofman, 2001).

Three reports specifically focus on knowledge use in road safety policy. One is a recent publication on the use of CROW guidelines by regional and local governments (Boer, Grimmius & Schoenmakers, 2008). Provinces, municipalities and regional water authorities were asked whether they use CROW guidelines when deciding upon their road safety policies. Using an internet survey, the response was 65% (N= 443 municipalities, 6 regional water authorities, 12 provinces). In only 5% of the cases did regional and local governments not use the guidelines in their policy at all. A third of the respondents always used the guidelines and two thirds used them most of the time.

In a second report, Bax (2001; 2006) examined the policy-making process of the National Traffic and Transport Plan (NVVP) between 1999 and 2002 by means of a case study, with 35 interviews in total. Among other things, she looked at the use of knowledge in this process. Interviews were conducted among interest groups for traffic and road safety related topics, various levels of government, including the Ministry of Transport, and knowledge organisations. It was remarkable that in the orientation phase of the policy-making process, well-known knowledge was used for the most part, with colleagues being a more important source of knowledge than literature searches. The final phase of the policy-making process offered more



opportunities to look at a broader range of knowledge, for example by requesting advice from several advisory boards.

The third report, by Davidse and Brouwer (1998), examined the use of knowledge in the province of Zuid-Holland. In a survey, the authors asked 68 respondents, including road authorities, police and interest groups, about the importance of various kinds of knowledge for the execution of road safety tasks. The respondents found accident statistics very important (81%), but rated complaints by the general public even higher (90%). Furthermore, statistics on vehicle speed (cars, 81% and mopeds 52%) and other kinds of dangerous driving behaviour (52%) were found to be very important for the respondents. Risk statistics, the cost of dangerous driving behaviour, statistics on driving under the influence of alcohol, and the use of safety devices such as seat belts and helmets were regarded as less important by the respondents. It is remarkable that half (54%) of the respondents who had experience in creating a policy plan, claimed to employ a consultancy to write it and that only 25% reported evaluating their own policy.

Although not stated explicitly, the three studies mentioned above examined knowledge use on the 'cognition', 'reference', 'effort' or 'implementation' level of the Knott and Wildavsky ladder. Boer et al. (2008) studied the use of CROW guidelines on both the 'effort' level, by asking whether respondents use guidelines when formulating their policies, and the 'implementation' level, by asking whether respondents implemented road safety measures in accordance with the guidelines (Boer, Grimmius & Schoenmakers, 2008, p. 48 and further). Bax also (2001; 2006) examined use at the 'effort' level, by studying the knowledge used to determine national road safety policy. Davidse and Brouwer (1998) investigate the 'implementation' level by asking respondents how important knowledge is for the execution of road safety tasks. None of the studies interpreted the use of knowledge in terms of instrumental, strategic, pacifying or conceptual knowledge use explicitly, but implicitly, the studies seem to consider 'use' as instrumental knowledge use for the most part.

Overall, Dutch studies on the use of knowledge in road safety policy are limited in number, and they deal with a limited number of knowledge types, a limited number of governmental levels or a limited part of the Netherlands. In addition, they seem to lack a firm theoretical basis, as none of them refers to any common knowledge use theories. Although these studies are useful in

specific situations, it is hard to draw general, or empirical conclusions from them.

### **5.3.2. Studies conducted outside the Netherlands**

Outside the Netherlands, in the United Kingdom, Sweden and on the European level, a limited number of scientific studies on the use of road safety research have been commissioned. As mentioned above, studies on knowledge needs rather than knowledge use (such as Muhlrud & Dupont, 2010) are not discussed in this thesis.

In the UK, the British Department for Transport has carried out a study on the commissioning, dissemination and use of road safety research (Department for Transport, 2008). An online survey consisting of 530 respondents, 6 focus groups and 11 interviews was used to study the opinions of the respondents. The respondents included road safety officers, road engineers, researchers, safety engineers, police officers and campaign groups. The study revealed that over 50% of the respondents used road safety knowledge at least once a month, and half of this group weekly. This knowledge consisted mainly of statistical analyses, causes of accidents and policy monitoring, but knowledge of vulnerable road users, about driver behaviour, road engineering and speed management was also mentioned.

The Swedish Transport Research Council (VINNOVA) initiated a case study on the benefits to Swedish society of their road safety research in Sweden in the period 1971-2004 (Elvik et al., 2009a; Kolbenstvedt et al., 2007). The study comprised the selection of five cases and a review of their most important publications. The cases included research into urban safety management, child restraints, neck injury protection and side impact protection, police enforcement and research conducted in a driving simulator. The cases were selected using three criteria. Firstly, the cases had to have peer reviewed publications. Secondly, they had to have led to the development of increased use of road safety measures, thus have been 'implemented' in Knott and Wildavsky terms. Lastly, it had to be possible to evaluate the effects of these measures, thus to have an 'impact' in Knott and Wildavsky language. The researchers defined the cases and estimated the safety effects of four of them (in retrospect, one case did not lead to road safety measures). These four cases were shown to be, at least to some extent, based on VINNOVA research in the period 1971-2004. Elvik et al. also conducted a cost-benefit analysis, weighing up the costs of research and implementation against the casualties prevented. The research projects seem to have contributed considerably to

reducing road deaths in Sweden, saving up to 450 lives in total since 1970, and their benefits seem to have greatly outweighed their costs. The authors, therefore, claim that road safety research has had a positive influence on Swedish society. However, the researchers themselves admit that their calculations are very complicated and can be problematic, as it is difficult, if not impossible, to determine the exact effects of specific road safety measures. Therefore, the analyses are to some degree qualified guesses, and a causal relationship cannot be proved.

In addition to the limitations mentioned by the authors, two further remarks can be made on the external and internal validity of this study, more precisely on the methodology and the presumed causality. As the authors themselves acknowledge, only a few cases were selected. Due to the selection criteria, these were probably not only rather straightforward to evaluate, but were also the most successful in terms of either knowledge applied to road safety measures, the prevention of casualties or cost-benefits balance. The cases therefore, may not be representative of all Swedish research and its impact on policies and casualties. That means that possibly many other cases were not successful, that a good deal of knowledge could have led to measures that did not prevent many casualties, or did not lead to road safety measures at all. Therefore, the outcomes should be viewed as the absolute maximum achievable. As far as the external validity is concerned, the study only proves that the knowledge that led to these cases has made a positive contribution to Swedish society.

With regard to the internal validity, the authors do not make clear how they assessed that the road safety measures were indeed based on road safety research and if so, to what extent. For example, it can be called into question whether more effective police enforcement is based solely on research or whether it also stems from a change in political culture over time, whereby the current political culture demands stricter enforcement (not only in road safety) than in the seventies. Approached from the 'knowledge use' perspective, this is a critical question, given that variables other than knowledge may be crucial.

A consortium funded by the European Union conducted a study on barriers to the use of cost-benefit analyses (CBA) and cost-effectiveness analyses (CEA) (Rosebud, 2006). In face-to-face structured interviews in 7 countries, 83 respondents on national and regional and/or local levels were asked to describe the use of CEAs and CBAs in their country (Elvik & Veisten, 2005).

The respondents were road safety policy-makers and researchers. Almost a third of the respondents claimed to base their policy priorities on CBAs or CEAs, on both local and national level. The use of these analyses appeared to be much greater in the Northern European countries than in the Southern or Central European countries (60% versus 15%) (Elvik & Veisten, 2005, p. 73).

Interpreted in terms of the Knott and Wildavsky ladder, the British study investigated the 'reception', 'cognition', and 'effort' level of the ladder by asking about the accessibility, the readability and the relevance of research. The EU study looked at the 'adoption' and 'implementation' level by asking for barriers to actually include cost-benefit knowledge in policy plans or barriers to the implementation of road safety measures based on this knowledge. The Swedish study even tried to cover the 'impact' level of the ladder, by measuring the indirect impact of knowledge on the number of road casualties. None of the studies explicitly mentioned the use of knowledge in instrumental, strategic, pacifying or conceptual terms. Nevertheless, the studies seem, for the most part, to consider knowledge use in an instrumental way.

Overall, as regards the Dutch studies, the conclusion can be drawn that the literature on knowledge use in road safety policies is limited in number and in range. One study only mentions a specific type of knowledge, namely that of CBA and CEA (Elvik & Veisten, 2005). Another study (Elvik et al., 2009a) has several limitations regarding its internal and external validity. Two out of three studies (Department for Transport, 2008; Elvik et al., 2009a) examine knowledge use only in one country. All three studies seem to lack a theoretical base, as none apply theories of knowledge use as a framework for their results. Overall, it is not easy to paint a clear and theoretically underpinned picture of knowledge use in road safety policy out of these publications.

All in all, the Dutch studies and the studies conducted outside the Netherlands provide a small empirical basis, both in number and in terms of the samples they use. Most of them also seem to lack a strong theoretical basis. Nevertheless, taken together, they seem to cover most of the levels of the Knott and Wildavsky knowledge use ladder. The following table provides an overview of the levels covered in the studies.

Stage	Description	Reference	Dutch or international	Method and N
1 Reception	Practitioners and professionals concerned have received the research results	Department for Transport, 2008	International	Survey, interviews, focus groups, N = 582
2 Cognition	The research reports have been read and understood by the practitioners and professionals concerned	Department for Transport, 2008	International	Survey, interviews, focus groups, N = 582
3 Reference	The work is cited as a reference in the reports, studies and strategies of action developed by practitioners and professionals	--	--	
4 Effort	Efforts have been made to adopt the results of the research by practitioners and professionals	Bax, 2001; 2006	Dutch	Interviews, N = 20 and N = 15 respectively
		Boer, Grimmus & Schoenmakers, 2008	Dutch	Internet survey, group discussions, N = 298
		Department for Transport, 2008	International	Survey, interviews, focus groups, N = 582
5 Adoption	The research results have been adopted within the choices and decisions of practitioners and professionals	Elvik & Veisten, 2005; Rosebud, 2006	International	Survey, interviews, N = 83
6 Implementation	The policy that has adopted the research findings has been implemented	Boer, Grimmus & Schoenmakers, 2008	Dutch	Internet survey, group discussions, N = 298
		Davidse & Brouwer, 1998	Dutch	Survey, workshops, N = 68
		Elvik & Veisten, 2005; Rosebud, 2006	International	Survey, interviews, N = 83
7 Impact	The policy that has adopted the research findings has shown the desired effects	Elvik et al., 2009; Kolbenstvedt et al., 2007	International	Multiple case study, N = 5

**Table 5.1.** Overview of levels covered on the Knott and Wildavsky knowledge ladder.

The table reveals that nearly all levels of the knowledge use ladder are covered in the studies discussed in this chapter. However, only a few levels are investigated in Dutch research and overall, the number of studies per level is low. Furthermore, none of the studies covered all levels of the ladder at the same time, nor did they interpret knowledge use as instrumental or strategic. The table demonstrates that the 'effort' and 'implementation' level are both relatively well-represented by an international study as well as by two Dutch studies. The most obvious reason for this might be that these two levels can be operationalised unambiguously.

This thesis aims to investigate multiple levels of the ladder to apply a theoretical basis to the results. The reception level is investigated in *Chapter 8*, the cognition level in *Chapter 6* and the reference level in *Chapter 4*. *Chapter 6 to 8* examine the effort and the implementation level. *Chapter 7 and 8* describe knowledge use not only by means of the knowledge use ladder, but also in terms of instrumental or strategic use, for instance.

## **5.4. Studies on barriers to knowledge use**

### **5.4.1. Dutch studies**

Three Dutch studies mention barriers to knowledge use in Dutch road safety policies. Wijnolst (1995) investigated the process of policy-making, obstacles to an effective road safety policy and the preferred forms of knowledge exchange. Based on 51 interviews with road authorities, she implies some barriers to implementing road safety measures such as a low priority for road safety and lack of knowledge of the effects of road safety measures. A low priority among politicians, lack of support amongst the general public and incident politics are the main institutional reasons for not using road safety knowledge on the 'implementation' level.

Methorst and Hofman (2001) evaluated the functioning of KEVER, the temporary road safety knowledge infrastructure for regional and local governments (1996-2000). Although a list of relevant documents is given in the report, it does not explicitly mention a research method. They focussed on institutional barriers by noting a missing link in the organisation of the knowledge-policy field. They argued that insufficient contact between knowledge centres and implementers of road safety policies has complicated knowledge exchange, especially about non-infrastructure measures and that the various levels of government seem to have different knowledge needs;

more practical and simple knowledge with concrete examples for local governments for instance, as opposed to aggregated information for national policy-makers. Methorst and Hofman conclude that the knowledge production of national knowledge organisations such as CROW, SWOV and AVV meets the needs of the national government but not the more practical knowledge needs of local governments. From this study it seems that knowledge supply takes place on the national level, whereas the knowledge request is made on a local level. Furthermore, the authors state that knowledge exchanges with other policy fields, such as spatial planning and urban planning are extremely rare, but they do not identify barriers.

Boer et al. (2008), as mentioned in the previous section, have made a more extensive study on barriers to using knowledge in CROW guidelines. They investigated barriers to the use of guidelines in general and of nine specific guidelines in detail. With respect to the use of the CROW guidelines in general, the respondents in the study mentioned several reasons for not or not fully adapting the CROW guidelines. The most common responses were the impossibility of implementing road safety measures due to local circumstances (95%-100% of the respondents, depending on government type) and the belief that following the guideline would not always lead to the most safe situation (0%-29% depending on government type). Provinces (57%) stated that their organisation did not always agree with the guidelines. Viewed in the terms set out in *Chapter 2*, these reasons qualify as barriers in the category *the needs of users*. This study therefore, suggests a discrepancy between local knowledge need and national knowledge supply.

Furthermore, the respondents mention a number of dissemination barriers. Even though three quarters of them find the guidelines clear, half of them required more communication about the contents of the guideline to regional and local governments. This includes the status of the guidelines (whether it can be considered a law, guideline or recommendation) and the accessibility of the guidelines (titles are not always self-explanatory and guidelines are not available online). The use of guidelines in non-standard situations is also mentioned as a topic on which more communication is needed. However, as guidelines, by definition, tend to be made to cover standard situations, this is not a surprising result. These latter barriers can be ranged in the category *dissemination conditions*.

Apart from these barriers to the use of the CROW guidelines in general, Boer et al. prompted the respondents to mention barriers related to nine specific

measures. The table below shows the barriers experienced per measure. The one or two barriers mentioned most often are listed.

Measure	Barrier to using the measure	Percentage	N
Speed humps	Complaints from the general public	75%	221
	Inconvenience to emergency services	44%	
Roundabouts in built-up areas with priority for bicycles	Road safety	61%	125
Road markings on access roads and distributor roads in and outside build-up areas	Lack of space	47-86%*	7-159
Exit constructions, priority regulations (no priority road signs or priority road marking)	Road safety	44%	143
	Unclear road situation	40%	
Exit constructions, raised pavement and entry blocks	Complaints from people living and working in the area	29%	171
Pedestrian crossing	Complaints from people living and working in the area	34%	103-132
	Road safety	31%	
Road signs for urban areas	The guideline is too strict	38%	169
* This measure comprised four questions: road marking on access roads outside built-up areas, road marking in distributor roads outside build-up areas, road marking in distributor roads in build-up areas with a speed limit of 70 km/h and road marking in distributor roads in build-up areas with a speed limit of 50 km/h. The number of respondents varied between 7 and 159, due to the number of respondents administering roads with a certain speed limit.			

**Table 5.2.** Barriers for implementing nine road safety measures in CROW guidelines. Based on Boer et al. (2008).

Generally, two types of barriers were mentioned. A number of *institutional barriers*, such as complaints from the general public and the reference to other interests than road safety (comfort for emergency services and people living and working in the area) were raised. The second type of barrier mentioned was *the needs of users*. For example, the frequent mentioning of 'road safety' as a reason for not implementing a road safety measure indicates a lack of confidence in road safety research on these measures: respondents assessed the guidelines as not leading to a safe situation.



#### 5.4.2. Studies outside the Netherlands

Studies conducted outside the Netherlands on barriers to use road safety knowledge in policy can be divided into two types of research. The first type consists of two studies that investigated barriers to the use of road safety knowledge in general. The second contains several studies that focussed specifically on cost-effectiveness analyses (CEA) or cost-benefit analysis (CBA).

In the first category, the Centre for Research on Utilisation of Scientific Knowledge of the University of Michigan, USA, conducted a study on the utilisation of research for the National Highway Traffic Safety Administration as early as 1971 (Havelock & Markowitz, 1971). The researchers used a survey to question 273 researchers and 244 policy-makers in highway safety. Before asking for barriers to knowledge utilisation explicitly, the respondents were asked whether they were satisfied with the present dissemination and utilisation of research on highway safety. Both researchers and policy-makers indicated that they were extremely satisfied with dissemination, 48% and 44% respectively being (very) satisfied; considerably more than with the utilisation of research, 26% and 17% respectively being (very) satisfied. Policy-makers were also asked what role research played in policy-making. Only 21% indicated that their decisions were mainly research based, while 61% indicated that public opinion played the most important role. The study summarized their responses as follows: "We weigh the evidence objectively, but research is not the only one source, public opinion and what the public and industry will accept are equally important factors" (Havelock & Markowitz, 1971, p. 79), thus indicating the existence of an *institutional barrier*.

The respondents were then asked for barriers explicitly, by means of an open question. Researchers indicated that the legitimacy of the research was the most important barrier to knowledge use (22%). Their term legitimacy of research included not only the statement that more research was needed on a subject, but also that research conflicted with existing knowledge, Decision-makers found this much less important: only 10% of them indicated this as a barrier. In contrast, while the most important barrier for decision-makers was the reaction of the public (38%), only 17% of the researchers shared this view. These two barriers can be classified as respectively *the needs of users* and *institutional barrier*. The difference between the answers of researchers and policy-makers highlights a difference in values. Researchers find correct

knowledge most important, and consider a lack of it as a main barrier. Decision-makers rate public opinion most important and consequently see a lack of support as a main barrier. Researchers were also asked what barriers they experienced in communicating with policy-makers (policy-makers did not receive a similar question). 48% indicated that value differences between researchers and policy-makers were a (very) important barrier to communication. For 47% a lack of time available to policy-makers was the second most indicated barrier. The value differences that researchers mentioned as a barrier corresponded closely to Caplan's Two Communities metaphor (Caplan, 1979).

More recently, and also mentioned in the previous section, the British Department for Transport investigated barriers to the use of general road safety knowledge (Department for Transport, 2008). 66% of the respondents mention a lack of time and/or capacity to read the research on road safety. In addition to that, 58% was unaware of the available knowledge or did not know where to find the knowledge (49%). Nearly all respondents commented that the number of studies published made it difficult to navigate the knowledge, partly due to a lack of co-ordination and online search facilities. Besides these barriers, which can be classified as *dissemination barriers* focussing on the use of knowledge in terms of 'cognition', 'reference' or 'effort', respondents mentioned barriers to implementing road safety measures. They stated that issues other than road safety knowledge, such as politics, cost, local evidence and the media often have more influence. These can be seen as *institutional barriers*. Lastly, the respondents experienced barriers classified as *the needs of users*. They found the road safety knowledge generally difficult to implement in practice (49%), too academic (38%), too detailed (33%) and too technical (29%). A qualitative evaluation of a course on the use of road safety research for 22 road safety policy professionals in the UK in 2006 found similar, though only anecdotal, results (Hewson, 2007a; 2007b).

The second category of research comprises a number of studies addressing the use of CBAs or CEAs on road safety topics specifically. Based on both Norwegian and Swedish economic studies, Elvik (2001; 2003) developed his own categorisation of barriers to road safety CBA use, distinguishing several *institutional barriers* for applying road safety CBAs to policy. Some have to do with the different discourses and values of science and policy. In CBA studies especially, discourses stress the value of human life and weigh this up against investments in road safety. Politicians object to this rational-

economic discourse sometimes. The following barriers to implementing road safety measures according to CBA outcomes were distinguished:

- A rejection of the basic principles of cost-benefit analysis
- The existence of policy objectives that cannot be calculated with cost-benefit analyses
- The priority given to other policy objectives, in particular regional development
- An acknowledgement of social dilemmas, which means that measures that are cost-effective from a societal point of view might not be cost-effective from the point of view of individual road users
- A lack of formal authority to introduce road safety measures
- A scarcity of resources to take road safety measures

In the European study 'Rosebud' mentioned previously, Elvik and Veisten investigated the barrier categorisation listed above (Elvik & Veisten, 2005). The questionnaire administered in the study contained open questions about barriers to CBA use, whereby respondents could mention barriers spontaneously. In addition, by means of a list of pre-selected barriers respondents could indicate whether they experienced these. The most frequently mentioned barriers, both spontaneously and by means of the pre-selected list, are listed in the table below.

Spontaneously mentioned barrier	% mentioned (more than 1 barrier could be mentioned) N= 83	Question about pre-selected barrier	% of respondents considering this as barrier N=83
There are ethical and/or emotional objections to the use of cost-benefit analysis.	6	Do you see any ethical objections to evaluation in € of reduced risk of injuries and deaths on roads, and if so, could you please state what such objections might be?	27
		In cost-benefit analysis, all relevant impacts are valued in €. In your opinion, is this helpful for road safety, or is it better only to estimate impacts in terms of numbers of fatalities and injuries?	23
Economic analysis is an unknown/unfamiliar tool ('obscure').	13	Not on pre-selected list	--
Cost-benefit analysis is not in the standard procedures or reasoning in the decision-making of the respondent's country.	36	Is a lack of clarity about the responsibility for performing cost-benefit analysis on road safety measures an obstacle to carrying out such analyses?	36
Cost-benefit analysis is only performed if it is imposed by the government or by the EU.	17		
It is not necessary to perform economic analysis (e.g. low cost measures).	12	In your opinion, are there types of road safety measures that are less suitable for cost-benefit analysis than other measures; and, if so, why?	55
Cost-benefit analysis may be impossible because the effects of measures are not known or not trusted.	48	Are the impacts of road safety measures sufficiently known to permit an estimation of expected effects during the planning of such measures?	83

Spontaneously mentioned barrier	% mentioned (more than 1 barrier could be mentioned) N= 83	Question about pre-selected barrier	% of respondents considering this as barrier N=83
There is a lack of tools or resources to carry out cost-benefit analysis.	23	In your opinion, are the current tools for performing cost-benefit analyses on road safety measures adequate? By tools, we mean the resources available in terms of software, guidelines, courses, et cetera?	59
There is a lack of confidence in cost-benefit analysis; the method is disputed and uncertain.	8	In your opinion, can we trust current economic valuations of reduced risk for accidents and injuries on roads, and if not, why?	33
		If the uncertainty in the results from cost-benefit analyses is presented, do you think this could lead to a disregard for the results from cost-benefit analyses?	22
Not mentioned spontaneously	--	If results from cost-benefit analyses are given limited weight in prioritising, do you think this would change if the results were presented in another manner?	41
Not mentioned spontaneously	--	Will the results from cost-benefit analysis and cost-effectiveness evaluation have more influence on final political decisions if they are performed at an earlier stage of the decision-making process?	70
Interests other than the results of economic analysis are more important in the decision-making.	18	Not on pre-selected list	--

**Table 5.3.** Barriers to the use of CBAs mentioned, both spontaneously and on the basis of a pre-selected list. Based on Elvik & Veisten (2005) and on Bax et al. (2009).

