Public Faces of Science

Experts and identity work in the boundary zone
of science, policy and public debate

Erwin van Rijswoud

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This project was funded by the former interfacultary Science & Society working group and the Faculty of Science, Computing & mathematics of Radboud University Nijmegen.

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Experts and identity work in the boundary zone of science, policy and public debate

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For Hannah, Jonathan & Marjan

Preface

What an expert is, is not easy to define. The meaning of this dissertation on public experts has changed significantly over the last four years. When I started in June 2007 to study the role of experts in a knowledge society, the focus would be on the way they handled the challenges and dilemmas that accompanied their work as public experts. In the interviews which I subsequently held, the public credibility of science (as an institute) and scientists (as individuals) was a key issue the experts discussed with me. But the theme seemed a rather innocent topic in view of what was to come.
In the public and political domains a change in the role of experts set in, one that is still unfolding. The term 'expert' received a more negative connotation in on-going debates. Experts were no longer predominantly regarded for their relevant and critical role in the knowledge society, but fiercely contested for their role in public controversies. Since 2009 'my' experts found themselves heavily discredited in public. In particular the discussion of the integrity and reliability on virology experts was and still is a persistent one. The disastrous vaccination campaign against human papilloma virus (HPV) is virology's Waterloo, and the various parliamentary investigations into the decisionmaking regarding Novel Influenza (A) H1N1 demonstrate that infectious disease control is an issue that deeply concerns society – and not only because of its contribution to the public health.
Many recent scholarly discussions on expertise and credibility take these and related examples as the starting point for analyses and try to sketch a new framework for understanding expertise. With this thesis, that started before the recent controversies set in, I present contextual and historical perspectives to the so-called crisis of expertise, and thus hope to elicit current developments.

In the course of writing this thesis, I have had the joy of getting to know quite a few people that contributed to the completion of this work, either by stimulating the research or by inviting me to keep discovering the world outside academia.

A first word of thanks is to the seven scientists whom I studied in this thesis. Without knowing me, from the start they allowed me to interview them on their biography and

they did not refrain from sharing their experiences as experts. Ab Osterhaus, Roel Coutinho and Jaap Goudsmit on the one hand; and Pier Vellinga, Han Vrijling, Marcel Stive and Huib de Vriend on the other all provided their personal narratives, which composed the basic and essential material for this dissertation. Without their willingness to do so the project could not have been completed in the way I aspired to. I can only hope that this book will be of value for them, perhaps providing a starting point for reflecting on what they themselves as experts do, and why they do it in that particular way. Furthermore, I would like to thank the other interviewees for their contribution.
In addition, I am grateful to the former Science & Society working group for funding this research. Sadly enough, this project is the last that was funded, and I can only hope that the Radboud University will revigorate its university-wide research efforts in this area.

During my time at the Radboud University I have had the pleasure of working in a research institute that is embedded in the Science faculty. I am thankful to my colleagues of the Institute for Science, Innovation & Society. The diversity of people working there and the research orientations they have, creates an open and constructive environment for doing research that spans different disciplines. I sincerely hope that despite the tumultuous developments ISIS will strengthen its position as an institute that opens science to society.

Within ISIS I belonged to the Department of Philosophy and Science Studies, a department that is composed of strong and authentic characters. That stimulated me in developing an academic and normative-professional identity, and I would like to thank everybody for that. I have had the great pleasure of formerly belonging to the Center for Society & Life Sciences. Although during me time in Nijmegen I did not belong to the CSG in a formal sense, I have always felt welcome and supported.

I am grateful to the students and staff of the science communication track. Roald Verhoeff, Leen Dresen and in particular Riyan van den Born, not just offered me the opportunity to take part in the different educational aspects of the track, but also granted me trust and support in making a contribution to the curriculum. Their trust and support certainly stimulated my career in science communication.
Hedwig te Molder, Anne Dijkstra and the staff of ELAN have welcomed me as their science communication colleague at the University of Twente, and I feel honoured and grateful for the opportunity of working there as an assistant professor. I am looking forward to strengthening research and education in science communication, and in forging links with science education and hard core science at the University of Twente.

For most of my time as a PhD researcher I have been involved in the Nijmegen PhD Council PON. I have had the pleasure of getting to know many PhD researchers and

postdocs from Radboud University who are concerned with the different aspects of working as temporary academic staff. A special word of thanks to the Works Council, of which I was a member of the board on behalf of PON. I would like to thank Margot van den Berg and Guiselle Martha-Starink in particular. I believe that together we were a strong team, standing up for the interests of postdocs and PhD's. I also thank different members of the Presidium. It was a great and pleasant learning experience to work with you, one I wouldn't have wanted to miss.

The graduate school WTMC provided a welcome distraction from the day-to-day routine with intense and enjoying workshops and meetings at Soeterbeeck. Talking to fellow PhD researchers about how to manage one's project and all the struggles that working towards a doctorate entails was a great support. The academic climate was very stimulating. I would like to thank the (former) coordinators Sally Wyatt, Els Rommes, Willem Halffman and Teun Zuiderent for their skills and efforts in making these workshops and meetings a continuous success and joy.

Hub Zwart, my promotor, laid the foundations for this thesis and helped me to complete it. The project he developed for the Science & Society working group formed a constructive and fascinating start. He has provided support and constructive comments, but also quite a bit of freedom and trust in my capacities to manage things. Writing a dissertation by default implies facing difficulties and making choices, and that goes for me as well. Sometimes I managed things myself, but when I consulted Hub he always had clear and convincing answers ready. That has assisted me in staying on track with a decent pace of work, and I am truly grateful for that.
The nature of the project called for expertise in social science methodologies as well, and the project greatly benefited from the guidance of my co-promotor Hans Marks. Hans jumped on a running train and managed to insert critical thinking at crucial moments, for example by comparing experts with Scandinavian goblins. As an anthropologist foreign to science and technology studies, he thus stimulated me to observe things with more distance to the object of study. Despite us being relatives, the discussions were so focussed that we often forgot to talk about family life. That doesn't mean we are not concerned about one another, and I wish you all the luck.

Frans van Dam, Willem Halffman and Bert Theunissen also contributed to the supervision as members of the supervisory committee. Bert, under whom I studied in Utrecht, provided his expertise in history science and in thinking with a pleasant and constructive irony. Frans, CSG's communications officer, shared his expertise with the topic of public experts, and was a stimulating voice in placing this project in a real time context. Willem supervised me on the science policy and expertise aspects, and was kind enough to help me whenever I needed advice. Collectively, my supervisors formed a

theatre of voices, allowing me to learn, to perceive and analyse the research topic from very diverse standpoints.
In addition to the formal supervisors, my fellow PhD researchers at ISIS, the philosophy department in particular, provided a solid source of peer supervision and consolation. I find great value in the PhD meeting we held. I wish you all the luck with completing your theses. A special word of thanks to Meggie and Sanne, who are a great support as my paranimfs. And of course to my many roommates (I used up five offices), in particular Peter, Bart, and Inge and Meggie.

So far words of thank to my academic partners in crime. Alex Pagel, thanks for being my dear friend since the year we were housemates in Hull (UK) and listened to music. It is great to see that our families have extended in tandem, and I hope we will stay friends for many years to come.
My parents have unconditionally supported me in my studies and work. Ook al wisten jullie niet altijd waar alles precies voor diende en wat het precies inhield, steunden jullie mij onvoorwaardelijk in de keuzes rondom studie en werk. Niet alleen materieel, maar ook moreel. Vragen die jullie stelden als 'mijn experts' weer eens op TV waren, waren ook voor mij goede vragen om scherp te krijgen wat er speelde, dank voor alles. Jan en Agnita, my parents in law, have welcomed me with great warmth, and cared for us as a family without hesitation. That meant and still means a lot to me.

Hannah Älva and Jonathan Birk, two little creatures that were born right before or during this project. Terwijl ik dit schrijf staan jullie appeltjes te eten en kijken naar buiten. Mondjes die smakken, in stilte genieten jullie. Jullie hebben me altijd het vaderschap de boventoon over al het andere laten voeren, en onbeschrijflijk geniet ik van jullie. Op de moestuin, terwijl jullie slapen of appeltjes eten, en zelfs als jullie even ongenietbaar zijn, bewonder ik jullie wezentjes. Dankjewel dat ik de eer heb jullie papa te mogen zijn.
Dear Marjan, my soulmate. Since the first time we met more than ten years ago, our lives have merged in a balanced and loving way, full of inspiration. Talking together about all the things we experience in our family, in work, and in the deepest nocks and crannies of our beings keeps inspiring us in the things we do, the persons that we are and who we want to be. You have been the greatest support for this thesis, not just morally but also as a critical reader of many drafts of this thesis. I would like to dedicate this thesis to you, Hannah and Jonathan.

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Introduction: Scientific experts in the boundary zone of science, policy and public debate

1.1 H1N1, and the art of presenting science

On 30 April 2009, the Dutch Minister of Health, Ab Klink, held a press conference to announce the country's first case of H1N1 novel type A influenza, also known as Mexican flu[1]. The press conference was not held at his ministry, or at Nieuwspoort, the home base for political journalists in The Hague, but in an anonymous conference room at Rotterdam Airport. The reason for this change of routine: Klink would fly off to Luxembourg right after the press meeting to discuss the matter with his European colleagues. In the improvised press room – it could equally well have been used for an informal get-together – Klink was flanked by two scientific advisors: Professor Roel Coutinho, director of the national Centre for Infectious Disease Control (CIb) and Professor Ab Osterhaus, director of the World Health Organization's (WHO) National Influenza Centre (NIC).

The first case of Mexican flu in the Netherlands was a three-year-old child, who had been to Mexico with his parents for a family gathering[2]. After developing the first symptoms of influenza, he was taken to a family doctor, and after a few days, laboratory tests confirmed the child had contracted H1N1. The response to contain a further spreading from this infectious source was to put the parents on antiviral drugs, and to track the passengers who sat next to the toddler on the flight from Mexico to the Netherlands, offering them antiviral drugs as well. Besides these direct policies to contain the virus, the Minister also released a large number of the 4.7 million doses of antiviral drug Tamiflu, kept in storage since 2005 as part of Dutch pandemic preparedness plans.

[1] The news report of the press conference can be found at http://nos.nl/artikel/86737-nederlandse-besmetting-mexicaanse-griep.html (last visited 12 July 2011). Although the term 'Swine flu' also circulated, the name was soon abandoned to prevent public boycott of pig meat, after which it was claimed that referring to H1N1 as 'Mexican flu' would compromise tourism to Mexico. That argument, however, could not stop people from continuing to use the nation's name as the name of the pandemic.

[2] The identity of the child, including the gender, was kept anonymous.

But the Minister seemed to expect more from H1N1, as he also announced that the Dutch government took an option on 34 million doses of H1N1 vaccines, two doses for each inhabitant. The news report ended with images of the Minister's jet taking off to Luxembourg.

According to the two scientists present at the meeting, the first case of H1N1 in the Netherlands did not at all change their assessment of H1N1, as they had predicted this to happen (Coutinho), and the speed at which H1N1 was cultivated and diagnosed demonstrated that surveillance systems were properly functioning (Osterhaus). Despite the spread of H1N1, they seemed to be confident in their capacity to predict, survey and control the budding pandemic[3]. Who are these two scientists, and why were they asked by the Minister of Health to escort him to this press conference? And what can be said of the way they handled the communication to the public during the pandemic?

The night before, Osterhaus had made his appearance as a guest in the immensely popular TV talkshow *De wereld draait door* (*'The world keeps turning'*). Asked by the host whether we would witness the outbreak of Mexican flu in the Netherlands the day after, Osterhaus unflinchingly said that this would not be the case, as there had been no diagnosed cases as yet. But he then added that it could be a matter of days. He then went on to explain the WHO responses to the H1N1 outbreak, interpreted what were possible scenarios and brushed aside fellow scientists who spoke of a 'CNN hype'. "We should not be surprised if H1N1 would equal the Spanish flu in 1918, an influenza pandemic that killed 50 to 100 million people. Good surveillance and good pandemic preparedness will give us time to bridge the time to develop vaccines and to contain the virus, but we should not believe that fatalities could be excluded." The talkshow host, a man known for his habit of dominating interviews, was visibly awed by the vigour and agitation with which Osterhaus spoke about the H1N1 virus, and its pandemic potential.

Coutinho is an equally well-known figure. As director of the CIb, it is his responsibility to direct the government's infectious disease policy, and whenever something happens in this domain, he appears on the 8 o'clock evening news as formal spokesperson. Just a few months before the H1N1 press conference, he was prominent in the vaccination campaign against Human Papilloma Virus (HPV). During the HPV campaign, his scientific authority was heavily contested by grass-roots social movements, and the H1N1 outbreak thus followed a period of intense public debates over the role of viral expertise in public policy.

In short, the presence of Osterhaus and Coutinho at the press conference was hardly surprising. Not just their formal positions in viral science and policy, but also their experience in communicating to the public at large and to the Minister explained their presence. In the days before the Dutch H1N1 case, they had already dominated the

[3] At the time of the press conference, it was a level 4 outbreak. On 11 June 2009 it was upgraded by the WHO to level 5, an official pandemic.

media, given updates on the events and fed public sentiment in terms of reassurance or fear. During the H1N1 outbreak, they would stick to that role.
But how did they arrive at such elite positions? Why were they granted the possibility to escort the Minister of Health? To inform the public at large on prime-time television, to advise them on what to fear from H1N1, and what not to fear? And why did they present themselves as they did? What lessons have they learned from their previous experiences with advising politicians and communicating to the public? These are the types of questions that will be addressed in this thesis.

1.2 Research aims and question

This thesis studies the role of scientific experts in policymaking and public debate. I will analyse the different challenges and dilemmas that 'visible' scientists encountered in their role as policy advisors and public experts, and how they, in the course of their careers, learned to handle the various aspects of their expert role. The aim of this research is to understand the role of scientific experts in both policymaking and public debate, notably in settings like the one described above. Thus, I wish to contribute to the scholarly debate over experts, public communication and policy development. In addition, this thesis aims to enhance a more reflexive understanding of experts among both the scientists confronted with the role of being an expert, as well as among the diverse publics that interact with these experts. The research question to be addressed in this thesis is as follows.

> *How has the role of scientific experts in policy and public debate evolved in a society in which this expertise is both indispensable and highly contested?*

This question will be answered by studying a select group of elite and visible scientists, such as Coutinho and Osterhaus, who have a track record as 'public experts'. In my analysis, I will use the views of the experts involved as my starting point, and subsequently show how they, on the basis of these views, interacted with their environment. The focus is on their development as public experts. In order to come to terms with that development, I have used a biographical-narrative approach. While the 'biographical' aspect refers to the long-term learning perspective, the career as public experts they have gradually built up, the 'narrative' aspect refers to the fact that this thesis takes an interest in their own interpretations of their role as experts. The narrative dimension implies that I take the expert's interpretive frame as the core of the study. The expert is not just central as the unit of analysis, but also as the main source of meaning in understanding a biography.
The scientists selected for this study are leading figures in their fields of their expertise. They are widely recognised as the most prominent scientists in the public and political

domains, and have assumed the role of policy advisors or public communicators for a significant period of time, sometimes more than three decades. As we are dealing with prominent experts both in the academic and in the public domain, I will refer to them as 'elite scientists'. In addition, I have chosen to select these elite scientists from two disciplines that are explicitly devoted to protecting the public's well-being, namely *virology* (protecting the public against infectious agents) and *hydraulic engineering* (protecting the public against flood disasters). As a consequence of this responsibility, these scientists have developed intense relations with media and politicians, and their communication with the public, notably in times of crises, entails much more than disseminating findings that have resulted from 'normal', 'basic' science.

In the following sections, I will explain the various concepts and themes that are implied in the research question, in order to frame this thesis in relation to the broader horizon of scholarly work that, notably during the past two decades, has been devoted to the study of experts. This will also include a further introduction to the case studies. I will conclude this introductory chapter with an overview of the thesis.

1.3 What is an expert, and what is a scientific expert?

A first concept to be explained in this thesis is what I mean by 'expert', and how related concepts such as 'scientific experts' (as individuals) and 'science-based expertise' (as a category) will be used. In fact, 'expert' proves to be a contentious category. There is no one clear-cut definition that will capture all possible meanings of the term. In accordance with Wittgenstein's notion of family resemblance (Wittgenstein 1968 [1953]), experts have a number of features in common, although not all features necessarily apply to all of them. Thus, experts form a category of individuals who have similar, but not identical, characteristics, and what an expert is can be explained by comparing the phenomenon of 'an expert' in different contexts (viz. Blok 1978). As a general definition, one could say that an expert is someone who has acquired specialised knowledge in a particular field and is recognised as such in the sense that he or she is consulted by others. Scientific experts are a particular kind of expert. Their expertise is related to an academic research field (formal knowledge). In this thesis, I will focus on scientific experts coming from two academic research fields and compare them with one another. The focus of attention will not be on their academic expertise, but rather on its enactment in policymaking and public debate.

In explaining what an expert is, one can either refer to the particular knowledge people have, or to the position they occupy in a social network. The first is referred to as a 'realistic' approach to expertise, as it claims that expertise is something (insight or knowledge) that truly grants the holder of specific expertise an advanced position. The second approach to expertise is referred to as 'relational', and regards expertise as a social attribute. It basically contends that experts are granted their authoritative position

due to the existence of a clientele. As Nico Stehr describes it, "[t]he constitution of experts requires the parallel constitution of a certain clientele or public. Clients and experts have certain minimal common features, be it only the conviction that specialized knowledge is functional under certain circumstances" (Stehr 1994, p. 164). This relation of functionality between expert and clientele is not limited to scientific experts, but could equally well apply to, for instance, experts on the Swedish King Oscar II postmarks in the stamp collector community. One could, therefore, also describe this in terms of Bourdieu's concept of symbolic capital: "[e]xperts possess cultural capital, which they have acquired as members of specific fields, but which is recognized as valuable outside the field, and which therefore becomes a form of symbolic capital" (Arnoldi 2007).

I will study therefore what scientists actually do to make their knowledge 'functional'. How do they see this task, what challenges and questions does it raise and how do they handle those challenges under conditions that often require policy relevant scientific advice under time constraints? Below I will refer to this with the notion 'boundary work', understood as separating science from non-science in order to remain credible as scientific experts. First, however, I will further elaborate the 'relational' and 'realistic' approaches to expertise, as they have been debated in science and technology studies.

The well-known case of the Cumbrian sheep farmers, whose expertise was neglected in handling the fallout consequences of the Chernobyl disaster for Cumbrian sheep, was analysed by Brian Wynne as the example of how trust in expertise is a *relational* concept, subjected to negotiations: "Trust, or trustworthiness, and credibility are relational terms, about the nature of the social relationships between the actors concerned. They are not intrinsic to either actor nor to the information said to be transmitted between them" (Wynne 1992, p. 282).

Ironically, to the dismay of Wynne, his analysis of the Cumbrian sheep farmers was subsequently used by Harry Collins and Robert Evans to illustrate how expertise is not a relational, but a *realistic* category, as, in the words of Wynne in the original article, "the farmers had expressed valid and useful specialist knowledge for the conduct and development of science, but this was ignored" (Wynne 1992, p. 287). This, according to Collins and Evans, demonstrated that the major challenge for studies of expertise is to point out how one comes to identify those individuals who hold this real expertise. They thus developed an elaborate periodic table of expertises that treats expertise as a realistic category (Collins and Evans 2007). "The realistic approach (…) starts from the view that expertise is the real and substantive possession of groups of experts and that individuals acquire real and substantive expertise through membership of those groups" (Collins and Evans 2007, pp. 2-3).

In his defence, however, Wynne argues that Collins and Evans side with 'propositionalism' (those in power to define the question at hand are in charge of determining which experts are included, and which are not) and 'essentialism' (the positivistic ideal of old-school sociology of science) (Wynne 2003). In particular, Collins

was charged with deserting his earlier contributions to the sociology of scientific knowledge that demonstrated how science is constructed through social interactions (Collins 1983). In studying the sheep farmers' case, Collins and Evans "do not appear to recognize that issues of public meaning or framing of the issue are open, and usually disputed, before we reach the propositional questions about risks, benefits, and so on, which they assume automatically to define the 'core' issue" (Wynne 2003, p. 405).

In response to this debate I think it is important to view realistic and relational approaches not as mutually exclusive. Whether we see a certain form of expertise as realistic or relational depends on the perspective that is taken. In this thesis, the focus will be on the relational aspects of expertise. I am interested in the social roles of experts, in the relational dimension of their work. I acknowledge expertise as something that is real in principle, but when studying and trying to understand the role of experts, the primary focus is on the relational dimension. Part of the game of this relational approach to expertise then is to see how scientific experts have positioned themselves vis-à-vis their clientele and other expertises.

1.4 Relational expertise as boundary work

The relational dimensions of the experts in radioactive pollution, who were central to Wynne's analysis, centred around their public credibility and the trust they were given by the sheep farmers. The effort governmental experts have made in maintaining a credible position, separating nuclear science from non-scientific farming knowledge, is characterised by Thomas Gieryn as 'boundary work' (Gieryn 1983, 1995, 1999). In the study of boundary work, "characteristics of science are examined not as inherent or possibly unique, but as part of ideological efforts by scientists to distinguish their work and its products from non-scientific intellectual activities. The focus is on boundary-work of scientists: their attribution of selected characteristics to the institution of science (i.e., to its practitioners, methods, stock of knowledge, values and work organization) for purposes of constructing a social boundary that distinguishes some intellectual activities as 'non-science'" (Gieryn 1983, pp. 781-2). In advising government and communicating to the public, scientific experts seek to maintain or enhance the public's perception of them as having epistemic authority, in particular in the areas where science has departed its institutional comfort zone and entered the open cultural space of society. Boundary work thus closely relates to the efforts going into maintaining a clientele, or in acquiring symbolic capital.

In the open cultural space contestations of one's credibility may not just come from politicians or publics. Competing expertises also challenge the authority of the scientific experts studied here, and the question in those situations becomes who comes to hold jurisdiction or authority over the particular affair, or as Andrew Abbott described it, which profession gets "to classify a problem, to reason about it, and to action on it: in

more formal terms, to diagnose, to infer, and to treat" (Abbott 1988, p. 40). Media performances of experts such as Ab Osterhaus often entail interesting examples of how experts claim the authority to diagnose and treat a problem emerging in their realm of expertise, attacking competing experts for not properly 'diagnosing' the significance and danger of viral threats, such as the H1N1 outbreak, and not proposing the adequate actions required to 'treat' it. As we will see, the battles over who is credible as an expert, and who has jurisdiction over issues, are a pertinent issue for visible experts.

Boundary work originated in Gieryn's publications during the linguistic turn development in the 1980s, and this infused his earliest account of it (Gieryn 1983): it was presented mainly as a rhetorical or literary exercise. As boundary work can equally be located in objects and people (Star and Griesemer 1989), Halffman (2003) suggested to study the Texts, Objects and People of boundary work (Halffman 2003, p. 58). In the cases of virology and engineering under investigation here, all three kinds can be identified and play a role. The *texts* or rhetorical devices abound in the role of experts. How they express themselves in the newspapers, giving particular examples again and again, using disasters rhetorically to induce policy change, creating dichotomies to settle one's position and fuel the debate; a large part of this study deals with the rhetoric of experts. From the perspective of this study, it hardly needs further specification to explain the boundary workers as *individuals*: the scientists who perform the boundary work. Yet, their role is not singular: the approach taken here studies the experts as the individuals *doing* the boundary work (as a subject), but also as being the *focal point* or personification of broader debates and controversies, as catalysts in these debates. The controversy over a specific boundary worker may reflect ideas or sentiments that exist in isolation of this particular scientist, the *object* of boundary work. I believe the contestation of scientific credibility in, for example, climate science or vaccination policies has scientific experts as both the object and subject of debate. The objects of boundary work also comprise more concrete things like dams, rivers and viruses (HIV and influenza viruses in particular); or more abstract entities such as institutions and advisory reports.

The cultural space of science where boundary work is performed is not, Gieryn argues, settled beforehand, but "[t]he contours of science are shaped instead by the local contingencies of the moment: the adversaries then and there, the stakes, the geographically challenged audience" (Gieryn 1999, p. 5). What is striking is the emphasis Gieryn puts on the 'then and there', each new situation creating a new round for contesting credibility. Although I fully acknowledge this aspect, in the context of this thesis the 'then and there' of boundary work is not entirely an isolated event: in the course of biographies, relations between experts and their clientele develop, and scientists develop a particular skill or style in presenting themselves as credible that may be more or less constant, depending on whom you are talking about. Boundary work in this thesis thus is not solely perceived as the interplay between people 'there and then',

but always against the backdrop of earlier experiences of the scientific experts under study. The long-term perspective therefore is more than just looking at events in a longer time frame; it focuses on the learning processes of experts in performing boundary work.
What I have come to refer to as the skill or style of presenting oneself in interactions with others reflects the work of Erving Goffman (Goffman 1959). He explains that people want to give off a particular impression of themselves, and that, with this 'impression management', individuals seek to control the behaviour of others: "when an individual projects a definition of the situation and thereby makes an implicit or explicit claim to be a person of a particular kind, he automatically exerts a moral demand upon the others, obliging them to value and treat him in the manner that persons of his kind have a right to expect" (Goffman 1959, p. 13). In the case of experts and their boundary work, the presentation of oneself, and the specific type of organisation of the boundaries of science that are part of that presentation, are a means to make a claim to authority that people should feel compelled to adhere to.

1.5 Scientific expertise as boundary work in the political and public domains

Now that I have explained how the relational dimension of expertise studied here concerns the boundary work of experts, and how biographies of scientists are an instructive part of that, I will turn to a third and related aspect of this research: discussing the domains in which this boundary work is performed. In other words, how do I conceive the 'cultural space' in the context of this thesis?
As becomes clear from the opening example and the related research question, the work of the scientific experts covers both the public and political domain in a way that does not allow for making the one subordinate to the other. Besides the direct interactions with politicians and the public, the public domain often is used to influence politicians, and via advisory work to politicians the scientists perform a role in the public debates. Sometimes, it is even impossible to ascertain whom the scientific expert is addressing: politicians or the general public? The theme and method of this thesis – a biographical study of the role of scientists as policy and public experts – does not allow for the drawing of such strict boundaries or for making elements of the one domain subordinate to the other. By studying the individual scientists and their actions, experiences and lessons, both the public and the political domains are connected through the expert's interpretations and stories, and these are consequently studied. I therefore will define the empirical domain I investigate as the *boundary zone between science, politics and the public*.
This implies two things. First of all, the focus is not on the *scientific* biographies of the scientists, but primarily on their role as experts. Of course, I have studied their track records in science, their academic careers, and have gained a fair understanding of their scientific biographies. Nevertheless, I have refrained from writing a kind of scientific

biography. As the title of the thesis indicates, this is primarily about the *public* faces of science.

The second implication is that my research is relevant for two problem fields that are usually kept separate from one another. One field is devoted to the study of the science—public interaction, i.e. science communication; while the other is devoted to studying the science—policy interface, i.e. policy studies. Although elements from the one problem field may enter the other and vice versa (e.g. politicians and agenda-setting entering the science—public relation; the public and public communication as a factor in the science—politics relation), these elements often remain marginal so that the main analytic dichotomy of either the science—policy or science—public interface tends to be upheld. This thesis starts from the conviction that the one cannot be studied without the other, and that it is no coincidence that experts who are active in the public realm are active in the policy realm as well and vice versa.

From the thesis's perspective, studying the work of scientific experts in both policy and public domain is regarded as relevant and indispensable. This can be illustrated with an example on German climate scientists, and their interaction with the media and policy (Weingart, Engels, and Pansegrau 2000). In that study, the relations between the three are clearly present, for example in the way in which the scientists got a political foothold. When, more or less unintentionally, one climate scientist had qualified the potential of a 'climate catastrophe', this was picked up by the media in a way the scientist did not anticipate. Initially, the scientists were even shocked and wanted to correct this dramatic message. But besides the fact that the tide could not be reversed, it turned out that by employing this phrase, politicians started to take notice of them more than ever before. Thus, in understanding German climate science and policy, one cannot fully grasp the relationship without including the interaction between scientists and the public sphere. In looking at the role of scientists, I take a similar perspective, and observe the scientific, political and public domains in relation to one another.

In the next section I will outline how the boundaries between science and policy, and science and the public, are studied in current literature. Notably I will focus on three approaches in these two literatures: linear approaches, the development of typologies and descriptive studies.