The table reveals a number of institutional barriers, such as ethical objections, policy-making in which CBAs do not play a role and the existence of interests other than road safety in policy processes. Furthermore, the 'obscurity' barrier can be interpreted as a *dissemination barrier*. The table also indicates a number of barriers in the category *the needs of users*, such as lack of confidence in CBAs, and the manner of presentation and the timing of CBAs. These last two objections were not mentioned spontaneously, but were recognized frequently when presented on the pre-selected list. Also in this category, two barriers were mentioned which are not barriers to the use of CBAs, but to the production of CBA knowledge. According to this research, CBAs might be impossible to perform because the effects of measures are not known. Also, the research indicates a lack of tools and resources such as software, guidelines and courses to execute CBAs.

Bax et al. (2009) elaborated on the Rosebud study by carrying out an additional data-analysis and studying the barriers in detail. The authors concluded that two groups of respondents naming different barriers to knowledge use could be distinguished. Ethical issues, e.g. objections to some of the principles of CBAs, generated a fundamental division here. The first group of respondents mentioned ethical objections as a barrier to using economic analysis, but indicated that other possible barriers did not form an obstacle. A second group of respondents on the other hand did not mention ethical objections, but other barriers in the category *the needs of users*, such as the production of CBAs. Barriers to the production of CBAs that were mentioned were the lack of available information about the impacts of measures, the lack of tools to perform cost-benefit analyses and the fact that some measures are not suitable for such analyses. Other barriers in the category *the needs of users* were the timing and the presentation of cost-benefit analyses.

Veisten et al. (2010) also ran extra analyses on the Rosebud data. They focussed on the respondents' assessment of statements about the principles and applicability of CBAs regarding road safety as true or false, and their indication as to how certain they were about their answer. They found a correlation between respondents who answered the statements correctly (i.e. in line with the theoretical principles of CBAs) and a background in economics. Likewise, a correlation was observed between incorrect answers and negative attitudes towards using CBAs for road safety policies. In addition, a qualitative analysis of interviewees' responses was performed. This analysis indicated that respondents may have perceived the statements

about CBAs as a question about their opinion of CBAs, thus indicating objections to the methodology rather than measuring the understanding of the methodology. The responses demonstrate that, although the rules for performing a CBA have always been set by economists, policy-makers now claim the right to change these rules. Policy-makers, for example, stated that regional effects should be included in CBAs and question the equal weight given to the different interests concerned, such as travelling times and safety, in CBAs. In this, they dispute the traditional division between science and politics.

## 5.5. Institutional analyses

The majority of studies concentrating on the institutional context of road safety policy merely provide an inventory of tasks of governmental levels and knowledge organisations, for both the Netherlands (Brouwer & Mulder, 1997; Heijkamp & Kraay, 2001; Wijnolst, 1995) and other countries or the EU (Chapelon & Lassarre, 2010; Elvik & Veisten, 2005; Hakkert & Wesemann, 2005; Havelock & Markowitz, 1971; Johns, 1988; Schulze & Koßmann, 2010). Some are predominantly literature based discussions on preferred relationships between knowledge and policy (Bax, De Jong & Koppenjan, 2010; Hauer, 2007). Few actually investigate and analyse the relationship between policy and science in the road safety field.

Some early studies focus on the differences between science and policy, although none of these are empirical studies, but literature reviews or essays. Carlquist (1969), for example, stresses the dissimilarities between the two, in line with the ideas of Caplan (1979). Others focus on the growing similarities between science and policy since the 1980s (for the USA: Haight, 1994; for the Netherlands: Kraay, 1989; for France: Muhlrads, 1994). Kraay also gives a useful overview of the development of the interaction between knowledge organisations and policy-makers since the 1960s and the effect that changes in scientific thinking had on this interaction, referring to Caplan's two worlds metaphor by way of explanation, without mentioning it explicitly. He claims that policy did not use scientific knowledge at that time, while knowledge producers did not ask which knowledge policy-makers wanted. However, this claim can be disputed, since in *Chapter 4* it was indicated that Dutch policy did use scientific knowledge by the explicit use of a SWOV report in the first road safety plan (Tweede Kamer, 1962). Kraay further states that, in the 1970s, the scientific view on accidents changed from mono-causal to multi-causal, transforming road safety into a more complex subject (see also

Asmussen, 1983). In the early 1980s, the view developed further into a dynamic systematic approach (see also OECD, 1997). This same development is described in *Chapter 4*. Kraay argues that this increasing complexity of the problem made the exchange of knowledge between science and policy problematic. Policy-makers could no longer take simple measures and they found the new research difficult to understand (Kraay, 1989, p. 269). Kraay thus seems to describe relations between science and policy in terms of Caplan's (1979) Two Communities metaphor.

Muhlrad describes a similar development in France (Muhlrad, 1994, p. 48). She states that due to the aforementioned increasing complexity, policy-makers tend to use common sense instead of scientific knowledge to decide about road safety measures. Haight (1994) states something similar when he stresses the hostility of American road safety policy-makers towards research, mentioning different rationalities for scientists and policy-makers. Scientists emphasise rational behaviour, using research to solve dangerous situations, whereas policy-makers react more emotionally, taking on a justified "Crusade" against danger. The difference he observes refers to the *institutional barrier* discussed in *Chapter 4* with regard to the different rationalities (political versus technical) of policy-makers and scientists. These two authors seem to echo the Two Communities metaphor. Like Kraay, their argument is not grounded in empirical research, but in their own experiences and knowledge of the road safety field.

Apart from these general studies on the relationship between science and policy, and more recently, empirical institutional studies have been directed at very specific subjects. These comprised an analysis of one knowledge organisation such as KEVER (Methorst & Hofman, 2001), for example, or of one research subject such as the network of organisations providing knowledge of the accident costs (Blaak & Van der Meer, 2007). Other very specific topics are the transfer of road safety knowledge from developed to less developed countries (Ericson, 2007; 2009), a single case study on the engagement of policy-makers on road safety research in Malaysia (Tran et al., 2009) and the outsourcing of road design by Dutch provinces and municipalities (Boer, Grimmius & Schoenmakers, 2008). These studies are not discussed further here, since their subjects are not directly relevant to this thesis, due to their small scale and the limited transferability of outcomes.



## 5.6. Conclusions

To what extent is road safety knowledge used in policy and what are the most relevant barriers to this knowledge use? These are the central questions addressed in this chapter. This final section summarises the findings of previous Dutch and international studies, provides a quantitative and qualitative review, points out blind spots in the literature and, from there, determines the focus of *Chapters 6 to 8*.

Several Dutch and international studies have examined knowledge use. The most recent and extended Dutch study (Boer, Grimmius & Schoenmakers, 2008) reveals a wide, instrumental use of applicable and practical road safety knowledge, such as guidelines, in policy, an indication of 'effort' and 'implementation' on the Knott and Wildavsky ladder. British (Department for Transport, 2008) and EU (Elvik & Veisten, 2005) studies support this vision and extend the knowledge use to other levels of the ladder. All in all, although no study mentioned these levels of knowledge use explicitly, together they covered nearly all levels of the knowledge use ladder. Few levels are covered by Dutch studies however, and just one study covers three levels. None of the studies interpret knowledge use in instrumental or strategic terms.

A number of studies has investigated barriers to knowledge use. Overall, three of the four types of barriers, as mentioned in *Chapter 2*, were found. The first type, *dissemination barriers*, was found in examples such as the inability of users to find the right knowledge on time and the lack of awareness among users of available knowledge. The second type of barrier, *the needs of users*, could be seen in studies that displayed a lack of confidence in road safety research, impractical research outcomes that could not be implemented easily, and road safety measures which could not be taken due to local circumstances. The third type of barrier, *a lack of co-production of knowledge*, was not found in any publication. The fourth type of barrier, *institutional factors*, was mentioned in the majority of the studies. They indicated a lack of support for road safety measures and missing links between knowledge organisations and governmental bodies. But also the different knowledge needs of the various governmental bodies can be viewed as an institutional barrier, as can the prevalence of other interests over road safety and the differences in general between the scientific and policy worlds. Lastly, the studies on the use of CBAs and CEAs indicated that the use of these instruments bring with them a specific type of barrier,

i.e. barriers to performing CBAs, such as a lack of knowledge on effects of measures.

Some remarks can be made regarding the quantity and quality of the studies mentioned in this chapter. A first and obvious remark on the quantity being the existence of a limited number of studies on road safety knowledge use and on barriers to road safety knowledge use. Several of these studies deal with one subject or organisation only, or focus on a single type of knowledge, especially CBAs and CEAs. Furthermore, several studies have a small empirical basis, for instance case studies, or do not have an empirical basis at all. This provides in some cases a weak internal validity and an overall weak external validity. Another remark can be made about the application of theories in the reviewed studies. Few of the studies made reference to theoretical literature on knowledge use or process related or institutional barriers to knowledge use.

A review of the above-mentioned studies reveals several blind spots, theory being the most obvious. Not only are results not explained in theoretical terms, theories on knowledge use and barriers also do not form the basis for the operationalisation of the research questions. As a result, some parts of theory, for instance some levels of the knowledge use ladder, are studied more often than others. Several levels of this ladder (reception, cognition, reference, adoption and impact) have not been studied at all in the Netherlands. In addition, studies seldom refer to each other, causing each study on road safety knowledge use to stand alone. Another blind spot can be found in studies on co-production of knowledge. The phenomenon is not described in existing studies on knowledge use in road safety policy. It is unclear whether this can be explained by the non-existence of co-production of knowledge. Furthermore, although several studies investigate the use of various types of knowledge, for example, statistics, costs, effects of measures, the studies do not clearly distinguish these types and the kind of use that they may lead to, such as instrumental use or strategic use. Lastly, although some studies mentioned what can be called institutional barriers, an overall institutional analysis of the road safety knowledge and policy field seems to be lacking, as are attempts to position knowledge use and barrier to knowledge use in the existing institutional relationships.

Is the above an agenda for the remainder of this thesis? Surely not. But it can be seen as a list of possibilities for future research on this topic. Furthermore, it serves to position this thesis in the range of existing national and

international studies on knowledge use. Before a connection between the institutional analysis of the knowledge-policy arrangement and process related barriers for knowledge can be made in *Chapter 9*, more studies on these process-related barriers, preferably theory driven, are necessary. Therefore, *Chapters 6, 7 and 8* investigate the various stages on the ladder of knowledge use in provincial and municipal road safety policies. *Chapter 6 and 7* extend in more detail the research on CROW guidelines, investigated by Boer et al., to road safety knowledge in general. In addition, *Chapter 7* examines knowledge use of cost and effect knowledge on road safety measures to investigate whether the barriers to the use of CBAs and CEAs as mentioned in *Chapter 5* are typical for these techniques or whether they apply to the use of knowledge of costs and effects in general, or maybe even to knowledge of road safety in general. *Chapter 8* takes this even further by leaving out the focus on costs and effects altogether and focussing on knowledge of interests other than road safety.

## 6. Use of knowledge by policy-makers in Dutch provinces

### 6.1. Introduction

Having investigated the institutional context of road safety in *Chapter 4*, and distinguished three institutional barriers specific to the road safety field, the following *Chapters 6, 7 and 8* focus on both institutional and process-related barriers by studying concrete policy processes. *Chapter 5* analysed several studies on knowledge use in road safety policy processes. However, these studies have some limitations that make it difficult to draw conclusions appropriate to the Dutch situation, where a large part of policy-making and implementation takes place at a regional and local level. Some are not based on Dutch policy-making while others only consider policy-making at a national level. Few of them study more than one case systematically and the majority does not consider institutional as well as process-related barriers. *Chapters 6, 7 and 8* provide studies on barriers based on actual policy processes in the Netherlands at various policy levels, taking into account the given institutional context as sketched in *Chapter 4*.

The present chapter investigates whether these institutional and process barriers can be identified and understood in multiple case studies in Dutch provinces. The study looks at the use of cost and effect knowledge of infrastructural measures in provincial road safety policy-making in an explorative way. The guiding research questions for this chapter are:

- *To what extent do provinces use cost and effect knowledge of infrastructural road safety measures in their policy?*
- *Which barriers do provinces experience in using knowledge of cost-effective infrastructural road safety measures in their policy?*

The following section restates the analytical concepts employed to describe and interpret the empirical findings, provides a methodological account of the choices made in this investigation. The third section analyses the extent to which knowledge is used in provincial policy processes. The fourth section inventories and evaluates the barriers to the use of knowledge in road safety policy that provinces themselves mention. *Section 6.5* concludes on the main findings.

## **6.2. Concepts and methods**

### **6.2.1. Analytical concepts**

As mentioned in *Chapter 5*, two analytical concepts are used throughout *Chapters 6 to 8* to describe and understand two types of empirical findings. The first concept, the Knott and Wildavsky ladder of knowledge use (Knott & Wildavsky, 1980), measures the use of cost and effect knowledge in provincial road safety policy. The ladder distinguishes seven ascending levels of knowledge use, described in detail in *Chapter 2*. *Section 6.2.3* explains which levels are investigated in this study. The second concept, the four groups of process-related and institutional barriers mentioned in *Chapter 2*, is used to identify the barriers to using knowledge in policy processes named by provinces in the present chapter.

### **6.2.2. Selection of the cases**

In this section, the decision to study cost and effect knowledge, and policy processes with respect to infrastructural measures at provincial level is explained. The choice stemmed from the observation in *Chapter 4* that a large part of road safety policy is currently developed at a regional and local level. Furthermore, provinces are alleged to be the directors of regional and local road safety policy (Ministerie van Verkeer en Waterstaat, 2008). In addition to this, investigating policies of the provinces provided an opportunity to conduct a comparative multiple case study. All twelve provinces were investigated.

A second decision made in this study was to investigate the use of cost and effect knowledge. There were two reasons for focussing on this specific type of knowledge. Firstly, it was a way of limiting and thus managing the amount of knowledge to be studied. Secondly, it was expected that studying the use of cost and effect knowledge would provide an opportunity to observe one of the institutional barriers to knowledge use in optima forma. As was reported in *Chapters 4 and 5*, the technical knowledge provided by knowledge organisations in cost-benefit analyses and cost-effectiveness analyses have tended not to correspond to the political language and thinking of policy-making in governmental bodies (Bax, Elvik & Veisten, 2009; Elvik, 2003). CEA and CBA related knowledge have seemed thus to be an exemplary case for this institutional barrier in knowledge utilisation research. However, since CBAs and CEAs for the most part did not target the

provincial level, the present study looked at cost and effect knowledge in general instead of focussing on CBAs and CEAs.

A third decision was to limit the study to infrastructural road safety measures, excluding educational and enforcement measures. This followed on logically from the second choice, since reliable cost and effect knowledge was widely available for infrastructural road safety measures (for example Elvik, 2001; Schoon, Wesemann & Roszbach, 2000; Winkelbauer & Stefan, 2005), but much less so for educational and enforcement measures.

### **6.2.3. Operationalisation of knowledge use**

When investigating the use of knowledge in policy processes, it is important to define the word 'use' precisely and clearly. In *Chapter 2* this was done theoretically (Edelenbos, 2000). It is important to realise that those interviewed for the study can be expected to comprehend 'use' in (slightly) different ways. This impedes an unequivocal empirical examination of the subject. In this chapter, the term 'use' is defined according to the seven level ladder developed by Knott & Wildavsky (1980).

Not all of the levels on the Knott & Wildavsky ladder are equally easy to operationalise. For example, it is easier to ask respondents whether they have read a report than to assess the impact of a report on the number of road deaths. The present study investigated three levels in particular: reading and understanding knowledge (cognition, level 2), efforts to adopt research results in policy (effort, level 4) and the influence of knowledge on the implemented policy (implementation, level 6). Although this can be seen as a restriction, these three levels are judged to reflect a sufficient spread over the original ladder.

The three levels were operationalised in three separate parts of a questionnaire. Respondents were asked whether they had used cost and effect information in policy-making on infrastructural road safety measures. It was assumed that respondents would interpret the word 'use' as a question on the effort level, for example, whether they had discussed the information or written about it.

Thereafter, respondents were given a short list of relevant publications on infrastructural measures containing cost and/or effect information. Three criteria determined the selection of the list of relevant publications. The publications had to focus on one or more road safety measures for 80

km/hour-roads. Furthermore, the publications had to be widely available to all provinces. Finally, the publications had to have practical relevance for road designers. All of the selected publications (see *Section 6.3.1*) meet these criteria. The 'cognition' level was operationalised by asking respondents whether they knew these publications, the 'effort' level by asking whether they had used them in their policy-making on infrastructural measures.

Furthermore, the 'implementation' level was operationalised by asking respondents which infrastructural measures they had and had not implemented on the provincial 80km/h roads. A list of all possible cost-effective measures on 80km/h roads was provided, based on the expert-opinions of SWOV-researchers. If measures had not been implemented, respondents were asked the reasons for this. All questionnaires were semi-structured and are included in Bax and Jagtman (2008, p. 41 and further).

#### **6.2.4. Further on method**

The questionnaire consisted of three parts, related to the three levels mentioned above. The first part, consisting of a general question about the use of cost and effect information, was carried out by telephone and directed at policy-makers responsible for, amongst others, road safety (hereafter: road safety policy-makers). These respondents were asked to select experts in the provincial organisation for the second and third part of the questionnaire, in which questions about the use of specific publications and about the implementation of measures were asked. In some provinces, one person could answer the second and third part of the questionnaire, but sometimes it was necessary to speak to a second person. Road safety policy-makers or road designers answered the second and third question. In half of the provinces, the second and third part of the questionnaire was conducted in a semi-structured face-to-face interview, taking one and a half to two hours. Due to limited time the rest of the provinces was approached by telephone. Both the face-to face and telephone questionnaire were tested in advance by means of a pilot study in two provinces.

The respondents were asked for the opinion of the province, not their personal opinion. Since the subject of the research was not expected to be politically sensitive, and the respondents were stating their professional opinion as a provincial official, the answers were not registered anonymously. A list of the respondents is given in Bax and Jagtman (2008, p. 51).

### 6.3. Results: use of knowledge in provinces

#### 6.3.1. Use of knowledge: cognition and effort

This section presents the results of the question as to whether those responsible at provincial level had read the cost and effect information about the pre-selected list of infrastructural measures on 80km/h roads (cognition) and whether they had made efforts to adopt this information in their policies (effort).

Table 6.1 displays the number of provinces familiar with cost and effects of infrastructural road safety measures.

Measure	Costs		Effects		
	Known	Not known*	Known in figures	Global impression known	Not known*
Cycle paths	10	2	3	5	4
Roundabout	12	0	11	1	0
Raised intersection	5	7	2	2	8
Driving direction separation **	4	7	2	3	6
Obstacle-free zone	7	5	2	5	5
Semi-hard shoulder	7	5	2	3	7
Cycle crossing	10	2	2	6	4
Service road	7	5	2	3	7
Rumble strip	6	6	2	3	7
Roadside safety construction	8	4	2	4	6
Overtaking section	3	9	0	2	10
* This includes provinces who do not implement the measure.					
** This question was omitted accidentally in one province.					

**Table 6.1.** The number of provinces that were familiar with the costs and effects of measures (N=12).

The obvious conclusion is that provinces had considerably more insight into the costs than into the effects of measures. Almost all of the provinces were familiar with the costs of three out of a total of 11 measures and more than



half knew the cost of seven measures. However, they were much less familiar with the effects of the measures. The vast majority of provinces had a quantitative knowledge of the effect of only one measure. The majority of the provinces had a general impression of another three measures. In addition, the interviews revealed that a minority of the provinces implemented measures of which they did not know the costs and/or the effects. In other words: the availability of knowledge on costs and effects was decisive for most provinces on whether a measure was implemented or not.

Table 6.2 shows the source of the information provinces use per measure.

Measure	Own study or accident figures	Other organisation, province or consultancy	Not applicable*
Cycle paths	5	0	7
Roundabout	8	4	0
Raised intersection	3	1	8
Driving direction separation **	3	1	7
Obstacle-free zone	2	1	9
Semi-hard shoulder	1	2	9
Cycle crossing	6	1	5
Service road	3	1	8
Rumble strip	0	0	12
Roadside safety construction	1	4	7
Overtaking section	1	0	11
* Not applicable = provinces who do not implement the measure.			
** This question was omitted accidentally in one province.			

**Table 6.2.** Source of information used by provinces (N=12).

Most provinces familiar with the effects of measures had derived these from their own studies or accident analyses before and after implementing a measure on a certain road section. Only a minority of the provinces based their knowledge on literature from outside their own organisation. While the differences were small, the province of Zeeland stood out clearly, by using only knowledge from outside its own organisation.

Provinces were asked to specify which sources of information they had used besides their own studies and accident figures. Studies conducted by other provinces were mentioned most frequently, e.g. those carried out by Zeeland and Overijssel on road shoulders, and by Gelderland on overtaking lanes for agricultural vehicles. Information was exchanged on consultation boards such as the Road Safety Trade Council (Vakberaad Verkeersveiligheid), for road safety policy-makers and the Building Trade Council (Vakberaad Bouw), for road designers of the Association of the Provinces of the Netherlands (IPO).

In addition to provincial studies, provinces referred to 'theoretical studies' as a source of information. They named few specific publications, but cited organisations such as CROW, SWOV and TNO. In addition, private consultancies were often mentioned as an important source of knowledge.

The provincial road designers were also asked whether they had read and understood certain publications on road safety measures on 80km/h roads and whether they had used these publications in their policy-making. The following publications were used. Note that the publications were presented to the respondents in Dutch,

- Handbook for Road Design (*Handboek wegontwerp*) (CROW, 2002a)
- Guidelines for Essential Distinguishing Features (*Richtlijnen Essentiële Herkenbaarheidskenmerken (EHK)*) (CROW, 2004c)
- Uniformity in Roundabouts (*Eenheid in rotondes*) (CROW, 1998)
- Guidelines for Raised Intersections (*Richtlijnen verkeersplateaus*) (CROW, 2007c)
- Handbook for Roadside Safety Design (*Handboek veilige inrichting van bermen*) (CROW, 2004b)
- Advancing Sustainable Safety (*Door met Duurzaam Veilig*) (Wegman & Aarts, 2006; Wegman & Aarts, 2005)
- Fact sheet Bicycle Facilities (*Fact sheet Fietsvoorzieningen*) (SWOV, 2008a; 2008c)
- Fact sheet Recognizable Road Design (*Fact sheet Herkenbare Vormgeving*) (SWOV, 2007b; 2008d)
- Fact sheet Regional Road Safety Explorer (*Fact sheet Verkeersveiligheidsverkenner voor de Regio*) (SWOV, 2005)
- Fact sheet Cost-benefit analysis for road safety measures (*Fact sheet Kosten-batenanalyse*) (SWOV, 2008b; 2008e).

All CROW publications were known to most of the provinces and well used. All provinces had also read and understood '*Advancing Sustainable Safety*',

but only half of the provinces actually used the book. The SWOV fact sheets were less well known: two fact sheets were known to the majority of the provinces, the other two were known to one-third to a quarter of the provinces. In addition, these fact sheets were used rarely; only a quarter to one-third of the provinces familiar with the fact sheets actually used them.

### 6.3.2. Use of knowledge: implementation

The text below describes the road safety measures that provinces implement on their 80km/h roads. Barriers to implementation are discussed in section 6.4.2. As mentioned earlier, a minority of the provinces were found to have implemented measures without prior knowledge of costs and/or effects, although it is not known whether this knowledge is an explicit (such as a specific publication) or an implicit assumption about costs and effectiveness.

Table 6.3 lists the measures provinces implement on their 80km/h roads. It does not reveal whether measures were taken incidentally or were the norm.

Measure	Implemented	Not implemented	Still considering
Cycle paths	12	0	0
Roundabout	12	0	0
Raised intersection	5	7	0
Driving direction separation	8	4	0
Obstacle-free zone	11	1	0
Semi-hard shoulder	6	4	2
Cycle crossing	11	1	0
Service road	9	3	0
Rumble strip	7	4	1
Roadside safety construction	10	2	0
Overtaking section	4	8	0

**Table 6.3.** Number of provinces implemented selected road safety measures (N=12).

The table indicates that virtually all of the provinces implemented some of the selected measures, such as cycle paths, roundabouts and obstacle-free zones. A minority implemented other measures, such as raised intersections and overtaking sections. The following section addresses the question as to why provinces implemented certain measures and did not implement others.