1.5.1 Linear models

For quite some time, the relation between science and society has been perceived as a linear one, for example in the theories on science and economic growth, which were prevalent until the 1960s (Van Rijswoud 2005). And although innovation research has developed a broad array of more complex models on the relation between science and economic prosperity, in the everyday world of policymaking linear rhetoric still prevails. This tension between theory and practice can also be found in policy studies and science communication.

A well-known linear model in the study of the science–policy boundary is the technocratic view, in which it is argued that experts not just provide technical advice on different policy options, but also limit the options for democratic decision-making regarding the policy options available (Fischer 1990). Underlying this technocratic view is the claim that scientific 'facts ' can and should be separated from societal 'values'. This is referred to as the decisionist model, grounded in Weber's distinction of specialist knowledge and political practice (Weingart 1999). In Weingart's view, the two dominant linear models (the decisionist model, which assumes a clear separation of facts and values, and the technocratic view, in which the politician becomes fully dependent on the experts) do not stand the empirical test (Weingart 1999, p. 154). Notwithstanding these empirical objections to a linear depiction, the fact that linear models are out of date does not imply at all that linear models are out of use. For example, the Intergovernmental Panel on Climate Change (IPCC) is moulded on a combination of the decisionist and technocratic model, and this proved to be problematic as "its use of the linear model of expertise leads to the 'schizophrenic' position of having an awareness of the political terrain while at the same time ignoring it" (Beck 2010, p. 3).

In science communication, linear models are perhaps even more persistent. The common linear model is the deficit model and explains that, by improving the public's understanding of science, the public legitimacy of science will be reinforced (known under the heading of 'PUS'). Infamous in this respect, at least in the Anglo Saxon world, is the report of the Bodmer committee that aimed to improve the public understanding of science. This committee of the Royal Society explained that "better public understanding of science can be a major element in promoting national prosperity, in raising the quality of public and private decision-making and in enriching the life of the individual. These are nationally important long-term aims and require sustained commitment if they are to be realised. Improving the public understanding of science is an investment in the future, not a luxury to be indulged in if and when resources allow" (Bodmer 1985, p. 9). Since then PUS "has emphasized the educational and 'civilizing role' science and scientists can play in the context of the new technological competition, and has framed its task as, first of all, one of combating public hostility and resistance to new technology" (Elam and Bertilsson 2003). Improving the public's scientific literacy, by increasing the public knowledge of facts of science, of the scientific methodology or of the culture of science, is stimulated in order to enlighten the public and to reduce its resistance (Durant 1993).

Much effort has since then gone not just into enhancing the public's literacy, but also in defying the deficit model of public understanding of science. New approaches were developed, under equally appealing acronyms such as Public Engagement with Science (PES), Public Awareness of Science (PAS) and Public Participation with Science (PPS). Nevertheless, as with institutions like the IPCC, the linear view on science communication is vivid in many practical representations and perceptions of this relationship. The catching phrase "hitting the notes, but missing the music" (Wilsdon,

Wynne, and Stilgoe 2005) describes these practices as, on the one hand, presenting a particular event rhetorically as an occasion of the public's opportunity to engage with decision-making, while on the other it simply acts from a PUS mindset. A fine example of this duality is provided by Alan Irwin in a study over genetically modified foodstuffs, which demonstrates that "[d]espite the stated intention of allowing public groups to frame issues in a manner that approximates to their own experience, there is little evidence that public talk has brought about a wider cultural and institutional transformation. This point may be reinforced by the growing assessment in some European countries (such as Denmark and The Netherlands) that such exercises have become increasingly bureaucratized and practically limited" (Irwin 2006, p. 316)[4]. These limitations inhibit making the most of what publics have contributed to such policy processes.

1.5.2 Types and typologies

A second approach to science's boundaries is to describe various types or frameworks, often along two axes. This delivers four quadrants that represent the science—policy or the science—public interface. A recent typology, which has been taken up by others for its analytic merits, is the one presented by Roger A. Pielke (Pielke 2007). Based on existing literature, he describes four types of scientist: the pure scientist, the issue advocate, the science arbiter and the honest broker of policy alternatives (for illustrative purposes, I have reproduced his typology here, see figure 1).

		View of Science	
		Linear model	Stakeholder model
View of democracy	Madison	Pure Scientist	Issue Advocate
	Schattschneider	Science Arbiter	Honest Broker of Policy Alternative

Figure 1. Four idealised roles for scientists in decision-making. Reproduced from Pielke (2007), p. 14

The axes used combine a view on the role of science (linear or multistakeholder) with a view on democracy (experts picking sides or serving all parties). Thus, the pure scientist combines a linear view on science with providing expertise to the interest group favoured

[4] As a recent example from my home faculty illustrates, public events on science are said to reach "a broad target group of thousands of young people, who, half a generation or a generation from now, will constitute society's political backbone. Fascination about how the universe works could be a motivation to invest in science" (CosmicSensation 2009).

most (a Madison view of democracy). The issue advocate holds a similar view on democracy, but combines it with a stakeholder model for science. The science arbiter wants to know of neither, and finds value in a linear view on science supplemented with a view on democracy in which the expert sketches alternatives without picking sides (a Schattschneider view of democracy). Lastly, the honest broker presents policy alternatives to everybody, while holding the stakeholder view. As such, Pielke's model seems to capture a wide variety of issues and concerns regarding experts and placing them into a single and appealing typology, and has been used with success in the study of the science—policy boundaries (a fine example is Huitema and Turnhout 2009). Other authors combine Pielke's typology with problem types (Hisschemöller and Hoppe 2001) to answer specific questions like the role of problem structure in the shaping of expert roles in environmental policy (see Turnhout, Hisschemöller, and Eijsackers 2008).

Another approach in which the relations between science and policy are presented as a typology is the knowledge utilisation studies by Robert Hoppe. The two axes Hoppe has integrated from existing literature are relative primacy (is decision-making primacy given to science or to politics?) and the operational codes or mode of being for science and politics (which can converge or diverge). Based on existing literature, Hoppe then discerns four types of boundary arrangement (which he subsequently subjects to the empirical test). His model, based on earlier work a technocratic approach, assumes that operational codes converge (science and politics have a similar goal) and gives primacy to science. Converging logic with a primacy for politics leads to the engineering model, and when the primacy for politics combines with divergent logic, one meets with bureaucracy. Finally, the enlightenment model combines divergent logics with a primacy for science (see Hoppe 2005).

A typology that is related to that of Pielke describes different types of interaction between science and the public. In her dissertation, Ann Van der Auweraert integrates Public Understanding of Science, Public Awareness of Science, Public Engagement with Science and Public Participation with Science by plotting them into four quadrants (Van der Auweraert 2008). These quadrants result from an axis that explains that the participation of the public can be open or closed, and from an axis that describes the aims of communication: is it the product or the process that matters (see figure 2)?

	Type of participation	**Aim of communication**
PUS	Closed	Product
PES	Closed	Process
PAS	Open	Product
PPS	Open	Process

Figure 2: Four types of science communication. Taken in adopted form from Van der Auweraert (2008, p. 46).

The resemblance with Pielke's typology is in the axis on the open or closed process, which is comparable to having a multistakeholder or linear view on science. The value of

Van der Auweraert's typology is that it captures the dominant perceptions of the science—public relation, in such a way that it helps to understand and analyse existing practices of science communication.

Although typologies may hold value for analytic, descriptive or even prescriptive purposes, there are several problems. The first is that typologies reduce complexity into four categories based on conceptual distinctions: the question is whether axial typologies stand the empirical test if one is looking for an accurate description of specific cases. The second objection is that using typologies for analytic or descriptive purposes implies that an expert being studied fits in only one single category, that of quadrant 1, 2, 3 or 4. As studies have demonstrated, however, in one particular case more than one type of science—policy boundary arrangement may be present (Halffman and Hoppe 2005), confounding typology-like projections. In addition, typologies fail to account for a temporal dynamic, unless it is explicitly included, and this is a particular reason why a typological approach is problematic for present purposes.

1.5.3 Qualitative and interpretive studies

A third body of work on expertise in policy and public debate involves studies that aim to describe the role of scientific expertise in its full complexity. Four studies may be regarded as exemplifications of this genre: a study of American regulatory agencies by Sheila Jasanoff (Jasanoff 1990); a study of the National Academy of Sciences (NAS) by Stephen Hilgartner (Hilgartner 2000); a study of the Health Council of the Netherlands by Wiebe Bijker et al. (Bijker, Bal, and Hendriks 2009); and a collection of case studies that challenge 'science' as a neutral category in science—society interaction (Irwin and Wynne 1996). These four studies analyse the relation between science and government by studying the development of the institute concerned as a whole, notably by studying advisory reports that exemplify the institute's role. By doing so, they describe the process, strategies and performances that are needed to uphold clear boundaries between science and government, and to maintain a credible position towards society and politics.

Jasanoff's seminal study of the Environmental Protection Agency (EPA) and the Food and Drug Agency (FDA) is presented as a critique on the technocratic and democratic commentaries on the relation between science and politics. The former perspective believes that, in order to improve policymaking, one should insert more and better science in the process, whereas the democratic view is that agencies such as the EPA and the FDA fail to include a wider range of values in their decision-making. She develops this critique by studying contemporary policy controversies and to ground them in an historical setting: studies "are presented as stories with a temporal dimension corresponding to changes in national politics and scientific knowledge" (Jasanoff 1990,

p.17)[5]. Making conclusions about these stories, Jasanoff claims that technocratic assumptions about the role of experts are challenged, and that "[t]he negotiated and constructed model of scientific knowledge (…) rules out the possibility of drawing sharp boundaries between facts and values or claims and context" (Jasanoff 1990, p. 231). Rather, according to her study, what makes for good scientific advice is a model that allows for the scientific advice and the policy context to mutually shape each other, where regulatory agencies and scientific advisors are at liberty to determine where the boundaries between science and policy are, and what they mean (p. 236).

Hilgartner studies the frontstage performance (that which is visible to the outside world) and backstage performance (which is only visible to observers on the inside) of the NAS. By employing Goffman's metaphor of the dramaturgy, he argues that 'enacting' its identity as an authoritative, disinterested, scientific institute is paramount (Hilgartner 2000, p. 14). Making conclusions on what characterises the performance of the NAS, Hilgartner states that "[m]any contingencies shaped the battles over science advice, and clearly, their dynamics cannot be deterministically predicted. But (…) the narrative strengths of report, the degree of dramaturgical cooperation achieved, and the public identities of the critics play a crucial role in shaping outcomes" (Hilgartner 2000, p. 148). Earlier, Hilgartner stressed that these were factors that, due to the variety of performative contexts, could not be turned into a simple typology (p. 19).

Although Wiebe Bijker and his colleagues who studied the Health Council of the Netherlands were inspired by Hilgartner's interpretation of Goffman for studying science advice, they present an ethnographic study of science advice (Bijker, Bal, and Hendriks 2009, p. 138). By extending the analysis not only to texts, but also to committees and staff working for the Health Council, and including the reception of the report, they present the front- and backstage of science advice. This yields a paradox: on the one hand, the Health Council presents itself as the voice of science and of objectivity, while on the other hand it maintains close contact to what is happening in its neighbouring non-scientific domains (Bijker, Bal, and Hendriks 2009, p. 138). This paradox is what characterises the Health Council of the Netherlands: "it is by using the assumed differences between science and non-science, and by deploying them in a flexible way, that the [Health Council] can manifest itself as a 'scientific,' authoritative body" (Bijker, Bal, and Hendriks 2009, p. 139).

A book that does not study the science—policy but the science—public relations, and which presents a clear departure from the linear understanding of PUS, is Misunderstanding Science? edited by Alan Irwin and Brian Wynne (Irwin and Wynne 1996). Drawing on case studies of science—public interactions (such as the study of the Cumbrian sheep farmers), they present a new orientation, one that does not take science for granted and problematises the public dimension to this relation. One observation they

[5] Willem Halffman argues that we should be careful in explaining the fast dynamics in such processes with reference to slow development on a national level; see (Halffman 2005).

make is that the public should no longer be regarded as emotive and irrational (as was done during the 1990 BSE scare), but that more complex relations regarding trust in scientific expertise should be acknowledged (p. 2). Thus they take a relational stance towards the science—public relations, and "interpret both 'science' and the 'general public' as diverse, shifting and often-diverging categories. (…) [T]he general argument (…) is that we need to rethink and reconceptualise the relationships between 'science' and the 'public' if we are to make progress at the level either of understanding or practical intervention" (Irwin and Wynne 1996, p. 7). As regards the studies on the science—policy relation, Irwin and Wynne pay particular attention to the establishment and maintenance of the science—public boundaries, analysing the separation of science from non-science or everyday knowledge.

As such, these four studies are exemplary for their in-depth analyses of the boundaries of science, the way those boundaries are maintained and how science gains or looses its credibility.

1.5.4 Back to the boundary zone

These linear, typological and interpretive approaches to the science—policy or science—public relations approaches entail different degrees of complexity and hence of generality. The linear perceptions are not very complex, and for some hold general value as explanatory or prescriptive accounts, whereas the interpretative studies aim to demonstrate the heterogeneity, complexity and context-bound nature of the relations. They do not prescribe, but through their descriptive analysis highlight the varieties of possible interactions. Typologies try to capture variety in a sort of generalisable manner, and empirical work is used for finding patterns and regularities, not localities and a complexity that exceeds two dimensions.

From the outset of this research project, I planned to develop a typology of expertise, based upon the biographical method. This is not uncommon in biographical research and, by using grounded theory approaches, typologies can be developed in a valid way (see Wengraf 2000). In the course of working on this project, I found that I have greater affinity with using the biographical-narrative research for presenting in-depth studies, which do not reduce complexity into a dual axed typology. Indeed, the way I appropriate the biographical-narrative research approach (see Chapter 2) was primarily oriented at such an interpretive study, showing the contingencies of the several biographies. Thus, in studying the boundary zone between science, policy and the public, this thesis has greatest affinity with the qualitative and interpretive studies.

1.6 Reflexive modernisation, and the need for and contestation of science

After outlining my basic approach, I will now introduce the two cases that I study in this thesis, the sciences of virology and hydraulic engineering. These two cases were selected, as I explained above, first of all because they are both concerned with public security[6]. This connection with public security implies that the forms of expertise involved are both greatly demanding and highly contested. There is a societal 'demand' for expert knowledge, but at the same time the authority and credibility of science is not beyond dispute. Precisely because this concerns the well-being and safety of many people, various interested parties seems to have a stake in this; notably when expert advice results in regulation, in constraints on freedom and mobility and in more intensive surveillance, the scientific expertise that is called upon to protect the public may well become contested. Furthermore, the grounds for contestation are varied: they deal not just with the diverse logics and consequences of policy decisions; the physical appearance of an expert as such can already result in acts of contestation (Kahan et al. 2010).

In addition to the nature of issues, scientific expertise may also be contested when it is felt that the experts involved assume undue political power, resulting in a perceived technocracy (that need not exist in a material sense). In his work on technocracy, Frank Fischer describes the 'quiet revolution' of technocratic politics, and this captures not just the dual nature of expertise, but also the nature of the process through which technocratic expertise is enacted. "Unlike traditional [democratic] political activity, [technocratic politics] displays neither leaders nor barricades. Instead, it moves quietly – even facelessly at times – through the administrative hierarchies of political and economic systems. (…) Politicians still choose one policy option over another, but it is increasingly the experts who shape the deliberative framework within which they much choose" (Fischer 1990, pp. 19-20). This so-called quiet revolution of technical experts captures the essence of the problem. In science and technology studies, this paradox has been described on many occasions, for example on the level of institutions that provide scientific advice, or in particular debates over technologies such as nuclear energy. In the latter case, Dorothy Nelkin observes that "[t]he complexity of public decisions seems to require highly specialized and esoteric knowledge, and those who control this knowledge have considerable power. Yet democratic ideology suggests that people must be able to influence policy decisions that affect their lives" (Nelkin 1975, p. 39).

In the wake of recent controversies over climate science, virology and various other contested items, it is tempting to summarise the public's attitude as fairly negative and critical of technocratic science. Interestingly enough, public surveys such as the

[6] Other, comparable areas that would have been interesting to study from this perspective would have been digital security, nuclear physics and perhaps even criminal law. I decided, however, to focus on a limited number of cases that could be studied in depth.

Eurobarometer indicate that public support for science remains guaranteed. The 2010 Science and Technology Survey, for example, demonstrates that 47% of the Dutch population believes that decisions about science and technology should be made by scientists, engineers and politicians (EU: 36%), and according to 73% of the Dutch (EU: 63%), scientists working in state-run knowledge institutions are best qualified to explain scientific developments (Eurobarometer June 2010). Boldly put, technocracy seems to be an undisputed and perhaps even a desired arrangement. However, the Eurobarometer provides a general image, and as in specific cases where the decision of scientists tends to invade the private sphere, the credibility of scientific experts has come to be disputed. This dual feature of the public opinion has for long been acknowledged, and "we should not be puzzled by the ordinary fact that 'science' (in general) enjoys high public esteem and interest in surveys yet suffers apathy and worse in many *specific* encounters" (Wynne 1991, p. 112 (emphasis in original)).

If we take a somewhat broader perspective on this issue, there are three themes regarding the role of sciences in society that merit attention in introducing the two cases: their dual role in preventing and enhancing society's vulnerability; the fact that society's challenges shape the core of these sciences; and the challenge for experts in these sciences to address complex, unprecedented problems on the basis of past experience and limited expertise.

All three themes are represented in both virology and engineering. First of all, they exemplify the dual nature of the role of science in society: on the one hand, the sciences involved address or even resolve today's problems, but at the same time they are contested for being the source of new problems through adverse side-effects. Thus we see, for example, that the technical possibility of air travel has contributed to the spread of viral infections (that is how H1N1 arrived in the Netherlands), that vaccines can also be the bad guys, not just the heroes, of health care and that the possibility of constructing water works has created effects that can potentially be disastrous: channelled rivers that cannot cope with peak discharges, citizens who live below sea level at the threat of the water, stagnant water reservoirs that are suffocated by pollution. Scientific advances have not just created new possibilities, but also new risks. This feature of modern science is captured in Ulrich Beck's well-known thesis that modernity has come to face the consequences of its own endeavour, a situation referred to as *reflexive modernisation* and defined as a "systematic way of dealing with hazards and insecurities induced and introduced by modernization itself" (Beck 1992, p. 21).

Throughout his work Beck describes the process that led to new risks that belong to modernity. Over the course of centuries, *natural hazards* have given way to *manufactured risks*. This transition is marked by three developments. The first is the shift from geographically and temporally contained hazards to risks as open phenomena, phenomena that have no geographical or temporal limitations and no solitary sources. Second, as open phenomena, risks are potentially catastrophic by definition. Whereas in earlier centuries viral outbreaks or floods were contained to a specific area, present viral

agents or climate-change-related disasters have no boundaries. In addition, climate change has presented new challenges for flood protection around the globe and, with the effects of climate change becoming more apparent in the coming centuries, it may assume catastrophic proportions. Finally, and this is where Beck's analysis comes closer to the concrete role of science institutions, the unmanageable quality of manufactured risks has had an adverse impact on the social institutions charged with maintaining health and security. The scope and prevalence of risks cannot be met easily by institutions that are intended to prevent them; the regulatory power of the nation state seems insufficient (Mythen 2004). These developments are clearly present in the present-day focus events in virology and water engineering. For this thesis the last feature, the institutional shortcomings, is most pertinent: it implies that scientific experts have to resolve the consequences of reflexive modernisation, while the risks themselves a priori transcend the problem-solving capabilities of normal science.

Wiebe Bijker relates Beck's understanding of the risk society to his concept of the vulnerable technological culture. In contrast to the pessimistic Beck, Bijker presents science and technology not only as the cause of problems, but also as the source for innovation and renewal. He describes current technological society in terms of its vulnerability: "[t]he vulnerability of a technical system describes the weakness of that system's capacity to maintain functional integrity" (Bijker 2006, p. 58), while this vulnerability is "at the same time an inevitable consequence of, and a prerequisite for, the advanced technological society we live in" (Bijker 2006, p. 53). This notion of vulnerability, in part created by science and the project of modernisation, is clearly present in the two fields of science that are studied in this thesis. The key characteristic that marks these two cases is their intense concern for public safety. In Bijker's terminology, both present-day virology and water engineering are in service of maintaining and protecting society's functional integrity. As the following chapters will demonstrate, fulfilling this daunting task entails more than concrete measures such as stockpiling antiviral drugs and constructing dykes and dams, aimed at restoring the functional integrity. Maintaining public and political awareness of these threats, and safeguarding political and public measures and investments required to prevent them from happening, is equally important. This orientation at maintaining the functional orientation of society implies that the science is produced in close interaction with the needs and interests of society. The task of science is tied to the political and public interpretations and framings of safety and security, and to their outlook on how the functional integrity of society is to be maintained[7].

[7] The political framing of security has recently changed in the Netherlands. In the last year or so, the political responsibility shifted from the Ministry of the Interior to the Ministry of Justice. At the end of July 2011, I received a letter from the Ministry of Justice, which informed me that responsibility for safety had been integrated into the functions of the National Coordinator for Counterterrorism. According to the letter, that makes sense because "[b]oth domains are aimed at protecting our crucial interests in order to prevent societal dislocation" (Akkerboom 29 July

Not surprisingly, in their public task to maintain functional integrity, virology and water engineering have not only changed in terms of their external, social role, but also in terms of their internal dynamics. This is a second important feature that marks these cases. The emergence of new infectious agents (starting with HIV/AIDS[8] and Bovine Spongiform Encephalopathy (BSE) in the 1980s, and Avian Influenza in the 1990s) and the floods in the Dutch Delta in 1953 and 1993/1995 were events that required the production of new types of scientific and practical knowledge. The concern with public safety thus went to the core of these scientific fields. Gibbons and others have contrasted this type of Mode-2 science to Mode-1 science. In Mode-2 science, knowledge is produced in the context of application, taking over its problem structure as the leading epistemological orientation. It thus exceeds traditional disciplinary boundaries of science, and is also more heterogeneous in its organisation. Likewise, Mode-2 science is more reflexive on its consequences in society, and hence is judged not just by its scientific achievements, but also by its societal consequences (Gibbons et al. 1994). In Mode-2 science, culture and science are in a process of mutual appropriations, in which the boundaries between the two have become more open and subject to change (Nowotny, Scott, and Gibbons 2001).

We can discern this shift from Mode-1 to Mode-2 science in both fields of science under investigation here. As professor emeritus in virology Jan van der Noordaa explained to me, the 1970s dealt mainly with viral oncology, a fundamental field at great distance from the active protection of public health. That changed entirely with HIV; as director of the virology department at the Academic Medical Centre in Amsterdam, he felt there was no alternative but to take up the daunting task of finding out what caused the unknown and fatal illnesses among Amsterdam homosexuals (Jan van der Noordaa 7 May 2008; Mooij 2004). This was the start of a novel societal contract between virology and society, reinforced by subsequent outbreaks of new viruses and other infectious agents, such as BSE. In water engineering, research at Delft Hydraulics was oriented at producing knowledge that made the construction of the Delta Works possible (Bijker 2002). The Delta Works created a new coalition between science, engineering firms and Rijkswaterstaat, the executive organisation responsible for water management, with the construction of the Oosterschelde storm surge barrier (1976-1986) as the resulting masterpiece (Van der Ham 1999; Bijker 2002). This implies that, since then, the science of hydraulic engineering has been oriented explicitly, and with increasing intensity, vigour and concerted action, at the task of protecting the country's safety against flooding.

2011). This raises the question of whether the public role for scientists will change due to this new, counterterrorism-oriented framing of the safety issue.

[8] Human Immunodeficiency Virus/Acquired Immunodeficiency Syndrome; the virus causes the syndrome**.** The first cases were reported in 1981.

The third feature that marks these two cases is the manner in which the public task of these sciences created a stage for the scientists to build their identity as experts. The public task for virology and engineering to enhance the functional integrity of society has also resulted in a societal role for scientists to translate this scientific knowledge and expertise into policy recommendations and communiqués to the public. Helga Nowotny has identified, as have others (e.g. Collins and Evans 2002), the problems this creates. The main challenge is that the knowledge of experts tends to lag behind the type of problems that emerge. A gap between *available* expertise and *required* expertise emerges, and it is up to the scientific experts to bridge that gap. In addition to the general shift of Mode-1 to Mode-2, the demand for expertise is audience-driven, time often is limited and the concreteness of the questions exceeds the competence of the experts: the problems they have to tackle transgress their expertise (Nowotny 2000). These circumstances frame the narratives for expertise, as "[t]he link to action and the possible consequences for policy recommendations frame the questions as well as the answers. In their narratives, experts have to act not only as if they knew the answers, but also the conditions under which the answers will fit in the future. Even if experts are not always conscious of this fact, it pervades their considerations of what is considered good scientific expertise" (Nowotny 2000, p. 15). This new task resonates with the thesis of post-normal science, in which uncertainties in policy topics of risk and the environment cannot be resolved with normal, Kuhnian science, and they have become a central concern for present-day science and science-based policymaking: "On the basis of such uncertain inputs, decisions must be made, under conditions of some urgency. Therefore policy cannot proceed on the basis of factual predictions, but only on policy forecasts" (Funtowicz and Ravetz 1993, p. 742). In the field of virology, the experts I have studied were pioneers in assuming this new task, as they were the first generation of scientists in their field to encounter the renewed importance of protecting the public against infectious diseases. The start of their careers coincided with the rise of this new public task for virology. In contrast, the engineers who I have studied were a generation of engineers who followed in the footsteps of the great 'water sorcerers', and hence were educated by the generation before them in handling such challenges and uncertainties. Of course, problems in water engineering have changed, and thus they had to develop a new approach to handle those problems.

1.7 In conclusion: summary and outline

This thesis addresses the question how the role of scientific expertise in policy and public debate evolves in a society that both needs and challenges this expertise. As I explained above, the role of scientific experts is conceptualised as a relational concept, so that the boundary work of scientists is an inherent part of their activities as an expert. The role and evolution of scientific expertise can be studied from various angles, and I have

argued that I will present a qualitative-interpretive study of the boundary zone of science, policy and public debate, using a biographical-narrative approach. This approach foregrounds the development of individual experts and their interpretation of events. An important, if not crucial, characteristic of the two cases that I study is their marked concern with public security, their aim to safeguard the functional integrity of society. This affects not just the type of knowledge these scientists produce, but also their role in public realms. In a public context, they are both needed for maintaining the functional integrity and contested when the approach they choose is at odds with societal expectations.

Throughout the past few years of talking, presenting and writing about the biographical-narrative approach and the studies of experts presented in Chapters 3 to 5, I have become familiar with two main responses among my audiences, whether departmental colleagues, conference participants or reviewers: "the studies are interesting … but can you explain more about the methodology?" Some conceptual and methodological pitfalls were identified in my work. However, from my point of view, what may appear to some as bear traps are basically epistemological characteristics of this type of study. That said, explaining to the reader the methodological specificities of this approach is required for understanding the empirical chapters and the conclusions. Thus, I present an elaborate discussion of the methodology and conceptual foundation in Chapter 2; however, as they were written as journal articles, Chapters 3 to 5 also contain methodological sections.

Subsequently, in Chapter 3, I will present the first case study: my analysis of the identity work of three virologists, understood as the way in which an expert's self-understanding shaped his interactions with policy and public debate. It tells the story of how they began their careers as public scientists in a time when new viral agents dramatically changed the scientific, political and public interpretations of infectious diseases. Combating viral agents became the key element of their scientific, political and public work. This study of virology was the first case study of my research project, and therefore provided the first insights in the role of experts. Only a few weeks after submitting the paper, two of the three research subjects, Ab Osterhaus and Roel Coutinho, were at the press conference mentioned at the beginning of this Introduction. Except for some minor references, the H1N1 pandemic, and the whole circus that resulted, 'my' experts featuring in the ring, could not be discussed extensively in this thesis[9]. Rather, the prehistory of the H1N1 crisis is unravelled, although I published short commentaries on the H1N1 case as well.

[9] Starting with this case, which was published in *Minerva*, proved to be a choice that had a greater impact than I anticipated. The Swine Flu pandemic followed shortly after completing the study, and the virology case translated itself in some real time analysis of these experts' roles in the media, including the organisation of a public debate with Osterhaus and Coutinho in Nijmegen. I would like to thank the Centre for Society and Genomics (Frans van Dam and Gijs van der Starre in particular) and Koen Dortmans for getting this organised, and Roel Coutinho and Ab Osterhaus for their participation.