## 6.4. Results: barriers to knowledge use in provinces

Provinces were asked to state reasons for not or not always using (in terms of cognition and effort) knowledge and for not or not always implementing the selected road safety measures on their 80km/h roads. The answer to the latter was expected to provide information about the problems provinces experience when converting knowledge into specific road safety measures.

### 6.4.1. Barriers to use in terms of cognition and effort

Table 6.4 gives an overview of the reasons given by the provinces for not using the selected publications.

	Too abstract	Not vision of province	Too old	Other reasons	Total*
CROW: Essential Distinguishing Features	0	1	0	0	1
CROW: Roundabouts	0	1	0	0	1
CROW: Raised Intersections	0	3	0	1	4
CROW: Roadsides	0	0	0	2	2
Advancing Sustain. Safety	2	0	2	2	6
FS Bicycles	1	0	1	1	3
FS Recognizable Road Design	1	0	2	2	5
FS RS Explorer	1	1	0	3	5
FS CBA	1	1	0	1	3
Total	6	7	5	12	30
* Number of provinces read and understood but not used the publication. Not included in the table are provinces that use the publication or that have not read and understood the publications.					

**Table 6.4.** Reasons given by provinces for not using the selected publications.

The answers varied a great deal as is illustrated by Table 6.4. The main reason for not using CROW guidelines was that these were not in line with the policy and design vision of the province. SWOV publications were not used because they were considered too abstract and out of date. Since the reasons for non-use were asked in an open question, a number of answers could be categorized as 'other reasons'. This category contains answers such as "we do not implement the measure at all", "we are familiar with similar knowledge"

and "we are not always aware of new/current fact sheets". Some provinces mentioned that 'Advancing Sustainable Safety' was used by policy-makers, but not by road designers. This could be due to the fact that this publication is of a more abstract nature than fact sheets and CROW publications.

#### **6.4.2. Barriers to implementation per measure**

Knowledge use on an implementation level was also studied. *Table 6.5* demonstrates the reasons for non-implementation per measure, given in response to an open question. The various answers were divided into ten categories. Two researchers carried out the categorization independently to minimize subjectivity. Provinces could name more than one reason per measure, or could indicate that there was no barrier to implementation. The total number of barriers plus the 'no barrier' option therefore can amount to more than twelve (the number of respondents). The first row, for example, can be read as follows: nine provinces did not see a barrier to the implementation of cycle paths while three provinces encountered five barriers in total.

*Table 6.5* can be studied at two levels: per measure and per barrier.

#### **Analysis per measure**

Three groups of measures can be distinguished. In only a few cases did the provinces hardly see any barriers, with cycle paths as an example. For some measures, the vast majority of provinces named the same barriers. For example: two-thirds of the provinces considered roundabouts in conflict with other provincial policies such as traffic flow or landscape policy. Three-quarters of the provinces stated the same reason for not implementing raised intersections. Rumble strips were considered a fairly undisputed measure in technical terms, but almost half of the provinces met with opposition from citizens due to noise. Half of the provinces claimed to lack space to implement an obstacle-free zone alongside the roads.

For yet other measures, provinces were not unanimous and stated various barriers to measures such as driving section separation, semi-hard shoulders, cycle crossings and service roads. Examples of barriers mentioned here are a conflict with provincial views on traffic policy and the absence of a problem, together with the costs of the measures, opposition from the public and not being convinced of the effect of the measures.

Measure	Too expensive	Excessive maintenance	No space	Not convinced of effect	No problem	Conflict with provin. views	Resistance of citizens	Other reasons	No barrier to implementation	Already implemented
Cycle paths	1	0	1	0	1	0	1	1	9	0
Roundabout	3	0	2	1	2	8	1	0	2	0
Raised intersection	0	1	0	0	0	9	4	1	0	0
Driving direction separation	2	4	2	3	4	2	2	1	0	0
Obstacle-free zone	4	0	6	0	1	4	2	2	0	0
Semi-hard shoulder	4	0	0	3	3	1	0	4	0	0
Cycle crossing	5	0	2	0	5	2	1	0	1	0
Service road	3	0	5	0	4	3	3	3	0	0
Rumble strip	1	1	0	1	2	0	5	3	1	0
Roadside safety construction	1	0	1	2	3	2	0	5	1	0
Overtaking section	2	0	2	1	4	3	1	2	0	0
Total	26	6	21	11	29	34	20	22	--	0

**Table 6.5.** Number of provinces that mentioned a barrier to implementing road safety measures.

### Analysis per barrier

Some barriers were scarcely mentioned by any of the provinces. The barrier 'excessive maintenance' appeared to be relevant only for driving direction separation. Few provinces questioned the effectiveness of the measures, and only then for measures such as driving direction separation and semi-hard shoulders. Only in the case of obstacle-free zones and service roads was 'lack of space' relevant, while opposition from the public played the main role in the non-implementation rumble strips and raised intersections. These findings correspond with the study of Boer et al. (2008, p.21 and 66), who reported similar opposition from the public to speed humps and found a

minority of 20% of the respondents to have reservations about the effectiveness of measures.

More often, the costs of measures were mentioned as a barrier. Cycle crossings especially were considered too expensive, but the same was true for obstacle-free zones and semi-hard shoulders. Roundabouts and service roads were less frequently considered too expensive.

*The barrier 'No problem'*

A remarkable reason respondents gave for not implementing road safety measures was the absence of a problem. They indicated that the type of accident that could be prevented by the measures was rare. To investigate whether this line of thought relates to the road traffic accident statistics, lists were made of the number of accidents per province on 80km/h roads between 2001 and 2006 and the accompanying accident types for each measure. *Table 6.6* includes only the provinces that mentioned the barrier was 'No problem'.

At first sight, *Table 6.6* would seem to reveal a contrast between the perception of the provinces and the actual accident figures. Accidents that could be prevented by the measures did not seem to be as rare as provinces claimed. However, on further inspection, provinces might have had good reasons for not perceiving these figures as a problem. A possible reason is the fact that most of the accident figures in *Table 6.6* are material damage only (MDO) accidents, which means that implementation of the measures would have prevented few or no road deaths or casualties. This might have been a reason for provinces to spend their budget on different measures. Another reason might be that if, as is probable, provinces had compared their accident figures to those of other provinces or to the total number of accidents in the province, they might not have perceived this type of accident to be a problem. The table does not provide for such a comparison.

Measure	Accident type on provincial, 80km/h roads in rural areas	Provinces indicating to have 'no problem'	Number of accidents 2001 until 2006*
Driving direction separation	Frontal accidents	Drenthe	71
		Flevoland	62
		Gelderland	461
		Groningen	83
Semi-hard shoulder	Shoulder accidents	Drenthe	551
		Flevoland	562
		Gelderland	938
Cycle crossing	Bicycle accidents (crossing on intersection)	Gelderland	317
		Groningen	46
		Limburg	123
		Overijssel	135
		Zuid-Holland	132
Service road	Accidents with access related traffic Accidents with off-turning slow traffic and motorized traffic	Drenthe	137
		Gelderland	675
		Groningen	189
		Limburg	274
Roadside safety construction	Shoulder accidents	Drenthe	551
		Flevoland	562
		Groningen	823
Overtaking section	Frontal accidents	Drenthe	71
		Groningen	83
		Limburg	141
		Noord-Brabant	205
* Source: BRON (Bestand geRegistreerde Ongevallen Nederland). Ministry of Infrastructure, including material damage only (MDO) accidents			

**Table 6.6.** Not implemented measures due to an indicated lack of problem.

*The barrier 'in conflict with the province's views on traffic policy'*

A last barrier to implementation frequently mentioned was a conflict with a province's view in traffic policies. *Table 6.7* sums up the measures for which provinces mentioned this barrier and the conflicting views.



Measure	Conflicting views on traffic policy
Roundabout	Hinder traffic flow
Raised intersection	Does not fulfil the requirements of distributor roads
Obstacle-free zones	Preference for different measure e.g. shoulder measures
Service road	Hinder traffic flow
Overtaking sections	Preference for different measures e.g. for example service roads

**Table 6.7.** Measures and conflicting views.

The table indicates traffic flow as an important reason for not implementing road safety measures such as roundabouts and service roads. However, it is remarkable that some provinces implemented service roads precisely for traffic flow reasons, while other used this argument to not implement them. There would seem to be a lack of agreement on the effects of this measure. Another reason for non-implementation was a preference for another measure, presumably having the same effect.

## **6.5. Summary and conclusions**

### **6.5.1. Knowledge use: cognition, effort and implementation**

Did provinces read and understand the information on costs and effects of road safety measures and thus use the knowledge on the cognition level of the Knott and Wildavsky ladder? Approximately half of them claimed to have a general idea of the costs and effects of road safety measures on 80km/h roads. Two-third said to have more insight into the costs than into the effects. Their knowledge was mainly based on their own accident analyses and to a far lesser extent (around 30% of the respondents) on information from outside their own organisation.

Did provinces make efforts to adopt knowledge of the costs and effects of road safety measures in their policy? Two-thirds of the provinces stated that cost and effect information was decisive in policy-making about road safety measures. However, a minority also indicated that they regularly implemented measures without being aware of their effect, and to a lesser extent of their cost. They scarcely adopted cost and effect knowledge from outside their own organisation in policy.

Did provinces implement road safety measures based on cost and effect knowledge? Provinces applied many of the selected road safety measures on their roads. These included cycle paths, roundabouts, obstacle free zones, cycle crossings and roadside safety constructions. Few provinces also constructed raised intersections and overtaking sections. Since the majority of the provinces had stated that cost and effect information played a role in the policy-making, it can be assumed that the implementation is also based on this information, either quantitatively or qualitatively.

### **6.5.2. Barriers to knowledge use**

Provinces were asked the reason for not implementing certain cost-effective road safety measures on their 80km/h roads. This question was expected to provide information about the barriers provinces faced when converting knowledge into specific measures. Three barriers were mentioned most often. Provinces stated that the road safety measures were in conflict with their views on traffic policy, that the measures would not solve existing problems and that they would be too expensive. In addition, the provinces were asked for barriers to the use of the pre-selected publication list. For road design guidelines, provinces perceived a difference between the publications and their own view on traffic policy as the main barrier. Barriers to consulting fact sheets were that they were out of date and too abstract. Although only a minority of the provinces indicate this barrier, it is still somewhat surprising to see that this does not correspond with the general opinion in the road safety field. A possible reason for this discrepancy could be a difference between the positions of the officials being the source of this general opinion and the respondents in this study.

In *Chapter 2*, barriers found in the literature were divided into four groups. The barriers observed in the present chapter can be interpreted within these groups.

It is striking that the present study did not encounter *dissemination barriers*, unlike Boer et al. (2008) who did, for example the inaccessibility of guidelines. A possible reason for this is the choice of an open question for listing the barriers in the present study, whereas Boer et al. used closed questions. The *dissemination barrier* could have arisen in this study if closed questions had been used. Another reason could be that the Boer et al. study was carried out by a private consultancy firm. The fact that this study and its questionnaires were carried out by SWOV, could have given rise to socially desirable answers, although some respondents' statements on SWOV fact

sheets being out of date and too abstract cannot be judged as a socially desirable answer.

With respect to the second group of barriers, that of *the needs of users*, the barrier 'no problem' indicates that knowledge organisations had provided knowledge that policy-makers did not request. In this case, policy-makers did not perceive a problem that needed solving. Although accident statistics would seem to support the presence of types of accident for which certain preventative measures were designed, a closer look at the figures reveals possible reasons why some provinces did not perceive this as a problem. Possible reasons are the relatively high number of 'material damage only' accidents, and the fact that a comparison, either with other provinces or with the total number of accidents in their province, could put their statistics into perspective. The barriers 'out of date' and 'too abstract' could be interpreted as *the needs of users*. The information, especially in fact sheets, was not recent, specific and applicable enough for some users.

The barriers 'in conflict with provincial views on traffic policy' highlights a difference between the knowledge and policy worlds. The knowledge world provided sectoral information on road safety, for instance the costs and effects of road safety measures. However, the policy world included more than road safety information in the decision to implement a measure. It employed a more integral approach, negotiating between various interests within traffic policy and regarding the knowledge world as a supplier of ammunition. These, therefore, can be seen as an *institutional barrier* described in *Chapter 4*, as the difference between a road safety sector oriented knowledge world and a policy world whereby road safety is an integral part of traffic policy.

The barrier 'too expensive' does not mean literally that provinces did not have the funds to implement the measure. Provinces in general had a fairly large budget for infrastructure (for example Ministerie van Verkeer en Waterstaat, 2005a; 2006a). Here, 'too expensive' means that provinces had other priorities than road safety measures. Although not subject to investigation in this study, common sense can indicate three reasons for not investing in expensive, yet cost-effective measures. Firstly, provinces have to invest a large amount of money in infrastructural road safety measures all at one time. Secondly, the economic gain resulting from the measures is not returned to the provinces, so they do not benefit directly from the measures, but the general public and insurance companies do. Thirdly, since the

number of casualties is relatively low at a provincial level, provinces cannot easily see a short-term effect in the casualty statistics. This barrier is an example of one of the cultural differences between knowledge and policy and can be interpreted as an *institutional barrier*. In *Chapter 4*, this is described as a difference in discourse. For science, where cost-effectiveness has a technical and objective meaning, it is a technical discourse; for policy it is a political discourse, stressing individual political assessment and responsibility.

## 7. Barriers to knowledge use for provincial policy-makers: an experimental setting

### 7.1. Introduction

*Chapter 6* investigated the extent to which knowledge is used in designing provincial road safety policies, and identified barriers to the actual use of available knowledge. The focus was on the use of cost and effect knowledge of infrastructural road safety measures for 80km/h roads. The present chapter investigates these same questions, but with a quite different research approach.

So again, the questions addressed in this chapter are:

- *To what extent do provincial policy-makers use cost and effect knowledge of infrastructural road safety measures in their policy?*
- *Which barriers do provincial policy-makers experience to use knowledge of cost-effective infrastructural road safety measures in policy?*

These two questions, however, are now to be answered using an experimental setting as a research method. There are two main reasons for investigating these same questions in a different way. Firstly, in interviews respondents have to rely on their memory while answering questions, which is not always reliable (Baddeley, 1999). In an experimental setting the researcher is able to observe and to ask questions during the task itself, instead of afterwards. In this case, respondents could be asked which knowledge they had used in their policy-making immediately after they had taken their decision. Secondly, interviewing is an explorative way of investigating barriers to knowledge use. In an experimental setting, one can test whether and if so, which barriers actually influence knowledge use by constructing and comparing a situation with and without specific barriers.

This chapter is set up as follows. *Section 7.2* explains the experimental setting and discusses the analytical concepts and methods used. *Section 7.3 and 7.4* describe the results of the experiment by discussing respectively the use of knowledge and the barriers to knowledge use. *Section 7.5* concludes and discusses the results.

## **7.2. Concepts and methods**

### **7.2.1. Analytical concepts**

As this chapter investigates similar questions as did *Chapter 6*, it also uses the same analytical concepts. The use of cost and effect knowledge in the experimental setting is measured on the Knott and Wildavsky ladder of knowledge use (Knott & Wildavsky, 1980). Seven hierarchical levels of knowledge use are distinguished. The levels concerned are reception of knowledge, cognition (read and understand), (frame of) reference, effort (making efforts to adopt knowledge in policy), adoption of knowledge, implementation and the impact of knowledge (effects). *Section 7.2.3* explains which levels are investigated in this study. Furthermore, this chapter investigates different types of knowledge use such as instrumental use, conceptual use and strategic knowledge use. Lastly, barriers from the four groups of barriers to knowledge use, as discussed in *Chapter 2*, are examined. The following section sets out which of the four groups (*dissemination, needs of users, unilateral or co-production of knowledge, institutional factors*) are the focus of the experimental setting.

### **7.2.2. Operationalisation of the analytical concepts**

In this section, the analytical concepts used in the experimental setting are operationalised. The various levels of knowledge use to be investigated are marked out. Then the barriers used in the experimental setting to measure knowledge use are discussed.

#### **Levels of knowledge use investigated**

As in *Chapter 6*, this chapter focuses on the 'effort' and the 'implementation' level of the Knott and Wildavsky ladder. In the experimental setting the respondents were asked to formulate their policy recommendations for the implementation of road safety measures. Immediately after deciding, they were asked on which criteria their decision was based. The question refers to the 'effort' level on the Knott and Wildavsky ladder: did the respondents make an effort to incorporate the knowledge presented to them in their decision?

#### **Barriers used in the experimental setting**

In *Chapter 6*, two groups of barriers that were mentioned most often as reasons for not using knowledge in policy-making were found. The first group consisted of *institutional barriers*, namely the barriers 'conflicts with

provincial views on traffic policy' and 'too expensive'. The second group consisted of *the needs of users*-barriers: the barriers 'too old, too abstract' and 'no problem'. These two barrier groups were also used in the experimental setting.

In the experimental setting, participants received three cases. All of the cases consisted of a road safety problem on a road section or intersection. The cases, designed by a research team with a background in civil engineering, economy and public administration and tested by two provincial policy-makers not involved in the study, were fictitious, but intended to be realistic. Two cases were constructed around *institutional barriers*, deliberately creating situations in which road safety has to compete with other policies or interests. Participants received two versions of these first two cases; one version with the barrier and one version without. The third case was based on the barrier *the needs of users*, providing a variety of texts suitable for different requests for advice. The three cases are described below (for details see Bax & Jagtman, 2009).

In the first case, road safety has to compete with circulation policy. The case describes a T-junction on a distributor road where many accidents occur. Knowledge is provided that indicates that the most cost-effective and safe option is to convert the junction into a roundabout. In the version of the case that includes a barrier to knowledge use, knowledge was given that indicated a serious decrease in traffic flow if a roundabout was constructed. Traffic lights at a raised intersection would be the ideal solution for the traffic flow problem, but would be far less safe.

In the second case, road safety has to compete with the wishes of the public. The case is constructed around the question of whether agricultural vehicles should use the main (distributor) road, or (much safer and cost-effective) use service roads. Although studies show that agricultural vehicles on service roads are a safer option (Schoon, Wesemann & Roszbach, 2000, p. 24), and even though this knowledge was presented to the participants, most citizens do not believe this and dislike the combination of agricultural vehicles and bicycles on service roads. In the version of the case that includes an institutional barrier to knowledge use, citizens are strongly opposed to this measure.

In the third case, participants were asked to choose the most appropriate knowledge source for formulating their policy recommendations to their

deputed, given various types of requests for advice. The case was devised around the implementation of rumble strips. Three advice requests were formulated:

- A general one, to make general recommendations on rumble strips for a province with no experience with this measure;
- A strategic one, to advise the deputed strategically not to implement rumble strips;
- A specific one, to make recommendations for extra budget for rumble strips, while the decision to implement the measure had already been taken.

The participants received three texts, (a general, a strategic and a specific text) tailored to these three advice requests. In addition to measuring the barrier *the needs of users*, this question was also expected to reveal which types of knowledge use (strategic, instrumental, conceptual) actors favour.

### **7.2.3. Experimental setting**

#### **Selection of participants**

Due to the time consuming nature of the study - a full day per participant - a relatively small number of participants was invited to take part. To minimize the burden on the provinces, the maximum number of participants was limited to two per province. As in *Chapter 6*, all of the provinces received an invitation to take part in the experiment. Both policy-makers and road designers were approached. A different use of knowledge was expected; policy-makers were expected to focus more on knowledge about the various interests involved in the policy-making, while road designers were expected to focus more on technical knowledge.

Initially all twelve provinces gave their consent for participation in the study. However, at the last moment, the provinces Groningen and Zuid-Holland were unable to take part and the provinces of Zeeland and Limburg were only able to delegate one participant (Bax & Jagtman, 2009, p. 39). This resulted in a total number of 18 participants representing 10 provinces. The experiment was spread over two days, each involving about half of the participants.

#### **Study design and expectations**

As stated above, in the first and second cases, two versions of each case were presented to the participants. The participants received a neutral version of each case (control case) and a version of the same case with a barrier to knowledge use (experimental case), creating a situation in which road safety



had to compete with other policies or interests. The experimental cases are indicated here as case 1A and 2A, the control cases as case 1B and 2B. Each case provided several possible road safety measures to solve a road safety problem. One of these measures was presented as cost-effective and best suited to road safety interest. Another measure was presented as less suitable for road safety, but served another interest (of citizens in case 2) or policy (traffic flow in case 1) better, and functioned as a barrier to use road safety knowledge in the case. It was expected that participants would choose the safe, cost-effective measure in case 1B and 2B and the less safe measure serving the other interest in case 1A and 2A due to the added barrier in these last two cases.

The third case consisted of three versions. No control case was used here. The case was presented using three different types of advice requests, a request to make general policy recommendations (3A), a request to advise the deputed strategically (3B) and a request to write a budget proposal (3C). Participants had to choose a knowledge source that matched the request. For this purpose three texts were presented: a general policy text, a strategic text with a recommendation to abandon the measure and a specific text on costs and effects of the measure. It was expected that the participants would choose a text that matched the advice request. Each of the three cases was followed by a question on the reason for their decision.

In all three cases, participants received extra knowledge. The knowledge consisted of accident figures, circulation figures, maps and background knowledge with cost and effect knowledge about possible measures depending on the case. As mentioned above, policy-makers were expected to focus more on knowledge about the various interests, while road designers were expected to focus more on technical knowledge. A limited number of measures and knowledge sources was given in each case, and participants also had the option of putting forward their own solution to the problem. After making their choice, participants were asked to clarify their choice and their use of knowledge.

A within subjects design, in which each participant is given all versions of the cases, was chosen as research design. In this way, optimal use of the small number of participants was made. A disadvantage of this approach is that answers to the first version of the case could influence the answers to the second version (a 'learning' effect). To check for this influence, participants were divided into two groups on both days. One group received the

experimental case A first, and then the control case B. The other group was given the cases in reverse order. For the third case (with three versions), one group received the cases in the order A, B, and C, while the other group was given the cases in the order B, C and A. The two groups consisted of a mix of policy-makers and road designers. To adjust the presentation order of the cases even further, the participants started with case 1 on the first day and with case 2 on the second day. Where the analysis indicated an order of presentation influence, a new analysis was conducted, in which only the first cases presented were taken. This was done to exclude a learning effect.

### **Group Decision Room**

The experiment was conducted in the Group Decision Room (GDR) of the Radboud University Nijmegen. Here the participants sat at their own computer, which was part of a network of twelve computers. They received questions and could enter their answers into the computer. The cases were provided on two A3 sheets of paper. The participants were not allowed to confer with each other and had to make their choices individually. Preceding the experiment, the participants were asked to type their name, post and province into the GDR device, to become acquainted with it.

There were two important reasons for choosing the GDR as research instrument. Firstly, the GDR provides a tool to enable a structured discussion with a relatively large group of people. It allows discussion and at the same time provides an opportunity of eliciting an opinion from every individual. Furthermore, the discussion using the GDR takes less time than a verbal discussion, because all participants can type at the same time. Secondly, the GDR has a very convenient storage function for data. This prevents extra work.

#### **7.2.4. External validity of the cases**

A criticism that has been made of experiments is their lack of external validity (Swanborn, 1987, p. 245). Experimental conditions are per definition not 'real' and therefore the outcomes of an experiment are not easily convertible to the world outside the laboratory. To overcome this criticism, in the afternoon session of the experiment, the participants were asked in an open question whether they considered the cases realistic and whether they had needed more or other knowledge to reach a sensible decision. First, all participants submitted an individual (initially private) statement, and could then respond to each other's statements. Not all of the participants' statements were formulated in such a way that their judgement was obvious.