The fourth chapter presents a case study similar to Chapter 3, but centres on four civil engineers, and the way they have developed their public role in a time frame that challenged the hegemony of the traditional engineer. Large engineering works in the context of flood protection had compromised ecological values, and an ecological approach to engineering and flood protection manifested itself. Climate change added a further challenge. In the biographical studies, I will describe how these engineers handled the balancing of engineering, ecology and climate change, and how this interacted with their political and public roles.

Although these two chapters of expert narratives can be read as stand-alone analyses, they also incited me to analyse the identity work of the experts involved in a comparative manner. Thus, as in both cases the role of crises proved to be an eminent feature, Chapter 5 presents an in-depth comparison of how these experts interacted with major crisis events in their domains, and used them for agenda-setting and identity-building purposes. By drawing on research material and the narratives that were collected for Chapters 3 and 4, I study the differences and similarities in agenda-setting between the two cases, involving the seven experts. For virology, the dual outbreaks of SARS[10] and Avian Influenza in 2003 constituted events that not only triggered scientific and public health responses, but were used by scientists to raise public and political awareness of what they regarded as the deplorable state of infectious disease control. A similar role was played by Hurricane Katrina (August 2005) for hydraulic engineers: Katrina and the flooding of New Orleans provided a 1:1 scale model of what a failure of the primary dyke system would entail. Dutch politicians seemed reluctant to draw the comparison, and the scientists therefore raised the red flag.

After the three empirical studies that focus on individual scientists, the final empirical study (Chapter 6) inserts 'contrast fluid' in this thesis by taking a closely related yet markedly different perspective of the role of scientific expertise. Rather than the work of individual scientists, I will study two scientific committees that have demonstrated to be of great importance for understanding the social and political role of contemporary scientific advice: the Health Council's committee on vaccination against cervical cancer, and the Delta Committee for sustainable coastal development. Both issued their reports in 2008, and in Chapter 6 I study the trajectories of these reports. This provides interesting insights in how both the development and presentation of expert advice, and the uptake of that advice, is shaped through social interactions.

In the conclusion of this thesis (Chapter 7), I will analyse the findings of the empirical chapters, and present an integrated version of my results, clustered around six themes: prominent aspects of what I refer to as 'identity work'. Indeed, I came to see the 'identity work' performed by experts as an overarching theme, a key element of what it means to be an expert. Finally, I indicate how the results of my analysis are highly relevant for understanding, assessing and enhancing the public and political role of scientific experts.

[10] Severe Acute Respiratory Syndrome.

Chapter 2: The biographical-narrative approach: conceptual foundations and methodological procedures

2.1 Introduction

In the introduction I explained how the idea to study experts and expertise in policy and public debate is linked with a specific research approach: an analysis of exemplary biographies of public experts. The purpose of this chapter is to outline the conceptual grounds and methodological design of my biographical-narrative approach, and the way I have appropriated this approach to fit the purposes of my thesis. The biographical-narrative approach in my research has resulted in what I refer to as expert narratives: storied accounts, on the basis of biographical material and interviews, as a manner to reflect on the role of experts and in their interactions with policy and society.

Although the Chapters 3, 4 and 5 contain concise discussions of the method used, this chapter will provide a more elaborate explanation of the biographical-narrative approach. In sections 2 and 3 I will provide a brief historical perspective on biographical and narrative approach, and discuss the conceptual foundations that I have used here. Section 4 explains the specificities of elite-expert interviewing, section 5 how I have put this approach to practice. Beyond the purpose of explaining data collection and data analysis, these last two sections are to explain what the role of myself, as a researcher, has been in constructing the expert narratives.

2.2 Making ways for contextualized biographies: bridging the gap between individual and structure

The biographical-narrative approach, as I have come to use it in this thesis, has a distinct place and history in the humanities and social sciences. Although nowadays it is settled well within fields like sociology, history and psychology, initially it had to compete with structuralist approaches that dominated between the 1960s and 1980s. From the point of view of hard core structuralist thinking, the individual as such was not regarded as a meaningful unit of analysis. Plummer (2001) has framed this as the problem of two cultures: “from most angles it does seem that the two cultures have grown irrevocably

apart: facts, generalizations and abstractions have become divorced from the imaginative, the inspirational and the idiographic, and – for all its critical pondering on 'positivism' – it is clear for all to see the path by which sociology has been most moulded" (Plummer 2001, p. 8).

The sociology of science is a case in point. Founding father of the sociology of science, Robert K. Merton, had started his academic career with the study of collective biographies, "[b]ut his subsequent work, and that of the sociological programme he initiated, demoted any close study of individual scientists in favour of an analysis of the social norms and conventions governing the scientific community" (Shortland and Yeo 1996, p. 5). The precise history of the Matthew effect in science (Merton 1996 [1988]) is a clear illustration of this transition in the work and school of Merton. Starting with Harriet Zuckerman's study of Nobel prize laureates, which had narrative interviews on individual life stories as the main empirical basis (Zuckerman 1977), this was reworked by Merton into a general thesis of how the reward system governs science: it was a move from the biographical to the structural view on credibility in science. The work of Thomas Kuhn (Kuhn 1996 [1962]) and Michel Foucault (Foucault 1970 [1966]) are further examples of how in structuralist approaches the individual became eclipsed by a focus on high levels of aggregations (such as groups, institutes and structures).

An early attempt to overcome this dichotomy between individual and structure comes from C. Wright Mills in 1959 (Mills 2005 [1959]) in his plea for coupling biography, history and structure in the social sciences. The sociology of his time and age had abandoned these three 'coordination points' without which "the social scientist cannot adequately state the kinds of problems that ought now to be the orienting of his studies" (Mills 2005 [1959], p. 5). Mills is more explicit about the way the biographical dimension relates to the other two coordination points, and thereby defies the individual-structure dichotomy. "Whatever else he may be, man is a social and a historical actor who must be understood, of at all, in close and intricate interplay with social and historical structures" (Mills 2005 [1959], p. 18).

On the European continent Norbert Elias also advanced sociology in the direction of such a dynamic view of society without clear boundaries between the individual and structure. Core notion in Elias' figurative sociology is a meaning of society which is the result of ongoing configuration processes between the actions of individuals. This does not mean that all sociology is behavioural science; through these actions, power and dependency creates 'chains of interdependence between individual actors' (Elias 1972, p. 147).

The balance between structuralism and the different schools that defied a dichotomy between individual and structure started to shift in the 1980s with the re-emergence of the biographical approach. The popularizing of the postmodern theory from the late 1970s onwards and the narrative turn during the 1980s implied an increasing interest in life story research and oral history, and this interest manifested itself in psychology,

sociology, anthropology, history, law and economics (Plummer 2001, p. 11; Wengraf, Chamberlayne, and Bornat 2002 pp. 247-252). Wengraf et al. identify three debates in the 1980s that stimulated the biographical approach in the human and social sciences. The debate over memory and validity stimulated researchers to move away from a 'positivist ideal' towards narrative approaches; as memories and narrations are subjective, that subjective meaning is to be accessed through oral history. The second debate was over feminism, and on the power relations that were present in the oral history and biographical work. The turn to reflexivity inspired a third debate in the biographical approach: the interview situation, as it was uncovered that the process of interviewing and being interviewed, "resulted in the exposure of often quite raw emotions, misconceptions, and even traumatic remembering, bringing oral history and biographical work close to an identification with therapeutic processes, far distant from their originating antecedents" (Wengraf, Chamberlayne, and Bornat 2002, p. 250). Even the modest form, that of introducing a historical approach in the social sciences can result in 'biographizing' social science: "Biographical social researchers in the 1990s were increasingly attempting to describe people as historically formed actors whose biographies are necessary to render fully intelligible their historical action in context – its conditions, meanings and outcomes, whether such conditions, meanings and outcomes be conscious or unconscious" (Wengraf, Chamberlayne, and Bornat 2002, p. 251).

As in social science in general, an interest in the relations between individual and structure has been gaining ground in areas of science studies. After the structuralist era of Merton, Kuhn and Foucault, the history and sociology of science became more open to symbolic interactionism at the close of the 1970s. In the history of science an interest in contextualized biographies increased (Shortland and Yeo 1996; Huisman, Santing, and Theunissen ed. 2000), taking an interest in the 'life of a scientist as the unit of analysis' (Porter 2006; Nye 2006; Terrall 2006).

Still, although these examples from the history of science reflected an increased interest in the biography or individual as the unit of analysis, the focus was not yet on narratives or life story approaches. Yet, from the late 1980s onwards, the narrative-biographical approach begins to proliferate. We find explicit and implicit examples of this approach in anthropological laboratory studies (Traweek 1988), feminist studies of science (Abir-Am and Outram 1987), the sociology of science (Zuckerman 1977; Kissmann 2007), and the epistemology of science (Zwart 2008). In addition, various scholars have been interested in studying how individual scientists handle interactions at the science-policy and the science-public interface. Ethnographic studies of policy processes include the activities of individual policy boundary workers (e.g. Bijker, Bal, and Hendriks 2009), and the analytic level of the individuals is chosen more and more often in policy or science communication studies (Waterton 2005; Davies 2008; Hoppe 2009).

The biographical-narrative method used here combines the study of socio-historical sources with narrative analysis to construct 'expert narratives'. In the following section, I

will describe how this core idea evolved into a systematic approach. Subsequently, I will indicate the procedures for collection and analysis of narrative material (sections 4 and 5).

2.3 Conceptual foundations

2.3.1 Meaning and action in symbolic interactionism

A first conceptual foundation to the biographical-narrative approach is symbolic interactionism (Blumer 1969). Although in the following two sections the elements of narrativity, identity and meaning are presented as core elements in this study, the glue between them is coming from this tradition in sociology, and has been an source of inspiration for much of present-day's sociology. Although symbolic interactionism is widespread and comes in many forms and shapes, in essence the different strands reflect a common core (Plummer 2000). Here I will rely on the perspective presented by one of the founding father's, Herbert Blumer.

In Blumer's account of symbolic interactionism three premises are central to its perspective and methodology. Although in isolation they may seem commonplace, their combination leads to a distinct understanding of the social world, and of the way to study it. Firstly, "human beings act towards things on the basis of the meanings that the things have for them"; secondly "meaning of such things is derived from, or arises out of, the social interaction that one has with one's fellows"; finally, "these meanings are handled in, and modified through, an interpretative process used by the person in dealing with the things he encounters" (Blumer 1969, p. 2). For this thesis, these premises further explain some of the method's conceptual underpinnings.

The perspective that Blumer thus presented is that 'meaning', and the attribution of meaning, is central to understanding society. It shapes the individual self, the social world that is made up of such individuals, and the objects that inhabit that world. The source of meaning is not something intrinsic to people or things, but arises out of interactions and interpretations of those interactions. In return, actions of people are directed primarily by those meanings, and society as a whole then is a result of the joint actions and interpretations. In this interpretative process, individuals not merely interpret their surroundings and one another, but also themselves, making themselves object of their own actions. This symbolic interactionist understanding not just points to the importance of how people interpret the world and act upon it, but also to the building up of networks, institutions or similar kinds of structures. Although this is just a very brief exploration of symbolic interactionism, it holds valuable premises that add to the following conceptual underpinnings. It not just defies the separation between individual and structure, but also explains why the individual level of understanding remains important (see also Plummer 2000, p. 208).

An observation made by Blumer that is particularly important for this thesis is that "any instance of joint action, whether newly formed or long established, has necessarily arisen out of a background of previous actions of the participants. A new kind of joint action never comes into existence apart from such a background" (Blumer 1969, p. 20). The study of interaction and interpretation thus cannot go without including the historical dimension. One could argue that, whereas symbolic interactionism tried to keep the individual and the social level together as two closely interwoven dimensions of the human world, the individual level tended to be eclipsed by the structuralist approaches that became dominant in the 1970s, only to be rediscovered and re-appreciated by more recent modes of research.

The perspective of boundary work, discussed in the Introduction, is grounded in symbolic interactionism: boundaries get drawn on each encounter between actors, and that this boundary drawing relies not on essentialist or philosophical boundaries between science and non-science, but on the work of actors in a particular situation (Gieryn 1995, 1999; Halffman 2003). The role of experts, as boundary workers, thus becomes related to, one might even say dependent on, the context in which they acted as experts.

2.3.2 Narrativity & Identity

A second conceptual ground is the role of narrativity. In the 1980s, a new boost was given to the narrative approach by the emergence of narrative psychology, a field of research devoted to studying the role of narrativity in shaping identities. It contends that identity and self image are at least partly constructed and reproduced through the telling of narratives or life stories. Some protagonists of this movement for example claim that "the very idea of human identity – perhaps we can even say, the very possibility of human identity – is tied to the very notion of narrative and narrativity" (Brockmeier and Carbaugh 2001 p. 15). In the words of Gullestad, "[h]uman beings use conventional narrative means to give shape to their experiences, and their experiences are to a certain extent constituted by the way they are told. Narratives are not only distilled from life, they also flow back into life" (Gullestad 1996, p. 8). In a narrative understanding the object of study is regarded "as an unfolding story, rather than a fixed entity in time and space" (Hayhoe 2007, p. 8). At the same time, an identity is shaped by the interactions and interpretations of others (Bruner 2001, p. 34), as a narrative landscape in which the individual situates himself (Zwart 1991). This means that narratives shape and frame experiences and that, in this process of narrative interpretation, identities are formed. In this study, I do not wish to make claims on the extent to which an identity is constructed by narratives and narrativity, but rather take it as a guiding principle in the construction of identities, one that is relevant to the experts studied here. Interviews should not be regarded as alien to these processes, but as a particular site where the development of identity (and the performativity of that identity) takes place, where the 'identity work' is done.

In studying the role of experts, I take this principle to be relevant in two respects. First of all, identity (and this goes for the building of an identity as an expert as well) is the result of processes of self-interpretation. In understanding the role of experts, we need to understand how they reflect on earlier experiences relevant to policy and public debate, and how they embed those experiences in their 'identity work' as experts. How they talk about themselves, about their expert identity, and how they narrate their life story as an expert, is an important entry point for understanding their interpretations of and responses to the situations and challenges they face. As Bruner (2001) puts it, "[n]arratives (…) should centre upon people and their intentional states: their desires, beliefs, and so on; and they should focus on how these intentional states led to certain kinds of activities" (Bruner 2001, p. 28). These intentional states then depict not just how individuals give meaning to situations they encounter, but also how they intend to interact with them. As identities are confirmed or revised in the act of narrating, these narratives are of relevance in understanding why experts act as they do.

Yet, narrativity is also relevant in a second manner. Being a public expert also means that one's identity or self image is constructed through a specific kind of story telling. The scientists studied here are public figures, who have been interviewed by journalists and academics on numerous occasions, or who have a track record of telling stories about themselves, their careers, and achievements in public. These iterative moments of public self narration not only provide the audience with a view of the expert's identity, they also create a specific narrative history. They should count as instances of identity work, fixating some aspects (acting as a narrative frame, in which the same events are repeated again and again until they become synonym with one's identity), or revising other aspects of the expert's identity. The public instances of narrative performances are to be seen as crafting the 'expert identity'.

2.3.3 Three levels of biographical meaning

In understanding the methodological value of studying biographies and using narratives as an entry-point, it is important to discern three levels at which biographies can be located. Identifying and discerning these three levels is also important when it comes to countering a criticism that is often raised vis-à-vis a biographical-narrative approach, namely that the experts' stories are 'taken for granted' as it were, and that a critical distance towards the narratives of the interviewees is lacking. As to the latter type of critique, it is important to point out that my purpose was to present the self image of the interviewee, as it was actually constructed by the interviewee in the context of the interview. It is not my intention to test the validity of the narrative identity through a comparison with 'the facts', but to use factual information to given context to the expert narratives, if that context is implicated in their narratives.

The first level is the level of the actual events as experienced by the experts involved, the so-called *lived story* (Rosenthal 2005, 27; Wengraf 2000). Subsequently the experts

themselves will reflect on these events retrospectively, and from a certain distance. This may take place in the interview setting, but it is fair to say that any act of retelling past events can be regarded as a post-hoc reflection. This level can be referred to as the *told story*. Finally, as a result of the interviewees post hoc reflections, the interactions between interviewee and researcher, and the construction of experts narratives according to the scheme and perspective presented here, the *written story* as a third level of biographical meaning emerges (Littig 2008, par. 17). Thus, the written story, that which is represented here in this thesis, builds on the two previous levels. Important to note is that this written story, through these two processes of interpretation, is not a *re*construction of past events, but rather the product of a process of constructing expert narratives based on narrative interviews and other data. In addition, the study is not solely dependent on these individual meanings. Additional resources, such as policy documents, news paper archives, and secondary literature are used to provide a context or backdrop for individual stories, providing factual background information on specific events, such as an viral outbreaks or political decisions regarding water policy. The thesis thus presents different interpretations of the role of the expert, but with the experts' own narrative interpretations as the focus point.

One important question then is how the written level of the biography relates to the actual, lived story. Some authors like Gullestad (Gullestad 1996), Wengraf et al. (Wengraf, Chamberlayne, and Bornat 2002) and Rosenthal (Rosenthal 2005), and I basically agree with them, see the told and written stories not as distortions of the lived story, but as dimensions of the narrative process, of identity formation in their own right. They contain important information as to the way in which the individuals position themselves at that particular moment in time (see Blumer above). However, in contrast to these authors, Peneff and others rather seems to opt for a clear separation between the 'imaginative' (told and written) and the 'objective' (lived) level. In this view, life stories are myths of the actual lives, myths in which we enhance our self image (Peneff 1990). In this thesis these 'myths' are regarded as highly relevant for understanding the narrative self-understandings of the experts studied here.

2.3.4 Constructing expert narratives

My approach to individuals and their identities is reflected in the way I integrated information from various sources (interviews, media coverage, policy documents) into expert narratives. The purpose of the integration is to address the wealth of narrative and other material, and to construct expert narratives in a way that follows the conceptual framework outlined above. In constructing expert narratives, I make use of Donald Polkinghorne's notion of 'narrative analysis' (Polkinghorne 2005).

The oral narratives, supplemented, contrasted, and contextualized with the help additional sources, are integrated or 'textualized' as expert narratives, depicting the individual's biography in quickly evolving public and policy contexts. In narrative

analysis, as understood by Donald Polkinghorne, "researchers collect descriptions of events and happenings and synthesize or configure them by means of a plot into a story or stories" (Polkinghorne 2005, p. 80). A plot "is the narrative structure through which people understand and describe the relationship among the events and choices of their lives" (Polkinghorne 2005, p. 73) The plots in experts narratives constitute the theme of this thesis. They represent possible story-lines in the development of researchers into policy and/or public experts. The configuration of data according to a plot into a coherent whole is a means of explicating an intrinsically meaningful form (Polkinghorne 2005, p. 93). 'Intrinsically' here means that throughout the research process I have been searching for what seemed to be meaningful narrative frameworks from the expert's perspectives, and this is why I have come to appreciate the 'told story' and all its so-called post-hoc 'distortions'. A critical question may be whether this plot, highlighted by me as a researcher, also is a plot with which the interviewees can identify themselves. As will become clear in the course of this study, I have selected interviewees for whom 'being an expert' indeed has an important meaning and functions as an important plot or story-line in their biographies, and as a significant dimension of their professional identity as a 'public expert'.

In integrating the concepts discussed above into a heuristic means to construction expert narratives and conducting interviews, two preliminary steps or operationalisations are made. First of all, I have identified types of narrative elements based on the conceptual understanding, which I use to order the empirical material and to construct the expert narratives. These narrative elements are the following:

> *Context & issue*: the object of interpretation;
> *Assessment*: the interpretation of this issue;
> *(Inter)actions & Intervention* of individuals in response to this issues and their assessment thereof;
> *Consequences* or effects of their interactions and interventions;
> *Reflection and learning* upon the actions, the context in which was acted, and the effects of the action.

The second step is directed towards discerning a coherent linking of events (horizontal linkage in Blumer's terms (Blumer 1969, p. 20), so that the outcomes of specific interactive events constitute the starting point for future interactions, (Blumer 1969, p. 20). This can be depicted as a circular or iterative process (see figure 3).

Consequently, this is not just a circle, a process that concludes with the same elements with which it begun, so ideally the process should be depicted as a three-dimensional spiral curve. In analyzing the data, I used these narrative elements as codes for analysing the data. By probing the material for not just these codes, but also for their linkages, the various sources were integrated according to this scheme. The coding relevant data for the expert narratives, and the integration of that data into the expert narratives thus occurs in the same process.

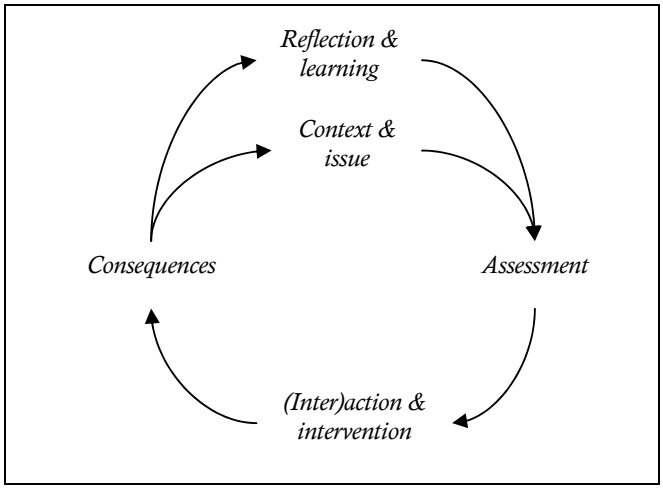

Figure 3: Narrative elements, depicted as a curve, as a heuristic for narrative constructions.

2.4 Interviewing elite experts

Now that the conceptual framework for the construction of expert narratives has been outlined, I will turn to more practical aspects of the biographical-narrative approach. Before describing the concrete research procedures, it is important to outline more precisely the category of respondents under study here. All respondents were regarded (by themselves as well as by others) as scientific experts. Moreover, they were seen (by themselves and by others) as belonging to the elite group of their field. Thus, interviewing them is a form of elite interviewing to the second degree: key players within a field of acknowledged experts. In the literature, elite-expert narrative interviewing is a specific type of interviewing, having specific methodological and practical challenges that differ from interviews with non-elites (Dexter 2006; Littig 2008). Lewis Dexter, an important author in regarding elite interviewing, mentions three ways in which the elite respondent should be given more room in the interviewing than usual, required for making the interview to succeed: stressing the interviewees definition of the situation, letting them structure the account of the situation and letting the interviewee determine what is relevant and what is not (Dexter 2006, p. 18). Building forth on Dexter, I will discuss four aspects that I found to be of importance in expert interviewing: accessibility, power relations, expert visibility and interview experience. Besides describing them in abstract terms, I will also discuss how they shaped the interactions between the respondents and myself.

The first aspect that marks this type interviewing is *accessibility*. Getting initial access to the respondent (sometimes having to bypass the secretary or personal assistant), and then

convincing them that their participation in the project matters was a first hurdle. I contacted them through e-mail, and next to explaining the nature of the project and my sincere interest in their experiences as an expert, the email was to do three things: pointing out that their experiences as an expert were unique and valuable for academic purposes; convincing them that I was informed on the topic, doing this project with right credentials; and hinting that fellow-scientists would participate as well, assuming that this would trigger them not to opt out too easily. Then there was the aspect of time: would these people, generally working under significant time pressure, allow me to take the time requested, usually 1,5 hours? More often than not, these circumstances also affected the interview setting of such, for example when the interview starting much later than agreed upon. These strains resulted in improvisations, such as prioritisations, trying to cover as much events as possible and questioning with sufficient depth even under non-optimal circumstances. These constraints were typical for the initial stages of the process. Gradually, the involvement and willingness of the interviewees to participate would increase.

Closely connected with this is the second aspect that characterizes elite-expert interviewing: the *power relations* that shape the interview setting. I was aware that I was 'merely' a PhD-researcher interviewing high-ranking professors, and that the interview would not be about the science they did, but about themselves, their lives, experiences and reflections. I addressed this difference in hierarchy in a number of ways. First of all by partially complying with it (it took a while for me to address them by their first name, rather than as 'dear professor'), by allowing them to exercise and exhibit their power and adapting myself somewhat to the interviewee's understanding of the situation and the content. Secondly. I also tried to reduce the power difference by investing in building a 'rapport', by presenting myself as a sincere, credible and informed researcher (having spoken to the right people, having prepared for the interview), and by addressing the fact that the interviewee and myself were part of one and the same academic community with related interests and values.

At some points during the interviews, I experienced some of the power differences to play a role. A clear example is when one interviewee positioned me in the role of his PhD candidate, with him as my supervisor directing me on the research process, and the fact that we needed to meet again so that we could engage in a scientific debate. In this interaction, which took place at the end of the first interview, this scientists thus not just defined the type of relation between him and me (supervisor-PhD), but also the nature of future interactions (as scientific debate), and that this type of interaction would be beneficial for my research process (as he had witnessed this before with his PhD's). As my aim at that particular moment was to get him to agree on a second interview, I fully accepted this framing of the relation.

Besides these basic aspects of power relations, the project's aim and projected outcomes could motivate their participation in the sense that they could see the interview and the

research project as being instrumental to their own purposes. For instance, it often happened that interviewees entered into a debate with other experts *through me*, using the interview setting so as to once again exhibit their views on particular issues or voice their views on the work of colleagues. Likewise, the way they usually presented themselves in the role as experts to others, could be mimicked in the interview setting, making the interactions during the interview a continuation of the self-presentation in other settings. Some developed an interest in participation, as it seemed to offer them a stage to present themselves in a way they deemed desirable. For me as a researcher this was not a 'problem' to be solved but rather a feature of the process of building narratives. It offered me an opportunity to see identity building at work, as these experts would use similar stages (media interviews, deliberations with policy experts and the like) in similar ways and for similar purposes. Rather than as an artefact of the interview situation, it made the interview become part of their real-life self-presentation, and that was in service to my research purposes. Moreover, additional sources of information to some extent could be used as benchmarks to assess the level of fairness of their judgements of the value of their own work and achievements as well as those of others.

This brings me to a third feature of elite-expert interviewing: the fact that these people were *highly visible* in scientific, political and public domains. In particular the virologists have been visible since the emergence of AIDS and BSE in the 1980s. This implied that my results could not be (and have not been) anonymized, and a possible concern for their public appearance may have shaped their attitude in the interviews, for example if they shielded themselves against public vulnerability. Besides such concerns, this visibility however also implied that much more resources were available for the construction of the expert narratives: media appearances, sometimes including profile interviews, policy debates in which they participated leaving their traces, these were invaluable resources for this research. In some instances secondary literature was available, such as on the history of HIV/AIDS in the Netherlands (Mooij 2004). Their value lies not just in the provision of more empirical resources for triangulation, facilitating a (sometimes critical) journalistic perspective on the expert's role. Interviews to newspaper also present the experts as narrators at a different point in time, for example in the mid 1990s. This would then allow me to compare their told stories *then* and *now*. I will return to that in an instance. First I will describe an example an example from Jaap Goudsmit's biography of how visibility provided resources for preparing the interviews and constructing the expert narratives.

In 1990 Jaap Goudsmit was part of a controversy over a supposed HIV/AIDS vaccine. In the preparation of the interview I not only learned about this controversy from news articles in *Science* (Eijgenraam 1991; Cohen 1993), the original research publication (Buck et al. 1990), but also through newspaper articles on the controversy itself and Goudsmit's reflection upon it, an academic paper (Hagendijk and Meeus 1993), and even a documentary in which the different actors told their story (Anderetijden 29

November 2005). Finally, in the year after the interview Goudsmit published a book in which this controversy was discussed briefly (Goudsmit 2009). The visibility of Jaap Goudsmit as an expert, and the visibility of this debate thus provided sources that allowed me to study his biography from various angles. But in preparing for the interview it also made clear to me that this was an event which he might want to avoid or refuse to talk about if I prompted it in a way that could be experienced as too obtrusive (this was the impression I got from reading a newspaper interview on the affair). During the interview, he himself introduced the event, and by not directing this narration, he placed it in the context of his entire career, explaining to me how the affair had changed his expert role, but also how it should be interpreted in light of other events in his career. In this example of Goudsmit, we thus see how his visibility had a significant impact on diverse aspect of the research process.