These answers were excluded. *Table 7.1* shows the summary of the statements.

	(Very) realistic	Realistic, but insufficient knowledge	Unrealistic
Case 1	6	8	2
Case 2	7	9	0
Case 3	7	2	5

**Table 7.1.** Number of participants who judged the cases to be realistic or unrealistic.

In general, the majority of the participants considered the cases realistic. Various participants indicated having experienced similar situations in practice, especially in case 2. In case 1, half of the participants indicated a need for (extra) knowledge about land ownership, about the traffic network and about the physical surrounding. In case 2, various participants indicated that the difference between case A and B in relation to safety seemed only very slight and that politics played a more important role in the decision than the cost and effect knowledge. In case 3, five participants did not consider the case realistic. Two of them would have liked to have had more knowledge about accident frequency; one was not in favour of rumble strips anyway. However, two others stated in their explanation that they wanted to give their deputed politically neutral recommendations, while the case tempted them to involve the opinion of their deputed in their advice in case 3B. This point was elaborated upon further in the group discussion. Most participants wanted to advise their deputeds as neutrally as possible, regardless of the wishes of the deputed. In their view, politicians are responsible for justifying an alternative choice. A few participants wanted to adapt their advice to the wishes of the deputed, stating that civil servants are employed to serve the authorities. This difference in vision on the role of officials caused a somewhat heated discussion.

### **7.3. Results: use of knowledge**

#### **7.3.1. Effort and implementation: use of cost and effect knowledge**

The first case was constructed around junction measures. Knowledge provided showed that the most cost-effective measure was a roundabout. When asked to explain their choice ('effort'), most participants indicated that their decision was taken on road safety and traffic flow grounds. Both in the

experimental case and the control case, only a few people mentioned costs and effects explicitly as a reason for their decision, although many made more implicit remarks such as "safer", "fewer accidents" et cetera. Almost all of the participants stated "road safety" as the main reason for their decision, possibly implying the expected effect of the road safety measure on accident frequencies. The second case was formed around agricultural vehicles on main roads or service roads. The most cost-effective measure here was to assign agricultural vehicles to service roads. Only one participant stated costs as a reason for his decision; no one mentioned safety effects explicitly. This is not surprising because the measure is very inexpensive. About half of the participants stated "road safety" as an important reason for their choice. This might well be an indication that they take the effect of the road safety measures into account.

The number of participants who decided to opt for the road safety measure was examined to measure the use of knowledge on the 'implementation' level. As *Section 7.4.1 and 7.4.2* show, a sizeable majority of the participants decided to implement this measure in both the experimental and control case.

### **7.3.2. Instrumental, strategic or conceptual use**

In the third case, participants received three kinds of policy questions (a general advice question, a strategic advice question and a specific advice question) on the implementation of rumble strips. At the same time, they received a general, a strategic and a specific text with knowledge on rumble strips and were asked which text they would use for which type of advice. It was expected that they would use the general text for the general advice request and so on. *Section 7.4.3* discusses whether this expectation was correct. The present section describes the choices of the participants for the various types of texts. *Table 7.2* describes all three advice requests.

The first request for advice is a general one: to write a policy document for a province with no prior experience of rumble strips. The accompanying general text contains knowledge regarding the necessity of roadside measures in general and rumble strips in particular. The second request for advice was for a policy document for a deputed who was sceptical about the applicability of rumble strips, and had asked for well-founded alternatives. The accompanying strategic text contained a report by a neighbouring province that is less than enthusiastic about the implementation of rumble strips on their roads. The third request for advice was for a policy document

with the financial consequences of the implementation of rumble strips. The accompanying specific text contained knowledge about costs and effects of rumble strips.

	General advice request 3A	Strategic advice request 3B	Specific advice request 3C
General text	9	3	3
Specific text	7	6	10
Strategic text	0	4	1
Combination of two texts	1	3	2
Other	1	2	2

**Table 7.2.** Text used in cases 3A, 3B and 3C.

When comparing the use of the three texts in the three cases, the specific text is clearly the one used most, whereas the strategic text was used the least. This indicates a preference for knowledge that is as specific and applicable as possible. The strategic text was chosen the least. The discussion in the afternoon session indicated that participants wanted to inform their governments neutrally and not strategically. This corresponds to the findings above.

#### **7.4. Results: barriers to knowledge use**

The three cases not only investigated the use of cost and effect knowledge; their aim was also to discover how much influence certain barriers have on knowledge use. The institutional barrier ‘conflicts with other policies’ was used in the first two cases in two variations: a road safety measure that conflicts with traffic flow policies (case 1), and a road safety measure that conflicts with public support (case 2). The barrier *the needs of users* was used in the third case: it tests the use of specific knowledge sources for parallel advice requests. The two cases and their results are discussed in the following subsections.

##### **7.4.1. Traffic flow or road safety?**

In the first case, participants were required to choose between a given number of junction measures. In the control case 1B, a roundabout was the most logical option for the road safety problem sketched in the case, as traffic flow is guaranteed sufficiently in this option. The roundabout would also be

a logical solution for the road safety problem in experimental case 1A, but here the knowledge provided indicated that the traffic capacity of the roundabout is just too small to deal with the (greater) traffic flow. From the circulation point of view, traffic lights would therefore be more logical in this case, but less safe. *Table 7.3* shows the choices of the participants.

	Case 1A	Case 1B
Single carriageway roundabout, including custom made solutions	13	16
Traffic lights at junction	0	0
Traffic lights and raised intersection	2	0
No changes	0	0
Other	3	2

**Table 7.3.** Alternatives chosen for case 1A and 1B.

In both cases, the majority of the participants chose a single carriageway roundabout with slightly fewer choosing this option in the experimental case 1A than in the control case 1B. Four (case 1A) and three (case 1B) participants respectively devised a custom made version of the single carriageway roundabout, by introducing one or more bypasses on the roundabout to solve the capacity problems. The possible influence of factors such as the presentation order of the cases, the type of participant and the day on which the study took place was examined, but no clear differences were found.

#### **7.4.2. Public support or road safety?**

In the second case, participants were asked whether to implement an agricultural vehicle exclusion ruling on a yet to be constructed distributor road. In the control case 2B, the implementation of this ruling, obliging the agricultural vehicles to use the adjacent service road, was presented as the most cost-effective option for the road safety problem. The same applied to experimental case 2A, but here there was insufficient public support for this measure. The participants were presented with knowledge indicating that objections had been raised against the ruling by an organised group of residents and parents of school-aged children who use the service road as their school route. Considering the lack of public support, the hypothesis was that it would be logical (but less safe) not to implement the agricultural vehicle exclusion ruling on the distributor road. The traffic flow in both cases was assumed to be equal. *Table 7.4* summarises the reactions of the participants to this dilemma.

	Case 2A	Case 2B
Agricultural vehicle exclusion ruling including custom made solutions	14	16
No agricultural vehicle exclusion ruling	1	1
Other	3	1

**Table 7.4.** Alternatives chosen for case 2A and 2B.

In control case 2B the vast majority of participants chose the agricultural vehicle exclusion ruling on the distributor road. Despite the lack of public support, only slightly fewer participants selected this measure in experimental case 2A. As in the first case (1A and B), participants devised custom-made solutions to the agricultural vehicle exclusion ruling, for example adapting the infrastructure or the network. As in case 1, visual inspection of the data indicated that factors such as presentation order, type of participant and the day of participation did not influence the results.

#### 7.4.3. General, specific or strategic knowledge corresponding to the advice request

In the third case, a choice between three types of knowledge was given, for three kinds of advice requests: general, specific and strategic knowledge for a general, specific and strategic advice. The goal in this part of the experimental setting was to investigate whether the participants used only that type of knowledge that corresponded closely to the type of advice request. In other words, would *the needs of users* be a barrier for knowledge use? The road safety measure involved was the rumble strip. It was not possible to construct a neutral control case here. The various advice types are compared. Whereas *Table 7.2* in *Section 7.3.2* presented the individual results for the three cases, *Table 7.5* below shows the total results.

	General advice request 3A	Strategic advice request 3B	Specific advice request 3C	Total
Expected text	9	4	10	23
Different text	9	14	8	31
Total	18	18	18	54

**Table 7.5.** Choice of text in relation to the advice request.

The table illustrates that about half of the participants chose the expected text in case 3A and 3C. In case 3B (strategic advice request) a different trend was observed; a majority of the participants chose a different text than was expected.

### **Influence of experimental design**

As in cases 1 and 2, factors such as the presentation order of the cases, the type of participant and the day may have influenced the results of the experiment. Contrary to the findings in cases 1 and 2, these factors do seem to have influenced the results in case 3.

With regard to the day on which the study was carried out, the results differ slightly. The choice of the specific text is more dominant on the second day than on the first day (52% on the second day versus 30% on the first day). No explanation for this difference could be found, given the fact that the composition of the participant groups on both days did not differ significantly. The order in which the advice requests 3A, 3B and 3C were offered also seem to have had some influence on the results. Each day one group received the advice requests in the order 3A-3B-3C, the second group in the order 3B-3C-3A. A larger number of participants in the second group than in the first group (50% in the second group versus 33% in the first group) chose the expected texts in the three advice requests. The difference is not substantial and may not have influenced the outcomes as a whole. Lastly, the position of the participants was also found to be relevant to their answering pattern. Policy-makers chose the specific text in 50% of the choices, road designers only in 25%. This is contrary to the aforementioned expectation, i.e. policy-makers were expected to focus more on knowledge about interests, while road designers were expected to focus more on technical knowledge.

## **7.5. Summary and conclusions**

In this chapter, the following questions were investigated:

- *To what extent do provincial policy-makers use cost and effect knowledge of infrastructural road safety measures in their policy?*
- *Which barriers do provincial policy-makers experience to use knowledge of cost-effective infrastructural road safety measures in policy?*



The questions were examined in an experimental setting for provincial policy-makers and road designers. The questions addressed two levels on the Knott and Wildavsky ladder (1980): effort (to adopt knowledge in policy) and implementation. They also addressed three types of knowledge use: instrumental, strategic and conceptual use. Furthermore, the influence of two barriers on knowledge use was tested: the barrier *conflicts with other policies* and the barrier *the needs of users*.

#### **7.5.1. Knowledge use: effort and implementation**

The first two cases studied the extent to which participants allow cost and effect knowledge to play a role in their decision. This question can be seen as an operationalisation of the 'effort' level on the Knott and Wildavsky ladder. Few participants answered explicitly that knowledge about costs played a role in their decision. Many participants answered that road safety was an important basis for their choice, possibly implying the effect of the road safety measure on road safety. The first two cases also investigated whether participants would implement cost-effective road safety measures. A large majority chose to implement the measures in both variations of the two cases. The third case showed that participants often chose to use a specific text to address the advice question, almost regardless of the type of advice request. The strategic text was chosen the least.

#### **7.5.2. Barriers to knowledge use**

The first two cases tested the influence of the barrier 'conflicts with other policies' by setting a road safety problem against negative traffic flow consequences and the opposition of the public. These barriers influenced the choices of the participants for road safety measures only very slightly. What is remarkable here is the participants' preference for tailor-made solutions. This preference can be seen as a strategy to overcome the barriers in the cases. The third case tested the barrier *the needs of users*, permitting participants to choose the most appropriate general, specific or strategic text for a general, specific or strategic advice request. In the general and specific case, half of the participants chose the texts in accordance with the expectation. In the strategic case, far fewer people chose the expected text.

Why did participants not react to the barriers in cases 1 and 2 and why did they choose mainly the specific text in case 3? There are several possible reasons for this. One reason could be that the participants seemed to use their knowledge instrumentally rather than strategically. Despite the barriers

in cases 1 and 2, they chose the safest and most cost-effective option rationally. The barriers did not make the problem less structured for them, nor did they tempt them to use the knowledge more strategically. This was confirmed by the discussion in the afternoon session about how realistic the cases were. For case 3, most participants stated that they wanted to advise their deputies neutrally. In their view, politicians are the ones responsible for making choices. This means that the participants aim to use their knowledge instrumentally, and that they expect their deputies to use the knowledge in a more strategic way. Another possibility is that participants answered the questions in a socially desirable way choosing the safest option, taking into account that SWOV was conducting the experiment. Furthermore, the cases may not have been complex enough. In real life, policy questions could include more than one barrier to knowledge use, and the pressure of real colleagues could be greater than the barriers in the experimental cases.

## 8. Municipal road safety policy-making

### 8.1. Introduction

The two previous chapters investigated knowledge use in road safety policy and barriers at provincial level. This chapter studies similar questions, but focuses on municipalities. It is interesting to investigate the differences between municipal and provincial road safety policies, since municipalities may have a closer relationship with their citizens than provinces. It is to be expected therefore, that municipalities will give more importance than provinces to the interests of their citizens. This chapter thus, more than the previous chapters, focuses not only on the use of road safety knowledge, but also knowledge concerning other interests. The questions in this chapter are:

- *To what extent do municipalities use knowledge on road safety and consider other interests in their policy?*
- *Which barriers are there for municipalities to use knowledge on road safety in policy?*

This chapter looks into the policy-making process on changing the speed limit on rural roads from 80 to 60km/h, and the accompanying infrastructural measures, in fourteen municipalities. This type of policy-making processes involves balancing road safety interests with other interests such as traffic circulation, travelling times, driving comfort et cetera.

The background to this issue can be described as follows. In 1997, the Start-up Programme Sustainable Safety (Ministerie van Verkeer en Waterstaat, 1997), a road safety policy covenant between national, regional and local road authorities, determined among other things, that local road authorities, i.e. municipalities, should reduce the speed limit on rural roads from 80 to 60 km/h. Several infrastructural measures, such as speed humps and edge marking, were to be taken to ensure the effectiveness of the speed reduction. At first sight, this would appear a simple, technocratic kind of decision, for which municipalities are not dependent on other actors. However, there are many more interests involved besides the apparent road safety interest. For instance, speed reducing measures have consequences for emergency services (increased response time, discomfort for patient and driver) and for public transport (delay, discomfort for driver and passengers). Furthermore, the measures may also create inconvenience (discomfort, delays, noise from

certain speed humps, damage to tractors and cargo) for people living and working in the area, such as farmers. It can also be noted that successful implementation of measures to provide a consistent road transition between their respective roads requires effective coordination with neighbouring municipalities. In addition, many municipalities consult with their community beforehand in order to forestall objections and legal procedures, which can slow down or postpone the implementation.

Some preliminary remarks can be made about the history of this study. The present chapter is based on Bax et al. (2008). The initial goal of the study was to investigate whether contact with actors in their road safety network helped municipalities to achieve safer roads. The assumption was that contact with specific, relevant actor groups, such as other municipalities, emergency services, public transport, the general public, businesses and interest groups, would lead to safer roads. The assumption was based on literature in which the outcomes of policy are related to data on network structure and network interaction (Agranoff & McGuire, 2001; Barnard, 1968; Daugbjerg, 1998; Dowding, 1995; Katz & Kahn, 1978; Provan & Milward, 1995; 2001; Voets, Van Dooren & De Rynck, 2008). Other authors have elaborated on this approach by stating that interaction between all actors in a network might not be necessary. It might be more interesting to study the interaction in semi-autonomous parts of the networks. They therefore no longer investigated the networks as a whole, but divided the networks into smaller subgroups (Chisholm, 1989, p. 53, 63, 199; Provan & Sebastian, 1998; Scharpf, 1973, p. 90, 106; Simon, 1962; Weick, 1976).

Bax et al. (2008) adopted this approach. The number and intensity of the contacts with the abovementioned actor groups were measured using the social network analysis method (Wasserman & Faust, 1994), which resulted in network pictures and data. Safe roads were operationalised on various levels, such as the road features as a whole, in addition to those features that could actually be influenced by actors in the network, such as speed measures and the consistency of road transitions. For more details, see Bax et al. (2008). Although this study was not designed to measure knowledge use, it appeared that several aspects of the study provided insight in this topic. Therefore, it was decided to re-analyse the data of the original study to enable the use of information on knowledge use relevant to this thesis. The present chapter accounts for the choices made in the study and refers to the original report when necessary. It indicates explicitly where the original

study presented limitations for the study on knowledge use, although it appeared that these limitations were very slight.

## **8.2. Concepts and methods**

### **8.2.1. Analytical concepts**

The same analytical concepts are used in this chapter as in *Chapter 5, 6 and 7*. Both the Knott and Wildavsky ladder of knowledge use (1980) and the barriers from the four groups of barriers to knowledge use (*dissemination, needs of users, unilateral or co-production of knowledge, institutional factors*) mentioned in *Chapter 2* are examined. The following section explains which parts of the knowledge ladder and of the four groups of barriers are focussed on.

### **8.2.2. Operationalisation of research questions**

To investigate the research questions, three concepts demand further clarification. Similar to *Chapter 6 and 7*, the levels of knowledge use to be investigated in this chapter should be determined. Specifically for the present study, it should be clear exactly what is meant by 'knowledge on road safety' and 'knowledge on other interests' within the context of this chapter.

#### **Operationalisation of knowledge use**

The present study refers to two levels of the Knott and Wildavsky ladder of knowledge use: the reception of knowledge and the implementation level. This choice stems from the available research method and techniques: the study contains fourteen cases and uses a telephone survey to interview relevant actors in the policy-making process. In addition, an open interview was conducted with the road safety official of the policy-making municipality. A survey is not the appropriate instrument for asking detailed questions about the understanding of knowledge or the efforts to include knowledge in policy documents. Therefore, the far simpler level of the reception of knowledge was chosen to measure knowledge use. The question about the implementation level was possible, there being a large number of municipalities in the Netherlands, of which we could choose only those that had already reduced the speed from 80 to 60km/h on some or all of their rural roads. Therefore it was possible to inspect the roads visually, by driving on them and examining the implementation level with the help of a checklist.

### **Operationalisation of two kinds of knowledge**

Two types of knowledge are investigated in this study: knowledge on road safety and knowledge on other interests in the policy-making process. This section specifies what is meant by these terms.

Not all knowledge on road safety is relevant to this study. The research focuses on knowledge of a safe design for 60km/h roads. In general, it is conceived these days that a safe design for a 60km/h road has a maximum width of 6.2 metres and broken edge markings, has an obstacle-free shoulder measuring at least 4 metres, has no centre line or parking space and has junctions without designated priorities or traffic lights, but with speed reducing measures (Houwing, 2003; Hummel, 2001; Van der Kooi & Dijkstra, 2000).

As indicated above, the use of this knowledge is measured on two levels: the reception and the implementation level. On the reception level, the availability of sources of knowledge of the design of 60km/h roads is not asked for explicitly, but the interview gave municipalities the opportunity to bring these up themselves. Sources they could mention were, for example, handbooks such as the Dutch ASVV (Recommendations for traffic facilities in built-up areas) (CROW, 2004a) or CROW publications (CROW, 2002a; 2002b). The reason for not being explicit is that, as mentioned above, this chapter is based on the study by Bax et al. (2008), in which knowledge use was not the primary goal of the study. This certainly limits the use of knowledge data on the reception level in this chapter. However, after reinvestigating the raw data for this chapter it appeared that many municipalities mentioned this use spontaneously anyway. *Section 8.3* reports on this in detail.

On the implementation level, the roads were examined to see whether or not the knowledge had been applied. This was done by driving along all 60km/h roads involved in the study and examining them with the help of a predefined checklist. The checklist contained the four most important features of the rural 60km/h roads (Henkens, 2006; Van der Kooi & Dijkstra, 2000), which had to be present for this type of knowledge to be seen as implemented. Two features were related to road sections; two others were related to intersections. The road sections should have a correct edge marking and there should be no centre lines. Examples are given below.



**Figure 8.1.** Examples of 60km/h road sections (Photography: Robert Louwerse).

At intersections, there should be speed reducing measures such as speed humps and there should be no priority regulation. Examples are given below.



**Figure 8.2.** Examples of 60km/h intersections (Photography: Robert Louwerse).

The various actors involved can have multiple interests, other than road safety. Therefore, to specify the concept 'knowledge on other interests', a list of possible types of actors assumed to be relevant in the policy-making processes was drawn up. This list was based on a pilot research report in which the methods and questionnaires were tested on six municipalities and their network, four of which also participated in the main study (Bax et al., 2004; Bax et al., 2007). The list was divided into three main groups of actors having more or less comparable interests:

1. Neighbouring municipalities
2. Emergency services (police, fire brigade and ambulance) and public transport
3. The general public, businesses and interest groups

The municipality itself and neighbouring municipalities have a strong interest in consistent transitions between the roads they are responsible for, especially on continuing 60km/h roads. Emergency services and public transport operators are known to have objections to certain speed reducing measures (CROW, 2002c). Such measures can lengthen their travel times, which may interfere with their response times or timetables and may influence the driving comfort of drivers, patients and passengers. The general public, businesses and interest groups are a rather mixed group with many different interests. Some are in favour of an increase in infrastructural measures for speed reduction and safety, others are opposed to these, due to sound pollution, for example, or increased travel time, loss of nature, or driving comfort for drivers and cargo.

To ensure that this division into three groups of actors and their presumed interests are correct, those actors assumed to be relevant in the policy-making were asked to disclose their main interests in this policy-making in a survey, as described in *Section 8.2.4*. *Table 8.1* represents their choices, which confirm the set of interests for each group hypothesized above.



Interest	% case municipalities N=14	% neighbouring municipalities N=49	% other road authorities N=50	% emergency services and public transport N=63	% the general public N=63	% consultancies N=12	% all actors N=229
Improved road safety	100	100	86	85	93	89	92
Public support for road safety	69	55	49	25	43	67	46
Reducing speed	54	50	40	30	48	33	43
Cooperation with national policies	62	53	57	33	18	22	38
Less cut-through traffic	46	45	29	18	52	44	38
Consistent road transitions when crossing municipality borders	15	63	49	28	23	22	36
Travel times and driving comfort for business and agricultural traffic	8	13	6	43	50	22	28
Efficient combination of road safety measure with other measure	23	33	49	15	23	33	28
Protection of the rural character of the area	38	25	20	5	36	22	24
Acceptable response times for emergency services	8	13	3	63	16	33	23
Support for traffic policies from political decision makers	46	23	34	13	16	22	22
Other	8	5	14	10	16	11	11
Financial responsibility	8	8	3	5	4	11	5

**Table 8.1.** Self reported interests of actors (actors could indicate a maximum of five interests).

Whether municipalities use knowledge on the interests of these three different groups was measured on the same two levels as was the case with safety knowledge. On the reception level, both oral and written contacts between the three groups of actors and the municipality were counted. On the implementation level, site inspections on the municipal roads were executed to see to what extent these interests had been applied in the infrastructure. For the interests of the three groups, the following criteria were used.

1. To measure the implementation of the interests of neighbouring municipalities, the transition sections of roads between two bordering municipalities were examined. The transitions between the

municipalities should be consistent and meet certain requirements to prevent them from being confusing for the road user (Brouwer, Aarts & Louwerse, 2008; CROW, 2002a). A detailed scheme of requirements is given by Bax et al. (2008, p. 58 and further). Transitions that meet these requirements are named consistent transitions in the remainder of this chapter. The figure below gives an example of a consistent and a not consistent transition.



**Figure 8.3.** Example of consistent (left) and not consistent (right) road transition (Photography: Robert Louwerse).

2. For emergency services and public transport, the municipal roads were checked for speed reducing measures that do not affect emergency services and buses, known as 'driver friendly speed reducing measures'. Driver friendly speed measures are defined here as vertical speed reducing measures which can be driven over at a speed of at least 50km/h, both on road sections and intersections. Horizontal speed measures such as axis offsets and optical speed reducing measures are also classified as driver friendly measures. These criteria are based on several CROW-publications (CROW, 2002c; 2002d; 2007b; Goudappel-Coffeng, 1999).



**Figures 8.4.** Example of driver friendly (left) and not driver friendly (right) speed measure according to CROW-publications (CROW, 2002c; 2002d; 2007b; Goudappel-Coffeng, 1999) (Photography: Robert Louwerse).

3. The interests of the general public, businesses and interest groups are too mixed to formulate a single criterion to examine the implementation of knowledge from these groups on the municipal roads beforehand.

In addition to the site inspection, those involved in the policy-making process were asked whether their interests had been implemented satisfactorily on the municipal roads.

### **Barriers**

This chapter investigates barriers to the use of knowledge in road safety policy, as did the previous chapters. Even though these barriers were not requested explicitly here, the interviews with the municipalities revealed several barriers to the use of road safety knowledge, which are used in this chapter.

#### **8.2.3. Selection of cases**

The selection of the cases was carried out in three steps. Firstly, a list was made of as many municipalities as possible that had implemented 60 km/h roads, using information from pilot reports, from websites and from telephone inquiries made to provinces. Then, this list was reduced to a shorter list of 23 municipalities, using easily accessible information such as the number of inhabitants and the size of the rural areas in the municipalities. The short list contained municipalities with similar characteristics to enable comparison of the municipalities and to rule out these criteria as possible sources of differences. The two main characteristics selected were the number of inhabitants and the size of their rural areas, the

latter because no statistics are available on the total length of their rural roads. Municipalities with 10.000 to 50.000 inhabitants and with 10 to 350 square kilometre of rural area were selected. The remaining 23 municipalities were telephoned, to decide on the final selection of 14 of these for the study. The criteria for selection were the presence of 60km/h roads, the existence of a finalised decision-making on 60km/h roads, political support, i.e. from the responsible alderman and the city council, for this policy, and the absence of changes in personnel in the time span of the study. Municipalities in as many different regions of the Netherlands as possible were chosen, to exclude the region as an explanatory factor for the outcomes. Where the selection list contained adjacent municipalities, only one was selected.

#### **8.2.4. Further on methods**

Three research techniques were used in this study. Firstly, municipal roads were inspected visually. Secondly, the municipalities, represented by their policy-makers responsible for, amongst others, road safety, were interviewed using a semi-open questionnaire. Thirdly, all actors involved in the policy-making (or should have been involved on the basis of the above list of actors assumed to be relevant) were interviewed by means of a telephone questionnaire with closed format questions. The questionnaires are included in Bax et al. (2008). The survey response rate averaged 87% (range 71-100%, N=229).

### **8.3. Results**

#### **8.3.1. Use of road safety knowledge**

Although the municipalities were not asked directly what kind of information they had used in the policy-making, they spontaneously reported some kind of knowledge use. Eleven municipalities (80%) mentioned the use of CROW guidelines (on markings and on the combination of speed reducing measures and public transport and emergency services) and the ASVV handbook. Some were less precise, referring to "general guidelines", "sustainable safety publications" and "the theory of sustainable safety". Clearly, municipalities have used knowledge on road safety in a 'receptive' way. The use of this type of knowledge in their policies indicates knowledge use on the 'effort' level of Knott and Wildavsky's ladder.

To measure the implementation of this knowledge, a visual inspection of all 60km/h roads in the municipalities was carried out. Four safe road features were examined (Henkens, 2006; Van der Kooi & Dijkstra, 2000). For road sections, the presence of the correct edge marking and the absence of a centre line were inventoried. For intersections, the presence of speed reducing measures and the absence of priority regulation were observed. The number of road sections and intersections inspected in the 14 municipalities varied; 18 to 118 road sections with an average of 63 were studied and 10 to 146 intersections with an average of 55. Per municipality, an average score for the two features for road sections and intersections was calculated, both having the same weight. The table below lists the average score for the fourteen municipalities, again each municipality having the same weight.

	Average score (%)	Range (%)	Standard deviation (%)
Road sections	89	59-100	10
Intersections	51	37-70	8

**Table 8.2.** % of 883 60km/h road sections and 768 60km/h intersection in 14 municipalities with positive scores on two road safety features for road sections and two road safety features for intersections.

The table shows that most roads were designed in accordance with knowledge on safe 60km/h roads, but only half of the intersections were. *Section 8.3.3* discusses the barriers that may underlie this difference between road sections and intersections.

### 8.3.2. Use of knowledge on other interests

The question as to whether the fourteen municipalities used knowledge and interests of other municipalities, emergency services, the general public, businesses and interest groups on a 'reception' level, was studied by way of interviews with the respondents from the municipalities and in telephone surveys with other actors assumed to be relevant. All fourteen municipalities were asked for their contacts with these other actors and, vice versa, all actors who, according to our list of relevant actors, were assumed to have participated in the policy-making process received a question about their contacts with the municipality. The number of actors varied per municipality. One to six neighbouring municipalities were interviewed, with 3.6 as an average. All three emergency services (police, fire brigade and ambulance) were interviewed in the fourteen municipalities. In 10 municipalities the public transport operator was also interviewed, since the

roads investigated were also public transport routes. The number of respondents in the group 'general public, businesses and interest groups' also varied per municipality, from 1 to 6 with an average of 3.8. The results are listed in the table below.

	Average score (%)	Range (%)	Standard deviation (%)
Neighbouring municipalities	67	0-100	34
Emergency services and public transport	81	33-100	23
General public, businesses and interest groups	100*	--	--
* score is 100%, because only actors were studied who had contact with municipality			

**Table 8.3.** Average over 14 municipalities of % of actors that had contact with the municipality.

The percentage of actors with whom municipalities had contact was calculated. The percentages were calculated per municipality and the average score over all 14 municipalities is included in *Table 8.3*.

The table shows high average percentages of contacts between other actors and municipalities. This means that the municipalities must have been at least receptive to knowledge from the three actor groups. However, it also shows that the percentages vary greatly per municipality.

To measure the use of knowledge on the 'implementation' level, two road characteristics were evaluated on visual inspection. The implementation of the interests of neighbouring municipalities was measured by examining consistent road transitions between their roads and the roads of the case municipality. *Table 8.4* shows the amount of roads with a consistent road transition in the fourteen municipalities. For this, the percentage of roads with a consistent transition was calculated per municipality, then the average over the 14 municipalities was included in the table. The municipalities were used as the appropriate level for analysis, because the interest of this study lies in how municipalities use knowledge in the implementation phase of policy-making. Driver friendly speed reducing measures were examined to measure the implementation of the interests of emergency services and public transport. The table gives an average of the percentages of speed reducing measures that are driver friendly in the 14 municipalities. As in the first row, the percentage of speed reducing measures that are driver friendly was calculated per municipality. Then the average over the 14 municipalities

was included in the table. The implementation of the interests of citizens, businesses and interest groups has not been measured in numbers, because their interests are too mixed to define their influence. However, more than half of the municipalities indicated that the opinion of people living and working in the area is often decisive for making changes in the implementation. Based on these arguments, various municipalities indicated, for example, that they had abandoned intended speed measures and road closures.

	Average score (%)	Range (%)	Standard deviation (%)
Consistent road transitions	54	0-100	33
'Driver friendly' speed measures	62	33-100	23

**Table 8.4.** Average over 14 municipalities of % roads with a consistent road transition.

The table above illustrates that, on average, on half of the roads municipalities use knowledge and the interests of neighbouring municipalities on an implementation level, and on almost two-third of the roads, municipalities do this with regard to the interests of emergency services and public transport. The table also demonstrates that the percentages vary greatly per municipality. *Section 8.3.3* discusses possible reasons for these differences.

In addition to the visual inspection, the three groups of actors assumed to be relevant for the policy-making-process were asked whether their interests had been implemented on the municipal roads. As mentioned earlier, the number of respondents varied per group and per municipality. The scores were first averaged per group per municipality. The table shows an average of the percentages in the fourteen municipalities. The respondents could score their answer on a 4 point scale, rating from (1) not implemented, (2) somewhat implemented, (3) reasonably implemented to (4) fully implemented.

	Average score	Range	Standard deviation
Neighbouring municipalities	3.33	2-4	0.62
Emergency services and public transport	2.95	1-4	0.90
General public, businesses and interest groups	2.65	1-4	0.73

**Table 8.5.** Implementation of interests (4 point scale).

All actor groups score well above two on the four point scale. This means that emergency service/public transport and citizens/businesses/interest groups judged their interests to be implemented and neighbouring municipalities even to be more implemented on the municipal roads. For the first two groups (neighbouring municipalities/other road authorities and emergency services/public transport) this is somewhat contradictory to the findings in *Table 8.4* above (% of roads that have consistent road transitions or 'driver friendly' speed measures), in which is drawn that only half to two-thirds of the roads were designed according to the interests of these two groups. This might indicate that these groups did not expect their municipalities to design all of the roads in accordance with their wishes.

### 8.3.3. Experienced barriers to the use of road safety knowledge

Barriers to the use of road safety knowledge were inventoried in interviews with the participating municipalities. Municipalities were asked in an implicit way what prevented them using road safety knowledge on the 'implementation' level when taking effective road safety measures. This restriction is the reason for choosing to report the findings in a qualitative rather than in a quantitative way. Several municipalities have mentioned the following barriers.

#### **Physical barriers**

Some municipalities mentioned practical reasons of a physical nature, such as soil characteristics that can cause ground collapse or traffic vibration nuisance due to weak soil.

#### **Weighing interests**

Nearly all municipalities mentioned that they have to weigh the road safety interest against several other interests, and that road safety simply does not always 'win'. When these other interests are studied in detail, several groups of interests can be distinguished, along the lines of the three actor groups



mentioned above. Neighbouring municipalities do not usually have interests that are contradictory to road safety. Emergency services and public transport, however, often object to speed measures on 60km/h roads, because these slow them down and reduce comfort for driver and passengers. The general public, businesses and interest groups such as LTO (the Dutch Federation of Agriculture and Horticulture) often object to these speed measures for the same reason. They also object to some other measures such as road closures for specific vehicles or at specific times.

Municipalities give in to these arguments, especially if they come from the general public and businesses. Around two-thirds of the municipalities find public support an important consideration in their policy-making. More than half of the municipalities indicate that they have decreased the number of speed measures and road closures due to contact with the general public. Sometimes a road is not even downscaled as planned at all. Interest groups such as LTO have been successful too. In half of the municipalities, their protests were met with fewer speed related measures and road closures, and with wider roads and more exemptions for heavy traffic.

### **Uniqueness**

Some municipalities mention specific or recent accidents that make them deviate from the road safety guidelines. The guidelines do not 'feel' logical to them and they consider their situation so specific that a deviation from the general guidelines is called for. It concerns the preservation of priority regulations ("because the general public is used to it"), not adapting the road markings ("because it seems safer") and the use of physical separation of driving directions (due to motorcycles practising their curve techniques). These solutions are based on another kind of knowledge, i.e. 'gut feelings' or the intuition of municipalities. However, they are not confirmed by research findings, nor are they explicitly mentioned as interests by actors in the policy process.

### **Budget restrictions**

All municipalities mention a tight budget as an important barrier to implementing road safety measures on rural roads. Rather than abandoning certain measures, municipalities tend to temporise measures and prioritise them along several lines.

Firstly, municipalities give priority to certain areas, based on accident data or on subjective feelings about safety. The most important reason for

municipalities prioritising an area is a request from the general public for the downscaling of rural roads. This can be a justifiable strategy, since public support is very important for the observance of the speed limit on 60km/h roads. At the same time, prioritising based on accident statistics can be very tricky at a local level. Since the number of accidents is so small at this level, the role of coincidence is considerable while a statistical analysis is not reliable.

Secondly, municipalities prioritise on the argument mentioned above, that some road safety guidelines do not appear logical to municipalities. The implementation of speed humps on road sections and intersections in particular was mentioned in this respect. Municipalities delay the removal of the priority regulation and maintain the old priority regulations until they have enough money to implement a raised junction. Junctions without priority regulation and without a speed hump are, in their opinion, too unsafe because the general public has become too accustomed to the priority regulation and a raised intersection is needed to change their behaviour. Simply removing the priority traffic sign is not sufficient, according to the municipalities.

Thirdly, many municipalities prioritise by combining road safety measures with other road works such as regular maintenance. The maintenance scheme is in all municipalities the guiding principle for the pace of carrying out road safety measures. This form of prioritising can be both a curse and a blessing, from a road safety point of view. It can be the cause of a protracted situation involving a 60km/h road that does not have an ideal design, because adapting the design in accordance with the road safety requirements must wait until the regular road maintenance are carried out. On the other hand, since the costs of implementing the road measures decrease when combined with regular maintenance, fewer road measures will be abandoned due to tight budgets. They are merely temporised.

#### **8.4. Summary and conclusions**

In this chapter, two kinds of questions were answered:

- *To what extent do municipalities use knowledge on road safety and consider other interests?*
- *Which barriers do municipalities experience when using knowledge on road safety?*

The use of knowledge was investigated on the reception and the implementation level. Municipalities did use knowledge on road safety and on other interests on both levels.

It appeared that 80% of the municipalities spontaneously mentioned the use of written sources such as handbooks and guidelines on the effort level of their policy-making on 60km/h-roads. Most of the municipalities had contact with neighbouring municipalities, other road authorities, emergency services, public transport, the general public, businesses and interests group and have thus been able to receive knowledge on their respective interests.

On the 'implementation' level, nearly all municipalities used road safety knowledge on their road sections and half of them on intersections. On half of their roads, municipalities have used knowledge on the interests of neighbouring municipalities to implement consistent road transitions and on nearly two-third of them municipalities have used knowledge on the interests of emergency services and public transport to implement driver friendly speed reducing measures. More than half of the municipalities stated that the opinion of people living and working in the area had led to changes in the implementation. Furthermore, the three groups involved in the policy-making judged their interests to be implemented on the municipal roads.

This study has investigated several reasons for the non-use of knowledge in policy-making on municipal 60km/h-roads. One barrier can be classified as *needs of users*, as municipalities mentioned practical reasons, partly of a physical nature, for not implementing road safety measures, thereby questioning the technical applicability of the knowledge in their specific context. They weighed the generic knowledge produced by knowledge suppliers such as CROW and SWOV against local knowledge about their own circumstances, based on municipal data or intuition. This practice seems to suggest a need for concrete knowledge applied to specific situations.

The other barriers can be classified as *institutional barriers*. These do not stress the cognitive knowledge or the technical applicability, but rather the political feasibility and the moral weighing of knowledge. For example, municipalities mentioned weighing road safety against other interests. This refers to the difference between sectoral road safety knowledge used in an integral policy environment, where road safety is part of traffic and transport policy, as mentioned in *Chapter 4*. Often, the interests of the general public

and businesses outweigh road safety measures. Not only did they weigh road safety against the interests of emergency services, public transport, the general public and businesses such as agriculture, they also had to prioritise road safety measures and often chose to include them in maintenance schedules.

The answers from the municipalities also indicated the presence of the contradiction, discussed in *Chapter 4*, between the technocratic discourse of science versus the political discourse of policy. The study indicated the use of knowledge from non-scientific, somewhat 'political' or subjective sources to prioritise measures. This 'other' kind of knowledge comprises 'gut feelings' and intuition, for example, but also public support and scientifically irrelevant accident statistics. This knowledge seems to be highly relevant to municipalities. At the same time, it lacks the quality guarantee of scientific knowledge.

In conclusion, this chapter has shown that many municipalities implemented available road safety knowledge on road sections while half of the municipalities did so on intersections. Non-use of knowledge was mainly due to a discrepancy between the available knowledge which was often solely directed at road safety and focussed on technical aspects of road safety policy, whereas the municipal policy is directed at political aspects of road safety and to interests other than road safety.

## 9. Conclusions and recommendations

### 9.1. Introduction: looking back onto the questions

When formulating the research question of this thesis initially, in 2005, I hypothesised implicitly that there were many discrepancies between knowledge supply and knowledge demand in the domain of road safety policies. I also believed that knowledge was not used widely by policy-makers, and that science and policy were often two very distinct worlds. The examples given in *Chapter 1* illustrate this conviction. These pre-scientific convictions led me to the first general research question, formulated in *Chapter 1*:

*What are the reasons for possible non-use of knowledge in Dutch road safety policy processes?*

Phrasing the question in this way presumes a certain amount of non-use of knowledge in road safety policy. Based on what I knew and had read about the topic, I expected a more or less serious lack of knowledge use in road safety policy and a number of concrete barriers to knowledge use. A potential barrier was knowledge that was not suited to the needs of users, in terms of ease of implementation, addressing the problems experienced in practice. Another potential barrier consisted of political arguments for not using knowledge, such as a lack of public support or other interests prevailing over road safety interests. However, I also expected the institutional context to play a role in the non-use of knowledge in policy. I expected, for example, the existence of national knowledge organisations such as SWOV and TNO providing road safety knowledge and the recent decentralisation of road safety policy to be influential.

Of course, before drawing conclusions about non-use, I had to investigate the actual use of knowledge use in policy, together with barriers to knowledge use and recommendations for improvement. Therefore, the following research questions were added:

- *To what extent is knowledge used in Dutch road safety policy?*
- *Which barriers are there to knowledge use in Dutch road safety policy?*
- *How can knowledge use in this field be increased?*

After exploring the existing scientific literature on knowledge utilisation and the institutional context of knowledge and policy in *Chapter 2*, I expected that the Knott and Wildavsky ladder would enable me to distinguish several levels of knowledge use. Furthermore, I anticipated finding barriers from all four barrier groups in the knowledge utilisation theory. I also expected to observe a number of knowledge arrangements associated with the boundary theories, such as Mode 2 organisations, Fifth Branch advisory forms and relationships between knowledge and policy that could be described using the typologies put forward by Landry et al. and by Hoppe.

Several studies were carried out to investigate the research questions and to enable confirmation or refutation of these expectations. Since the subject of this thesis is a well-defined and a relatively small-scale policy field, a triangulation of methods was used to increase the overall validity of the thesis. Historical studies as well as literature studies, multiple case studies and a study within an experimental setting were used. The research methods in the various studies were described in *Chapter 3*.

A long-term institutional analysis was performed in *Chapter 4*. It provided an overview of the emergence and development of knowledge production and policy-making, and of the interaction between these in the Dutch road safety field. In *Chapter 5*, a review of available studies on the use of knowledge in road safety policies, in and outside the Netherlands was carried out. It not only provided a review of existing knowledge, but was also a guide to choosing the course of the subsequent, empirical chapters. In *Chapters 6 and 8*, barriers to knowledge use in concrete road safety policies were analysed at provincial and municipal level. These explorative studies showed a number of barriers to the use of knowledge on infrastructural measures in road safety policy. In *Chapter 7* some of these barriers were tested in an experimental setting at provincial level. The experimental setting made it possible to investigate the presence and the meaning of these barriers as well as the motives of the respondents.

The long-term institutional analysis, the multiple case studies and the study with an experimental set-up were chosen with great care. Since the long-term institutional analysis concentrates mainly on the national level, the empirical cases were chosen for the regional and local level by studying provinces and municipalities. As a result, almost all governmental levels were involved in the studies, although the city regions and the (few) road owning regional water authorities were not covered. The emphasis on regional and local

governmental bodies in the empirical studies was also prompted by the fact that currently, regional and local governments are important executors of the Dutch road safety policy. Provinces can even be considered directors of the regional and local road safety policies.

## 9.2. Conclusions: looking back onto answers

This section describes the findings on knowledge use in road safety policy, on barriers to this knowledge use and on the institutional setting of road safety policy-making and knowledge production. The subsections first describe the analytical concepts used to address the research question. The empirical findings and the analysis are then discussed in more analytical terms.

### 9.2.1. Knowledge use in Dutch road safety policies

#### Analytical concepts

The use of knowledge in road safety policy was measured with the Knott and Wildavsky ladder of knowledge use (Knott & Wildavsky, 1980). As indicated in *Chapter 2*, they distinguish seven ascending levels of knowledge use, shown in the table below.

Stage	Name	Description
1	Reception	Practitioners and professionals concerned have received the research results
2	Cognition	The research reports are read and understood by the practitioners and professionals concerned
3	Reference	The work is cited as a reference in the reports, studies and strategies of action developed by practitioners and professionals
4	Effort	Efforts are made to adopt the results of the research by practitioners and professionals
5	Adoption	The research results are adopted in the choices and decisions of practitioners and professionals
6	Implementation	The policy that has adopted the research findings is implemented
7	Impact	The policy that has adopted the research findings shows the desired effects

**Table 9.1.** Stages of the ladder of knowledge utilisations based on Landry et al. (2001a), Lester (1993) and Knott and Wildavsky (1980).

Furthermore, in *Chapter 2* four kinds of knowledge use were distinguished, based upon Weiss (1977) and others. These are: instrumental use, strategic use, pacifying use and conceptual use. The four kinds of knowledge use have been paired with four kinds of problems, distinguished by Hoppe (2002a): structured problems, unstructured problems and two kinds of moderately structured problems, with consensus on goals and means respectively. With structured problems, policy-makers tend to use knowledge instrumentally. With unstructured problems, they tend to use knowledge conceptually. Moderately structured problems with agreement about goals tend to lead to a strategic use of knowledge. Finally, with moderately structured problems with agreement about means, knowledge tends to be used to pacify. The empirical findings are interpreted along these conceptual lines.

### **Empirical findings**

Three general conclusions can be drawn from the previous chapters. Firstly, and contrary to my initial expectations, the available knowledge on road safety is widely used in Dutch road safety policies. On a national level (see *Chapter 4*), road safety knowledge from SWOV, the Road Safety Board and other organisations is often used in national policy plans. Although it was impossible to investigate this in-depth due to time and capacity constraints, a scan of the national policy plans revealed several examples of knowledge use in road safety policy. This ranges from the first Road Safety Memorandum in 1967 (use of SWOV report) via the Multi-year Road Safety Plan 1 (use of quantitative targets suggested by the Road Safety Board) and the Multi-year Road Safety Plan 3 (use of the concept Sustainable Safety developed by SWOV) to the Mobility Policy Document in 2006 and the Strategic Plan Road Safety in 2008 (use of cost-effectiveness rates calculated by SWOV, the Advancing Sustainable Safety vision and the adaptation of the road safety target for 2020). Furthermore, the above-mentioned policy plans referred occasionally to reports from TNO, private consultancies such as McKinsey, Traffic Test and Berenschot and international organisations such as the World Health Organization (WHO) and the Organisation for Economic Co-operation and Development (OECD). The wide use of knowledge in (Dutch) road safety is supported by other studies, both Dutch and international (Boer, Grimmius & Schoenmakers, 2008; Department for Transport, 2008; Elvik & Veisten, 2005).

Secondly, on a national level as well as on a provincial level, the use of road design guidelines is extensive. The interviews in *Chapter 6* revealed that all provinces were acquainted with and had read road design guidelines, and



had implemented many of the road safety measures on their roads. In addition, many respondents in the experimental study in *Chapter 7* found road safety to be an important basis for their choice of road measure, often letting the road safety interest prevail over other interests. However, although two thirds of the provinces claim that cost and effect information is taken into consideration when taking decisions about road safety measures, just one third of them reports actually having read publications on it.

Thirdly, *Chapter 8* revealed that on a municipal level, although not asked for explicitly, 80% of the municipalities studied mention the use of guidelines and handbooks when implementing road safety measures spontaneously. They also use knowledge regarding other interests than road safety, brought in by neighbouring municipalities, emergency services, bus companies or the general public. Almost all municipalities use road safety knowledge on road sections and half of them on intersections. Nevertheless, on 50% of their roads, other interests prevail over road safety when implementing road safety measures.