A final feature of elite expert interviewing is that, in varying degrees, the interviewees were *used to being interviewed*, either for academic or journalistic purposes. This means two things. In a practical sense, experience with being interviewed shapes the interactions and expectations. In almost all instances being interviewed was almost a routine, and the interviewees seemed to know what they were up to. The recording of the interview, knowing that things could be made public (instructing me when not to use something in my thesis), the fact that I would make a transcript, it all seemed to be unexceptional. In other words, this aspect had become an normal component of their professional career. I know other researchers who also interviewed some of my respondents (e.g. Mooij 2004), making these experts familiar with scholarly interviewing. Nevertheless, while preparing the interviews, I noticed that some of them had been extensively interviewed by journalists and this gave them a specific kind of experience with being interviewed. One interviewee for example expected that an interview would take 30 minutes and that I arrived with a clear journalistic agenda. At the end of the second interview he expressed his surprise about the nature of the interviews. He complimented me with my interview skills, saying it was a pleasant experience, that I did not fill things in but was probing well. Journalistic interviews shaped his ideas and expectations about interviews, and hence the early interactions with me. Another interviewee mistook me for a journalist when I appeared in his office for the interview without appointment (due to a planning error); for him journalist stepping in his office just like that seemed to be part of daily routine.

These experiences in being interviewed are also relevant is second way. What can be deduced from this, both from the theoretical perspective that states that narratives and identity shape one another and from actual comparisons between interviews published earlier (even in the 1990s) and my own interviews, is that earlier interviews, which often contain narrative structures and elements, shaped self perceptions of the interviewees, ordering their experiences through the act of narration. And from the understanding that telling a life story is presenting a different, adopted version of the lived story, each act of

narration is an act of revising some elements of a life story while confirming and stabilising others. My experience is that for some interviewees being interviewed meant reproducing an already existing narrative story line. Others, and these are the ones who either had fewer experiences with being interviewed, seemed to really order and construct their narratives while being interviewed by me. This, in short, means that what comes to count as a 'told story' varies with personal style and experience in being interviewed.

A final word on the published interviews concerns the source they provide for me as a researcher. In preparing for the interview I read numerous published articles in which 'my' experts told stories on their lives, and this not only helped me to design the interview protocol (see below) but also to see which stories were retold again and again. I found that one expert in particular has a sort of 'narrative stockpile', specific moments that are presented as central and important events in his career. Reading these narratives in other interviews and seeing how they were spread over time, stimulated my understanding of how an expert builds his public identity upon this stockpile of narratives.

2.5 Procedures for the construction of expert narratives

In this section I will describe the process that led to the expert narratives as presented in the empirical chapters 3 to 5. This process is not only informed by the conceptual foundations described above, but also by the fact that the respondents belong to a scientific elite within a specific field of interest. Throughout the discussion of the research process I will not just explain what steps were taken, but also reflect on the methodology and the way I addressed challenges and problems.

2.5.1 Selecting individual experts

In the Introduction the two cases of the thesis are substantially introduced thematically as fields of science and policy concern. Here I will come to explain how the experts for this study were selected. I have used five selection criteria.

(1) The respondents were still active and leading in their field;
(2) they had demonstrable experiences as public and political experts;
(3) had such experiences over a longer period of time;
(4) collectively they were of the same generation;
(5) they were native speakers of Dutch and approachable for me as a researcher.

The first three criteria demarcate the phenomenon of the experts into a particular category, that of experienced public scientific experts. In addition to these criteria on their 'track record' the generational aspects also matters in understanding experts: it

acknowledges the importance of a 'generation cohort perspective', paying attention to the relevance of the interpersonal and social age of this cohort of experts (Plummer 2001, pp. 128-129). The final criterion seems trivial, but given the scarcity of elite experts in the particular fields of science, I considered this a relevant criterion.
The first case study I started with was virology, and based on the aim to study experts in policy and public debate, I conducted a broad search. In the policy domain all Health Council (GR) and the Advisory Council on Health Research (RGO) committees that had handled infectious diseases were scanned on their topics and the composition of the committees, going back to 2000[11]. The media were consulted by searching in LexisNexis for articles containing the combined words 'viruses', 'man' and 'animals' (387 articles), and by searching in the online database of public TV and radio broadcasting companies (www.uitzendinggemist). From these sources I then made an inventory of all the virology scientists who appeared in policy and the media, and constructed a time line of all important events in virology science, policy and society. From the extensive database of experts, three were selected as the prime experts.

- Roel Coutinho (1946)
- Albert Osterhaus (1948)
- Jaap Goudsmit (1951)

I have considered to include more experts, but besides practical aspects (the time consuming nature of a biographical-narrative analysis), it proved that the distance between these three and the virologists lower down the list was significant[12]. With these three, I found that I had selected the three virologists who most met my inclusion criteria. In addition, in the stage of selecting experts the case constructing already started; going through these resources not just resulted in the selection of the research subjects, but also in a good familiarization of the case of virology.
Once I had selected these three experts, I invited them via e-mail to participate in this research project. This was a crucial stage; if these experts were unwilling to participate, the case study of visible scientists in virology had to either be abandoned or continued with experts who, I then knew, were not the prime candidates for the research. The first I contacted was the most visible of the three, and he agreed to the interview within a few hours. That allowed me to refer to his participation in the email to the other two.

[11] In early 2008, the time of this phase, digital records at the council's websites www.gr.nl went back to 2000. I then contacted the secretary of the RGO, which resulted in a few more reports and committees.
[12] There was one virologist who was really a 'policy tiger', Jan van der Noordaa, and he was initially selected and interviewed. But because he belonged to a previous generation, and because his interactions with the media were quite scarce, I decided not to include him in study on virologists. However, he provided many useful insights, and the interview with him was an important basis for Chapter 6.

Luckily, the other experts also agreed to participate, although one of them seemed to have serious doubts.
Given this fruitful selection process, I repeated the same procedures in selecting the water experts. There are, however, two notable differences. One is that in December 2007, before starting the actual research, I prepared and conducted a test interview with a prominent water management expert who happens to be a member of the Research Institute (ISIS) of which I am a member as well. This gave me insight not just in how a narrative interview could be prepared and conducted, but also familiarized me with relevant actors and debates. The second difference is that the list of experts for water security was less clear-cut about who were the most relevant for my research. To select the most significant experts for my purposes, I consulted two other researchers who had been studying the field, and eventually selected four experts.

- Han Vrijling (1947)
- Huib de Vriend (1947)
- Pier Vellinga (1950)
- Marcel Stive (1951)

As the water case was studied in the context of the test interview, the selection of water experts was a continuous process from 2007 onwards, and these four appeared quite early on as the most likely research subjects. In April/May 2009 they were invited to participate, and all of the selected experts agreed, although one of them explained having some doubts as to whether he should participate or not. Having three virologists and four engineers from the same generation who have a long term life story of being a policy and/or public expert (covering three decades), this provided me with seven individuals whose life stories promised to provide ample resources for a biographical-narrative study, including the possibility to compare these three and four biographies. As such, this study is not just on individuals, but also on a generation of scientists in a particular scientific field, being exposed to similar external events and challenges.
Looking at the seven scientists that were selected for the study, it struck me that they were all male and around sixty years of age; a very particular selection of scientists indeed. Of course, female experts are active in the fields, but based on the selection criteria they were not included. I concluded that this male dominance (the underrepresentation of women) reflects the fact that women in general are still underrepresented in the higher ranks of science (Evetts, Mieg, and Felt 2006), and that, perhaps as a consequence or this, women in these areas of science are not in the public spotlights to the same extent as some of their male colleagues are. I considered selecting a third case in the social or legal science, expecting to find more women as elite experts, but time was not available to do so. That may have answered the important question if and how gender matters in scientists' role of public experts, and also made the

biographical research more varied. Nonetheless I think that, notably in view of underrepresentation (which, in future, may well become something of the past) studying female elite experts is a promising issue for further research.

2.5.2 Preparing, conducting and processing the interviews

Preparing the interview

The narrative interviews were prepared, conducted and processed according to a scheme that was more or less similar for all research subjects. Given the fact that these scientists were highly visible, I prepared the interview beforehand by reading all newspaper articles in LexisNexis on the individual scientists, and studying the policy documents and committees the scientists had participated in. In addition, the scientific track record was studied by searching references in, for example, PubMed, Web of Science and Google Scholar, and reading articles or abstracts that seemed relevant for the narratives interview and the research topic. In addition, with Web of Science I produced publication and citation reports of the scientists. By studying all this material, I created a first picture of the academic, political and public dimensions of the expert's career, the start of the construction of expert narratives.

This was then shaped into an interview protocol. The protocol started with a general introduction to the research topic, the case study and interview setup, followed by an open question regarding the entry point of the narrative interview: "*What are, from your perspective, the most important experiences in your development as scientific expert in relation to politics and the media?"*. Then I would use interview techniques and the initial picture of one's career to ask secondary questions or to switch to topics that, from my first understanding, were of relevance. For those purposes the interview protocol listed such themes and events chronologically.

Conducting the narrative interviews with an expert-elite

The interview was conducted in line with the protocol; combining the open question with the continuation according the protocol proved to be useful, and therefore this approach was not changed significantly over the course of the project.

In follow-up questions, I not just asked them to clarify specific elements, but when we were talking about specific events I tried to get a complete picture of the event, their interpretation, and their response to it. For example, if someone explained he experienced or identified a particular problem, ideally I would continue asking not just why this was the case (his *assessment*), but also how he *acted* and why; what the *effects* of his actions were, and what he had *learned* from this event. Or if someone told what he had done at a certain moment, I would try to construct the narrative back by asking why he did so, what the underlying problem and problem assessment were. Thus probing the initial experience in accordance with my research understanding of narratives.

Of course, during this process of constructing the expert narratives more data was collected, sometimes by conducting follow-up narrative interviews, or by conduction interviews with informants (people well informed in the field and/or well acquainted with the interviewees, and sometimes, the one expert commented on the others). In these second interviews, which were use to ask specific questions that emerged from the construction of expert narrative, or to confront them with ideas I had about their careers as experts, the atmosphere was more relaxed, at least for me as an interviewer: I was familiar with their personality and their narrative styles, and they had been able to familiarize themselves with me. The transcript of the first interview that I would send beforehand.

Processing the interviewing

Each interview then was processed in three ways. First of all, I made a debriefing report of each interview in which I reported my experiences of the interview and the setting, and reflected upon them. In addition to the narratives themselves this would allow me to come to understand the interviewee in a way the taped interview would not (the non-verbal appearance, the messiness of a desk, the lay out and supposed function of the office; the way I was welcomed and how we parted). This was particularly helpful in getting a fuller understanding of the character of the respondent, and hence to interpret better what he had said during the interview. Secondly, these debriefings were useful in preparing (mentally) for the second interviews. The taped interviews would then be fully transcribed, or in case of second round interviews, transcribed when relevant and otherwise summarized. The final step was to look back at the interview protocol and the pre-interview understanding of one's biography, and then reflect on how what I had learned from the interview fitted with that earlier picture. That assessment provided a foundation for further constructing the expert narratives.

I have send the transcript to the interviewees for approval, and sometimes with additional questions. Some responded by giving unconditional approval to use the material, others corrected things or marked what I should not use. Often, there was no response to the transcripts, and I took this as a signal of approval.

2.5.3 From (narrative) material to expert narratives

The production of the expert narrative iterated between the collection of sources and the construction of the expert narratives. As said, already during the process of selecting scientists for this study the construction of the narratives started. Besides the transcript and what I discussed with them in the interviews, the interviewees did not receive any other material from this study until a published version (when available), and hence were unfamiliar with my interpretation and the developing expert narrative.

As a first outcome, the process of constructing expert narratives resulted in extensive expert narratives for each individual expert. Here I had integrated the narrative material

with other sources, such as secondary literature, (e.g. the history of HIV/AIDS in the Netherlands), policy documents and media sources. Towards producing the different case articles (Chapter 3-5), these extended expert narratives were then integrated with each other by presenting sections of expert narratives in specific stages, and ordering the different expert narratives in these stages. The selection of these stages was based on both the turning points that were visible in the extended expert narratives, as well as in the context of the field under study. This integration implied two things: on the one hand the boiling down of the essential meanings the expert narratives, leaving out many (colourful) details. Secondly, this implied that the meanings of the expert narratives were complementary to one another, demonstrating the experts' careers at similar moments in time. In this sense, the biographies of individuals in a particular field of science were integrated with both the biographies of colleagues and the public side of this field of science. This integrated version of the expert narratives is the end product of the biographical narratives approach.

2.5.4 Grounding the water case in the virology case

An important research dynamic that should be accounted for is the maturing of the results. Not only increasing experience with the biographical-narrative research, but also budding constructions and analyses that matured during this research project is intrinsic part of the results. I will begin with which what is mostly linked to the content: the transgression of the case of virology to the water case. What was uncovered to me as an researcher while working on the virology case, was that crises, moments when science and government lost control over viral threats, played an important role in both the lives of individuals as well as in the field as such. Crises create moments when the appeal on scientists to inform policy and the public and to tackle the threat is most pregnant. While tracing this dynamic between experts and crises, the case analysis got structured around this, distinguishing between a number of stages that are demarcated by crises. As I then progressed to the case of water security, a field where protection against flooding is as central to the field as the protection against viruses is for the virologists, the idea that crises may structure the history of the field and the biographies of its experts was a starting hypothesis in the exploration and analysis of this case study. Although this idea remained hypothetical for some while, in the course of making the extended expert narratives and the integrated expert narratives, this structuring principle proved to apply to water security as well.

On the level of the individual experts the research also became focused on specific aspects. For example, I learned that view on the science-policy interface were relevant, and this stimulated the analysis more towards the way scientific advice to government was organised. The perspective on policy of the scientists, and their experiences with policy and politicians were topics that gradually became more prominent in the interviews. On a more general level, the mutual development of the research findings

and the research process, stimulated that interviews and actions later in the research process were more focused on the themes that were emerging as central themes in the studies. That is why, for example, following the two studies on the cases as such (chapter 3 and 4), chapter 5 deals with the theme of agenda setting. In the Conclusion to this thesis, the most central themes are presented.

2.6 In conclusion

In this chapter I have presented the conceptual foundations of the biographical-narrative approach that I have used in this thesis, and explained how I have translated this in methodological procedures. In the introductory chapter, I promised to demonstrate what the wolf traps were, and where they can be found. This has provided the reader with a clearly articulated outlook on some of the wolf traps and the research findings to which I will now turn.

Chapter 3. Virology experts in the boundary zone between science, policy and the public: a biographical analysis[13]

Abstract

This article aims to open up the biographical black box of three experts working in the boundary zone between science, policy and public debate. A biographical-narrative approach is used to analyse the roles played by the virologists Albert Osterhaus, Roel Coutinho and Jaap Goudsmit in policy and public debate. These figures were among the few leading virologists visibly active in the Netherlands during the revival of infectious diseases in the 1980s. Osterhaus and Coutinho in particular are still the key figures today, as demonstrated during the outbreak of novel influenza A (H1N1). This article studies the various political and communicative challenges and dilemmas encountered by these three virologists, and discusses the way in which, strategically or not, they handled those challenges and dilemmas during the various stages of the field's recent history. Important in this respect is their pursuit of a public role that is both effective and credible. We will conclude with a reflection on the H1N1 pandemic, and the historical and biographical ties between emerging governance arrangements and the experts involved in the development of such arrangements.

Keywords: expertise; virology; policy development; public communication; biographical-narrative method.

3.1 Introduction

With the recent outbreak of novel influenza A (H1N1), better known as swine flu, familiar faces became even more familiar. In the Netherlands, the experts who not only frequently informed the public and investigated the virus, but also predicted the

[13] This chapter has been published with Open Access in *Minerva* (2010), Volume 48, Number 2, pp. 145-167. DOI:10.1007/s11024-010-9145-z. The headings have been numbered to fit the lay-out of the thesis. I would to thank Hub Zwart, Hans Marks, Willem Halffman and the two anonymous referees for their critical yet constructive comments. I am indebted to Ab Osterhaus, Roel Coutinho and Jaap Goudsmit for their willingness to contribute to this study.

pandemic's course and handled public health policy problems, were figures that had assumed this role ever since the 'revival' of infectious diseases in the late 1970s and early 1980s. The general public, politicians, journalists and sceptics alike were already familiar with their names and faces, reputations and views, and even with their tactics and styles of handling such affairs.

This article is about these actors. I have studied the way in which three Dutch virologists, Albert Osterhaus, Roel Coutinho and Jaap Goudsmit, became both prominent and visible experts, and how they dealt with the various challenges entailed by such a role. This article uses a biographical-narrative approach to analyse their advancement into public and policy experts on infectious diseases, against the backdrop of the broader developments in Dutch policy and society.

In this article, the genesis of the visible expert (visible for policymakers, the media and the general public) is studied on an individual or micro-level by examining a number of stages between the late 1970s and the present day. Although textual sources (media coverage, policy reports and so on) are used as a backdrop and frame of reference, the basic source of input for my study is a series of narrative interviews with the experts themselves. Before turning to the case study as such, I will outline the theoretical and methodological framework of my research. I will also place biographical research in the broader field of science studies and discuss the methodological opportunities and risks involved in such an approach.

3.2 Looking at and acting on the science-policy-public boundaries

In science studies the science-policy nexus has been extensively studied by looking at boundary organisations (viz. Jasanoff 1990; Guston 1999; Bijker, Bal, and Hendriks 2009; Huitema and Turnhout 2009), at the role of experts in policy development (Rutgers and Mentzel 1999; Nowotny 2000; Hoppe 2005, 2009; Turnhout, Hisschemöller, and Eijsackers 2008) and at policy cultures, or their absence (Hellström 2000; Halffman and Hoppe 2005; Halffman 2005). In this biographical study, a biographical approach has two major advantages. First of all, a biographical approach allows us to study the individual views of the experts themselves and the assessments of their own roles. Secondly, a biographical approach allows us to flesh out the relationship between experts, policymaking and public communication.

The views of experts working in close interaction with policymaking and the public sphere have been extensively studied. Hoppe, for instance, described the views of scientific experts as boundary workers, and discerned several ways of looking at the science-policy boundary (Hoppe 2009). Dave Huitema and Esther Turnhout (Huitema and Turnhout 2009) focus on the institutional level and describe the 'political' roles of experts working in a Dutch boundary organisation. Claire Waterton (Waterton 2005) also focused on the science-politics boundary, in particular in the field of research policy

and funding. Together with Sarah Davies (Davies 2008), who describes the views held by scientists regarding the science-public boundary, these authors analyse the outlooks of individual scientists working across the boundaries of their organisations and disciplines. One of the challenges of discussing the views of scientists in the science-policy and science-public zones is to point out how each of the experts acted in these boundary zones and how they negotiated tensions within the boundary zone, creating an identity for themselves in the process.

In light of the 'Third Wave' debate on expertise (see Collins and Evans 2002; Collins and Evans 2007; Wynne 1992, 2003), a distinction can be made between a 'relational' versus a 'realistic' view on expertise. In this paper we will look at the experts and their expertise from a relational or social role perspective (Collins and Evans 2007, p. 2). We treat the role of experts not as a given solid state, but as something in flux. This flux is the net result of interactions between the actions of individuals, and the attributing of trust and credibility by others (viz. Goffman 1959, p. 15-16; Wynne 1992, p. 282; Huitema and Turnhout 2009, p. 579), turning the experts into 'hybrid characters' (Daston and Sibum 2003). A role in this understanding cannot be attributed solely to what the individual expert wants. Roles are contingent outcomes of these interactions, in which trust and credibility play a crucial part.

This article studies these interactions under specific circumstances, i.e. during moments of crisis. Crises as focusing events challenge experts to inform and comment on the crisis, to assist in the development of appropriate policies, and more generally to sketch the prospects of where the crisis is heading (Birkland 1997). Understood as such, we will see how crises function as springboards for experts from relative invisibility to visibility, and how experts are thus invited or forced to develop their own style of crisis management. Some authors point to the strategic use of crises in inducing policy change (Kingdon 1995; Birkland 1997; Weingart, Engels, and Pansegrau 2000). These sources demonstrate that a crisis is not something that 'just happens' to experts, but that experts, as policy entrepreneurs, also shape and give voice to crises. They tend to use moments of crisis to 'capture attention for their causes', at times even by 'overselling to the media' (Weingart 1999, p. 159; see also Edwards 1999, p. 169).

In the expert narratives we will see how perceptions of science, policy and public boundaries, and strategic ways of acting on the boundaries, are viewed from a biographical perspective. This shows the developments, the challenges and crises that experts engage with, and the learning experiences of 'being an expert'. It opens up the biographical 'black box' of experts in policymaking and public debate.

3.3 A biographical-narrative approach: narratives in action

The biographical-narrative approach has been gaining ground in the areas of science studies and social sciences (Shortland and Yeo 1996; Huisman, Santing, and Theunissen

ed. 2000; Plummer 2001). We find examples of this approach in anthropological laboratory studies (Traweek 1988), feminist studies of science (Abir-Am and Outram 1987), the sociology of science (Zuckerman 1977; Goodell 1977; Kissmann 2007), the history of science (Porter 2006; Nye 2006; Terrall 2006) and the epistemology of science (Zwart 2008). The biographical-narrative method used here combines social-historical studies and narrative analysis, and provides an idiographic view on expertise in the form of 'expert narratives'. To produce these narratives, data from various types and sources were ordered around a specific 'plot' or thematic thread (Polkinghorne 2005, p. 69): the advancement of virologists from laboratory experts into experts on policy and the public domain.

The inductive development of narratives involved four iterative stages. In the first stage, data were collected on the academic and public *track records* of the three virologists, and on the socio-historical context of infectious diseases in which these virologists were situated. This was used to prepare *biographical-narrative interviews*[14], the second step. These interviews focused on their experiences in policymaking and public debate. The experts also commented on each other in these interviews. The third step was to *organise the data temporally*, hereby focusing on the diachronic data (data on events, their relations and the effects of events). This step included the collection of additional data, for example by conducting a second round of interviews. In the final stage, the expert careers were written down as *coherent and empirically-grounded narratives*, thereby 'explicating an intrinsically meaningful form' (Polkinghorne 2005, p. 93).

Rather than being the only true *re*construction of past experiences and events, the narratives constitute one possible approach to ordering them coherently. The labels used to structure these narratives must likewise be seen as provisional headings. As to the methodological validity of the narratives that emerge in this manner, it is important to see that the production process of narratives takes place on various levels. The first level is the level of the actual events as experienced by the experts involved, the so-called *lived story* (Rosenthal 2005, 27; Wengraf 2000). Subsequently the experts themselves will reflect on these events retrospectively and from a certain distance. This level can be referred to as the *told story*. Finally, as a result of the interactions, post hoc reflections and reframings between interviewee and researcher[15], the *written story* as a third level of narrative emerges[16] (Littig 2008, par. 17). Thus, the written story builds on the two

[14] Interviews with experts or elites differ remarkably from other kinds of interviews; for a brief discussion see Beate Littig (Littig 2008).

[15] In this paper I unfortunately cannot illustrate this dimension with a structural analysis of the narratives. For reasons of space I therefore limit myself to a thematic analysis (see Riessman 2008, chapters 3-4).

[16] The virologists themselves also produce written narratives on their roles, creating fascinating comparative research material on narrativity and identity (see Goudsmit 2009; Coutinho 2 February 2010).

previous levels, and care is taken to secure the internal validity through iterative data collecting and interview sessions, as is also the case here.
Moreover, the written story also feeds back into the previous levels and shapes the lived story. Narrating is a way of constructing ones identity (Brockmeier and Carbaugh 2001, p. 15; Bruner 2001, p. 34-5). In the course of constructing a 'front region' narrative, the identities the virologists assume as experts shape their actions and interventions, allowing them to present themselves in a way they find desirable (Goffman 1959). Narratives not only constrain, they also enable action (Deuten and Rip 2000, p. 72). By being involved in narrative processes in biographical-narrative interviews, and by intervening in the identity constructions, I actually came closer to the lived story.

3.4 Dutch cultures of expertise

Before coming to the actual expert narratives, I will give a brief overview of the main Dutch institutes and their functions, the institutional landscape as it were. The Ministries of Health and of Agriculture are the two major policymaking bodies in the domain of infectious diseases, while local (Gemeentelijke Gezondheidsdiensten, GGD) and national (Rijksinstituut voor Volksgezondheid en Milieu, RIVM) public health institutes have an executive task. University Medical Centres (UMCs) play a more independent role. A central advisory body is the Dutch Health Council (Gezondheidsraad, GR). The Health Council is an advisory body that presents the 'state of affairs' of science, and explicitly *advises* policy, it does not *make* it (Interview Knottnerus & De Visser. 30 January 2006; Bijker, Bal, and Hendriks 2009). In 2005, the Centre for Infectious Disease Control was established as a specialised body for scientific advice and outbreak control, emerging as a new boundary organisation in the Dutch institutional landscape (CIDC, see Ministry of Health 7 December 2004). The Dutch advisory sector for infectious diseases can thus be characterised as a 'corporatist policy arrangement', with a restricted and formally accredited set of experts that act on personal title (Halffman and Hoppe 2005, p. 137; Bijker, Bal, and Hendriks 2009, pp. 85-6). On an international level we find the European Scientific Working Group on Influenza (ESWI), the European Centre for Disease Prevention and Control (ECDC) and of course the World Health Organization (WHO).
This landscape constitutes the backdrop for the three biographical narratives. Osterhaus started his career as a veterinarian at the RIVM (1978) and went to Rotterdam UMC in 1994. Coutinho worked at the Amsterdam GGD from 1977 until 2005, after which he moved to the CIDC. He has always been affiliated with the Amsterdam Medical Centre (AMC). Goudsmit also spent much of his career at the AMC; in 2002 he joined Crucell, a Dutch biotech vaccine company.

3.5 Stages of crisis and control

In discussing the expert narratives, we divide the field of virology into a number of stages. Roughly, we identify five stages, based on the alternation of times of crisis and of control.

1. Late 1970s: The end of infectious diseases: controlling the known enemies
2. 1982-1993: First crisis in virology
3. 1993-1997: Reaching relative stability: controlling the current crisis
4. 1997-2003: Second crisis in virology
5. 2003-April 2009[17]: Anticipating future crises

Towards the end of the 1970s, infectious diseases were a dull field of science, on the verge of extinction in a world that knew soap and sewers, vaccines and antibiotics. Research into virology consisted by and large of fundamental research into viral oncology where public stakes were low (Van der Noordaa 7 May 2008).
Then, all of a sudden in 1982, HIV/Aids emerged as an unknown enemy in the Dutch gay scene. It constituted a challenge and problem for human virology, accompanied by a sudden influx of research funding, public concern and policy development[18]. Furthermore, there was an aggressive viral outbreak in seals in the North and Baltic Seas around 1988, which killed tens of thousands of seals. BSE was seen just before this, putting veterinary virology firmly on the map and introducing virologists into the midst of political and public debate. As it turned out, these crises were a springboard to visibility for the three virologists studied here.
At the start of the 1990s, these crises had more or less been brought under control. The causal agents were discovered and the era saw the development and implementation of policies in routine veterinary and human healthcare practices. The HIV/Aids epidemic stabilised in the Netherlands and government interest in infectious diseases decreased. This stability would last until 1997, when new infectious threats suddenly emerged. For the virologists this was a moment to once again assume visibility in public debate and involvement in policy development. The first H5N1 deaths marked the advent of a second crisis. Besides fears of an avian influenza pandemic, scientists and politicians were concerned about the growing threat of bioterrorism and outbreaks of foot and mouth disease. Finally, the outbreak of SARS in 2003 came as a complete surprise. It was SARS that highlighted the real danger of pandemic outbreaks, but that also triggered

[17] This study ends just before the novel influenza A (H1N1) pandemic, to which we will turn in the conclusion.
[18] Of course, the use of the name HIV/Aids here is ahistorical since many other names and abbreviations circulated in the early years, see Randy Shilts (Shilts 1987). The First Dutch HIV/Aids death was reported in the spring of 1982 (see also Mooij 2004; Anderetijden 26 November 2002).

the awareness of preparedness and prevention plans as new instruments in preventing a pandemic from developing to its full capacity (Osterhaus 6 March 2009).

3.5.1 Stage 1: late 1970s: Controlling the known enemies

Towards the end of this period of declining public and political need for virologists, all three virology experts completed their studies. Their careers were to become heavily intertwined with the events that followed; they had positioned themselves in such a way that, unaware of future challenges, their involvement with policy and the media during the first crisis was inevitable.

3.5.2 Stage 2: 1982-1993: First crisis in virology

Ab Osterhaus: the strategic scientist

Although Osterhaus had been in the media since 1978 (on the death of dogs at the world dog show), his story really begins in 1985 with Bovine Spongiform Encephalitis (BSE). In the early years, no one believed BSE could become a human pathogen; 'people said it was just scrapie' (Osterhaus 6 March 2008)[19]. However, Osterhaus suspected it could indeed become a human pathogen, and in 1988 he pursued it to the EU policymaking arena with backing from his director. As chairman of the EEC Scientific Veterinary Committee he acted cautiously. Nevertheless, he met with scepticism, since pointing out the possible public health dangers went against the grain of policymakers. He did not refrain from setting policy machinery in motion, and a proposal for legislation on the various dangers of BSE was issued almost monthly. In his opinion, this had its effect on policy processes (Osterhaus 29 July 2008).

In 1988 he became more visible to the general public with the dramatic death of seals in the North Sea[20]. Osterhaus was called in to investigate these deaths, and discovered that the seals had died of a previously unknown virus. However, Greenpeace opposed his conclusion: they were convinced that pollution or poisonous algae had caused the fatalities, since this fitted their own objectives. This disagreement with the environmentalists challenged Osterhaus to prove he was right, and he conducted extensive experiments with seals. To his surprise these studies *did* identify pollution as a contributing factor in the seals' deaths, but as an indirect causal factor: it made them less resistant. Osterhaus considered this a success: he had discredited his own hypothesis and discovered a causal chain more nuanced than either he himself or Greenpeace had expected (Osterhaus 6 March 2008). The research on seal death, that started in 1985 and has continued ever since, has had an enormous impact on several aspects of Osterhaus' career. It delivered him his first four *Nature* publications in 1988 and 1989, and many

[19] All quotes were translated from Dutch by the author.

[20] He often tells this story. I heard it during a master class he gave (29 November 2007), and newspaper articles often mention it. The master class also showed how he weaves science and personal narratives together into one story.

other papers followed. His reputation grew, and the conflict with Greenpeace pulled him into political and public debates. Due to the seal death research he also became scientific advisor to a national seal shelter.

The controversies surrounding BSE and the seal deaths show two aspects of Osterhaus' role. He was self-confident in his estimations about risks, but also acknowledged criticism from his sceptics. The tricky question was when to stick to his original position, and when to adopt the opposing view, and, consequently, the appropriate strategy. This, he says, created a tension: on the one hand he had his own gut feelings, and at the same time he tried to think through competing viewpoints. There was not only an epistemological choice to be made, but also a balancing act to carry out: considering various interests and health threats. We will characterise his role as that of the *strategic scientist*: someone who carefully balances different viewpoints and forms of evidence, but who also has the strategic skills and will to further his own case.

Roel Coutinho: from critical to controversial collaborator

Of the three virologists studied here, Coutinho's role was the one shaped the most by the nature of his research and the positions he held. As a public health director in Amsterdam with expertise in viral epidemiology and professional relations with homosexuals and intravenous drug users, it was obvious he would be involved in dealing with HIV/Aids, and he was very motivated to do so.

In 1984, Coutinho, Goudsmit and their superior, Jan van der Noordaa initiated the Amsterdam Cohort Studies (ACS)[21] on HIV/AIDS, and began testing a cohort of homosexual men. The results were alarming: 30% of the participating 750 homosexuals were infected with HIV, revealing an urgent public health issue. However, as homosexuals were in a process of emancipation they feared discrimination and blame for bringing HIV/Aids into the world. Disease prevention did not outweigh this concern. Since Coutinho saw that both homosexuals and drug users tended not to take the danger of infection seriously (as they had previously done with venereal diseases), he used the statistics to make them aware of the scale and nature of the epidemic. His rationale was that without being open about a problem, one cannot start solving it. Also, covering up the truth implies a disdain for society and is likely to result in a loss of credibility (Coutinho 13 May 2008; Mooij 2004; Anderetijden 26 November 2002).

Although a sound approach for Coutinho, it met with substantial opposition on various fronts. Indeed, the slightest hint towards the identification of homosexuals as a risk group made them revolt; and to Coutinho's dismay the national government gave equal weight to the control of HIV and the prevention of discrimination. A chasm emerged between scientific and socio-political realities[22], but this was something that could be

[21] Still ongoing, see http://www.amsterdamcohortstudies.org/ (accessed 8 December 2009).

[22] This chasm was not uniquely Dutch, but a feature of the early HIV/Aids years in all countries.

handled within the National Committee on AIDS Control (NCAB) to which he belonged[23].

If the scientists were taken by surprise by the HIV/Aids epidemic then the media were even more so. They desperately needed information, and Coutinho and other members of the NCAB were in a position to virtually control the coverage of HIV/Aids (Mooij 2004 p. 21). By doing so they also influenced policy (Coutinho 13 May 2008), since politics, especially in those days, was very susceptible to public opinion.

Despite this chasm, in the beginning he perceived and experienced the collaboration with homosexuals as 'extremely good, very constructive and also very useful' (Coutinho 25 July 2008). But tensions increased as time progressed: HIV/Aids spread, the number of parties involved increased and the decision-making structure grew more complex. From 1986 onwards, when a new information campaign was launched, Coutinho's critical, factual, and open attitude was too problematic for those working with him; he openly stated that the campaign masked the fact that homosexuals were a distinct risk population (Coutinho 25 July 2008). Following this criticism, the productive working relationship with the gay community started to crumble.

On two occasions in 1989 the tensions between Coutinho, homosexuals and politics culminated in conflict. A clash with politics came when the Secretary of State for Health rejected a report on anonymous HIV testing. Coutinho, one of its authors, openly mocked the Secretary and he was brought to account. Although this was an unpleasant experience, Coutinho said he would do the same again (Coutinho 13 May 2008). And so he did. Later that year he was appointed professor, and in his inaugural lecture he surprised friend and foe by again criticising the HIV/Aids communication policy of the NCAB. Members of the NCAB and of the gay community were outraged: how could someone like Coutinho threaten the societal position of homosexual men? Coutinho was forced to step down from the NCAB.

But how dramatic was his departure? The information campaigns were up and running (if not without some hiccups), a policy framework was in place and 'personal relations were fine' (Coutinho 25 July 2008); he actually felt relieved to be out of the NCAB.

Coutinho's role during this stage started out as *critical collaborator*, and it shifted to *controversial collaborator* after 1986: he was very outspoken, stubborn, did not negotiate with others on the contributions he made to the media, and he did not let himself be tamed by the sensitivities of gay emancipation. He described this period as being jammed between science and policy[24]. The collaboration in the control of HIV/Aids became gradually more problematic, which resulted in this shift in Coutinho's role.

[23] Since 1987: National Committee on AIDS Control. The change from 'coordinating' to 'controlling' HIV/Aids is a remarkable one, airing an increased demand for control over the epidemic.

[24] Every time he spoke about this, he made a wrenching gesture with his hands.

Jaap Goudsmit: the hubristic expert

Goudsmit's role contrasts those of Coutinho and Osterhaus. He was not heavily involved in the development of health policy frameworks or legislation, as his sphere of activity was more limited to public debates. These debates included the debate on gay blood donors and on the origins of AIDS. When invited to reflect on the 1980s during interviews, he did not recount specific moments, but rather gave a general impression of his contacts with the media. What dominated was the sense of losing control over his utterances in the media, and this had a lasting influence on Goudsmit's attitude towards the media (Goudsmit 2 April 2008).

One event in the expert development of Jaap Goudsmit, which gradually takes us to the end of the second stage, is an affair that shocked many: the Buck-Goudsmit affair[25]. Early in 1990 Henk Buck, a professor of chemistry, wanted to check whether DNA drugs he had discovered could work on HIV. Goudsmit therefore ran tests with the substance, and mistakenly confirmed that it worked. A letter was sent to *Science* and Buck and Goudsmit held an official press conference. This was, after all, a discovery of great importance.

The positive atmosphere turned bleak when Buck started making claims that went beyond the original significance of the discovery, promising a cure within a few years. People were outraged, since HIV/Aids patients were given false hope. While Buck himself was scapegoated, Goudsmit got away, but not entirely untouched. The drama affected him, and he became more reluctant when called on as an expert and more cautious when in contact with the media (Goudsmit 2 April 2008). Despite criticism of his role in the controversy, Goudsmit kept his position at the AMC; and when three years later *Science* announced him as Europe's most important HIV/Aids researcher (Cohen 1993) the Buck-Goudsmit affair was not mentioned at all.[26]

During the second interview Goudsmit described his 1980s self as a *hubristic expert* (Goudsmit 19 May 2008), and other sources support that view: someone who is very confident about his knowledge base. This stage of his career involves frequent loss of control over statements and quotes: being tempted by journalists to utter sweeping statements and daring analyses. Analysing the interviews with Goudsmit, we find two interrelated problems for the hubristic expert. The first is a lack of experience in controlling the media; the second is a lack of knowledge of the limits to his expertise. As we will see, a gradual shift in both these aspects later in his career would change his role.

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[25] See (Hagendijk and Meeus 1993; Eijgenraam 1991; Anderetijden 29 November 2005).

[26] After this article had been published, I received an e-mail from Henk Buck, in which he argued that 1) it concerned DNA drug in the plural sense, and I have corrected that here; 2) that the representation of the controversy in Eijgenraam (1991) contains pertinent errors; and 3) that he had refute the charge of fraud in later articles (e-mail Henk Buck, 21 May 2011). I would like to stress that this chapter is not to place to discuss these affairs in greater details, and that articles I have referred to a historical resources, presenting different interpretations of the controversy.

3.5.3 Stage 3: 1993-1997: Reaching relative stability: controlling the current crisis

In 1993, some ten years after the first Dutch cases of HIV/Aids, the epidemic stabilised, a partial indication that the expert community had gained relative control over the situation. The general implications were that HIV/Aids became less newsworthy, which of course had implications for the roles of the scientific experts, in particular Roel Coutinho. Transformation is a recurring theme in this third stage: positions, whether in a political, institutional, public or epistemological sense, changed, and the role of our experts changed accordingly.

Ab Osterhaus: the prophet of doom

Osterhaus experienced a number of changes that were to make him even more visible than before. An important change in this respect is that of occupational context. In 1994 he left the RIVM, 'the institute that muzzled him' (Osterhaus 29 July 2008), when he refused to end his seal research (Kohler 14 April 2003). He and his staff moved to the Erasmus Medical Centre in Rotterdam, where he still holds a position.

This change from a muzzling institute to a university that was not familiar with 'Ministerial responsibility' liberated him in his role as public expert; and with this change a second came along: he became director of the WHO National Influenza Centre. Influenza appeared on his radar screen and Osterhaus became interested in past influenza pandemics. He then became chairman of the European Scientific Working group on Influenza, the ESWI. On a more personal note, being struck by influenza himself made him experience the severity of flu. These personal, professional and scientific experiences with flu would from now on become a dominant factor in his contact with policy and the media (Osterhaus 29 July 2008). In 1995 he made some initial, cautious remarks that hinted at the lurking threat of influenza (Schipper 17 February 1995). But in 1997 the cautiousness gave way to a much more alarming message when the first human bird flu casualty was reported (Osterhaus 6 March 2008). Osterhaus and others wrote a letter to *Nature* entitled *A Pandemic Warning* (De Jong et al. 1997), in which they referred to H5N1 as a virus with 'unknown pandemic potential'. A few months later he would be more straightforward in a Dutch newspaper, saying that 'a future pandemic flu on the scale of the 1918 Spanish Flu was not unimaginable'(Jaspers and Voorn 30 December 1997).

The flu deaths were to trigger the second crisis in the recent history of virology. In contrast to the first crisis, when the virologists were taken by surprise, Osterhaus became the advocate of awareness of and preparation for influenza. From now on, a discursive strategy announcing the coming pandemic was aired in public media and in policymaking, using the pandemic warning as an instrument to create awareness and a policy forum (Anonymous 26 April 2001). This led to the charge from politicians and

colleagues of being a *prophet of doom* (Osterhaus 6 March 2008), which marks the role he had during this stage.

Roel Coutinho: an expert's hibernation

Although not of his own bidding, Coutinho's preoccupation with policymaking and the media decreased significantly after 1992. A quite visible expert began to hibernate. He felt content with these developments since he had become worn out with endless debates in committees and with telling the same stories to the media over and over again. *Expert hibernation* in this sense does not mean he was entirely absent in the media or in policymaking, but compared to the preceding and following periods there was a significant decrease of exposure. There is one event, however, which demonstrates his view as an expert on health problems. After a decline in HIV/Aids cases in 1993, he later reported the epidemic to be far from over, and stated how he thought the problem should be prevented: 'It makes a huge difference when you get the problem out in the open' (Anonymous 5 December 1998). This strategy was put to the test during the 1980s, and it passed. He says that it has been the key to his expert policy and still is today.

Jaap Goudsmit: vaccine research taming the hubris

Goudsmit's role also changed during this stage. At the end of the second stage he was recovering from the Buck-Goudsmit affair, but in retrospect he claims the whole affair did not fundamentally change his ideas on how to be an expert.

The two processes that we identified earlier – learning to control the media and becoming more aware of his knowledge base – are drawn to a close at the mid-1990s by the realities of vaccine research. In 1990, Goudsmit and Osterhaus received funding to develop a candidate HIV vaccine. In 1992 the former was very confident about the prospects for such a vaccine (Van der Laan 24 March 1992); but just two years later we see a mixed attitude: Goudsmit is still optimistic regarding the possibilities of a vaccine, although he thinks that it will require international coordination and prolonged collaboration (Vermij 26 March 1994). That is what he therefore endeavours: in 1994 Goudsmit becomes a co-founder of the IAVI, the International Aids Vaccine Initiative. In the mean time, the joint project with Osterhaus fails, in part because they 'entirely underestimated the difficulties in developing a vaccine' (Goudsmit in Mooij 2004 p. 164). Goudsmit is currently still active in the development of vaccines, but his prospects for an HIV vaccine are sombre (Kohler 1 December 2007; Goudsmit 19 May 2008). In Goudsmit's own words, the hubristic expert discovered that he was not that knowledgeable at all, that despite all his knowledge about HIV he could not produce a vaccine. This is what in effect changed the way in which he performs as an expert in public. As he became painfully aware of the limits of his expertise, Goudsmit changed into an expert who wants to be in strict control of what to say, when, where and to whom (Goudsmit 2 April 2008).

3.5.4 Stage 4: 1997-2003: Second crisis in virology

It was during this stage that Osterhaus incited awareness of a potential pandemic. He became a key figure in the Dutch, European and WHO pandemic preparedness plans, and he aired his pandemic warning ever more frequently and urgently, acting as a catalyst for policymakers. But other threats, such as the threat of bioterrorism (Gezondheidsraad 2001, 2002), foot and mouth, and later SARS, were also posing challenges for virologists. The greatest fears were, and still are, zoonoses: animal viruses that evolve into human pathogens (Gezondheidsraad 2005). Collectively, this amounted to the second crisis.

Ab Osterhaus: the entangled expert

Following the H5N1 deaths in 1997, Osterhaus unfolded a scenario that matched his earlier response to BSE. Virologists, including Osterhaus, urged the WHO to develop pandemic preparedness plans, which was done instantly. In an individual capacity, he then initiated a meeting to discuss the appropriate policy responses for Europe. Besides him initiating the meeting, it is interesting to see *how* he organised this meeting and steered its outcomes.

Osterhaus was a well-known and respected figure in the European health policy scene, belonging to some of the key health care committees. A first move he made when organising the 1998 meeting was to hand it over to an EU civil servant, now the meeting's captain. The civil servant would take credit for this meeting, and it would also be political. The second move was to select the participants, including the responsible EU commissioner and a range of influential virologists. By selecting the participants himself, Osterhaus brought together a specific body of political power and scientific expertise; and he managed to orchestrate the political process in a direction he deemed optimal without drawing attention to himself. Osterhaus strategically translated *his* pandemic warning into an official and visible EU committee.

From then on, a discursive strategy in the media invoked a coming crisis: 'we have had three pandemic outbreaks of influenza, in 1918, 1957 and 1968, killing some 100 million civilians. We can be sure a new pandemic will arrive, and unless we take appropriate measures, hundreds of thousands will die'. Although the pandemic warning was a policy lubricant (Anonymous 26 April 2001), Osterhaus believed in the reality of this message and he says it was a plain technical assessment (Osterhaus 6 March 2008). His colleagues, however, believed the message to be an overstatement, bordering on lobbying for research funds (Coutinho 13 May 2008; Goudsmit 2 April 2008, 19 May 2008; Van der Noordaa 7 May 2008). They also say that Osterhaus' tone has tempered over the years, perhaps because the discursive strategy has had its desired effects, perhaps because the scientific reality has changed[27].

[27] This was before the H1N1 pandemic; the pandemic warning gained force with H1N1.

This tension between his own scientific gut feeling and the scepticism of his critics is a dilemma he dubbed the 'cry wolf dilemma'. This 'visionary virologist' had to perform a balancing act between two extremes: on the one hand the credible but reticent academic, on the other hand the 'incredible fool' (Osterhaus 6 March 2008); and the longer it took for a pandemic to strike, the more his credibility would be at stake.

His public appearances became numerous as the concerns over bioterrorism, influenza, bird flu and SARS increased, and as the Dutch government neglected public communication. The media's solution to this latter problem was straightforward: call Osterhaus. He is always willing to spare a moment since he believes science communication is part of a scientist's professional ethos (Osterhaus 6 March 2008). These appearances amounted to a clear media policy with a handful of tricks to safeguard his public credibility.

It was not only the media who sought his assistance. In the midst of the BSE outbreak of 2000, Osterhaus was also asked to personally advise the Minister of Agriculture, who appeared to be ill-informed by his own staff. That same afternoon, the Minister informed Parliament of his BSE policy. Osterhaus heard the same sentences he had spoken that morning, and in the interview says he felt relieved: 'democracy was still able to function as it should' (Osterhaus 6 March 2008). Civil servants lack the expertise to make informed decisions and they need experts to give advice, even if that means importing their political agenda.

2003 was a busy year for virology, but especially for Osterhaus. In addition to his professorship and his extensive policy work, both avian flu and SARS struck in the spring of that year. He became involved in both of them. One moment that Osterhaus especially recalls regarding avian flu is a meeting of the Outbreak Management Team (OMT) to determine the necessary policy. The majority opposed Osterhaus' policy view, and rather than conforming, he tried to enforce his view by threatening them with a minority point of view, sketching what might happen should the OMT abstain from following his advice. It proved effective, but also demonstrated the fragility of his position: had he not been there, policy would have been very different (Osterhaus 6 March 2008).

When SARS struck, the pandemic preparedness plans came into effect. Under the direction of the WHO a small selection of laboratories, including Osterhaus' own lab in Rotterdam, were on the hunt for the cause; and on 16 April 2003 the Osterhaus lab managed to find the final and most rewarding piece of the puzzle. A press meeting was held at the WHO Geneva headquarters that same afternoon; a letter in *Nature* (Fouchier et al. 2003) and a royal decoration followed. Osterhaus reaped the rewards for the discovery and his status rose (Enserink 2003). But what is more: the WHO prevented a pandemic. This marks the SARS crisis as a moment when virologists could control a crisis. Osterhaus himself noticed that his credibility, authority and power in science, politics and society rocketed.

However, the various cases he narrated illustrate the strategic position Osterhaus held, a position that slowly became problematic. The many 'hats' he wore and responsibilities he carried, both nationally and internationally, confounded his expert role. *He* says it was manageable to know when to speak from which position and responsibility, but outsiders saw this same person in quite different settings, taking up both scientific and political roles in one same interview (Netwerk 21 February 2003). Other virologists noted that he was doing the government's dirty work (Osterhaus 29 July 2008; Goudsmit 5 July 2003), and even a Ministerial letter to parliament had to justify the way Osterhaus' view was accommodated in policy (Veerman 23 April 2003). In the second crisis Osterhaus had scientific credibility and political responsibilities, he made scientific and strategic statements, and he spoke in both a personal and collective capacity, making him an *entangled expert*.

Roel Coutinho: a technical spokesman

The hibernation of Coutinho lasted until 2000, when after more than 20 years at the public health division of the Amsterdam GGD, Coutinho became scientific director of the entire institute. In his new position his role as expert changed. HIV/Aids was still on his agenda, as was venereal diseases in general, but as the second crisis called for experts to master a wide array of human and veterinary infectious agents, he also had to inform the public on a broad portfolio of diseases. The number of public appearances increased dramatically, and he once again became a familiar figure in the newspapers[28]. This increasing diversity of topics was welcomed, but it also implied challenges, as he now had to keep track of all kinds of developments and topics that went beyond his original expertise (Coutinho 25 July 2008).

How did he cope with this? In really complex cases, Coutinho says, he referred the journalist to a knowledgeable colleague. But in most other cases, Coutinho did it himself. He read up on the subject matter, called a few people, and then appeared in the media to comment or inform. The major challenge was to decide when he felt knowledgeable enough not to consult others. We note that this back region (Goffman 1959), the preparation, remains invisible to the public view; that which is visible in the front region is the knowledgeable expert, who then takes the credit. The role he takes up is that of spokesperson and translator: speaking on behalf of the institute, and translating the specialist expertise residing there to public or political contexts (Coutinho 13 May 2008). There are a number of reasons to do so. First of all, he believes that it is part of his responsibility to carry the risks involved here. Secondly, he is the experienced expert, aware of the intricacies of communication. Thirdly, he enjoys communicating with the media, and this is stimulated by the many successes he has experienced (Coutinho 13 May 2008). Consequently, he is again a familiar face in the media. As the topics have

[28] Between 1992 and 2000 LexisNexis reports 21 articles for Coutinho; between 2000 and 2008, an equal time frame, there were 96.

become far less controversial and political than they were during the 1980s, the contributions to policy and to the public sphere and are also more technical (determining risks, developing preparedness plans). This makes him a *technical spokesman*.

Jaap Goudsmit: the puritan

In the fourth stage we see several changes affecting Goudsmit's expert role. During the mid 1990s, he held a full professorship at the Amsterdam Medical Centre, and the IAVI was a side project. After 2002 the balance started to shift. He moved to biotech firm Crucell in 2002, where he is now director of research and member of the board. He ended his board membership of the IAVI in 2004, and he swapped his full professorship for an honorary one.

In addition to the professional changes, as a virologist he became more cautious and reserved regarding what he knew. From studying his narrative, we see that 'taking control', that lesson from the 1980s and 1990s, is accomplished at two levels: on the communicative level by knowing when to stop talking, and on the strategic level by choosing the right battlefields. It is his habit of selecting the more regulated battlefields that is a very distinct feature of his expert career after the mid-1990s (Goudsmit 2 April 2008). He chooses spaces he feels comfortable and secure in, spaces that respect the strict boundaries of his expertise. Although these factors are important in understanding *why* Goudsmit takes up a certain role, in practice the different constituents are difficult to discern.

Two loci where he prefers to act are the courtroom and the study, writing popular science books. In a long laudation on his experiences as a courtroom expert[29], he describes it as the site where expertise is used in the 'purest way possible' outside of science, where all agendas lie open and only the expert's *knowledge* is questioned. The courtroom enhances the separation of facts and their interpretation; the juridical boundaries create a regulated environment, which is appreciated by Goudsmit (Goudsmit 2 April 2008).

Another preferred site for showing his expertise is his writing desk, where he is in charge of the content and form. Since the turning point in his expert biography in the mid-1990s, a steady stream of popular science books has been published. He tries to communicate technical knowledge to the public in the purest possible way, although he has not been well received by either book reviewers or editors, who say his books are too technical, too hard to read, or promise more than they actually contain (Goudsmit 19 May 2008; Becker 17 June 2000, 1 March 2003).

Next to these 'battlefields' that are cherished for their safety, Goudsmit avoids policymaking, for he loathes the conflicts of interest and the consensus finding. He has developed a love of purity in expertise that excludes policy rooms. Because of his love of

[29] It is not clear exactly how often he has been in court as an expert witness. Court case reports place him in court between 2001 and 2007.

purity, the preference for a clear expert role and the resulting choices, we refer to him as the *puritan*.

3.5.5 Stage 5: 2003-April 2009: Anticipating future crises

Pushing through the fifth stage: concerted action for control

Following years of a pandemic warning, the rapid spread of SARS, and numerous actual or possible outbreaks, politicians in the Netherlands were well aware that the lack of political responsibility, coordination, and strategic planning for outbreaks needs to be addressed. Furthermore, in 2003 a veterinarian died after being infected with bird flu[30]. This focusing event (Birkland 1997) triggered the shift to the fifth stage, during which there were endeavours to increase control over the viral threats. What is remarkable about this shift is that although the virologists occupied different positions and held different views on the science-policy-public nexus, they pushed it through collectively.

Goudsmit chose to write an open letter to a Dutch newspaper with the provocative title 'The Netherlands are unprepared for a viral attack'. The message was that the government was failing to take responsibility for the control of epidemics and public communication; people like Osterhaus were doing what the government should have been doing (Goudsmit 5 July 2003). The Director-General of the Ministry of Public Health replied, in which he acknowledged part of the critique (De Goeij 17 July 2003). Osterhaus and Coutinho also campaigned for a new infectious disease infrastructure, referring to SARS and avian flu as the wake-up calls. Osterhaus continued his alarming predictions of a pandemic, and even Coutinho made dramatic statements to create awareness (Van den Broek 5 June 2003), which is contrary to his factitious style of communicating. It was, in his words, steering between the Scylla of a failing outbreak management and the Charybdis of creating a panic (Coutinho 25 July 2008).

The collective efforts proved effective: in the course of 2004 a decision was taken to install the Centre for Infectious Disease Control (CIDC) at the RIVM, a centre that, under political accountability, would coordinate outbreaks of infectious diseases and handle public communication (Ministry of Health 7 December 2004). This new instrument for control embodies the fifth stage.

Ab Osterhaus: the seemingly invincible

When the government planned the CIDC in 2004, Osterhaus was officially consulted regarding these plans and asked to stand as candidate director. Alarmed by the fact that the government would set up the centre without proper consultation with the Health Council, Osterhaus informed them of this and suggested a consulting committee. The next step was the selection of a director. Osterhaus turned the offer down, as he had had his share of the RIVM in the past. In his view, the only other person capable of the job

[30] There was even a television documentary made about the death of the vet, featuring both Goudsmit and Osterhaus. Zembla, 2 October 2003.

was Coutinho, and Osterhaus personally phoned him (Osterhaus 29 July 2008); Coutinho accepted. Again, Osterhaus was tying a policy process and its outcome together by using formal and informal relations and his credibility in policy; this again took place in the back region.

The implication of the CIDC was that the political complexity surrounding Osterhaus was temporarily resolved, and that there was a government voice for public communication. Meanwhile, Osterhaus' campaign for more pandemic vigilance continued. Starting in 1997, major steps were taken in this direction, such as the national storage of antiviral drugs (Gezondheidsraad 2005).

Osterhaus' role in avian flu and in the successes regarding SARS resulted in a dramatic increase in public, political and scientific credibility. Through his countless media appearances he gained the status of a public figure, and some even call him 'the David Beckham of virology' (Scholtens 10 February 2009). He seems to be an *invincible expert*, not just because of this increase in credibility, but also because the risks of entanglement had been resolved. But as the H1N1 pandemic demonstrated, 'David Beckhams' are particularly prone to loss of credibility; there was great upheaval with regard to Osterhaus' commercial, scientific and political interests (Enserink 2009).

Roel Coutinho: directing a new boundary organisation

Coutinho has been director of the CIDC since January 2005 and his main responsibility has been to set up a new control structure for infectious diseases. Zoonoses are by far the greatest threat, and there is considerable conflict between the interests of agriculture (a melting pot for infectious agents) and of public health. Notorious cases are MRSA and Q fever bacteria (Coutinho 25 July 2008). Coutinho is caught in the middle of both ministries, and acts as a kind of buffer. Whenever there is an outbreak, Coutinho and his centre are on top of it, with regard both to outbreak management and to public communication. The CIDC has the data, the expertise and the responsibility to do so. He is still a spokesman and translator, but now under Ministerial responsibility.

Coutinho's role has led to a dispute between Coutinho and Osterhaus. Coutinho describes himself as an expert who is independent of the institutional setting and always does what he believes in. Osterhaus, however, depicts Coutinho as a governmental expert, since he falls under direct responsibility of the health Minister. Osterhaus recounts how he has seen Coutinho change over the years, becoming less outspoken, and says that his political accountability has contributed to this (Osterhaus 29 July 2008). Although Coutinho clearly experiences the political pressures, he says it *has not* changed him; he is not the governmental representative Osterhaus claims he is. He is less outspoken, since there is no need for him to act otherwise (Coutinho 13 May 2008).