### **Interpretation of empirical findings in analytical terms**

This thesis investigates various levels on the Knott and Wildavsky knowledge use ladder. The reception level, the cognition level, the reference level, the effort level and the implementation level are all covered throughout the various chapters. As a rule of thumb, it can be concluded that knowledge use was more extensive on the lower rungs, and more limited higher up the ladder. At the reception level, studied in *Chapter 8*, municipalities had contact with relevant actors and received their comments. At the cognition level, investigated in *Chapter 6*, provinces were all acquainted with and had read the road design guidelines. About 30% knew of and had read publications on cost and effect information. On the reference level, examined in *Chapter 4*, many examples of reference to knowledge from the Road Safety Board, SWOV and occasionally from others were found in national policy documents. *Chapter 5 to 8* studied the effort level. On the provincial level, two-thirds of the provinces stated that cost and effect information had played a role in their policy-making on road safety measures, and the provinces that took part in the experiment reported in *Chapter 7* made similar comments. Although not explicitly asked, half of the municipalities spontaneously mentioned the use of written sources such as handbooks or guidelines. These findings were supported by several national (Boer, Grimmius & Schoenmakers, 2008) and international (Department for Transport, 2008; Elvik & Veisten, 2005, on CBA and CEA use) studies

discussed in *Chapter 5*. The implementation level was researched in *Chapter 5 to 8*. All of the chapters identified a wide implementation of road safety measures mentioned in guidelines and studies on provincial and municipal roads, both in real life and in an experimental setting. National and international studies, examined in *Chapter 5* confirmed these findings. Municipalities not only implemented knowledge from research; in half of the municipalities knowledge and interests from relevant actors in the policy process also influenced the measures taken on their roads.

In addition to the ladder of knowledge use, four types of knowledge use and their associated four types of problems were investigated in all the empirical chapters. Throughout the chapters, but especially in *Chapter 4*, it appeared that the knowledge and policy field agree about the objective of the road safety policy: the reduction of the number of fatalities and serious road injuries. Although they also agree on the general approach to solve this problem, *Chapters 4 to 8* gave many examples of different views on specific road safety measures. Regarded in terms of the four types of problems, road safety thus seems to be a moderately-structured problem with consensus on goals, but not (entirely) on means, among both policy-makers and scientists. However, policy-makers and scientists seem to use this characterisation for different reasons. For scientists road safety is a moderately structured problem, because it is not as simple as it seems, in scientific terms. Accidents are not mono-causal and the effect of road safety measures is not easily demonstrated scientifically. Policy-makers regard road safety as a moderately structured problem because although all actors involved in the policy-making processes agree about the goal of the policy, they do not agree about the measures to be taken. In addition, several interests have to be weighed against each other, between the road safety field and other policy fields and within the road safety field itself.

The four types of knowledge use were investigated explicitly in the experimental study in *Chapter 7* and more implicitly studied in the other chapters. In general it is safe to say that road safety knowledge seems to be used both instrumentally and strategically. In *Chapter 7*, the experimental study showed that the respondents, provincial civil servants, did not wish to use their knowledge strategically, but to inform their politicians as neutrally as possible. Another argument for labelling the knowledge use as instrumental can be found in *Chapters 6 and 7*, where it was shown that policy-makers wanted tailor-made solutions to their policy problems. However, the *Chapters 6 and 8* also reveal that road safety policy-makers have

to weigh various interests against each other. Respondents in *Chapter 6* mentioned weighing taking road safety measures against other provincial policy objectives, such as landscape policy and traffic flow policy and against the interests of other actors, such as noise hindrance for people living and working in the area. The study in *Chapter 8* shows that the general public, businesses and emergency services, but also civil servants in other policy areas, often have interests that conflict with road safety. The findings in this chapter indicate that policy-makers weigh up these interests and thus use knowledge strategically.

Having reflected on the largely instrumental use of knowledge, this study did come across some other types of knowledge use occasionally. For example, on a national level (see *Chapter 4*), the use of the Sustainable Safety concept in the Multi-year Road Safety Plan 3 and the Strategic Plan Road Safety 2008 can be considered a conceptual kind of knowledge use. In the experimental setting, a few provincial civil servants mentioned the strategic use of knowledge explicitly, to serve their authorities. Studies conducted outside the Netherlands have indicated the strategic use of cost-benefit analyses in road safety (Elvik & Veisten, 2005, p. 60-61) and in road investment (Fridstrom & Elvik, 1997; Nyborg, 1998).

### **9.2.2. Barriers to knowledge use in Dutch road safety policies**

#### **Analytical concepts**

Four groups of barriers, derived from a large body of literature (see for an overview *Chapter 2* and Blake & Ottoson, 2009; Landry, Amara & Lamari, 2001b), were distinguished in *Chapter 2*:

1. Dissemination conditions: This barrier group stresses the dissemination efforts of scientists. The assumption is that knowledge is useful to policy-makers, and should be distributed and explained properly to them. Communication, explanation and popularisation of research for policy can be used as strategies for dissemination.
2. The needs of users: Knowledge should meet the needs of users. Criteria can involve issues such as timing, presentation, relevance, usefulness and implementability. Also, the quality of the research in terms of methodological reliability should be guaranteed to provide a basis of trust between researcher and user. Policy-makers will not use knowledge they do not have confidence in.
3. Unilateral or co-production of knowledge: Frequent interaction between researchers and policy-makers will ensure socially robust

knowledge, which is more likely to be used. Some authors even suggest co-production in the knowledge process.

4. Institutional factors: Knowledge should correspond to the knowledge needs called for by the type of policy problem. *Chapter 4* suggests contradictions between a somewhat more decentralised, integral and politics orientated policy world and a rather more national, sectoral and technical orientated knowledge world.

### **Empirical findings**

In the foregoing chapters, five different types of barriers could be identified on various governmental levels. On a national level, barriers to knowledge use were not studied explicitly, although institutional settings on a national level did seem to influence barriers. These factors are discussed in section 9.2.3. *Chapters 5 to 8* revealed five types of barriers. International studies have mentioned the mistiming of knowledge provision and poor access to knowledge as a barrier, the first barrier also mentioned by provinces in *Chapter 6*. Furthermore, both in *Chapter 6 and 7*, provinces mentioned a lack of specificity and applicability in some of the knowledge provided, and in some cases there is not even agreement on certain specific problem definitions of knowledge providers. Municipalities and provinces referred to physical obstacles to the use of knowledge for implementing road safety measures. A lack of space, excessive maintenance or soil conditions prevented them from taking certain measures. Both these types of barriers are supported by international studies reviewed in *Chapter 5*. The difficulty mentioned most often by both municipalities and provinces was the weighing of other interests against road safety. These other interests may derive from their own policy, for instance on traffic flow or landscaping or from opposition by citizens to certain road safety measures. Lastly, municipalities and provinces mention more elusive reasons for not using knowledge, such as intuition, 'gut feeling' and not being convinced of the effect of measures despite scientific research.

### **Interpretation of empirical findings in analytical terms**

The findings in the different case studies confirm barriers in three of these four barrier groups.

The barrier *dissemination conditions* is only mentioned in the literature review in *Chapter 5*. Studies conducted outside the Netherlands indicate that dissemination of road safety knowledge could be a problem, because users were not able to find the knowledge easily. From a questionnaire in a British

study (Department for Transport, 2008), it appeared that users had problems finding the right knowledge at the right time, due to inadequate search options or to an overload of information. However, the historical analysis in *Chapter 4* does not, at any stage of the co-development of policy and knowledge, point in this direction. More importantly, the respondents in the empirical *Chapters 6, 7 and 8*, do not mention these barriers spontaneously. Thus, the results in this thesis do not show dissemination as a serious problem in the Netherlands. This may be due to the fact that there are several organisations responsible for disseminating research findings, such as KpVV and CROW; also SWOV does this in addition to its research tasks. Further research to explore this barrier in depth may shed more light on this topic.

The *Chapters 5, 6, 7 and 8* all provided several indications of barriers in the group *the needs of users*. Within this barrier group, the reason mentioned most often was that knowledge could not be implemented due to local circumstances or that the knowledge provided was too abstract to be suitable for implementation. The literature review in *Chapter 5*, as well as the empirical studies in *Chapters 6* (on a provincial level) and *8* (on a municipal level), all reveal indications of these barriers in the (non) implementation of road safety measures. Two other results fall within this barrier group. The first was a lack of confidence in researchers or research results. Studies in *Chapter 5* noted a lack of confidence in cost-benefit analyses as a specific form of presentation of decision-supporting knowledge. For example, national and provincial respondents in an EU questionnaire (Elvik & Veisten, 2005) mentioned ethical objections and unfamiliarity with the type of research method. In addition, *Chapter 6* pointed out that provincial policy-makers were not convinced that national research findings would suit their decentralised settings. They questioned the effects of measures found in scientific research. Secondly, policy-makers and researchers appeared to have a difference of opinion about the existence of policy problems. *Chapter 6* illustrated that researchers sometimes develop measures for policy problems that policy-makers consider non-existent in their province. For instance, provincial policy-makers regarded the number of some types of accidents, frontal, shoulder and bicycle accidents among other things, as too small to require road safety measures such as driving direction separation, semi-hard shoulders and cycle crossings. The experimental study in *Chapter 7* demonstrated that provincial policy-makers demanded knowledge that corresponded to their needs closely. This was illustrated by the fact that respondents asked for tailor made knowledge in the three cases of the experimental study.

What is remarkable is the fact that in none of the studies the barrier group *unilateral or co-production of knowledge* was encountered. It should be noted that this barrier was not explicitly addressed in the *Chapters 6 to 8*. However, the topic was studied explicitly in *Chapter 4*, where the interaction between the knowledge and policy world was examined. Although further research on this topic is certainly necessary, some findings indicate that in the Netherlands co-production of knowledge exists to some extent. Examples which support this are the fact that CROW uses committees consisting of a variety of professionals (representatives of the national, provincial and local governments, researchers and businesses) to formulate its road design guidelines. Furthermore, several research organisations (SWOV, TNO and KpVV) are financed by either the national or the regional and local governments, granting them some kind of say on the research topics through subsidy conditions and through their presence on advisory and supervisory boards. In addition, a structural involvement of knowledge organisations in policy-making is shown clearly in *Chapter 4*. The frequent questions to knowledge organisations for facilitating knowledge for policy plans and their presence in several advisory groups illustrate this. Given this existing institutional framework, policy-makers might not have a need for more involvement in knowledge production than they already have.

Institutional factors were seen most often in the various studies. These are discussed in *Section 9.2.3*.

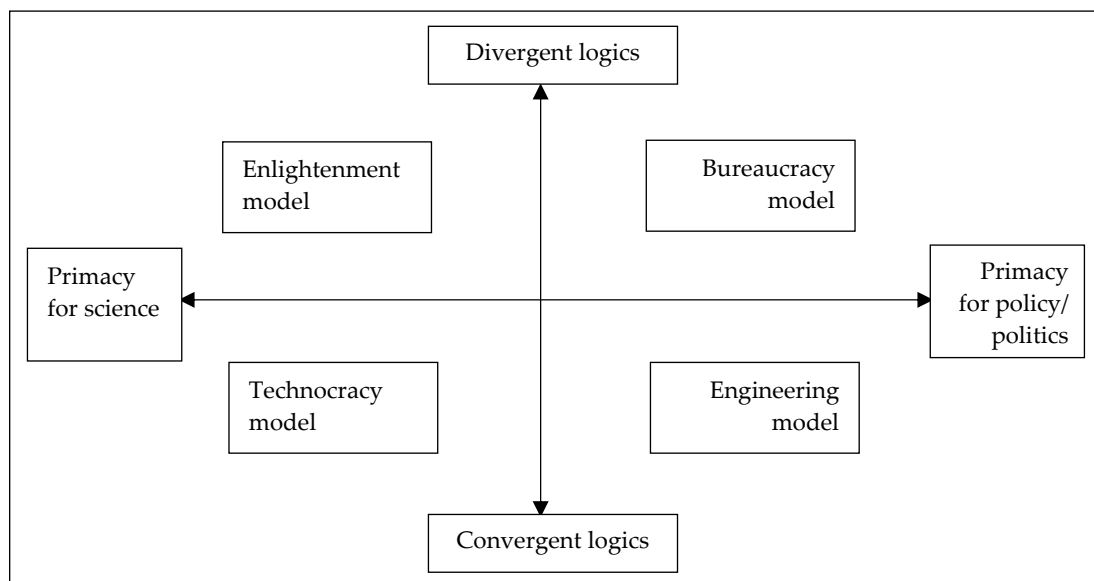
### **9.2.3. The institutional setting of road safety policy-making and knowledge production**

#### **Analytical concepts**

As mentioned in the section above, *institutional barriers* to knowledge use were mentioned most often in the empirical studies. To gain insight into the nature of these institutional barriers, the section below gives a short description of the past and present institutional context. This is based on the findings in *Chapter 4*, using the four aspects of the knowledge and policy arrangement: actors, rules, resources and discourses. Two kinds of discourses are distinguished here. Substantive discourses discuss problem definitions and solutions to policy problems. Governance discourses focus on the organisation of the policy (and knowledge) field.

The knowledge and policy arrangement can also be described in terms of the typologies put forward by Hoppe and Landry et al. Hoppe (2005) mentions

four types of boundary work, for the relationship between science and policy. In *Chapter 2*, these are summarised in a figure as follows:



**Figure 9.1.** Four models of boundary work (based on Hoppe, 2005).

Landry et al. (2001b) distinguish four models for interaction between science and policy: the science push model, the demand pull model, the dissemination model and the interaction model. In addition to these two typologies, *Chapter 4* described three institutional barriers. The barriers are based on the three governance trends mentioned in *Chapter 2*; these are multi-actor governance, multi-sector governance and multi-level governance, as well as on the Two Communities metaphor of Caplan (1979).

### **The institutional context: past and present**

With respect to actors, governmental bodies have always played an important role in road safety policy. Initially, only the national government was engaged in road safety policy. Since the 1990s, however, regional and local governments have played an increasingly important role in designing and implementing regional and local road safety policy. Provinces are even referred to as directors of regional and local road safety policy-making (Ministerie van Verkeer en Waterstaat, 2008). In addition to governmental bodies, interest groups (for example ANWB, VVN and their predecessors, Fietsersbond) have also played a major role in road safety in the Netherlands. Throughout the development of road safety policy, the ANWB especially has played a significant role in its development as an independent policy field with associated policy and knowledge organisations. Although interest

groups currently seem to play a more modest role, they are still involved in making and executing policy. There is a relatively small number of knowledge organisations, for example TNO, SWOV, KpVV, CROW, most of which are organised and oriented nationally. Also, various universities are involved in road safety research to some extent. Examples of this involvement are the psychological research at the University of Groningen and the infrastructural research at the University of Twente and Delft University. Regional and local governments can use information from knowledge organisations specialised in disseminating road safety knowledge to the local level, such as KpVV and CROW.

Many institutional rules in road safety are derived from the traffic and transport policies, such as the Mobility Policy Document and the regulation of regional finances (BDU). Nationally, consultation on road safety is also integrated in traffic and transport consultative bodies, such as the Consultative Body Passenger Transport (OPV). Up until a few decades ago, rules used to be organised in a more sectoral way, with sector specific consultative bodies, sector specific policy divisions and sector specific policy documents and finances. In the knowledge field, there are few rules governing the specialisation of knowledge organisations on various topics, although a de facto division of tasks can be seen. Similarly, there are no rules governing the access to the knowledge and policy arrangement by knowledge actors. The knowledge field can be characterised as an open, inclusive network with frequent contacts amongst knowledge organisations and between these organisations and policy-makers.

On a regional and local level, resources for road safety have had to compete with traffic and transport policy since the introduction of the Broad Goal-oriented Grant. In the recent past, regional and local road safety budgets were sector specific. This is still the case for national road safety budgets. Resources for research are provided mostly by the national government, through subsidies to SWOV and TNO, and by the regional and local governments who subsidise KpVV.

Discourses, with respect to both content and governance, play an important role in road safety. Policy-makers and knowledge organisations are not equally active in the various discussions. Both policy-makers and scientists take part in discussions about the substantive discourse on road safety measures. Their opinions have not differed greatly throughout history, as reconstructed in *Chapter 4*. The substantive discourse on the integration of



road safety into traffic and transport policy, on the contrary, and the governance discourse on the organisation of the policy and knowledge production are mostly conducted by policy-makers and to a far lesser extent by scientists.

### **The institutional context in terms of two typologies**

According to Hoppe's typology, the first and obvious thing to be noted is that no single model of this typology is dominant in the road safety field and that dominant models vary over time. Road safety policy and knowledge were not developed sufficiently to qualify as a knowledge-policy arrangement until 1945. An increase in both knowledge and policy took place between 1945 and 1975 approximately. In general, the knowledge world set the tone and policy followed on, agreeing to and gradually adopting the ideas put forward by science. In Hoppe's typology, this situation can be characterised as a technocratic model, which stresses the primacy of science over politics and the convergence between their worlds. From roughly 1975 to 1995, both the knowledge and the policy worlds had grown considerably and both wanted to have their say on the content of knowledge. The national government took over some of the knowledge activities. Hoppe's bureaucracy model describes such a relationship between the knowledge and policy worlds, as it presupposes a primacy of politics over sciences and stresses the divergence between the two worlds. At the same time, however, knowledge organisations developed new strategic visions such as Sustainable Safety and their own agendas, and stressed their independent position. These actions can be seen as an attempt, conscious or not, by knowledge producers to maintain a certain degree of primacy over politics, which matches the technocracy model of Hoppe as described above. In the last 15 years, the knowledge organisations' behaviour has not changed much in this regard. However, although (national) policy-makers have the same intention to direct research as in the previous decades, currently knowledge activities no longer take place within the national government, but in more or less autonomous knowledge organisations outside the government. This national need for directing paralleled by a lack of state organisations for knowledge production qualify as characteristics of the engineering model. However, other characteristics of this model are a lack of agreement about research topics and a lack of conviction that the knowledge and policy worlds are convergent. These characteristics do not seem to be present in the current road safety knowledge and policy field. The relationship between regional and local governments and knowledge organisations is slightly different. The primacy of science is greater here and steering by regional and

local governments is virtually non-existent. These are characteristics of Hoppe's technocratic model.

The developments in the knowledge-policy arrangement can also be described in terms of the typology of Landry et al. Since the 1960s, national policy-makers have applied the ideas of road safety knowledge organisations to their policies. This development can be characterised by the science-push-model of Landry et al. However, since the mid-1970s, policy has tried to determine the research agenda for road safety. This situation can be typified as the demand-pull-model of Landry et al. At the same time, knowledge organisations have tried to retain the possibility of determining their own agenda. In Landry's terms and due to this boundary conflict, characteristics of the two above-mentioned models coincide. This is similar to the presence of characteristics of the bureaucratic and recently the engineering model versus the technocratic model of Hoppe outlined above. Since the 1990s, the knowledge-policy arrangement can be characterised on a regional and local level as a dissemination model. The regional and local governments have access to knowledge organisations specialised in dissemination that can identify and translate usable knowledge into a practical policy context.

Can any trends in governance be observed in the road safety policy field? The previous chapters show evidence of all three main governance trends, which means that due to an increase in the number of actors, levels and sectors, multi-actor, multi-level as well as multi-sector trends can be distinguished. Yet, the road safety policy field has been a multi-actor field from the start. Various kinds of actors such as the interests groups ANWB and VVN, but also businesses, have been present in the road safety field since the 1920s and 1930s, and the number and variety of actors further increased in the 1970s. *Chapter 4 and 8* provides several examples of their considerable influence at certain times.

Multi-level governance is a more recent development and is shown by the increasingly important role of the regional and local governments. Until the mid-1980s, the national government was the most important governmental body involved in road safety policy, whereas regional and local governments had a mere implementing role. Since the mid-1980s, and increasingly throughout the last 20 years, regional and local governments became responsible for their own road safety policies and recently for their own road safety budgets. In this thesis, all empirical chapters show examples of topics that are the domain of provinces and municipalities.

Multi-sector governance is a very recent and still emerging development, illustrated by the gradual and on-going integration of road safety into other policy fields such as the traffic and transport policy. From the 1960s to the 1990s road safety was seen as a separate policy field. Since the development of the National Traffic and Transport Plan in 2001, however, road safety has become increasingly a part of traffic and transport policy. *Chapter 4* provides examples on the national level (the Mobility Paper and the Strategic Plan Road Safety), and the *Chapters 6, 7 and 8* confirm that this trend is also present on regional and local level. This trend is not only a lip service to integration in policy documents. Especially on the regional and local level, integration of road safety in the traffic and transport field takes place in practice, mainly because of two developments. Firstly, there is a need to constantly negotiate between road safety interests and other interests, such as traffic flow, in policy-making processes. This urges provinces and municipalities to operate in both the road safety policy field and the traffic and transport policy field when taking infrastructural measures. *Chapter 6* provides examples of this development. Secondly, the integration of road safety budgets in traffic and transport budgets in the BDU encourage regional and local governments to integrate infrastructural road safety measures into road reconstructions. The studies of Goldenbeld et al and of Jagtman et al. (Goldenbeld et al., 2010; Jagtman, Wijnen & Bax, 2010) point to this development.

It is worth noting that, contrary to the policy world, the knowledge world does not have examples of all these three governance trends. *Chapter 4* illustrated that knowledge organisations fall apart in several categories such as organisations exclusively focussed on road safety and those with a broader orientation, but also consultancies versus not for profit organisations. However, a multi-actor trend as seen in policy cannot be present, since knowledge organisations by definition can be typified as only one kind of actor. In addition, there is less evidence of multiple levels in the knowledge world than in the policy world, as most knowledge production is organised at national level and much of it, although not all (see for example: Mesken, Aarts & Vis, 2010), is targeted at the national level. Only dissemination activities are explicitly directed at the local and regional level. Lastly, the knowledge world is not as orientated towards sectors other than road safety as the policy world is. Some knowledge organisations are sector specific for road safety, such as SWOV. Others have a broader orientation, but have allocated road safety to a separate part of their organisation, such as the Dutch Safety Board and TNO (for transport safety). Yet others such as

KpVV and CROW do not have a separate division for road safety but they do consider road safety as a separate subject, judging by the lay-out of their website and publications. This results in a somewhat limited knowledge production for regional and local governmental levels and for or about sectors other than road safety.

The differences between the knowledge and the policy world with respect to these three governance trends may help to understand three institutional barriers to knowledge use, as discussed in the section below.

### **Three institutional barriers**

The institutional context of the road safety knowledge-policy field as described in *Chapter 4*, revealed certain differences between the science and policy world. These differences comprise for example the governmental levels and sectors on which policy and knowledge organisations are organised and aimed at and the difference in cultural focus between these two worlds. However, the *Chapters 5 to 8* have demonstrated that the institutional differences do influence the barriers to the use of knowledge in road safety policy. Three institutional barriers have been experienced throughout this thesis to a greater or lesser extent. All three have their origins in the institutional setting described in *Chapter 4*. Two differences can be described in terms of governance trends, one can be described in terms of the classical Two Communities metaphor of Caplan (1979).

Firstly, a difference was observed between multi-level policy and a somewhat more single-level knowledge production. Knowledge organisations seem to be organised mainly nationally and are aimed mostly at national demands. Consequently, their knowledge production is often nationally oriented, although some organisations and studies focus on adapting national knowledge to regional and local governments (for example: Weijermars, Aarts & Schoon, 2009). Policy, on the other hand, has become more and more the responsibility of regional and local governments. This results in a lack of specific knowledge for the regional and local level, or at least a need for even more adaptation of existing national knowledge to a regional and local policy level than is currently available. *Chapter 6* provides a number of examples; national figures on costs and effects of road safety measures were not always trusted on the regional level. Furthermore, provincial policy-makers found the number of some types of accidents to be too small to require road safety measures, indicating a difference in problem definition between themselves and scientists. Also, *Chapter 7* offers examples

of this barrier to knowledge use, when respondents state that knowledge is not available to their province on a tailor made basis.

Secondly, a difference was observed between a multi-sector policy and single-sector knowledge production. Knowledge organisations have a mainly sectoral focus by concentrating on road safety as a separate policy field. Policy, on the other hand, regards and deals with road safety in discourses as well as in rules and resources (for example the BDU) as a facet of other policies, such as traffic and transport policies, rather than as a separate policy field. This results in a general lack of knowledge, arguments and techniques for weighing road safety against other interests and integrating it in a broader policy field, such as traffic and transport, although some studies exist that make suggestions on this topic (for example: Schermers & Wegman, 2009). Several chapters provide examples of this barrier. *Chapter 6* reported that provinces often had to weigh road safety knowledge against other policies. In *Chapter 8*, knowledge about other interests (e.g. those of people living and working in the area) sometimes took precedence over scientific knowledge on road safety.

Thirdly, a difference was seen between the culture and rationality of policy-makers versus knowledge organisations. Policy-makers have to take into account many different interests, including public opinion. They therefore tend to use a political rationality. Knowledge organisations, on the other hand, use mainly a technocratic rationality when producing knowledge, focussing on measures anticipated to be most effective for road safety, and taking public opinion into account to a lesser extent. This difference comes close to Caplan's (1979) two worlds metaphor. The contradiction results in a lack of knowledge for coping with political arguments in road safety policy and creates a need for the application of the existing technocratic knowledge to the political reality. *Chapter 5* gives examples of national and provincial policy-makers in Europe rejecting knowledge from CBAs and CEAs on ethical grounds (Elvik & Veisten, 2005), whereas *Chapter 6* and *Chapter 8* demonstrate that a considerable number of municipal and provincial policy-makers allow political arguments such as public support to prevail above rational arguments, especially in the implementation of infrastructural road safety measures such as raised intersections, rumble strips and service roads.

### **9.3. Looking back and forward: reflection and recommendations**

#### **Reflections on the research**

There are three main areas of reflection with respect to this thesis: the general purpose of the thesis, its limitations and its theoretical and practical value.

The general purpose of this thesis was to study the utilisation of knowledge in road safety policy. The thesis aimed at researching this topic from various angles. This means that various methods were used and that three governmental levels were studied empirically. Furthermore, both the history as well as the present era of the road safety policy field were taken into account. Also, various kinds of knowledge were studied, and theories from both knowledge utilisation and institutionalisation were used. This resulted in a broad overview of knowledge utilisation in Dutch road safety policy. Research on this specific topic has not been performed often. Moreover, the choice of research methods and the combination of the methods is not common practice in public administration studies.

Obviously, this thesis has some limitations. Some stem from conceptual choices and were made deliberately; others were inevitable choices because of the restricted time available for a thesis. The first two restrictions are obvious ones. The scope of the study was deliberately limited to the road safety field and the geographical scope was limited to the Netherlands. This means that results are valid for the Dutch road safety policy field only. It is not the purpose of this thesis to apply the results to other policy fields. Furthermore, some issues were not investigated in this study, due to restrictions in time and capacity, for instance, the role of private consultancies in knowledge use, was not investigated, although they do seem to play an important role in applying knowledge to national but especially to regional and local governments and fill the gap between available and required knowledge. Also, not all levels of the Knott and Wildavsky ladder were covered, although the reasons for this were not only time and capacity, but rather the feasibility of operationalising the various levels.

This thesis has both a theoretical and a practical value. As far as the theoretical value is concerned, an attempt is made to connect the viewpoints from the knowledge utilisation and the institutionalisation theories. It shows that the 'classical' barriers to knowledge use from the knowledge utilisation perspective are embedded in an institutional context. Moreover, the

institutional context also influences the 'classical' barriers from the knowledge utilisation perspective. For example, the absence of the barrier *dissemination conditions* in the results might be due to how the dissemination of research findings is organised in the Netherlands. Organisations such as KpVV, CROW and SWOV have been responsible for this for several years and dissemination, together with scientifically sound research, is one of the pillars of their legitimacy. Also the barrier *unilateral or co-production of knowledge* was not mentioned in the various studies and again this could be due to the organisation of the knowledge-policy interaction, where co-production of knowledge seemed to have a place. After all, policy-makers have been involved in choosing research topics and researchers have been involved in policy-making since the establishment of the road safety knowledge and policy field.

In addition to its theoretical value, this thesis has also practical value for policy-makers and researchers. It provides some insight into the relationship between policy-makers and researchers and might therefore add to the understanding of each other's world. Furthermore, for researchers it presents knowledge about common barriers to knowledge use and suggestions to try to overcome them. In the next section a number of recommendations are formulated for additional research and for knowledge organisations and policy-makers.

### **Recommendations for policy and for further research**

Two types of recommendations can be formulated. The first are recommendations for further research. The second type are recommendations on the practice of knowledge-policy interactions and their institutional setting. Some findings in this thesis can be used to ease the communication between science and policy, and make for a better use of knowledge in policy.

With regard to the recommendations for further research, of course, additional research can be done by extending this study to research on knowledge use in road safety policies outside the Netherlands. Both within and outside the Netherlands more research could be carried out to combine the detailed process perspective of knowledge use with a thorough institutional analysis. *Chapter 2* illustrated that both perspectives are covered widely in the scientific literature. Although the process perspective does take notice of institutional barriers, and the institutional perspective takes notice of some kind of knowledge use, few try to integrate these two viewpoints.

This thesis has made a modest start in combining the two perspectives. In the road safety field, this start can be extended by comparing an in-depth analysis of a national policy process with an institutional analysis.

Recommendations to improve the relationship between science and policy can be made in twofold, based on the observed barriers in this thesis. Two barrier groups are prominent: *the needs of users* and *institutional barriers*. The recommendations can be divided into two categories: recommendations for types of knowledge that can be developed further, and recommendations for the organisation of the knowledge production and knowledge use.

The research presented in this thesis makes clear that there is a need for more knowledge on at least two topics. The first is knowledge on how to deal with contradictory interests of different actors in road safety policy, such as travelling time, driving convenience, public support and landscaping policies. This relates to the research findings in *Chapter 4, 6 and 8*, that policies appear to be somewhat more integral while knowledge appears to be more sectoral in character. It also relates to the findings that knowledge producers generally use a more technical language and arguments, whereas policy-makers use more political language and arguments. For some contradictory interests (for example those of the emergency services and public transport), guidelines from CROW are available on how to reach a compromise between these interests. Many municipalities are already familiar with this knowledge and use the guidelines. However, the interests of other actors such as people living and working in the area and nature conservation groups are often not discussed in road safety knowledge. By considering these interests, road safety policy-makers can take important road safety measures without risk of being overruled by other policy fields. There has been limited research carried out into public support (Goldenbeld, 2002; 2004; Goldenbeld & Bax, 2001) and a start has been made in this field with research into subjective safety (Van Bruggen, 2007; Vlakveld, Goldenbeld & Twisk, 2008). More research into these subjects is called for. Methods to balance rational scientific knowledge on road safety and the other, possibly equally important public support and interests outside the road safety field can help policy-makers to take decisions that are more consistent and can help knowledge providers to get their knowledge used more often. It would be helpful for road safety policy-makers if knowledge of these various interests could be included in methods of integration and weighing, such as multi-criteria analyses or road safety effect reports, analogical to the environmental impact reports.



There also appears to be a need for knowledge aimed at regional and local governments. The research findings in *Chapter 4 and 6 to 8* support this, in that knowledge producers are aimed more at the national level, whereas regional and local governments in the Netherlands nowadays have a very important role in road safety policy-making. Furthermore, various examples in *Chapter 6 and 8* illustrated that provinces and municipalities, more than once, were unable to implement infrastructural road safety measures due to local physical circumstances. Research has been carried out on a small scale on local and provincial topics (for example: Aarts, 2008; Weijermars, Aarts & Schoon, 2009), yet generally national figures are used, especially for cost and effect information. Regional and local governments have already asked for criteria to measure road safety other than road deaths and serious road injuries (for example: Mesken, Aarts & Vis, 2010). Tailor-made knowledge for regional and local governments will help them improve their policies. The knowledge that might meet their needs is concrete knowledge that deals with road safety in their own local circumstances.

Finally, a number of recommendations for the organisation of the knowledge production and knowledge use can be made. Firstly, with respect to the slight difference between the knowledge and policy world on considering road safety a separate sector or not, it might be desirable to encourage a certain amount of integration of road safety knowledge into the area of traffic and transport. Such an integration does not need to be physical. Orientation of road safety knowledge organisations towards the traffic and transport policy field and cooperation with traffic and transport knowledge organisations could provide knowledge for integrating road safety policy into traffic and transport policy without neglecting the road safety topic or changing road safety in a simple tick-off list of road design requirements. Research into the organisational aspects of considering road safety in an early stage of the policy-making on traffic and transport policy would improve the integration of road safety in traffic and transport policy.

Secondly, with respect to the difference between the knowledge and policy world on the attention they give to different kinds of actors, more contact between knowledge organisations and actors with different interests in road safety policy may result in a method to weigh these interests in road safety policy. Regular meetings with the general public, interest groups and businesses such as farmers may provide new insights and new research topics. National, regional and local governments regularly include these groups in the policy-making process. Contacts between governments and

interest groups, the general public and businesses are therefore common. However, contacts between these groups and knowledge organisations are less common or sometimes non-existent. Including interest groups on topics other than road safety, businesses and members of the general public in advisory boards, organising hearings or allowing them to comment on research proposals, could help understand their opinions and interests.

Thirdly and lastly, regarding the gradual difference in focus between the knowledge and policy world on the level of governance, a dialogue between regional and local governments and knowledge organisations may help to identify knowledge gaps and to improve the connection between available knowledge and policies. This may help to provide more knowledge aimed at the regional and local governments as mentioned earlier. On a provincial level, this dialogue frequently takes place in the Road Safety Trade Council (Vakberaad Verkeersveiligheid). However, on a local level, no such platform for dialogue exists. Such a platform would contribute to a better understanding between knowledge organisations and policy-makers. The Association of Netherlands Municipalities VNG could fulfil an important role in this, as it always has done in policy fields such as social security, welfare and spatial planning.



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## List of abbreviations

\* No authorised translation

<b>Dutch meaning</b>	<b>Abbreviation</b>	<b>English meaning</b>
Geen afkorting, voorheen: Algemene Nederlandse Bond van Ouderen	<b>ANBO</b>	No abbreviation, Dutch association representing seniors*
Koninklijke Nederlandse Toeristenbond ANWB	<b>ANWB</b>	Royal Dutch Tourist Club ANWB
Aanbevelingen Stedelijke Verkeersvoorzieningen	<b>ASVV</b>	Recommendations for traffic facilities in built-up areas*
Adviesdienst Verkeer en Vervoer	<b>AVV</b>	Transport Research Centre
Brede Doeluitkering	<b>BDU</b>	Broad Goal-oriented Grant*
Bond van Autohandelaren en Garagehouders	<b>BOVAG</b>	Dutch Alliance of Garage Owners*
Bureau Verkeershandhaving Openbaar Ministerie	<b>BVOM</b>	Bureau Traffic Enforcement of the Public Prosecution Service
Centraal Bureau Rijvaardigheidsbewijzen	<b>CBR</b>	The Dutch Driving Test Organisation
Centraal Bureau voor de Statistiek	<b>CBS</b>	Statistics Netherlands
Centrale Commissie voor de Verkeersveiligheid	<b>CCVV</b>	Central Commission for Road Safety*
Kennisplatform voor infrastructuur, verkeer, vervoer en openbare ruimte	<b>CROW</b>	Information and Technology Platform for Infrastructure, Traffic, Transport and Public Space*
Democraten 66	<b>D66</b>	Democrats 66
Dienst Verkeer en Scheepvaart	<b>DVS</b>	Centre for Transport and Navigation
Dienst Verkeerskunde	--	Centre for Traffic Studies*
Dienst Verkeersongevallen	--	Centre for Traffic Accidents*
Directie Verkeersveiligheid	<b>DVV</b>	Directorate-General for Road Safety*
Essentiële Herkenbaarheidskenmerken	<b>EHK</b>	Essential Recognisability Characteristics
Europese Unie	<b>EU</b>	European Union

<b>Dutch meaning</b>	<b>Abbreviation</b>	<b>English meaning</b>
Geen afkorting, voorheen:Eigen Vervoerders Organisatie	<b>EVO</b>	No abbreviation, lobbyist and adviser for businesses concerning logistical activities*
Fietsberaad	--	Centre of expertise on bicycle policy
Fietsersbond	--	Dutch Cyclists' Union
Geen eenduidige Nederlandse vertaling, soms wordt het woord versnellingskamer gebruikt	<b>GDR</b>	Group Decision Room
Gebundelde Doeluitkering	<b>GDU</b>	Combined Goal-oriented Grant*
Ministerie van Infrastructuur en Milieu	<b>IenM</b>	Ministry of Infrastructure and the Environment
Interprovinciaal Overleg	<b>IPO</b>	Association of the Provinces of the Netherlands
Interdepartementale Stuurgroep verkeersveiligheidsbeleid	<b>ISVV</b>	Interdepartmental Steering Committee on Road Safety*
Kennisinfrastructuur Verkeersveiligheid	<b>KEVER</b>	Road Safety Knowledge Infrastructure *
Koninklijke Nederlandse Automobiel Club	<b>KNAC</b>	Royal Dutch Motoring Club*
Kennisplatform Verkeer en Vervoer	<b>KpVV</b>	Transport Knowledge Resource Centre
Land- en Tuinbouworganisatie	<b>LTO</b>	Dutch Federation of Agriculture and Horticulture
Uitsluitend materiële schade	<b>MDO</b>	Material damage only
Meerjarenprogramma Verkeersveiligheid	<b>MPV</b>	Multi-year Programme Road Safety*
Ministerie van Binnenlandse Zaken en Koninkrijksrelaties	--	Ministry of the Interior and Kingdom Relations
Nationaal Plan Verkeersveiligheid	<b>NPV</b>	Road Safety National Plan *
Nationaal Verkeers- en Vervoerplan	<b>NVVP</b>	National Traffic and Transport Plan
Onderzoeksraad voor Veiligheid	--	Dutch Safety Board
Overlegorgaan Personenvervoer	<b>OPV</b>	Consultative Body for Passenger Transport*

<b>Dutch meaning</b>	<b>Abbreviation</b>	<b>English meaning</b>
Overlegorgaan Verkeersveiligheid	<b>OVV</b>	Consultative Body for Road Safety*
Overlegorganen Verkeer en Waterstaat	<b>OVW</b>	Consultative Bodies for Transport, Public Works and Water Management*
Permanente Contactgroep Verkeersveiligheid	<b>PCGV</b>	Permanent Road Safety Contact Group *
Partij van de Arbeid	<b>PvdA</b>	Dutch Labour Party
Provinciaal Verkeers- en Vervoerplan	<b>PVVP</b>	Provincial Traffic and Transport Plan
RAI Vereniging, geen afkorting, voorheen: Rijwiel en Automobiel Industrie	<b>RAI</b>	RAI Association, no abbreviation, Dutch Bicycle and Automobile Industry*
Regionaal Orgaan Verkeersveiligheid	<b>ROV</b>	Regional Road Traffic Safety Authority*
Raad voor de Verkeersveiligheid	<b>RVV</b>	Dutch Road Safety Board*
Raad voor Verkeer en Waterstaat	--	Advisory Council for Transport, Public Works and Water Management
Regionaal Verkeers- en Vervoerplan	<b>RVVP</b>	Regional Traffic and Transport Plan
Structuurschema Verkeer en Vervoer	<b>SVV</b>	Traffic and Transport Structure Plan
Stichting Wetenschappelijk Onderzoek Verkeersveiligheid	<b>SWOV</b>	Institute for Road Safety Research
Technische Hogeschool	<b>TH</b>	Technical College*
Transport en Logistiek Nederland	<b>TLN</b>	Dutch Employers Organisation on Transport and Logistics
Transportongevallenraad	<b>TOR</b>	Transport Safety Board*
Toegepast Natuurwetenschappelijk Onderzoek	<b>TNO</b>	Netherlands Organization for Applied Scientific Research TNO
Technische Universiteit	<b>TU</b>	University of Technology
Convenant Verkeer en Vervoer, Regionaal, Decentraal en Integraal	<b>VERDI</b>	Covenant for Regional, Decentralised and Integral Traffic and Transport *

<b>Dutch meaning</b>	<b>Abbreviation</b>	<b>English meaning</b>
Verkeerskundig Studiecentrum	<b>VSC</b>	The Traffic Research Centre VSC
Vereniging van Nederlandse Gemeenten	<b>VNG</b>	Association of Netherlands Municipalities
Veilig Verkeer Nederland	<b>VVN</b>	Dutch Traffic Safety Association
Ministerie van Verkeer en Waterstaat	<b>VenW</b>	Dutch Ministry of Transport, Public Works and Water Management

## Samenvatting

Tijdens tien jaar onderzoek op het terrein van de verkeersveiligheid heb ik verschillende voorbeelden gezien van niet-gebruik van wetenschappelijke kennis in verkeersveiligheidsbeleid. Deze voorbeelden maakten mij nieuwsgierig naar het onderwerp 'gebruik van kennis in verkeersveiligheidsbeleid', en naar de vraag of achter dat al of niet gebruik van kennis wellicht bepaalde processen en patronen schuilgingen. Literatuurstudie liet zien dat dit onderwerp nog weinig onderzocht is en dat de wel beschikbare studies vaak niet systematisch zijn uitgevoerd of een theoretische onderbouwing ontberen. Deze dissertatie wil ertoe bijdragen om die beide manco's te verhelpen. De hoofdvraag luidt daarom als volgt:

*Welke redenen zijn er voor mogelijk niet-gebruik van kennis in het Nederlandse verkeersveiligheidsbeleid?*

Voordat conclusies over niet-gebruik getrokken kunnen worden, moet natuurlijk eerst het gebruik van kennis in verkeersveiligheidsbeleid worden onderzocht. Daarnaast worden barrières voor kennisgebruik bekeken, en worden aanbevelingen voor verbeteringen gedaan.

De hoofdvraag is daarom uitgewerkt in de volgende subvragen:

- *In welke mate wordt kennis gebruikt in het Nederlandse verkeersveiligheidsbeleid?*
- *Welke barrières bestaan er voor kennisgebruik in het Nederlandse verkeersveiligheidsbeleid?*
- *Hoe kan het kennisgebruik in dit veld worden verbeterd?*

De bestaande wetenschappelijke literatuur over het gebruik van kennis, de processen daarachter en de institutionele patronen tussen kennis en beleid zijn onderzocht in *Hoofdstuk 2*. Daarin wordt ook de ladder van Knott en Wildavsky (1980) gepresenteerd, die in de verschillende hoofdstukken wordt gebruikt om de empirische resultaten te duiden. Verder komen verschillende soorten barrières voor kennisgebruik aan bod, en typologieën die de verhouding tussen kennis en beleid beschrijven. *Hoofdstuk 3* geeft een verantwoording van de methodische benaderingen en technieken die in de empirische *Hoofdstukken 4 tot en met 8* gebruikt worden. Het gaat om vier verschillende methoden: een historische reconstructie, een kritisch



literatuuroverzicht, twee meervoudige casestudy's en een experimentele setting. Deze triangulatie van onderzoeksmethoden maakt het mogelijk het onderwerp van verschillende kanten te onderzoeken en zo een breed beeld te krijgen van de verschillende aspecten van kennisgebruik.

In *Hoofdstuk 4* is een historisch-institutionele analyse uitgevoerd van de opkomst en ontwikkeling van het Nederlandse verkeersveiligheidsveld, toegespitst op het beleid, op de kennisproductie ten behoeve daarvan, en op de relatie tussen deze twee. Een kritische review van beschikbaar onderzoek op het terrein van kennisgebruik in verkeersveiligheidsbeleid, zowel binnen als buiten Nederland, is het onderwerp van *Hoofdstuk 5*. Dit hoofdstuk ordent niet alleen de bestaande literatuur, die kritische ordening heeft ook gefunctioneerd als gids voor de daaropvolgende hoofdstukken. Na de historisch-institutionele patronen die uit *Hoofdstuk 4* naar voren komen, zijn in de *Hoofdstukken 6 en 8* processen van kennisgebruik bij het verkeersveiligheidsbeleid op provinciaal en gemeentelijk niveau geanalyseerd. Deze exploratieve onderzoeken laten een aantal barrières zien voor het gebruik van kennis over infrastructurele maatregelen in verkeersveiligheidsbeleid. In *Hoofdstuk 7* zijn enkele van deze barrières getoetst in een experimentele setting op provinciaal niveau. De experimentele setting maakte het mogelijk om naast het bestaan en de betekenis van deze barrières, ook de motieven van de respondenten in hun omgang met kennis te onderzoeken.

### **Kennisgebruik in Nederlands verkeersveiligheidsbeleid**

Om de mate van kennisgebruik in verkeersveiligheidsbeleid vast te stellen, is gebruikgemaakt van de ladder van Knott en Wildavsky (1980; Landry, Amara & Lamari, 2001a; Lester, 1993). Zij onderscheiden zeven niveaus van kennisgebruik: van het ontvangen van kennis ('reception'), via het lezen en begrijpen ervan ('cognition'), het refereren aan die kennis ('reference'), de inspanningen die kennis in beleid om te zetten ('effort'), tot het daadwerkelijk adopteren van kennis in beleid ('adoption'), het implementeren daarvan ('implement') en het meten van de effecten van het beleid (impact).

Geïnspireerd door Weiss (1977) en anderen zijn vier soorten gebruik van kennis onderscheiden: instrumenteel gebruik, strategisch gebruik, pacificerend gebruik en conceptueel gebruik. De vier soorten gebruik zijn gekoppeld aan vier soorten beleidsproblemen, zoals onderscheiden door Hoppe (2002a; 2008). Bij getemde (ook wel gedomesticeerde of gestructureerde) problemen bestaat consensus over het doel van het

beleidsprobleem en over de kennis en de middelen die nodig zijn voor het oplossen van het beleidsprobleem. Ongetemde of ongestructureerde problemen kennen juist een grote onzekerheid of onenigheid over het doel en de waarden van het beleidsprobleem en ook de kennis over deze beleidsproblemen is onzeker. Daartussenin bestaan twee soorten gedeeltelijk getemde of gestructureerde problemen: degene waarover wel consensus bestaat over de doelen maar niet over de beschikbare kennis en middelen, en degene waarbij het omgekeerde het geval is. Bij gedomesticeerde problemen zijn beleidsmakers geneigd kennis instrumenteel te gebruiken. Ongetemde problemen leiden juist vaak tot conceptueel gebruik van kennis. Bij gedeeltelijk getemde problemen met consensus over de doelen neigen beleidsmakers naar strategisch kennisgebruik. Ten slotte leiden gedeeltelijk getemde problemen met consensus over de middelen vaak tot pacificerend kennisgebruik.