The debate of his role is illustrative for the embedding of the CIDC as a new 'boundary object' in the Dutch institutional landscape, combining science, policy and communication in a novel way.

Jaap Goudsmit: hobby expert

Following his interventions in infectious disease control in 2003, Goudsmit repeated the same strategy in 2004. In the same form and in the same newspaper, he castigated the Dutch education policy and pleaded for a dual university system(Goudsmit 10 June 2004). This was not based on his expertise as a virologist, but on his experience in academia and in industry. Again, this letter evoked much response, some of it critical, and a documentary (Tegenlicht 5 February 2006) and book essay followed (Goudsmit 2006).

In addition to this interest in education, he is still writing popular science books on virology. This is probably the only topic in which he still publicly discusses his expertise in virology. He is constantly experimenting with form, and in his present book he is again trying to communicate pure knowledge, which remains difficult. The resulting book is *Dromen van vaccines* ('Dreaming of vaccines', Goudsmit 2009).

The puritan expert keeps the hubris on a leash, and Goudsmit is very selective in his expert dealings. He nevertheless displays what he calls his 'hobbies' (Goudsmit 2 April 2008): writing novels and sharing his views on issues he feels knowledgeable about. This combination of a strict expert acting within virology and a hobbyist outside of virology leads to the role of *hobby expert*.

3.6 Conclusion: On opening up the biographical black box

This article has studied from a biographical-narrative perspective how Albert Osterhaus, Roel Coutinho and Jaap Goudsmit positioned themselves over the years as policy and public experts in the field of infectious diseases. Their narratives covered five stages, from the late 1970s until April 2009, when the swine flu pandemic struck. Right from the start, they were all simultaneously conducting research, drafting public health or veterinary policy based on that research, and communicating to various public and patient groups on the diseases. In some cases communication was used strategically to induce policy change (Birkland 1997; Kingdon 1995), but often enough communication was aimed at solely informing the public on the status quo of outbreaks.

Of the various elements of the experts' biographies, two aspects stand out from the rest: the personal reflections of these experts on their roles; and the tandem development of governance arrangements and the role of these virologists therein. To start with the first: the biographical approach shows us how the early, trial and error methods of 'being an expert' steadfastly developed into more crystallised views on their roles. The experts based their methods on the early-career understandings of the relationship between science, politics and the public domain. This article opens up the biographical-narrative 'black box' of these experts, and the enactment of that biography in practice (Goffman 1959; Deuten and Rip 2000; Brockmeier and Carbaugh 2001). Learning experiences,

personal or communal reflections on specific events, the continuous process of re-narrating and reframing past experiences, all added up to an individual conviction on 'how to perform as a credible expert'. In Coutinho's case, we might say that his self-perception as an expert has not changed dramatically, but solidified in a repertoire of communicating the facts. Goudsmit, on the other hand, following a redefinition of his expertise, radically changed the way in which perceived his role in policy and in public debate. Then we have Osterhaus, who still finds himself in a continuous balancing act between a credible scientist, a policy entrepreneur, a public communicator and an industry advisor. The biographical-narrative approach has elucidated how each of them have accommodated themselves in the boundary zone between science, policy and public debate, and thus juxtaposes with a more macro-sociological understanding of expertise, such as Nowotny's 'narrative of expertise' (Nowotny 2000).

The second aspect that stands out is the development of governance arrangements. The studies of Coutinho and Osterhaus demonstrate that since they were pioneers in the development of new governance arrangements, they remained central figures in these arrangements for infectious disease control. The emerging governance structures and the pioneering virologists remained tied together. It is no accident that when the CIDC was being set up, Osterhaus and Coutinho were the prime, if not only, candidate directors. Up until the H1N1 pandemic, these two virologists were the key figures in policymaking and public debate. In cases where new governance arrangements emerge, we can thus expect the leading figures in that process to remain tied to those arrangements. It is certainly relevant to scrutinise the degree in which the experts themselves strive to remain tied, whether the arrangements as such keep them tied, and *why*. This article demonstrates how the involvement of certain figures is understandable from a historical and biographical perspective.

However, with shifting challenges and changing social, economic and political contexts, it is desirable to renew the composition of expertise in governance arrangements. Without wishing to pass direct judgment on either Coutinho or Osterhaus, I suggest that biographical ties should not grant access by default. Probing these dimensions, as this study does, assists in the assessment of the nature and structure of contemporary governance arrangements, the persons involved and their relationships to science, politics and the public sphere. Although this does not provide a prescriptive approach to expertise, such as that suggested by Collins and Evans (Collins and Evans 2007), it may help to critically question the almost automatic policy involvement of some experts.

The recent H1N1 pandemic demonstrates that this problematisation is not merely a scholarly exercise. From the first announcements of the new virus, Osterhaus and Coutinho dominated politics and the media. Their performances raised a plethora of comments and questions and, to put it mildly, were not undisputed (Van Rijswoud 2009). This led to the organisation a public debate with Osterhaus and Coutinho, inviting them to publicly reflect on their roles (see Dortmans and Van Rijswoud 2009).

A last and important conclusion of this case study is that during the recent pandemic the historically grown roles of Osterhaus and Coutinho did not resonate with the changing ideas of various public domains on the roles of experts. As norms and expectations for credibility and authority change over time, these experts cannot rely on the crystallised understandings of their roles and their settled positions in governance arrangements. During the course of the pandemic, for various reasons, Osterhaus' and Coutinho's credibilities were severely damaged and their authorities disputed. Osterhaus' balancing act could not withstand the growing wave of criticism (Enserink 2009), and Coutinho's notion of medical authority was challenged down to the bone (Coutinho 2 February 2010). These controversies raise a call for a more thorough reflection on their roles, both within governance and public communication. Answering that call, this article tells us, is a continuous struggle and challenge.

Interviews

Roel Coutinho: 13 May 2008; 25 July 2008.
Jaap Goudsmit: 2 April 2008; 19 May 2008.
Andre Knottnerus & Marianne de Visser (president & vice president of the Health Council): 30 January 2006.
Jan van der Noordaa (emeritus professor of virology): 7 May 2008.
Albert Osterhaus: 6 March 2008; 29 July 2008.

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Chapter 4. The Dutch ecological turn in flood protection: biographical perspectives from hydraulic engineers[31]

Abstract

In the Netherlands, a country of water, dykes and dams, ecology has pervaded the domain of civil engineering over the last four decades. Starting with the ecological turn in the 1970s (Disco 2002), the policies, practices and institutes of engineering have changed significantly. Classic engineering lost its authority, and problems and solutions traditionally pertaining to engineering became more complex and varied. This article studies these shifts as reflected in the biographies of four leading hydraulic engineers. These senior professors and advisors to government have, each developed their own position towards the ecological turn from which they redrew the boundaries between engineering science, ecology and political expertise. With their expertise and experience, they appropriated the recent ecological turn in their own expertise and role in Dutch science, policy and society, trying maintain a credible political position and to safeguard a solid standard of flood protection.

Keywords: civil engineering; ecological turn; authority of expertise; policy development; biographical-narrative approach.

4.1 Introduction: Civil engineering, old and new

In the corridors of the Department of Hydraulic Engineering of Delft University of Technology, a series of standing banners proudly presents three of the four professors in civil engineering, who I study in this article as examples of public experts[32]. Flanked by a

[31] A shortened version of this chapter is prepared for resubmission to *Science as Culture*. So far, this article has benefited from the comments of many, in particular Hub Zwart and Hans Marks. WTMC colleagues Peter Paul Verbeek, Willem Halffman, Matthijs Kouw, Lotte Krabbenborg, Federica Lucivero and Alexandra Supper have provided a critical reading of this article, which has been a joy. Lastly, I would like to thank the reviewers and editors from *Science as Culture* for the valuable suggestions for improvements to an earlier version of this article.

[32] This was the situation at the time of my visit in June 2009. Upon my second visit in June 2010 I found the waiting area had been renovated, and the banners removed.

model of a ship dredger, these banners decorate the otherwise sober waiting area. Photos and catch phrases convey the areas of expertise of the department's professors. Han Vrijling's banner represents what is most commonly regarded as the tradition of Dutch hydraulic engineering: photos of immense structures of steel and concrete intervening in the landscape and protecting the hinterland, under bellicose headings such as 'STORM SURGE BARRIERS' and 'FLOOD DEFENSE STRUCTURES'. Marcel Stive's and Huib de Vriend's banners depict nearly artistic coastal shorelines, the result of the natural interplay of sand, water and currents (Stive), and aerials of meandering rivers and estuaries (de Vriend), accompanied by phrases like 'COASTAL ZONE MANAGEMENT', 'BIOGEOMORPHOLOGY' and 'SAND ENGINE' (Stive), or 'SPACE FOR THE RIVER', 'MEANDERING' and 'MORPHOLOGY' (de Vriend). Various contrasts can be drawn between these banners ('water barriers vs. water management'; 'defence structures vs. natural morphology') and these reflect different perspectives in the debate on 'new vs. old engineering'[33], a debate that takes us right to the heart and soul of the Dutch approaches to 'living and working with water'[34]. The breadth of this debate can be illustrated with the position of the fourth engineering expert studied here, Pier Vellinga. Although he was also among the ranks of Delft engineers in the 1980s, he subsequently moved to study climate change problems. At Wageningen University and Research Centre, he currently studies the consequences and challenges of climate change for water security. Were Vellinga to present himself on a similar conference banner, it would probably say something like 'CLIMATE PROOFING', 'ADAPTATION' and 'DAMAGE MITIGATION', and show pictures of broad yet overflowable dykes.

These four professors are not random figures in the broad scientific field of civil engineering. Rather, they are elite engineers, advising government on water and engineering policy, and they have a long career behind them in which they attained leading positions in engineering science and policy. As these banners demonstrate, they hold rather different positions in the debate about how to connect civil engineering with ecology. In essence, this debate deals with the question of how to balance ecology with water security in the domains of science, politics and planning. How have these four engineers attained and retained these leading positions as advisors to government policy? And how have they, as part of that, handled the political challenges that adjoins the balancing of ecology and water security?

In this article, I will provide a biographical-narrative analysis to demonstrate how each of these exemplary public and political experts interacted with the debate about engineering and ecology over the course of their careers, with a particular focus on the political and public dimensions. This will show that by appropriating the ecological dimension to engineering, they not just changed the context and framing of the debate,

[33] This dichotomy is described in a opinion article by Han Vrijling, (Vrijling 13 September 2008).
[34] A phrase used in the title of second the Delta report, see (Deltacommittee 2008)

but also had to redefine their own position as government advisors. As such, this article studies the evolution of scientific experts from a micro level perspective.

4.2 Analysing engineering experts in a contested context: a biographical-narrative approach

Scholarship on engineering in the Netherlands demonstrates, from various angles, that the relation between ecology and engineering is one that gives rise to various tensions. Although at present the debate is on the balancing of ecological values with flood protection, on the way the policy process is organized, and on the role of scientific experts in that process, in more general terms the debate is not new. The question of how to balance the ecology of the coastal zone and the Rhine and Meuse delta with the technological interventions required for safety, the navigation of ships or the division of water has concerned both contemporary water managers and their predecessors for the last 200 years.

In the previous centuries, the perceived lack of technical means to intervene in the river delta implied that the rivers took their natural courses. Between about 1800 and 1850 the balance started to tip, and the understanding that rivers could be 'normalised' gained the upper hand (Van Heezik 2008). This not only changed the physical landscape, but also the relations between the main actors in this field, such as the water boards and the provinces, responsible for the maintenance of water works, and Rijkswaterstaat, founded in 1798. At the turn of the twentieth century a series of Acts were introduced that further articulated and regulated the relations between actors in this domain, with Rijkswaterstaat as the most authoritative body (Lintsen and Ten Horn-van Nispen 1998). The channelisation of rivers entailed the construction of numerous locks and weirs, and Rijkswaterstaat and the newly founded Delft Polytechnic School cooperated in innovating the construction of locks. The research facility for water works, Delft Hydraulics, was opened in 1928 and greatly enhanced the Dutch innovative capacity in the construction and design of water works (Disco 1998).

A landmark event in the Dutch history and tradition of engineering is the 1953 flood disaster, in which the South Western region of the Netherlands was inundated by the sea, killing over 1800 inhabitants. Immediately after this dramatic event, innovative plans were designed and executed to prevent such a disaster from ever happening again: huge dams would close off all but two estuaries in the Rhine, Meuse and Schelde Delta. In the first half of the twentieth century, the new engineering works had become ever more complex and with the construction of the Delta Works, engineering firms not only executed the constructions, but also were involved in their design (see Bijker, 2002, Van der Ham, 1999, Berkers and Ten Horn-van Nispen, 1998).

The balance of power for technocratic engineering started to shift in the 1960s and 1970s, when the public started to express concerns about the declining quality of nature, for

example the water quality in the rivers (Van Heezik 2008), the construction of infrastructure (Van der Ham 1999; Van der Vleuten 2010) and, last but not least, the Delta Works, including the Oosterschelde dam (Van der Ham 1999; Disco 2002; Bijker 2002).

No less than a crisis unfolded in modern civil engineering. This crisis forced Rijkswaterstaat to take the ecological dimension seriously (Disco 2002; Bijker 2002). According to the original plans, a dam would close off the entire Oosterschelde Estuary, destroying the estuary's ecological dynamics and affecting the region's economic prosperity. Following the general election a new central-left government decided to re-evaluate the Oosterschelde closure, and the closed dam option was discarded (Disco 2002, pp. 217-8). Disco describes how the decision to build a storm surge barrier with sliding doors created a professional space and even a habitat for ecologist and biologists at Rijkswaterstaat, a new 'jurisdictional vacancy' (Abbott 1988). The Institute could not provide the expertise required to handle the ecological dimensions of the Oosterschelde barrier out of its own ranks, and so it had to employ academic ecologists and biologists. In Bijker's words, '[t]he Oosterschelde barrier plunged the Netherlands and Dutch water management into deep crisis' (Bijker 2002, p. 528). Despite, and perhaps because of, the challenges the Oosterschelde created, this was only a partial victory for ecologists over civil engineers, because the core identity of Rijkswaterstaat, and even more so of the academic branch of civil engineers, remained unaffected by this 'ecological turn' (Disco 2002, p. 224).

This balance has, however, shifted over the course of the last four decades in favour of the ecological perspective. Crises in water management, for example peak discharges in the Rhine and Meuse delta in 1993 and 1994/1995, were focusing events for ecologists to push their perspectives higher on the political agenda (Kingdon 1995; Birkland 1997). They claimed that river channelisation transformed the hydro-morphology of rivers from wide and meandering streams into static and navigable logistic arteries, reducing their capacity to cope with peak discharges (Havinga and Smits 2000, p. 23). The answer was to create 'Room for the Rivers'. This 'new approach to river management' (Smits, Nienhuis, and Leuven 2000) centred around the idea of enlarging the flood plains by relocating the dykes further away from the river, giving space to the river and restoring (or remaking) the ecology of floodplains. The ecological turn continued to affect the field of engineering, creating both dilemmas for Rijkswaterstaat (Van den Brink 2009, p. 13), as well as opportunities for scientific cooperation – or tolerance – across disciplinary boundaries, as Mieke van Hemert has demonstrated (Van Hemert 2008; Van Hemert and Van der Meulen 2010).

In relation to the questions regarding the four engineers presented in the Introduction, this scholarly debate presents two concerns for contemporary engineers. To start with, the relation towards politicians has come under great tension, and more than ever the engineers have to compete with other expertises and disciplines. This is not just a 'crisis'

as Bijker interpreted the events in the 1970's, but also a continuation of the jurisdictional battle over who has authority over which issues, over which profession gets "to classify a problem, to reasons about it, and to action on it: in more formal terms, to diagnose, to infer, and to treat" (Abbott 1988, p. 40). As Nico Stehr comes to describe it, "[t]he constitution of experts requires the parallel constitution of a certain clientele or public. Clients and experts have certain minimal common features, be it only the conviction that specialized knowledge is functional under certain circumstances" (Stehr 1994, p. 164). The challenge for the engineering experts has been, and still is, to ensure that their specialist *engineering* knowledge and the underlying agenda of flood protection remains authoritative as the dominant policy frame, that politics remains in need of their expertise.

The second issue is that this has not just been a concern towards policy and politics; also at a scientific plane the engineers had to tackle the ecological turn. As Gibbons et al. have explained, in Mode-2 Science the epistemological orientation is more organised towards to the structure of the problems it addresses (Gibbons et al. 1994), and this concerns engineering as well. Indeed, the scholarly research into engineering demonstrates this feature composes its raison d'être. In addition, demarcating the boundaries of science is part of the enterprise in upholding one's public and political credibility and authority (Gieryn 1999). Therefore, studying the boundary work of these four engineers is key to understanding how they have faced the challenges of the ecological turn.

Thus far, these political and scientific concerns for credibility and authority have not been analysed on the level of those leading the field. This article will therefore investigate how four leading engineers, with a long career as key advisors to government, handled this issue of balancing security and ecology at a political and a scientific level. As "[t]he contours of science are shaped … by the local contingencies of the moment: the adversaries then and there, the stakes, the geographically challenged audience" (Gieryn 1999, p. 5), a biographical approach is a very suitable means to understand the role of experts in policy and public debate in general, and Dutch engineering practices in particular.

In the next section I will briefly outline the methodology for this analysis, and how I have selected the four experts for this study. I will then present the empirical analysis in the form of four expert narratives, and in the Conclusion will analyse how they handled the political challenges that adjoins the balancing of ecology and water security.

4.3 A biographical-narrative approach: constructing expert narratives

The biographical approach as presented here builds on symbolic interactionism and studies the interactions and interpretive processes between the individual and his

surroundings (Blumer 1969). The main sources for this study are narrative interviews with the respondents, and empirical material that relates to those narratives (media sources, scientific publications and policy documents). The material was then interpreted from the perspective of the research theme, and was integrated in the form of expert narratives.

The inductive development of narratives involved four iterative stages. In the first stage, data were collected on the academic and public *track records* of the four engineers, and on the socio-historical context of water engineering in which they were situated. This was used to prepare *biographical-narrative interviews*, the second step. These interviews focused on their experiences and development as experts in policymaking and public debate. The third step was to *organise the data temporally*, with a focus on the diachronic data (data on events, their relations and the effects of events). This step included the collection of additional data, for example by conducting a second interview, or interviewing informants. In the final stage, the expert careers were written down as *coherent and empirically-grounded narratives*, thereby 'explicating an intrinsically meaningful form' (Polkinghorne 2005, p. 93). Rather than being the only true *re*construction of past experiences and events, the expert narratives are a construction that, in view of the theme research and the way this theme appears in the empirical resources, is most coherent. The labels used to structure these narratives must likewise be seen as provisional headings.

As to the methodological validity of the narratives that emerge in this manner, it is important to see that the production process of narratives takes place on various levels. The first level is the level of the actual events as experienced by the scientists involved, the so-called *lived story* (Rosenthal 2005, p. 27; Wengraf 2000). Subsequently, the scientists themselves will reflect on these events retrospectively and from a certain distance, and this continuous process changes their interpretation of the events that have taken place. This level can be referred to as the *told story*. Finally, as a result of the interactions, post hoc reflections and reframings between interviewee and researcher, the *written story* as a third level of narrative emerges (Littig 2008, par. 17). Thus, the written story builds on the two previous levels, and care is taken to secure the internal validity through iterative data collecting and interview sessions, as is also the case here. Rather than discarding these reframings by the interviewee and the researcher as creating a 'myth' (Peneff 1990), one can also find value in them. It captures the individual in his intentional state, and comprises the interpretation of himself, the outside world and the role he wished to perform in the outside world (Goffman 1959; Bruner 2001).

The scientists for this study were selected on a number of criteria, all directed at understanding the role of leading scientists in policy and public debate: (1) The respondents were still active and leading in the field; (2) they had demonstrable experience as public and political experts; (3) had gained such experiences over a longer period of time; (4) collectively, they belonged to the same generation. The first three

criteria demarcate the phenomenon of the experts into a particular category, that of experienced political and public experts. In addition to these criteria on their 'track record', the fourth criterion also matters in understanding experts: it acknowledges the importance of a 'generation cohort perspective', paying attention to the relevance of the interpersonal and social age of this cohort of experts (Plummer 2001, pp. 128-129). By studying policy reports, relevant committees and advisory councils, media records and consulting colleagues in the field[35], I came to select Pier Vellinga (1950), Marcel Stive (1951), Huib de Vriend (1947) and Han Vrijling (1947) as the engineers to be studied. Following an invitation by e-mail to participate, they all agreed.

Pier Vellinga started his career in civil engineering at Delft Hydraulics in the late 1970s, where he obtained his PhD. In 1987, he moved to the Ministry of Housing, Spatial Planning and the Environment, and in 1991 returned to academia. He is currently professor at Wageningen University and Research Centre and director of research programmes that connect engineering, climate change and spatial planning. Marcel Stive also started to work at Delft Hydraulics in 1977, and in 1994 was appointed professor in coastal engineering. His expertise lies in modelling coastal erosion. Huib de Vriend also worked at Delft Hydraulics, but in the area of river modelling. He has worked at Delft University of Technology for most of his career. In 2002 became scientific director of Delft Hydraulics, and since 2008 he has held a similar position at its successor Deltares. Han Vrijling is the only expert in this study who did not start at Delft Hydraulics. He started his career with the construction of the Oosterschelde storm surge barrier, where he developed the approach of probabilistic designing. After the barrier had been completed, he combined working for Rijkswaterstaat with a professorship in probabilistic design at Delft University of Technology, where he has been a full professor since 1995.

4.4 Stages of appropriation

The developments in engineering that we have already outlined will be used as a backdrop to analyse the biographies of the four engineers. Rather than presenting the biographies one after the other for the entire time span of this article (1980-2009), we will discuss a number of successive stages. These stages are defined by important turning points in science, politics or society that impacted the roles of these scientists[36].

1. 1980s-1993: Building careers as a new generation of engineers
2. 1993-2003: River floodings and the return to Room for Rivers
3. 2003-2007: From politics to policy: expert advice in peril
4. 2007-present: Planning without flooding: the era of the Delta report

[35] I am indebted to Anna Wesselink and Madelinde Winnubst for their advice on this.
[36] As the expert roles and narratives of each expert varies with regard to these stages of different lengths, the length and depth of the studies also changes between experts and periods.

The first stage describes the first years of the engineers' careers, a new generation of scientists who were raised in a in a period when ecological approaches to engineering were starting to make inroads.
The second period starts with the 1993/1995 river floodings, events that gave extra force to budding ecological concerns in river management and resulted in the *Room for Rivers* programme. The third period was introduced by what can be dubbed a political crisis, arising out of a rather dramatic shift in the advisory structure. This was reinforced by Hurricane Katrina, an actual crisis that reinforced concerns about Dutch water security. The appointment and report of the second Delta Committee (the first handled the 1953 flooding), a committee that was to present a solid water policy for the coming 100 years, marks the fourth and last period. An examination of these periods indicates that they would appear to suffer from a focus on the present, with almost all attention being given to the more recent events. Due to the nature of the main empirical source, narratives told by engineers, some degree of presentism cannot be avoided as being inherent to people's narratives. However, there is also a contextual explanation as to why recent years are discussed in greater detail: the theme of balancing water security with ecology has become more forceful in recent years, and in combination with the changing of the advisory structure, developments in water engineering have been more rapid and fundamental since 2003.

4.4.1 Building careers as a new generation of engineers

During this first period, that followed the ecological crisis about the Oosterschelde storm surge barrier, Pier Vellinga, Marcel Stive, Huib de Vriend and Han Vrijling were completing their studies, making their first career moves and developing their own fields of expertise. They embodied a new generation of civil engineers from Delft. For Pier Vellinga, it was a period of dramatic career changes; the other three moved upwards in the ranks of 'classic engineering'.

Pier Vellinga: from engineer to ambassador
In the 1980s, Pier Vellinga was working towards a professorship in his area of expertise: modelling dune erosion and sand transportation (Vellinga 1986). However, the continuing focus on modelling without taking into account the broader socio-scientific context seemed a dead end to him, and reading the 1987 Brundtland report drew him closer to the climate issue. As an engineer he started to address the issue of sea level rise and climate change, which did not go unnoticed (Vellinga 26 May 2009). In 1988, Winsemius and Nijpels[37] managed to get Vellinga to become what he calls a 'CO_2 diplomat': directing Dutch climate policy on the international stage. That implied two career moves in one go: the transition from science to policy, more precisely to the

[37] Consecutive Ministers of the Environment (1982-1986; 1986-1989) for the VVD (Dutch Liberal Party).

Ministry of Housing, Spatial Planning and the Environment (VROM); and the shift of focus from hydraulic engineering to climate change. Gradually, Vellinga moved closer and closer to the IPCC, the Intergovernmental Panel on Climate Change. In 1988, he became a delegate in the first IPCC session (November 1988). He was also delegate to the second (June 1989) and third sessions (February 1990), and during the fourth IPCC session (August 1990) he became member of the IPCC's central bureau that coordinated the Panel. Thus, Vellinga's involvement in new topics during these years at VROM dramatically increased the content and scope (politically, internationally and scientifically) of his expertise. However, this excursion into politics also entailed a number of challenges. The scientific problem framing of climate change with which he had started, was increasingly challenged by political and economics interests. These political, public and scientific impediments for a successful climate change policy led Vellinga to believe that they were too early with their policy proposals and made him susceptible to economic approaches to the climate problem. In 1991, he chose to become director of the Institute for Environmental Studies (IVM), a leading Dutch institute with expertise in the economics and modelling of climate change. Combined with his background in engineering and politics this gave him a unique position (Vellinga 26 May 2009).

Marcel Stive: politics of coastal engineering

Vellinga's former colleague at Delft Hydraulics, Marcel Stive, had a more tranquil career. One of the first projects he worked on at Delft Hydraulics was the plan for an industrial artificial island off the Dutch coast, a theme he would reencounter later in his career. Towards the end of the 1980s, Stive became part of a multidisciplinary project called *Coastal Genesis*, and this project would result in his first real performance as an expert in the political arena. When Delft Hydraulics had just reorganised and the Minister for Transport, Public Works and Water Management visited the institute, Stive was asked to present 'something innovative'. Accordingly, he and his colleagues produced a white paper that presented the novel idea of underwater sand nourishment as a means to compensate for continuous coastal erosion. Rijkswaterstaat employees objected to this new method, for it disturbed their routines of beach maintenance, but Stive persisted and successfully brought it to the Minister's attention. When the first white paper on coastal policy was produced[38], researchers like Stive made important contributions.

These episodes demonstrate how Stive was in a position to overtake policy makers by presenting his ideas directly to the Minister and to make authoritative policy recommendations. His influence, unlike Vellinga's, did not come from switching positions, but from staying in one. Retrospectively, he also stressed the uncertainty and

[38] Stive pointed out to me that it was quite unusual for the Netherlands not to have a coastal policy before 1990.

contingency of his own role; he presents himself as someone 'who's ideas happen to be accepted' (Stive 23 June 2009).

Huib de Vriend: from river modelling to coastal modelling, and back again

Huib de Vriend is the third in a row of the engineers who spent the 1980s at Delft Hydraulics. Following his PhD in river morphology (De Vriend 1981) his research focus shifted towards coastal morphology, a field Stive also worked in, and consequently they often published together. This multidisciplinary research at Delft Hydraulics continued until 1993, the year in which the University of Twente received permission to start its own civil engineering faculty. Then de Vriend accepted a professorship in coastal morphology and management there. Soon, however, a research assessment advised the Twente Faculty to collaborate with Delft. When a professorship at Delft in his home discipline of river morphology became available, Delft and Twente both supported the nomination of de Vriend. Since 1995, he has worked in both Twente and Delft, bridging the gap between the two universities.

Han Vrijling: on becoming a fossil

In 1974, the same year when it politically proved impossible to build a closed dam in the Oosterschelde, Han Vrijling, the final figure of the foursome studied in this article, graduated from Delft University of Technology and started his career at an engineering firm. The relation with the Oosterschelde barrier soon became an intimate one, for he was seconded to the construction of the storm surge barrier. He found the science behind the project to be thrilling and experimental, and until 1982 he worked on the design of the barrier. These experiences with building the barrier reveal a firm relation between Vrijling and the traditional identity of civil engineering, that of construction major waterworks. The greatest difference he identifies between him and his colleagues is that he is the only one who was actually involved in the designing and building of the Delta Works. With irony in his voice, he calls himself a 'fossil', the last of the Mohicans of traditional engineering who has a sense for the restrictions imposed by the realities of actual building (Vrijling 28 June 2010).