Uit dit onderzoek kunnen drie algemene conclusies over kennisgebruik in het Nederlandse verkeersveiligheidsbeleid getrokken worden. De eerste is dat, anders dan mijn intuïtieve aanvoelen, de beschikbare kennis over verkeersveiligheid breed gebruikt wordt. Op nationaal niveau (*Hoofdstuk 4*) wordt kennis over verkeersveiligheid, zoals geproduceerd door de SWOV, het CROW, de toenmalige Raad voor de Verkeersveiligheid en andere organisaties, vaak gebruikt in nationale beleidsplannen. De tweede conclusie is dat op nationaal en provinciaal niveau veelvuldig gebruik wordt gemaakt van de door kennisproducenten aangeleverde richtlijnen voor infrastructuur. Alle provincies bleken bekend met de richtlijnen en hadden deze gelezen. Bovendien hadden vele deze verkeersveiligheidsmaatregelen geïmplementeerd op hun wegen. Ook veel respondenten in de experimentele studie in *Hoofdstuk 7* gaven aan dat verkeersveiligheid een belangrijke basis is voor hun beslissingen over infrastructurele maatregelen. Ten derde laat *Hoofdstuk 8* zien dat 80% van de bestudeerde gemeenten het gebruik van richtlijnen en handboeken bij beslissingen over het implementeren van verkeersveiligheidsmaatregelen spontaan noemde. Tegelijkertijd echter lieten gemeenten bij deze implementatie op 50% van hun wegen andere belangen prevaleren boven verkeersveiligheid.

Bovenstaande opsomming illustreert dat in de diverse hoofdstukken veel van de volgens Knott en Wildawsky denkbare niveaus van kennisgebruik ook zijn aangetroffen, zoals het reception-niveau, het cognition-niveau, het reference-niveau, het effort-niveau en het implementation-niveau. De hoofdlijn is: kennisgebruik op de lagere niveaus van de ladder van Knott en

Wildavsky (1980) is vaker geconstateerd dan kennisgebruik op de hogere niveaus.

De vier typen kennisgebruik en de vier typen beleidsproblemen die daarmee geassocieerd worden, zijn in alle empirische hoofdstukken onderzocht. Alle hoofdstukken, maar vooral *Hoofdstuk 4*, geven aanwijzingen dat het kennis- en het beleidsveld het eigenlijk wel ongeveer eens zijn over het hoofddoel van het verkeersveiligheidsbeleid: de reductie van het aantal doden en ernstig verkeersgewonden. Terwijl de empirie aangeeft dat de kennis- en de beleidswereld het ook eens zijn over de algemene aanpak van dit probleem, geven de *Hoofdstukken 4 tot en met 8* veel voorbeelden van verschillende zienswijzen op specifieke verkeersveiligheidsmaatregelen. In termen van de vier typen beleidsproblemen, kan verkeersveiligheid worden beschreven als een gedeeltelijk getemd probleem met consensus tussen beleidsmakers en onderzoekers over de doelen, maar niet (geheel) over de middelen. De typen beleidsproblemen zijn in *Hoofdstuk 7* expliciet bestudeerd en in de andere hoofdstukken meer impliciet. Deze bevindingen laten zien dat verkeersveiligheidskennis zowel instrumenteel als strategisch gebruikt wordt. In *Hoofdstuk 7* gaven provinciale ambtenaren aan dat zij hun gedeputeerden zo neutraal mogelijk willen informeren en kennis niet strategisch willen gebruiken en in zowel in *Hoofdstuk 6 als 7* wilden provinciale beleidsmakers maatoplossingen voor hun beleidsproblemen. Echter, *Hoofdstuk 6 en 8* laten duidelijk zien dat beleidsmakers verschillende, vaak tegenstrijdige, belangen tegen elkaar moeten afwegen bij het vormgeven van verkeersveiligheidsbeleid. Deze bevindingen wijzen erop dat beleidsmakers kennis strategisch gebruiken.

### **Barrières voor kennisgebruik in Nederlands verkeersveiligheidsbeleid**

Op basis van de literatuur kunnen vier groepen barrières voor het gebruik van kennis in beleid onderscheiden worden (zie het overzicht in Hoofdstuk 2 en bijvoorbeeld Blake & Ottoson, 2009; Landry, Amara & Lamari, 2001b):

1. Disseminatiecondities: in deze barrièregroep is de aanname dat kennis nuttig is voor beleidsmakers en dat de verspreiding van en de toelichting bij deze kennis belangrijk is.
2. De behoeften van kennisgebruikers: de wensen van gebruikers ten aanzien van timing, presentatie, relevantie, bruikbaarheid en implementeerbaarheid, maar ook de kwaliteit van het onderzoek en het vertrouwen van beleidsmakers daarin staan hier centraal.

3. Unilaterale productie of coproductie van kennis: in deze barrièregroep is de aanname dat frequente interactie tussen onderzoekers en beleidsmakers of coproductie van kennis maatschappelijk robuuste kennis zal opleveren. Deze robuuste kennis zal, naar verwachting, vaker gebruikt worden dan kennis die unilateraal geproduceerd wordt.
4. Institutionele factoren: centraal hier staat dat kennis moet aansluiten bij het type beleidsprobleem en bij de institutionele context van het beleidsveld.

Op nationaal niveau zijn de barrières voor kennisgebruik niet expliciet bestudeerd. De historische reconstructie in *Hoofdstuk 4* geeft echter aanwijzingen dat de nationale institutionele context wel invloed heeft op deze barrières (groep 4). De volgende paragraaf gaat daarop in. Internationale studies geven aan dat een verkeerde timing van kennisaanbod (groep 2) en een slechte toegang tot kennis (groep 1), barrières zijn voor kennisgebruik. De barrière verkeerde timing is ook in *Hoofdstuk 6* genoemd door respondenten, slechte toegang werd echter niet of nauwelijks genoemd. Verder noemen provincies, zowel in *Hoofdstuk 6 als 7*, het gebrek aan specificiteit en toepasbaarheid van sommige kennis als een barrière (groep 2). Gemeenten en provincies noemen ook fysieke obstakels voor het implementeren van verkeersveiligheidsmaatregelen: gebrek aan ruimte, te hoge onderhoudskosten of lastige bodemcondities weerhouden hen ervan bepaalde maatregelen te nemen. Deze barrières zijn ook terug te vinden in de internationale studies besproken in *Hoofdstuk 5*.

Het probleem dat echter het meest genoemd werd, door zowel gemeenten als provincies, was de afweging van verkeersveiligheid tegen andere belangen. Deze andere belangen kwamen voort uit eigen beleid, bijvoorbeeld over doorstroming en landschappelijke inrichting, of uit oppositie van burgers tegen bepaalde verkeersveiligheidsmaatregelen. Ten slotte noemden gemeenten en provincies meer ongrijpbare redenen voor het niet-gebruik van kennis, zoals intuïtie, en het niet overtuigd zijn van het effect van maatregelen, soms ook ondanks wetenschappelijk onderzoek hiernaar.

Niet alle vier de barrièregroepen uit de literatuur bleken evenveel voor te komen in het empirisch onderzoek. De barrièregroep *disseminatiecondities* (groep 1) kwam alleen naar voren uit het literatuuroverzicht in *Hoofdstuk 5*, terwijl de historische analyse in *Hoofdstuk 4* in geen enkele van de beschreven periodes in deze richting wijst. Ook de respondenten in de *Hoofdstukken 6, 7 en 8* noemden deze groep barrières niet. De *Hoofdstukken 5 tot en met 8* geven

wel verschillende aanwijzingen voor barrières in de groep *behoefden van kennisgebruikers*. Binnen deze groep 2 waren de meest voorkomende redenen voor het niet-gebruik van kennis de onmogelijkheid om maatregelen te implementeren door lokale omstandigheden en de abstractheid van de beschikbare kennis. Voorts ging het in deze groep om een gebrek aan vertrouwen in onderzoekers en/of in onderzoeksresultaten, en bleken beleidsmakers en onderzoekers verschillende opvattingen te hebben over het bestaan van beleidsproblemen. Provinciale beleidsmakers zagen bijvoorbeeld het aantal frontale ongevallen, flankongevallen en fietsongevallen als te klein om maatregelen zoals rijbaanscheiding, verharde berm en fietsoversteekplaatsen te nemen. Opmerkelijk is dat in geen van de studies in dit proefschrift barrières in de groep *unilaterale productie of coproductie van kennis* (groep 3) zijn gevonden. Deze barrièregroep is niet expliciet aan de orde gekomen in de *Hoofdstukken 6 tot en met 8*, maar het onderwerp is uitgebreid behandeld in *Hoofdstuk 4*, met betrekking tot de interactie tussen de kennis- en de wereld van de beleidsmakers. Diverse bevindingen wijzen erop dat in Nederland feitelijk een vorm van coproductie van kennis bestaat: zo worden veel richtlijnen voor verkeersveiligheidsmaatregelen gezamenlijk ontworpen door beleidsmakers en onderzoekers, en hebben overheidsorganisaties via de financiering van onderzoeksinstellingen zeggenschap over kennisonderwerpen. *Hoofdstuk 4* laat een langdurige en structurele betrokkenheid van kennisorganisaties in het beleid zien.

De barrières die het meest genoemd zijn, zijn de *institutionele barrières*. De volgende alinea gaat hierop in.

### **De institutionele context van het Nederlandse verkeersveiligheidsbeleid en de kennisproductie**

De ontwikkeling van de institutionele context van verkeersveiligheidsbeleid en -kennis wordt hier kort geschetst aan de hand van de vier aspecten van het beleidsarrangementenconcept (Arts & Leroy, 2006a; Van Tatenhove, Arts & Leroy, 2000): actoren, regels, hulpmiddelen en discoursen.

Van oudsher hebben overheidsorganen een belangrijke rol gespeeld in het Nederlandse verkeersveiligheidsbeleid. In eerste instantie was alleen de nationale overheid betrokken bij verkeersveiligheid. Sinds ongeveer 1990 echter, spelen regionale en lokale overheden in toenemende mate een rol in het ontwerpen en implementeren van het regionaal en lokaal verkeersveiligheidsbeleid. Naast overheidsorganen hebben ook belangengroeperingen (bijvoorbeeld de ANWB, VVN en haar voorlopers, en de Fietzersbond) een

belangrijke rol gespeeld in de verkeersveiligheid in Nederland. Met name de ANWB heeft een significante rol gespeeld in de ontwikkeling van verkeersveiligheid tot een onafhankelijk beleidsveld met bijbehorende beleids- en kennisorganisaties. Binnen het veld bestaat een relatief klein aantal kennisproducerende organisaties, zoals TNO, SWOV, KpVV en CROW, die meestal nationaal georganiseerd en vaak ook nationaal georiënteerd zijn. Tevens zijn verschillende universiteiten betrokken bij het verkeersveiligheidsonderzoek.

Veel institutionele regels in het verkeersveiligheidsveld zijn ontleend aan verkeers- en vervoerbeleid zoals de participatieregels rondom de besluitvorming over de Nota Mobiliteit en de regels voor regionale financiering via de Brede Doeluitkering (BDU). Op regionaal en lokaal niveau moeten budgetten voor verkeersveiligheid sinds de invoering van de BDU concurreren met andere belangen in het verkeers- en vervoerbeleid. In het recente verleden waren deze regionale en lokale verkeersveiligheidsbudgetten sectorspecifiek. In het verkeersveiligheidsveld zijn enkele belangrijke debatten te signaleren die het denken over verkeersveiligheid structureren, ook wel discoursen genoemd. Deze debatten gaan bijvoorbeeld over concrete verkeersveiligheidsmaatregelen en hun kosten en effecten, over de afbakening tussen verkeersveiligheid en andere beleidsonderwerpen en over de organisatie van het verkeersveiligheidsbeleid.

Met behulp van de typologieën van Hoppe (2005) enerzijds en Landry et al. (Landry, Amara & Lamari, 2001b) anderzijds is de relatie tussen kennis en beleid inzake verkeersveiligheid in dit proefschrift beschreven. Zonder hier nader op deze typologieën in te gaan, helpen zij de historische afwisselende dominantie te laten zien: terwijl tot 1945 kennis- en beleidsorganisaties nog onvoldoende ontwikkeld waren om van een kennis-beleidsarrangement te gewagen, zette tussen 1945 en 1975 vooral de kenniswereld de toon. Het beleid stemde in met de onderzoeksbevindingen en nam deze geleidelijk aan over. Vanaf ongeveer 1975 tot 1995 groeiden zowel de kennis- als de beleidswereld aanzienlijk en beide drukten hun stempel op de inhoud van de kennis over verkeersveiligheid. In de laatste 15 jaar vonden kennisactiviteiten in mindere mate plaats binnen de nationale overheid, maar meer dan voorheen in min of meer autonome kennisorganisaties buiten de overheid. Sinds de jaren 90 heeft het kennis-beleidsarrangement ook een expliciete regionale component gekregen.

### **Governance trends**

In recente bestuurskundige literatuur is sprake van een ontwikkeling van 'government' naar 'governance'. In het kort: op meerdere beleidsterreinen zou een mon(opol)istisch optredende overheid, die beleid voert per beleidssector, plaats maken voor een overheid tussen andere actoren, zou ruimte komen voor meer integrale beleidsvoering en voor beleidsvoering op meerdere niveaus. Deze ontwikkelingen worden wel samengevat als de trend naar een multi-actor-, multi-sector- en multi-levelbeleidsvoering (Wiering & Crabbé, 2006, p. 103-104). Interessant is dan de vraag of die trends ook op het beleids- én kennisveld verkeersveiligheid te zien zijn.

De empirische hoofdstukken geven aanwijzingen voor alle drie deze governance-trends. Toch moet de multi-actortrend gerelativeerd worden: verkeersveiligheid is, door de aanwezigheid van overheids-, kennis- en maatschappelijke organisaties, al vanaf de start een multi-actorveld. De steeds belangrijker rol van regionale en lokale overheden duidt op een trend richting 'multi-level governance'. 'Multi-sector governance' is een zeer recente trend, die geïllustreerd wordt door de geleidelijke en nog voortgaande integratie van verkeersveiligheid in het bredere verkeers- en vervoerbeleid.

In de kenniswereld ziet het beeld er minder uitgesproken uit. Van een multi-actortrend, zoals in de beleidswereld, is in het kennisveld geen sprake. Kennisorganisaties, hoewel onderling soms erg verschillend, zijn per definitie één type actor. Ook zijn er minder aanwijzingen voor kennisproductie op meerdere niveaus: de meeste kennisproductie is georganiseerd op het nationale niveau en veel, maar niet alle kennis is ook gericht op het nationale niveau. Activiteiten gericht op het lokale en regionale niveau bestaan voornamelijk uit disseminatie van kennis. Daarnaast illustreren de empirische hoofdstukken dat de kenniswereld minder gericht is op beleidssectoren buiten de verkeersveiligheid dan de beleidswereld.

Ten slotte, terwijl de diverse hoofdstukken een verregaande consensus en samenwerking tussen kenniswereld en beleidswereld laten zien, bevestigen zij ook een bekend cultuurverschil tussen beide werelden. Beleidsmakers moeten rekening houden met veel verschillende belangen, waaronder de publieke opinie, en neigen dus naar een politieke rationaliteit. Onderzoekers daarentegen neigen vooral naar een technocratische rationaliteit. Zij richten zich op maatregelen waarvan het meeste effect wordt verwacht op de

verkeersveiligheid en hoeven minder rekening te houden met de publieke opinie. Hoezeer Caplan's (1979) two-communities-metafoor ook gedateerd lijkt, beleid en wetenschap zijn ook op het veld van de verkeersveiligheid twee werelden met een verschillende cultuur, rationaliteit en andere waarden en normen.

### **Drie institutionele barrières**

Uit de beschrijving van de institutionele context van het kennis-beleidsarrangement en uit de andere empirische hoofdstukken komen vooral drie institutionele barrières voor kennisgebruik naar voren. Twee daarvan berusten op de verschillen in governance trends tussen de kennis- en de beleidswereld en één barrière kan beschreven worden in termen van de two-communities-metafoor van Caplan (1979).

Het verschil tussen beleid met meer multi-levelkarakteristieken en kennis-productie die meer single-levelkenmerken vertoont, resulteert in een grotere behoefte aan specifieke kennis voor het regionaal en lokaal niveau dan nu beschikbaar is. *Hoofdstuk 6* geeft hiervan een aantal voorbeelden. Zo werden nationale getallen over kosten en effecten van maatregelen op regionaal niveau niet altijd vertrouwd. Ook *Hoofdstuk 7* geeft voorbeelden van deze barrière: respondenten geven aan dat er geen kennis op maat voor hun provincies beschikbaar is.

Het verschil tussen beleid met meer multi-sectorkenmerken en kennis-productie met meer single-sectorkarakteristieken zorgt voor een algemeen gebrek aan kennis, argumenten en technieken om verkeersveiligheid af te wegen tegen andere belangen en om verkeersveiligheid te integreren in een breder beleidsveld. Verschillende hoofdstukken geven hier voorbeelden van: *Hoofdstuk 6* laat zien dat provincies vaak kennis over verkeersveiligheid afwegen tegen andere belangen. In *Hoofdstuk 8* wordt duidelijk dat kennis over die andere belangen, bijvoorbeeld van burgers uit de omgeving, regelmatig prevaleert boven wetenschappelijke kennis over verkeersveiligheid.

Het geobserveerde verschil tussen de cultuur en de rationaliteit van beleidsmakers enerzijds en die van kennisorganisaties anderzijds leidt tot een gebrek aan kennis over het omgaan met politieke argumenten in verkeersveiligheidsbeleid. *Hoofdstuk 5* geeft voorbeelden van nationale en provinciale beleidsmakers in Europa die op ethische gronden kennis uit kosten-baten- en uit kosteneffectiviteitsanalyses verwerpen. *Hoofdstuk 6 en 8*



demonstreren dat een aanzienlijk aantal gemeentelijke en provinciale beleidsmakers politiek-rationele argumenten, zoals 'draagvlak', lieten prevaleren boven technisch-rationele argumenten bij de implementatie van infrastructurele verkeersveiligheidsmaatregelen.

### **Reflectie en aanbevelingen**

Deze dissertatie geeft een breed overzicht van kennisgebruik in het Nederlandse verkeersveiligheidsbeleid. Onderzoek naar dit specifieke onderwerp is nog weinig uitgevoerd. Bovendien is de keuze voor en de combinatie van meerdere onderzoeksmethoden uitzonderlijk in bestuurskundig onderzoek.

Het proefschrift heeft zowel theoretische als praktische waarde. De theoretische waarde ligt in de verbinding tussen de gezichtspunten uit de meer procesmatige benaderingen uit theorieën over kennisgebruik en meer institutionele theorieën over kennis en beleid. Die verbinding, bovendien toegepast op het nog redelijk onontgonnen terrein van de verkeersveiligheid, laat zien dat klassieke, procesmatige barrières voor kennisgebruik ingebed zijn in institutionele patronen. Bovendien beïnvloeden de processen de patronen en andersom.

Naast haar theoretische waarde heeft deze dissertatie ook een praktische waarde voor beleidsmakers en onderzoekers. Zij verschaft enkele inzichten in de relatie tussen beleidsmakers en onderzoekers, en draagt bij aan het begrip van elkaars werelden. Verder kunnen onderzoekers aan dit proefschrift kennis ontleen over veelvoorkomende barrières voor kennisgebruik en over suggesties om deze te slechten.

Twee typen aanbevelingen kunnen worden geformuleerd: aanbevelingen voor verder onderzoek en aanbevelingen over de praktijk van kennisbeleidsinteracties en hun institutionele setting.

Aanvullend onderzoek kan gedaan worden door deze studie uit te breiden naar kennisgebruik in verkeersveiligheidsbeleid buiten Nederland. Zowel binnen als buiten Nederland kunnen gedetailleerde onderzoeken naar het proces van kennisgebruik gecombineerd worden met gedegen institutionele analyses. *Hoofdstuk 2* illustreert dat beide perspectieven uitgebreid behandeld worden in de wetenschappelijke literatuur. Hoewel het procesperspectief aandacht besteedt aan institutionele barrières en het institutionele perspectief in een zekere mate aan kennisgebruik, proberen weinige onderzoekers deze

twee gezichtspunten te integreren. Deze dissertatie heeft hiermee een bescheiden start gemaakt. In het verkeersveiligheidsveld kan dit bijvoorbeeld worden uitgebreid door een diepgaande analyse van een nationaal beleidsproces te paren aan een institutionele analyse.

Aanbevelingen om de relatie tussen wetenschap en beleid te verbeteren zijn gebaseerd op de waargenomen barrières in deze dissertatie en vallen in twee soorten uiteen: aanbevelingen voor typen kennis die verder ontwikkeld kunnen worden en aanbevelingen voor de organisatie van de kennisproductie en het kennisgebruik.

Het onderzoek in deze dissertatie maakt duidelijk dat er behoefte bestaat aan meer kennis over ten minste twee onderwerpen. Het eerste is kennis over de omgang met tegenstrijdige belangen van verschillende actoren in het verkeersveiligheidsbeleid, zoals reistijd, rijcomfort, draagvlak en landschappelijke inrichting. Het tweede onderwerp betreft kennis specifiek gericht op regionale en lokale overheden. Meer kennis over deze onderwerpen is nodig. Methoden om technisch-rationele wetenschappelijke kennis in balans te brengen met andere, meer politiek-rationele kennis over publiek draagvlak en over andere belangen dan verkeersveiligheid, kunnen beleidsmakers helpen om beslissingen te nemen die consistenter zijn en kennisproducenten helpen om hun kennis meer gebruikt te laten worden. Kennis over deze verschillende belangen zou kunnen worden opgenomen in afwegings- en integratiemethoden zoals multi-criteria-analyses of verkeersveiligheidseffectrapportages, analoog aan de milieueffectrapportages.

Ten slotte kan een aantal aanbevelingen voor de organisatie van de kennisproductie en het kennisgebruik worden gegeven. Ten eerste kan het verschil tussen de meer multi-sectorbeleidswereld en de meer single-sector-kenniswereld wellicht overbrugd worden door een bepaalde mate van, niet noodzakelijkerwijs fysieke, integratie van verkeersveiligheidskennis in het verkeers- en vervoerveld te stimuleren. Ten tweede, om het verschil tussen de kennis- en beleidswereld op het gebied van aandacht voor verschillende actoren te verkleinen, zou meer contact tussen kennisorganisaties en actoren met andere dan verkeersveiligheidsbelangen kunnen resulteren in een methode om deze belangen mee te wegen in het verkeersveiligheidsbeleid. Ten derde, bij het verschil in focus tussen de kennis- en beleidswereld op het nationale versus het regionale/lokale niveau, zou een dialoog tussen regionale en lokale overheden en kennisorganisaties kunnen helpen

kennislacunes te identificeren, die nieuwe kennis te ontwikkelen, en de verbinding tussen de al beschikbare kennis en het beleid te verbeteren.

## Nawoord

*It takes a village to raise a child*, en zo is er een wetenschappelijke gemeenschap nodig om een proefschrift tot stand te brengen. Ik had het geluk twee wetenschappelijke gemeenschappen tot mijn beschikking te hebben: de collega's bij de SWOV en bij de vakgroep Milieu en Beleid van de Radboud Universiteit. Veel mensen in deze gemeenschappen hebben mij hulp geboden bij het schrijven van het proefschrift.

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## Curriculum Vitae

Charlotte Bax was born on February 5th 1973 in Deurne. After obtaining her Atheneum diploma from the Peelland College in Deurne in 1991, she started her study in General Social Sciences (Algemene Sociale Wetenschappen) at Utrecht University. She specialised in Public Sector Policy and Organisation and received her master's degree in 1996.

While working as a social security policy maker in Lopik municipality, she explored the public sector from within. She began as a researcher at SWOV Institute for Road Safety Research in 1999 where she specialised in road safety research in public administration. Here she also had the opportunity of studying national, provincial and municipal road safety decision-making processes as well as cooperation between policy actors in road safety policy implementation. Furthermore, she initiated a SWOV project on knowledge utilisation in provincial road safety policy and worked in the European project Rosebud, an acronym for research on the use of cost-benefit and cost-effectiveness analyses in decision-making on road safety policy. These last two projects inspired her to make this the subject of her PhD thesis.



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