Besides this success in combining engineering with the preservation of ecological values, he continued to combine both. One such example was the alternative design for the Jumana River in India (1987), where he combined classic engineering with ecology. In 1990 he had organised workshop under the wings of the International Association of Hydro-Environment Engineering and Research (Bogardi, Saeijs, and Vrijling 1991). It would turn out that these interactions with ecology would be the most constructive ones. The differences in modelling, the disciplinary boundaries and the supposed image of engineers as ecologists' enemies contributed in Vrijling's opinion to the ending of the cooperation (Vrijling 28 June 2010).

4.4.2 1993-2003: River floodings and the return to Room for Rivers

The 1993 and 1995 floods and the resulting *Room for Rivers* programme were key turning points in the relation between ecology and engineering. The grip of ecologists on engineering and water management became firmer and may even have taken the upper hand, depending on who you ask. One of the first responses from politics to the 1993-1995 events was to execute maintenance works that were due before the floods: in 1993 dyke reinforcements had already been authorised. Nevertheless, in the years following the flooding and these subsequent classic responses, the ecological approach started to manifest itself in river management, and the stage for water engineering changed accordingly.

Pier Vellinga: water security as a climate issue

The floods did not pose an immediate concern for Pier Vellinga. Water safety was not his main topic of interest, and the scarce references to threatened water security illustrate that there was a 'watershed' between the period 1987-2003, and the preceding and following periods in terms of his involvement in water security. At the time of the river floods Vellinga was director at the Institute for Environmental Studies (IVM). Since the 1990s, Vellinga had been a public figure who had campaigned for scientific, political, public and economic awareness of the climate problems. He presented and defended the evidence load of the IPCC, and belonged to a solid national and international network of energy, climate change and global development organisations. In other words, he was at the forefront of the major political and scientific developments. Upon arriving at the IVM he dived into the economic theories to understand the political and industrial resistance towards climate policy, believing climate policy's economic underpinnings were in need of improvement. He realised however that it was not a problem of economics, but of the underlying division of political power (Vellinga 26 May 2009). He then turned to political scientists to understand the role of power, and familiarised himself with the work of leading sociologists. In retrospect, taking that approach gave him an enormous head start in addressing climate change problems.

In the midst of this main occupation with climate change, flood issues were still remotely on his radar in relation to climate change. In 1995, he co-authored a report that explored the relation between climate change and river flooding (Weijers and Vellinga 1995), and in newspapers he has often warned for the hydraulic consequences of climate change (more precipitation and river floodings). His background as an hydraulic engineer and his concern with climate change were seamlessly knit together in his analyses of what the peak discharges mean for river planning (Trouw 4 February 1995).

Marcel Stive: lobbying for coastal protection

Around the time of the river floods, Stive had become professor in coastal engineering at Delft University of Technology. As his focus was on coastal engineering and coastal

morphology, the river floodings were not of eminent professional concern. The design of an artificial industry island, his project from the early 1980s, was taken off the shelf again in 1997 to give the prestige of Delft Hydraulics a boost. Stive was put on it and chose to come up with a multidisciplinary approach for an airport island[39]. In his opinion, the plan was received well, and resulted in 'Flyland', an immense governmental study. However, public support and financial possibilities diminished and in May 2003 Flyland ended without leaving any material traces (Schultz van Haegen 26 May 2003; Stronkhorst 2008). As I will come to explain later, Stive's these experiences with artificial islands gave him a key position in a politically heated debate.

Engineering Dutch national pride was just one of Stive's occupations in 1997; the other was the immense occupation with water security. Stive, like Vrijling and de Vriend, was a member of the Technical Advisory Committee on Waterworks (TAW), the main advisory body to politics. In the TAW an emerging security issue was discussed: the increased force and period of waves hitting the coast. The periods between the waves reaching the shoreline was increasing, and the force and duration of these waves increased accordingly. The problem was that the coastal dykes and dunes were not designed to withstand these longer wave periods. Media were pressing Stive to provide more information on this, but Stive did not need journalists to get his concern on the political agenda (Stive 23 June 2009). In the arrangement between Delft, the TAW and Ministry of Water Management, Stive and the TAW had no trouble in bringing this problem to the attention of politics. The fact that Stive was high in the ranks of Delft University of Technology, that he belonged to the TAW and that he did not go public with his concerns over the wave period, demonstrate that the arrangement channelled the concerns and ideas between science and government, and that he knew that communicating to the media could disturb this productive and efficient arrangement.

Huib de Vriend: river floods and the problems of design

Upon returning to his home discipline of river morphology as a Delft professor in 1995, Huib de Vriend joined the TAW as chair of the River working group[40]. From 1994 onwards he was also member of the Netherlands Commission for Environmental Assessment (NCEA), the body that produces environmental impact assessments. As a river morphologist who was involved in the TAW and the NCEA, de Vriend was seriously worried over the handling about the 1993/1995 events. The peak discharges and (near) floods created a boost for both his research and his interventions in river policy. His major concern was the neglect of river morphology in both the determination of design water discharge and the derivative implementations in river management plans

[39] see the project website http://eilandinzee.wldelft.nl/, last visited 12 January 2011.

[40] These chairmanships are coupled to the chairs at Delft University of Technology. Following the same principle, Han Vrijling chairs the Security working group and Stive the Coastal working group.

and actions. The 1995 peak discharges demonstrated that under such extreme circumstances, the river basin changes dramatically, and this changes the water flow. However, such factors were not included in the models that were used in *Room for Rivers* design, which gave rise to a major design flaw (de Vriend 6 July 2009).

Using his combined expertise in engineering and geosciences he raised awareness whenever he could, for example in NCEA and the TAW plenary meetings. These interventions had a common characteristic, namely that he kept things internal, a discussion from expert to expert, rather than "an uncontrollable process with the tabloids". But the practical impact was less than hoped for (de Vriend 6 July 2009).

For him personally, these experiences increased not only his scientific expertise, but also his knowledge of policy and governance. They added to his appreciation of, and skilfulness in policy and government processes, language and ways of thinking. He was taken by the discovery that there is more than 'one truth', and that other perspectives need to be embedded in civil engineering (de Vriend 6 July 2009). He experienced engineering science in its societal context, and learned to integrate this in his relation to politics.

Han Vrijling: river floods and the problems of planning

In the case of Han Vrijling we find similar concerns about the way new designs for river management were developed. Although Vrijling, as illustrated by his earlier efforts in combing ecology with engineering, had no moral objections to new approaches to river management, he objected to their scientific underpinnings and the consequences for security and decisionmaking. As the expertise of engineers failed to be sufficiently acknowledged in *Room for Rivers*, he feared that the political and practical stability of decisionmaking was under threat. When towards the close of the 1990s the ambitious sketches for *Room for Rivers* were drawn and it simultaneously became clear that many of the existing dykes and dunes did not meet the safety levels set by law (Schultz van Haegen 13 February 2003), Vrijling got nervous. He objected to the project's wrong prioritising (first nature, then security), wrong funding (building nature with security funds; spending money that was not available) and wrong budgeting (not including all the expected costs in the budgeting; ignoring cheaper options coming from traditional engineering) (Vrijling 28 June 2010). He now counts as the most ardent opponent, and Stive sometimes sides with him (e.g. Jongejan et al. 2008).

In talking about this, during my interviews as well as in public, Vrijling puts his comments of isolated cases, such as Room for Rivers, in a broader cultural, political and economic constellation. We live in a time that allows for 'Rousseauian romanticism' to flourish, in the form of expensive and unrealistic plans. This is contradicting his engineering disposition, an attitude that is based on the 'water is a firm master' credo and recognises the material, political and economic limitations this imposes on

engineering practices (Vrijling 28 June 2010)[41]. Vrijling is saying that old (classic) and new engineering are not just at odds with one another, but they also represent entirely different perspectives on politics, planning and engineering science.

4.4.3 2003-2007: From politics to policy: expert advice in peril

An event which had considerable impact on the role of engineering experts was a change in the advisory structure. In 1965 the Technical Advisory Committee on Waterworks (TAW) was established and since then the TAW has produced numerous report, manuals, studies and guides on primary waterworks[42]. The creation of the TAW implied that a forum had been established that allowed the Provinces, Rijkswaterstaat, engineers and water boards to meet and discuss the technical planning and advice. Beyond the production of technical reports, the TAW also aligned technical advice and the executive branch.

Despite its effectiveness, in 2003 it was decided to discontinue the TAW in its present form[43]. As early as February 2004 the State Secretary announced a full reorganisation of the advisory structure for water management (Schultz van Haegen 11 February 2004). In June 2005, the TAW was officially dissolved (Staatscourant 28 June 2005, p. 13), and replaced by the Expertise Network Water security (ENW). Its aims: to tie together all the expertise in hydraulic engineering, and to advise the Director-Generals of Water and Rijkswaterstaat (Ministry of Transport 1 September 2005). Besides the creation of the new advisory committee Water, the most significant change was that the ENW, unlike the TAW, did not advise *politics*, i.e. the Minister or State Secretary, but to Director-Generals, the *policy* level. This was a hard nut to crack for the engineers, who were used to speaking to politicians. In December 2005 the new ENW was appointed (Staatscourant 16 December 2005)[44].

Against the backdrop of this changeover, the results from a nationwide assessment of primary waterworks, which were to prevent floods like 1993 and 1995, shocked wide circles of engineers, political authorities and citizens. In 2003, it appeared that 15% of primary waterworks did not stand up to the norms, and for some 35% the safety could not be determined (Schultz van Haegen 13 February 2003). This led to the concern that efforts aimed at creating new nature with *Room for Rivers* had resulted in a further decrease, rather than increase, in water security. The changeover of the TAW and the

[41] What I should note in this analysis is that this is more of an analysis of his arguments, than of his biography. The material available (mostly the interviews) could not indicate clearly how these arguments and objections developed over a period spanning roughly the last 15 years.
[42] see http://www.enwinfo.nl/asp/content.asp?DocumentID=79&niveau=1, last visited 12 January 2011.
[43] The transformation of the TAW was not an isolated event, but part of a large political sweep that included the sobering down and restructuring of various advisory arrangements (De Graaf 1 December 2003, p. 12).
[44] From the changed addressee in the letters from the TAW to the Ministry it becomes visible that the 'degradation' had been effectuated in February 2005.

subsequent fierce debate on dyke security also shaped the Dutch reception of Katrina. No so much as an actual disaster, but as an example of what might happen in the geographically comparable Netherlands, Hurricane Katrina and the subsequent failure of dykes and floodwalls protecting New Orleans in October 2005 re-ignited the debate on protection against the rising sea levels and peak discharges in rivers. In a *Science* article, in which a visit to New Orleans by Dutch scientists was reported, the clash between traditional engineering and ecological water managers was staged as 'questioning the Dutch solution' (Bohannon and Enserink 2005; see also Wesselink 2007)[45].

All in all, the period 2003-2005 was rather tumultuous with these political changes and exemplary flooding events. The discontinuation of the TAW and the concerns about water security affected the engineer's policy agenda, and the narratives of these experts converge at these moments in time. Each of the experts has his own explanation of, and response to this transformation.

Pier Vellinga: return to water security

For Pier Vellinga, who until then only addressed water security in the broader framework of climate change, the discontinuation of the TAW was a moment when he re-engaged with the field. The change was induced by an invitation for the 2003 Erasmus lecture, organised by the Dutch section of the Club of Rome (Vellinga 26 May 2009).

While preparing for this lecture Vellinga was drawn back into the science and politics of water security; it proved an alarming exercise. The incongruence between the security norms set by law, plummeting budgets and the actual state of the dyke systems were concerns he could not fail to address alongside his interest in climate change. He advised coping with climate change consequences like heavier storms and increased precipitation in an adaptive manner, so step by step, and for billions of Euros to be invested in the coming decades. But Vellinga also raised the question as to whether or not the traditional approach to dealing with water security really was the only one we need (Vellinga 2003).

In the public sphere, he increasingly drew the public's attention to water security. In 2003, for example, exactly 50 years after the disastrous 1953 flooding, the TAW and Vellinga addressed the problematic state the Netherlands were in during a TV documentary (Zembla 2 January 2003). Vellinga called for a new Delta Committee to deal with the issue of climate change and sea level rise, and Hurricane Katrina was used in service of that (Kabat et al. 17 November 2005, p. 283). However, he did not use used Katrina to reinforce practices of traditional engineering, as others did, but to present new concepts for protecting a flood-prone country like the Netherlands.

Overall, he felt he was in a unique position to address these issues (Vellinga 26 May 2009). His position as an informed outsider and scientist with expertise in relevant policy domains granted him both authority and freedom, as well as skills, to take up a leading

[45] For reasons of space I cannot discuss the further impact of Katrina on the Dutch debates. This is analysed in Chapter 5.

position in the debate. In this episode, he worked as an entrepreneur, a campaigner, for this particular issue.

Marcel Stive: the disapproved expert

For Marcel Stive, the first of the three engineers discussed here who was part of the TAW, the transformation of the TAW soon resulted in changed attitude of him towards the media. Although he stayed loyal to the ENW he also, albeit modestly, started giving interviews to journalists as a way to compensate for loss of influence. For example, in March 2005, he created a stir by going public with data that indicated a number of weak spots in the Dutch coastal protection (Stive 23 June 2009). Unwillingly, he ended up on the front page of a popular national newspaper under the heading *Dunes are too weak*. "The chance of flooding is larger than calculated, and sea level rise still has to enter the picture", Stive said in a quote (Telegraaf 1 March 2005). Stive was taken by surprise with this, and feared that readers would take him for a prophet of doom. Although he was critical, he also had a concern for how others, the Ministry in particular, would judge his actions. Despite the fact that his criticism rose from a concern about the safety of the Netherlands, he wanted to be careful in how he expressed these concerns to the outside world. Stive was far from calculative and just wanted to give an impulse to change, not to direct policy processes in the strict sense (Stive 23 June 2009). Stive's intervention called for a dual response. Rijkswaterstaat refuted the allegations and claimed that they were already aware of the problem; indeed, that Stive himself relied upon Rijkswaterstaat research. But in the ensuing months, the vice chancellor of Stive's university referred to this incident as an example of how authoritative expert opinions were ignored by politicians (Telegraaf 9 April 2005).

Hurricane Katrina was used by Stive to indicate the precarious position of the Netherlands. He and Vrijling, for example, co-authored an editorial entitled: *New Orleans is a Lesson to the Dutch* (Jonkman, Stive, and Vrijling November 2005). And on national television he is said to have claimed, also during Katrina, that the Netherlands is not yet Delta proof.

Huib de Vriend: navigating between power and influence

Just before the redressing of the TAW, de Vriend joined the board of Delft Hydraulics as Science and Technology director in 2002, where he occupied a strategic position between science and politics. In addition to the already noted sweep of the sector advisory councils, de Vriend identifies another factor that led to the redressing of the TAW: the council's critical stance on a river management issue.

In the discussion on Room for Rivers, which had the aim of creating more capacity for water storage and water flow, one of the proposed solutions was to create overflow areas. In May 2002, a governmental committee issued an advice on this, and the TAW was rather critical. According to de Vriend, that triggered the discontinuation of the

TAW (de Vriend 6 July 2009). He first responded in anger, and together with the other three professors in the TAW he threatened to step down. But when dust had settled, successful efforts were made to convince them to give the new ENW a chance.
In the context of Katrina, he did express criticism about the Dutch security situation. In the Washington Post he criticised the Dutch way of calculating safety and the failure to take proper account of developments like climate change (Moore 8 September 2005). He did not, however, use Katrina for agenda setting. That was due to his outlook on policy-making processes. He disapproves of the media route to policy. Rather, issues should be handled between experts, with a clear view on the longer term processes and relations (de Vriend 6 July 2009). Furthermore, in 2005 he was not that upset by the change of the TAW into the ENW. De Vriend was therefore not as 'charged' by the crisis of political legitimacy, but instead experienced it as a blessing in disguise.
All things being considered, he believes the present ENW has more influence than the old TAW; the ENW not just receives more solicitations for advice, its advisory reports also have more impact on policy and research programmes. De Vriend now is explicitly positive about it; the old situation of advising the State Secretary was far from ideal, for it was shadow boxing with the civil servant who executed the political decision (de Vriend 6 July 2009).

Han Vrijling: the end of engineers' hegemony
Vrijling's account of why the TAW changed over to the ENW confirms the diagnoses from Stive and de Vriend. One of the formal reasons of the State Secretary, says Vrijling, was that too many of her civil servants were in the TAW, implying she would be advised by her own staff[46]. However, the informal reason may have been that the she was irritated by public criticism of the TAW chairman on the leeway in dyke maintenance.
Besides the degradation of policy advice, Vrijling observes that more diverse types of expertise concern themselves with engineering, even in the ENW. With mockery in his tone, he wonders whether it is philosophically possible that a sociologist is responsible at the Ministry of the security of the dykes[47]. In response to the degradation of expert advice, Vrijling also resorted to what was considered to be unorthodox measure to get a hold on decisionmaking: shooting from the outside. Following the TAW's demise he made it clear to politicians that now that expert advice was no longer embedded in the traditional domain of power, he would change his way of communicating on risk issues. This, he said, would have been unimaginable in the TAW days (Vrijling 24 June 2009). From the increase in his appearances in the written media since 2003, we see this effectuated instantaneously. In the context of Vrijling's earlier discomfort with flood

[46] This problem also occurred with other advisory bodies, and legislation was developed to prevent this ((Sorgdrager 3 July 1996)). However, TAW did not reside under this Act, and the problem thus continued after 1996.
[47] In the summer of 2010, two sociologists were actually appointed to the ENW, which marks a definite end to the engineers' monopoly over these issues.

security in the Netherlands, Katrina is mentioned in passing as an event that could further his case. In a *direct* sense he referred to Katrina as an example of what might happen when the Dutch dyke system continued to be ignored (Jonkman and Vrijling 1 September 2005). In an *indirect* manner he attacked the Dutch political lessons from Katrina.

His intervention towards politics was a critical article in a policy journal (Jongejan, Vrijling, and Jonkman February 2008), after which the Dutch Government dropped the idea of the safety chain (Vrijling 24 June 2009). A debate on flood insurance, in which government praised the American insurance schemes (Wesselink 2007), was a similar story: being banned from the centre of the discussion Vrijling cum suis had no other alternative but to target the discussion from outside with an ENW letter (ENW 5 March 2008) and an accompanying study that demonstrates the unfeasibility of mass insurance (Vrijling 2008). The single blow is said to have resulted in the dropping of the plans (Vrijling 28 June 2010)[48]. Vrijling was therefore a critical observer who managed to make some important adjustments to policy.

4.4.4 2007-present: Planning without flooding: the era of the Delta report

All the agenda-setting work of these and other scientists following the alarming assessment of the dyke system, the expected sea level rise, increased precipitation and the example set by Hurricane Katrina impacted Dutch politics. Now that the river delta has been made climate proof with *Room for Rivers*, the time has come to develop a sustainable coastal policy (Huizinga-Heringa 7 September 2007). In 2007, the decision was taken to install a 'deltacommittee' "to come up with recommendations, not because a disaster has occurred, but rather to avoid it. The nature of the advice requested is also unusual: to present an integrated vision for the Netherlands for centuries to come" (Deltacommittee 2008, p. 7). Again, it was an episode that drew the four engineers into the political arena.

Pier Vellinga: the engineer in disguise

After the 2003 Erasmus lecture and his campaign for climate proofing, Vellinga made a comeback to the domain of water engineering, and started to lobby for a Delta Committee. Once the Delta Committee had been appointed and sat down to its task, it had an interesting job for Vellinga: to cooperate with the Royal Netherlands Meteorological Institute (KNMI) to produce up-to-the-minute climate change scenarios, including the extremes. Producing sea level rise scenario's with the KNMI was a challenge: since Vellinga got involved in climate change in the 1980s, he and the KNMI had enjoyed a love-hate relationship, as they regarded him as an outsider to climate

[48] Vrijling's was also a key expert witness for the plaintiffs in one of the Katrina trials (the MRGO trial), in which flood victims successfully sued the American Corps of Engineers. As this falls outside the scope of this article, we cannot cover that aspect here.

science (Vellinga 26 May 2009). Despite these border conflicts, Vellinga and his subcommittee managed to make probability scenarios for sea level rise. The high end scenario predicted a sea level rise of 1.3 meters by 2100. However, the chairman of the Delta report presented the 1.3 meters not as the high end scenario, but simply as *the* scenario. It caused an upheaval and the internationally renowned experts from Vellinga's subcommittee protested in public.

In 2008, during the production on the Delta report, Vellinga left the Institute for Environmental Studies he had been at since 1991, and moved to Wageningen University and Research Centre. Over the last few years, he has moved himself into a position in which he directed large research programmes into climate change and water management. He is both vice chair of the *Climate Change Spatial Planning* programme (started in 2004), as well as scientific director of the *Knowledge for Climate* programme (started in 2007). The programmes are multidisciplinary and span diverse climate change related problems. One might say that with these programmes, Vellinga has continued to weld his renewed interest in hydraulic engineering together with his later passion for climate change.

The revived engagement with hydraulic engineering culminated in a conceptual idea that since then is Vellinga's pet idea: the broad dykes. With a width of 300 meters, these dykes are not only unbreakable; they are also a host to attractive recreating and housing possibilities. Vellinga believes that it is a much better way of protecting against the water then the 'thin lines in the landscape', a strange relict of the Middle Ages (Vellinga 26 May 2009). The concept of broad dykes was not just presented to the outside world; it was *launched* in the media as an alternative to the idea of raising dykes (Schreuder 6 February 2008). This last example illustrates Vellinga's self image as conceptual thinker in engineering.

Marcel Stive: fitting engineering science with politics

When he was invited to take place in the Delta Committee, Stive was surprised by the fact that this committee was appointed without a clear triggering event, such as the floods of 1953 and 1916 did before. That the Delta Committee would not be a traditional civil engineering enterprise was clear from the outset, and this was also reflected in the composition of the committee: Stive was the sole civil engineer. The responsibility of producing a report that was sound and acceptable for the Dutch community of civil engineers rested upon his shoulders (Stive 23 June 2009). The challenge was even greater, as Veerman had openly expressed his support for artificial islands for recreation or windmills, and this idea was embraced by the Dutch Prime Minister (Korevaar 17 September 2007). Indeed, artificial islands were the showpiece of Veerman's Christian Democratic Alliance. The image of a tulip-shaped island was born. But engineers such as

Vrijling and Stive believed it was a terribly bad idea[49]. Due to his long experience with industrial and airport islands, Stive knew artificial islands were only viable with a strong business case. And the Tulip's business case was rather meagre in view of the immense investments required.

He first had to convince the Veerman Committee. A coastline extension of 200%, no business case to finance the expected maintenance, and little extra effect for national security were needles that stung the balloon of tulip islands. In the committee "it took just an hour" for Stive to explain why artificial islands for housing, agriculture and recreation were objectionable (Stive 23 June 2009). That, however, created a second problem: translating this committee standpoint in such a way that it did not harm the Dutch Prime Minister's reputation as champion of the Tulip island. A clash between Balkenende and Veerman, between two prominent Christian Democrats, should be avoided at all cost. In a coordinated effort, Stive and Veerman delicately wrote an appendix in the report (Deltacommittee 2008, appendix 5, pp. 125-8) that refuted the idea for an island without a loss of face for the Prime Minister (Stive 23 June 2009).

As a member of the Delta Committee, Stive also experienced chairman Veerman and his faux pas with sea level rise. It called for some maintenance; Veerman and another member corrected it in a newspaper article (Fresco and Veerman 24 September 2008), and Stive always corrects this when he lectures on the second Delta Committee (Stive 23 June 2009).

After his experiences with the Delta Committee, Stive said he experienced a radical change in his perception of the world of science and policy. Witnessing how the Delta Committee's chair Veerman fluently knit together scientific facts with the interests of politics, sparked off on Stive. His work with the Delta Committee had changed him from a scientific rationalist to a political realist, someone who acknowledged that the world of science functions according to a different logic than society (Stive 23 June 2009).

Huib de Vriend: tying crucial strings together

Following a research assessment in 2008, Delft Hydraulics and other institutes merged into *Deltares*. As former director of Delft Hydraulics, Huib de Vriend was appointed as its scientific director, a unique and politicised position. With respect to the Delta Committee, Huib de Vriend's involvement was mainly institutional: Deltares did some of the background research. Notwithstanding this minimal input, he was more involved and occupied with working out the plans proposed in the Delta report. His directing of Delft Hydraulics and Deltares and his membership of the ENW, manoeuvred him in a position where he aligned the policy agendas and the knowledge agendas with one another. Following the Delta report, Huib de Vriend articulated voids in scientific

[49] In a TV news programme (Buitenhof, 10 February 2008) Vrijling dubbed the plan a delusion of grandeur, as he believed an artificial island distracted attention from the real concerns in water security.

knowledge, and his institute navigated its research programme to the knowledge needed to realise the Delta programme. (de Vriend 6 July 2009). One of his own scientific merits is *Building with Nature*, a programme that combines engineering challenges with natural dynamics, geoscience, engineering and ecology. In these and other narrated events, Huib de Vriend presents himself as someone who is continuously expanding his expertise, not just in engineering, but also in governing and managing the public dimension of engineering works.

Han Vrijling: champion of old engineering

Although Vrijling and Stive work just two doors away from each other, they never discussed the Delta Committee while it was producing its report. Vrijling's involvement was that of a critic. In part the critique was a continuation of his opinions on water management in general, but he also extensively criticised the Delta report itself. Vrijling's first critique came just days before the report was printed. He was consulted on a new definition of risk. When they wanted to advise that the maximum number of casualties should be limited to '100', he railed against them: that was a risk definition that lacked any relation to existing risk definitions. One or two days before the report was printed, they adopted the general definition (Vrijling 24 June 2009; Deltacommittee 2008, appendix 4, pp. 118-125), which "was written with the pen of old engineering" (Vrijling 28 June 2010).

Vrijling's second response came shortly after the report was published in September 2008. In a magazine for agricultural engineers, he addressed some fundamental inconsistencies of the report (Vrijling 2008). One such inconsistency is that in certain flood-prone areas people are encouraged to move away, whereas other areas, such as floodplains, should be inhabited more. Another is that in the Zeeland area, the Committee proposes that fresh water reserves be given over to salinisation, whereas elsewhere the Committee wants to increase the stock of freshwater because of expected shortages. Vrijling has little sympathy for these wild, contradictory and, above all, costly plans (Vrijling 24 June 2009). What concerns Vrijling most, is that the report does not explicitly mention the poor state of the dyke system, and the need to do something about it. Another mishap is its failure to include the economic function of the water system in its report (Vrijling 28 June 2010).

Beyond the Dutch dimension of the Delta report, Vrijling is also concerned about its international presentation. The Delta approach of the Netherlands is now being exported to Vietnam, New York and other locations around the world, but it is not the hydraulic engineers who act as ambassadors. Sociologists, geographers and agricultural engineers have taken over from civil engineers; civil engineers have lost power on that front line as well (Vrijling 28 June 2010). For Vrijling the ultimate fruit of the ecological turn lies in the political decline of traditional engineering.

At present, Vrijling is still active is various committees and projects, and in that capacity works in a field of engineering that has to appropriate other expertises, policy perspectives and views on how to 'engineer' the Netherlands. But in this process he is cynical, perhaps even embittered. Unlike Vellinga, who integrated engineering with clime science quite early on, and unlike Stive and de Vriend who have discovered new vistas of governing and of engineering, Vrijling remains a partisan who is fighting 'new' engineering whenever and wherever he can.

4.5 Conclusion: engineering experts and the new boundaries between engineering, ecology and politics

By presenting biographical analyses of the personal histories of four civil engineers, seniors in their field and advisors to politics and the public on flood protection and water policy, I have studied the appropriation of the ecological turn in the field of civil engineering in the Netherlands. More specifically, I have analysed how engineers handled the political challenges that adjoins the balancing of ecology and water security.
Following authors who study the effects of the ecological turn on large engineering works (Disco 2002; Bijker 2002) and the main executive engineering institute Rijkswaterstaat (Van der Ham 1999; Van den Brink 2009), this article describes this appropriation process at the level of these four contemporary engineers. By employing a biographical-narrative approach, I have come to understand how, by articulating and reformulating the boundaries of their political and scientific work, they aimed to keep jurisdiction over water engineering policy. Consequently, they have further appropriated the ecological turn in the domain of engineering science. Landmark events in the expert narratives presented were the river floodings (1993 and 1995), the change of advisory structure (2004) and the work of the Delta Committee (2007 onwards). In the remainder of this conclusion, I will first analyse the positions of these engineering experts vis-à-vis the ecological turn in engineering, and how they have contributed to an integration of engineering and ecology. After that, I will discuss what this means for the jurisdiction of engineering experts in policymaking.
The four expert narratives of Pier Vellinga, Marcel Stive, Huib de Vriend and Han Vrijling have demonstrated that the process of appropriation was not a smooth endeavour. All of them were trained at Delft University of Technology at the time when the ecological turn had just begun to present itself, and in response to the challenges of integrating the ecological perspective the experts involved moved in various directions. Despite these differences, a concern for flood protection giving way to nature development was common amongst the four, and that concern guided their roles. Pier Vellinga, the first engineer studied, represents an attitude of embracing the ecological turn and demonstrates a high level of responsiveness to environmental problems in general, and climate problems in particular. Since 2003, he has actively worked on both

fronts under the denominator of 'climate proofing the Netherlands', but with an open eye on flood protection. Marcel Stive and Huib de Vriend represent a more or less intermediary attitude. They never left the field of engineering, and have been mainly involved in modelling the river delta and the coastal zone. From their positions and expertises they have engaged with policymaking in these areas. Over the years, they have acquired new skills, new perspectives, new conceptual frameworks, and they have become more open to the dynamics of decision-making processes involving multiple stakeholders and multiple interests. Han Vrijling, the final engineer studied in this article, refers to himself as a 'fossil'. He occupies a critical position vis-à-vis the ecological turn and continues to firmly identify himself with the traditional approach. Having worked on the storm surge barrier that embodied the onset of the ecological turn, his main criticism is not that ecology and engineering cannot be combined, but that the present ecology-oriented development is pushed at the expense of water security, and creates various problems in terms of planning and budgeting.

The four expert narratives, however, have not just demonstrated how the historically recognised positions on ecology and engineering manifested themselves amongst leading engineers. The engineers have further shaped the ecological orientation in engineering, and thus redrawn the political and scientific boundaries of this debate yet again. The four expert narratives demonstrated in detail how this boundary work was performed. Vellinga, for example, coupled it to spatial planning and climate change, and thus forged a linked between this Dutch debate and the global scientific and political discussion on climate change. Stive and de Vriend have both contributed to a further integration of ecology and engineering by developing new approaches to ecological engineering, such as *Building with Nature*. They have shaped the integration at the core of civil engineering, the Delft University of Technology, and thus contributed to a form of ecological engineering in concordance with hard-core engineering science. Despite the fact that Vrijling's role in shaping this debate partly is that of maintaining the dichotomy of classic and ecological engineering, his interventions have in fact contributed to more a stable policy. His criticism aimed at making the river management policies more solid and politically sustainable. By contending the cultural, political and financial framework to these new approaches, he inserted the best practices for policymaking from traditional engineering in these recent water policy initiatives. As a result, the four engineers have shaped the boundaries and content of the ecological turn, appropriating it according to their perspectives and experiences as engineering experts.

Their appropriation of the ecological turn also entailed the adaptation to its more interactive governance paradigm. The traditional relations between engineering science and politics created an arrangement in which the engineers could address politicians directly, and in which they had almost full jurisdiction over engineering affairs (Abbott 1988). But with the rise of competing frameworks for flood protection, the Ministry of Water Management relies on expertises that do not solely belong to engineering science,

and other interests than those for flood protection are valued. These changes instigated these experts to adopt new perspectives on and strategies for policymaking. Three of the four (Vellinga, Stive and Vrijling) engineers have explicitly used the media to regain influence. Public lectures, background studies and critical editorials have been targeted at getting a political hearing, in keeping politicians as their most important clientele (Stehr 1994). More than before, speaking to politicians has included getting politicians to listen. Stive and de Vriend have explicitly explained how they learned to appreciate multi-stakeholder perspectives over the linear relation between expert and politicians, and this appreciation is translated in, for example, the work of engineering institute Deltares.

To conclude, the appropriation of the ecological turn in water engineering science and governance is far from concluded. We have seen how, in the course of their careers, scientific experts interact with this socio-political context of their work. This article demonstrates how science, and the role of scientific experts, develops in relation to societal developments and a context that is speaking back to science (Nowotny, Scott, and Gibbons 2001). It has also shown how this 'context' is interpreted and framed at the level on individual scientists, and how scientists in turn chose to interact with it. Amidst these processes, these scientists' desire to uphold the flood protection for the Netherlands, the ethos of their work, remained their leitmotif.

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Chapter 5. Experts as policy entrepreneurs: SARS, avian influenza and hurricane Katrina as focusing events in Dutch agenda setting[50]

Abstract

The idea that scientists provide sound scientific advice to politics, and that they communicate to the public in an unbiased manner suffered from the challenges that new crises posed for science. However, crises are not just a scientific, political and public challenge to scientific expertise; they also create an opportunity for agenda setting activities by experts. Experts then become policy entrepreneurs. In this article we study two cases in which Dutch virologists and water engineers used SARS, Avian Influenza and Hurricane Katrina as events that could be used for their potential to focus political and public attention into problems that should, according to the scientists, be resolved. By deploying a biographical-narrative approach, this article focuses on the individual problem assessments, actions and their underlying motives. The article demonstrates not just how the experts from the two cases interacted with the crises, but also how their role as policy advisors and public communicators was shaped by their work at the science-policy interface.

Keywords: knowledge society; crisis; experts; policymaking; public communication; agenda setting; virology; SARS; Avian Influenza; civil engineering; Hurricane Katrina; the Netherlands.

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5.1 Introduction

The close of the 1970s coincided with the emergence of new and unprecedented challenges for science, such as the HIV/AIDS pandemic, the disaster at the nuclear power plant on Three Mile Island in 1979 in the United States and acid rain in the 1980s as a major environmental problem. These cases were exemplifications of crises that posed novel challenges to the ways in which techno-scientific problems were framed and addressed, and challenged scientific legitimacy as such (Weingart 1999; Beck 1992).

These new challenges could not be resolved with normal, Kuhnian science (Kuhn 1996 [1962]; Funtowicz and Ravetz 1993). The case of AIDS teaches us that classic virology and vaccine science could not grasp the disease mechanisms – and it still hasn't come to understand this. The success with which acid rain was handled, demonstrates that new challenges are not without new solutions. In all, the experts handling the new crises worked with incomplete methods, knowledge and frameworks when they were trying to tackle these new crises. But on top of that, the problems experts responded to were not just of a scientific nature. The challenges pointed out a need of policymaking bodies for policy-relevant and science-based knowledge, and this created complex interactions between policy makers and experts. Sometimes technical expertise is constructed around desired policy options (Hellström 2000; Weingart 1999); in other cases there is a clear gap between the urgency with which policy knowledge is required and the pace at which relevant scientific knowledge can be made available (Collins and Evans 2002; Hellström 2000). In this situation, educated guesses and expert opinion stand in for the knowledge required, and as such, this articulates different demands on the individual scientists than during a situation in which an appeal is made on normal science. Finally, the public nature of events like this AIDS epidemic made an appeal on the experts to not just address and communicate with policy makers, but also with the public at large. This situation has been captured by Sylvio Funtowicz and Jeremy Ravetz with the catching phrase 'post-normal science'; "[t]o characterize an issue involving risk and the environment, in what we call 'post-normal science', we can think of it as one where facts are uncertain, values in dispute, stakes high and decisions urgent" (Funtowicz and Ravetz 1993, p. 744).

Underlying these practical consequences of new crises for science and scientific expertise is the problem of governmental and scientific legitimacy, as perceived by Jürgen Habermas and Jean-François Lyotard. The first claims that when government cannot manage the crisis according to its own criteria, legitimation of government as such is in peril (Habermas 1997 [1973]). The public realm then is an important space for maintaining legitimation; it has "the function of directing attention to topical areas – that is, of pushing *other* themes, problems, and arguments below the threshold of attention and, thereby, of withholding them from opinion formation" (Habermas 1997 [1973], p. 70). The source of renewed legitimacy according to Habermas lies in consensus formation between actors.

Lyotard locates the legitimacy problem – and hence the solution – within science itself. As science legitimated itself with an appeal to a master narrative of Enlightenment philosophy, and the postmodern age can be described as an "incredulity toward master narratives" (Lyotard 1999 [1979], p. xxiv), modern science consequently lost its legitimacy. In addition, the rise of manifold narratives or 'languages games' rather than a single master narrative prohibits that legitimation can be regained by falling back on widely shared procedures for consensus formation and legitimation, as Habermas proposed before him (Lyotard 1999 [1979], p. xxv). Rather, scientists could become participants in the many language games, and these language games provide a substitute for the loss of legitimation that accompanied the demise of the Enlightenment narrative. In line with Thomas Gieryn, we call this battle over public and political credibility or legitimacy 'boundary work', which "occurs as people contend for, legitimate, or challenge the cognitive authority of science – and the credibility, prestige, power, and material resources that attend such a privileged position" (Gieryn 1995, p. 405; see also Halffman 2003).

Summarizing, the position of science and scientific expertise in a post-normal situation is challenged on three dimensions: the scientific, the political and the public. On each of these dimensions problems pertaining to epistemology, policy advices, public communication and legitimacy have manifested themselves in complex interactions. Some scientists have acted on these three dimensions and handled the related challenges, and in this article we study some exemplary scientists to get insight in these new roles of science in the knowledge society.

5.2 Crises as perspectives for agenda setting

In the careers and biographies of scientists as policy and public experts[51], this complicated role manifests itself. In their efforts to respond to such crises, scientific experts are drawn into the public and political domains: experts are called in to advise policy makers and politicians on how to address emerging threats, explain to the public what the dangers involved are, what could expected for the future and what policy is required to handle the crises and minimize the (potential) damage. Scientists are expected to tell their stories, but in situations of great uncertainty. Once these experts have assumed such a role in dealing with such crisis events, some of them continue their role as policy advisors and public communicators. This for example goes for virologists who handled the outbreaks of HIV/AIDS and BSE in the 1980s. Being the first experts to address the risks involved in these outbreaks in a time when policy arrangements and

[51] I use 'scientists' and 'experts' to denote different sides of the person, although it sometimes it is hard to draw a clear boundary between the two. Ideally, however, 'scientist' refers to the professional occupation and professional identity, 'expert' to the role of being someone who employs experience and expertise in policymaking and public debate. Sometimes I use 'scientific expert' to indicate, rather then to mask this ambiguity.

communication channels needed to be developed, virologists grew together with these arrangements, a process in which public visibility of the crisis increased the public visibility of the experts and vice versa (Van Rijswoud 2010, pp. 163-164).

In practice, however, there is more ambiguity in the response to crises. Scientific experts may also use such crisis events to get their issues on the political agenda, and these events are then deployed by policy entrepreneurs, including scientists themselves, for their potential to 'focus' policy thinking in directions they deem necessary (Birkland 1997; Kingdon 1995). The posing of new challenges for science, the absence of frames or routines and the providence of a situation without clear solutions and meanings, created the opportunity for actors to add a symbolic, political and public value that is exogenous to the crisis itself.

The aim of this article is to study the practices of agenda setting in virology and water engineering, and hence to study the role of experts as policy entrepreneurs. In trying to analyse how experts handled the crisis and, at the same time, used the crises for the advancement of their policy agenda, I focus on two of the three dimensions referred to above: the policy dimension and the communication dimension. What the new crises have had for implications for the epistemological and methodological development of science and knowledge, and how this had an effect on the normal science, is not discussed in this article[52]. This approach fits in with ongoing research on boundary workers and their views on the science-policy of the science-public nexus as their central concern (Hoppe 2009; Waterton 2005; Davies 2008; Huitema and Turnhout 2009). I explicitly relate this policy perspective to a communication perspective by including public communication as a mean to perform agenda setting. By describing and analysing the relation between agenda setting activities and the role of public communication, this article provides insight into the mechanics of expertise and boundary work, as well as in the way in which experts strive for public and political legitimacy. Agenda setting and public communication are in this context understood as the Lyotardian language games that are deployed in the support of science's legitimacy.

How experts resort to the mass media to get their issue on the agenda is not just described in Birkland's work, but also in that of Peter Weingart's (Weingart 1999; Weingart, Engels, and Pansegrau 2000) and others (Petersen, Heinrichs, and Peters 2010), and this article will specify how this works on the level of individual boundary workers in the context of Dutch socio-political culture. In doing so, a biographical-narrative approach is used to get insight in the individual choices, motives and strategies of agenda setting and public communication. Rather than taking complete expert careers into account, this article zooms in on specific and recent crises.

[52] Of course, one can contend that the core of science cannot be detached from the political and public sides (Gibbons et al. 1994). I therefore acknowledge that the limitation introduced here is analytical, not empirical.

From the multitude of crises or pseudo-crises that affect contemporary society, this article centres around the combined outbreaks of SARS and Avian flu in the spring of 2003, and the flooding of New Orleans in the aftermath of Hurricane Katrina in August 2005. These events connect global developments and challenges for science with the challenges this creates on a local level. Two crises that are both recognizable to an international audience, and that illustrate the locality and specificity in the reasonably fixed political domain of the Netherlands. It may seem quite surprising, but Katrina had a great impact on the Dutch debates on water security and engineering. The flooding of New Orleans for many demonstrated what could happen to the Netherlands in case floodwalls failed. It provided lessons to the Americans, but also to the Dutch, and raised explicit and diverse responses in the Netherlands.

By studying these two crises, I will compare two types of cases, in total involving seven experts. The first case is virology (three experts), the second water security (four experts). Both cases are objects of wide-scale concern and invoke responsibility for public safety, both appeal to academics to commit themselves to the protection of (Dutch) society against real and potential catastrophes. Both, finally, are clear examples of the ambiguity noted above: experts not just responded to these crises, but also used them for political purposes.

In the following section, I will briefly discuss Birkland's agenda setting perspective. After sketching the biographical-narrative approach (section 4), section 5 presents the core of this article. Sections 5.1 to 5.3 deal with SARS and Avian Influenza, in sections 5.4 to 5.6 the case of Katrina is analysed. The conclusion (section 6) will compare the seven accounts along four themes that emerge in the analyses: the *identification of the issue,* the *necessity and urgency* one attaches to the issues, the *capacity* one ascribes to himself and the consequent *strategy* to do agenda setting work. In the conclusion I will also make further observations on what characterizes the roles of experts in a knowledge society.

5.3 Agenda setting, focusing events, and policy arrangements

Following the work of mainly John W. Kingdon (1995) on agenda setting, and that on advocacy collations in policymaking (Sabatier and Jenkins-Smith 1993) and on (in)stability in policy (Baumgartner and Jones 1993), Thomas Birkland (1997) has studied the policy effects of focusing events, and how focusing events are used by policy entrepreneurs to induce policy change. Focusing events are defined as events that have the potential to focus policy attention in specific directions, directions dictated by a specific analysis of political problems, and their solutions. By using this to understand the role of experts in a knowledge society, this perspective is valuable in analysing and understanding the dialectics between experts and crises, as described in section 2.

Birkland studied major US events, such as earthquakes and hurricanes, and oil spills and nuclear accidents, the latter two of which are far rarer than the former two. As the

focality of an event does not just depend on the internal characteristics of the event itself, that is, on the visibility, effects and tangibility of the event, but also on how this event is deployed by policy actors (external characteristics), Birkland refers to events as "potential" focus events. In terms of the event itself, he defines a potential focusing event as:

> an event that is sudden, relatively rare, can be reasonably defined as harmful or revealing the possibility of potentially greater future harms, inflicts harms or suggests potential harms that are or could be concentrated on a definable geographical area or community of interest, and that is known to policy makers and the public virtually simultaneously. (Birkland 1997, p. 22)

A prime example of such an event is the crash of an airplane. Although this need not outnumber the annual number of casualties of car accidents, the rarity, suddenness, and dramatic nature of the disaster increases the focal power of this event over car crashes. Beyond these internal characteristics the focality depends on external factors, such as characteristics in policy structure, the number of actors, the degree to which relations are formalized and the degree of competition between groups. Highly organized domains have a known number of actors and set of relationships. These combined factors in policy structure (number of actors, rigidity and formality of relations), advocacy coalitions (one or more, degree of polarization) and event type (how symbolic, visible, tangible, measurable it is) contribute to the focality of an event. In view of the windows of opportunity these crises create, focusing events can be used to get issues on the institutional agenda (issues actively and seriously considered by authoritative decision makers) and the decision agenda (items nearing the realization by a government body) (Birkland 1997, p. 8). A special role is taken up by policy entrepreneurs, "participants who are constantly involved in the policy community because of their technical expertise in their field, because of their political expertise and ability to broker deals that lead to new programs and policies, and because of their connection to the problem as representatives of a particular constituency" (Birkland 1997, p. 18).
Birkland also includes the degree to which a policy domain is organized as a factor in the use of crises as focusing events.

> Focusing events are much more likely to be important when the policy community that reacts to the event is relatively more organized. A highly organized policy community is important because the community needs to reach a certain state of organisation before there exists a segment of the community that can take advantage of an event as a change opportunity. Members of more organized communities are able to use focusing events to dramatize the need for improved policy, and therefore can use the opportunity raised by the focusing event to change relationships and power in the community. (Birkland 1997, pp. 36-37)

The degree organisation is defined in terms of actors and their relations: when a number of actors and the set of relations are known to the participants in policymaking, and

when group opposition takes place, then this is characterized as a high degree of organisation. In cases of episodic, incremental, non competitive and unremarkable policymaking with few actors, Birkland calls this a community with a low degree of organisation (Birkland 1997, p. 36)

Although the differences between the Birkland study and the type of study are significant in terms of methodology and socio-political context, this does indicate that the degree of organisation is a factor at play in the use of focusing events. The hypothesis I present here is that comparing the cases of virology and water security, the former of which is better organised than that of the latter, shapes the use of crises as focusing events. I will return to this in sections 5.3, 5.6 and the conclusion.

5.4 A Biographical narrative approach to experts

The research methodology for this article fits in with the biographical narrative research tradition in social science, which re-emerged in the 1980s as a response to excessive structuralism (Plummer 2001). The underlying idea coming from symbolic interactionism is that an in-depth study of well selected cases can be highly informative on broader developments in society – such as the role of experts in the knowledge society. The individual exemplifies a societal group, and an in-depth study thus facilitates a deep understanding of a sociological phenomenon.

Although ethnographic studies of policymaking may include a detailed study of the works of individual policy boundary workers (e.g. Bijker, Bal, and Hendriks 2009), and the analytic level of the individuals is chosen more and more in policy studies (Hoppe 2009; Waterton 2005; Davies 2008), the biographical dimension often not discussed in these studies, and thus merits more explicit study. The empirical material that is presented and discussed in this article has been collected in the context of a broader research project, which studies the role of experts in policy and public debate from a biographical-narrative perspective (see for example (Van Rijswoud 2010), for a study of virologists, and (Van Rijswoud Preparing for resubmission), for a study of hydraulic engineers). The empirical basis of these studies comprises interviews with the experts involved, in which they narrate their experiences in policy and public debate. In preparation for these interviews an analysis was conducted of the broader contexts of the cases, and the policy and communicative roles of the experts therein. Although the interviewees were invited to narrate what they regarded as relevant, the background study was used to trigger the narration on specific political or public events, in which the experts had played a prominent role.

These background studies and narrative interviews (for analytic reasons the number of interviews varies) were ordered around a specific ‘plot’ or thematic thread, thereby “explicating an intrinsically meaningful form” (Polkinghorne 2005, p. 93). Rather than being the only true *re*construction of past experiences and events, the narratives

constitute one possible approach to ordering them coherently; in the case of the broader project this thread is the development of experts in relation to the challenges that pertain to their role in politics and the public domain at large. As a subtheme to this rather broad thematic thread, this article is interested in the co-construction of experts and the focusing events of Hurricane Katrina, SARS and Avian Influenza.

Although at various points the expert narratives were triangulated by comparing expert interviews, policy documents, media sources and other interviews, the main characteristic of the experiential narratives is that it is highly subjective. This therefore includes reframing and re-construction of past experiences in the interaction between real events (the lived story) and memory (the told story) (Rosenthal 2005), and the ways in which memories are presented to the interviewer. Identity and self image in part get constructed and reproduced through the telling of narratives (Brockmeier and Carbaugh 2001 p. 15). This need not be problematic, for example if one takes the expert's self-narratives to not just be a source of stories and experiences, but also an extension and a re-presentation of the expert role. That is, the self presentation of experts in interviews mimics their role and performance in situations pertaining to their performance as expert (Goffman 1959); the interview situation not only reframes past events, it also re-presents them, and in a narrative understanding the object of study is regarded "as an unfolding story, rather than a fixed entity in time and space" (Hayhoe 2007, p. 8).

In presenting the case studies, I will begin with a brief display of the major biographical developments, and explain how that resulted in a particular outlook on the role of science in policy. Then I will study the agenda setting work, and the results of that work.

5.5 Focusing events in a Dutch context

The policy arrangements for water security and infectious diseases have a long history in Dutch society; the water boards, for example, are the country's oldest democratic institute,[53] dating back to the Twelfth Century. What goes for the policy arrangements in both cases is that they developed both as a way to handle routine tasks, such as dyke maintenance or disease prevention. Radical policy innovations followed crisis events, such as the flooding of Zeeland in the South-West of the Netherlands in 1953 or the Dutch outbreak of HIV/AIDS in 1982.

The Dutch advisory sectors for water security and infectious diseases can both be characterized as what is referred to as a 'corporatist policy arrangement', with a restricted and formally accredited set of experts that act on personal title (Halffman and Hoppe 2005, p. 137; Bijker, Bal, and Hendriks 2009, pp. 85-6). In this arrangement, experts have access to the higher politics and policymaking levels through the work of advisory councils and their committees. Between water security and infectious diseases the major difference is that, whereas engineers enter these committees as holders of a

[53] The dyke ward was selected, and still is, through elections.

specific chair at a university (mostly the Technical University of Delft), virologists enter the advisory sector for their personal expertise. This results in the situation that individual engineers have more certainty and clarity about their role in policymaking; their role is more 'settled'.

According to the criteria of Birkland, both the water security and virology events can be regarded as potential focusing events. First of all, they were *rare*: the flooding of a modern city and the simultaneous global outbreaks of a novel corona virus and a feared influenza strain are all rare events. The potential and real *harm* and damage was also great: many lives were lost in New Orleans and the city was devastated, and although the number was far less, SARS and Avian flu also caused fatalities in South East Asia and other regions, from which both diseases spread to other regions on the globe. Relevant also are the potential fatalities in *geographical locations*. The Western part of the Netherlands comprised everybody who was at flood risk, and SARS and Avian flu were perhaps mostly a crisis of the *potential* number of deaths that could follow. SARS and Avian flu were feared for their potential to affect everyone who lived in populated areas, in areas with intense bird-human interaction, and all those who could be in contact with someone from these areas. The community that would be affected by SARS of Avian Flu was difficult to delineate, as everybody was vulnerable to these threats. Finally, although science and policy had been preparing for years for events like these in general, the actual crises were known to policy makers and scientists *simultaneously*.

5.5.1 Crisis events and policy responses in infectious diseases

Before turning to the studies of the individual experts, this section will provide a brief historical background to the case, highlighting important crisis events and their impacts on policy arrangements.

What is invoked by some as the most important historical event for virology is the Spanish flu of 1918. Killing millions of people in multiple pandemic waves in the aftermath of the First World War, it still counts as the textbook example of how lethal pandemic influenza can be, and what public health policies are required to prevent such a culling. In the decades marked by the 1957 and 1968 pandemics, global vaccination programmes were developed under the aegis of the World Health Organisation (WHO, henceforth). In the Netherlands both the Health Council and the National Institute for Public Health (RIVM, henceforth) advise on and execute these programmes. In addition, the RIVM also developed vaccines. In the course of the 20th century, preventing infectious disease was thus embedded and routinised in the science of virology and pertaining policy. The successes of the vaccination programmes implied that towards the end of the 1970s infectious diseases were on the verge of extinction. Fundamental research in virology by and large consisted of fundamental research in viral oncology, where public stakes were low.

As referred to in the introduction to this article, AIDS emerged as an unknown disease in 1982, a situation for which there was no standard institutional and scientific response. The outbreaks of BSE and an aggressive viral outbreak among North and Baltic Sea seals around 1988 placed veterinary virology firmly on the map, and introduced virologists in the midst of political and public debate. Although AIDS and BSE still are immense public health threats, following the initial shocks, the policy arrangement responded and adapted itself to these new challenges. In the Dutch institutional sector dealing with these infectious diseases, the Ministries of Health and of Agriculture were and still are the two major policymaking bodies, while local (Gemeentelijke Gezondheidsdiensten, GGD) and national public health institutes (RIVM) had an executive task. The Dutch Health Council has an independent and important advisory role.
The first H5N1 deaths in 1997 marked the advent of new viral crises. Virologists feared the coming of a new, 1918-like pandemic influenza (De Jong et al. 1997), and under the leadership of the WHO pandemic preparedness plans were worked out, plans that needed to counter a pandemic influenza outbreak in a globalised world. Nevertheless, closer to the new millennium the fear of an Avian Influenza pandemic was joined by the growing threat of bioterrorism and zoonoses. So for these additional threats emergency response plans were developed (Gezondheidsraad 2001, 2002, 2004). Prior to the outbreaks of SARS and Avian flu the world was preparing for outbreaks of various kinds and from various sources, it was an alarming situation. And still, despite this culture of preparedness, in 2003 SARS struck as a complete surprise.

5.5.2 The individual experts (infectious diseases)

Against the backdrop of these developments the three virologists, and their interactions with SARS and Avian Flu will be analysed. The first is Albert Osterhaus, a veterinarian who holds a chair at the Erasmus Medical Centre in Rotterdam. He is regarded as a virus collector, for he has discovered a great number of new viruses (Enserink 2003), and is highly active as a policy entrepreneur on the national, European and global arenas. The second is Jaap Goudsmit, a human virologist. Before he took up a position as scientific director of a biotech firm in 2002, he was AIDS researcher at the Amsterdam Medical Centre, and had a solid reputation (Cohen 1993). The last virologist is Roel Coutinho. He is a professor in viral epidemiology and has been active on the border of science and public health from the late 1970s onwards. In that capacity he had to direct the public health response to AIDS when it struck in the 1980s.

Ab Osterhaus
In terms of narratives and crises, the shocking H5N1 deaths in Hong Kong in 1997 were the start of a new crisis narrative. Ab Osterhaus was one of the virologists who knew that ‘Hong Kong’ needed a firm response (De Jong et al. 1997), so from then on Osterhaus cooperated in a dual strategy for sound pandemic preparedness. One aspect was

political. Osterhaus was one of the virologists who urged the WHO to develop pandemic preparedness plans, which was done instantly. In an individual capacity, he then initiated an EU meeting to discuss the appropriate policy responses for Europe. Because of his earlier involvement in the European policymaking sector during the BSE scare, he was a well-known and respected figure on the European health policy scene and sat on some of the key health care committees. He managed to get the EU commissioner to sanction the meeting.

In the public domain he soon used a crisis narrative in the media to invoke awareness and preparedness. His basic message, aired on numerous occasions, can be paraphrased as followed 'We have had three pandemic outbreaks of influenza, in 1918, 1957 and 1968, killing some 100 million civilians. We can be sure a new pandemic will arrive, and unless we take appropriate measures, hundreds of thousands will die' (one such example is Jaspers and Voorn 30 December 1997).

Although this pandemic narrative, which was repeated so often that people called for a ban on references to 1918, was a policy lubricant according Osterhaus (Anonymous 26 April 2001), he also firmly believes in the reality of this message and says it was a simple technical assessment (Osterhaus 6 March 2008). His colleagues, however, believed the message to be an overstatement, bordering on lobbying for research funds (Coutinho 13 May 2008; Goudsmit 2 April 2008; 19 May 2008). This tension between his own scientific gut feeling and the scepticism of his critics and colleagues is a dilemma he dubbed the 'cry wolf dilemma'; and the longer it took for a pandemic to strike, the more his credibility would be at stake (Osterhaus 6 March 2008). It is important to note that in these activities, he skilfully integrated policy advising with agenda setting. But despite these skills, his strategies were not undisputed. Not just fellow virologists were sceptical about his assessments, but also the public at large had mixed feelings about Osterhaus and his pandemic warning, quite a few calling him a prophet of doom (Osterhaus 6 March 2008). During these years running up to 2003, the Dutch government neglected public communication on infectious diseases. Media often turned to Osterhaus instead, and he was always willing to gives comments on developments relating to viral infections (Osterhaus 6 March 2008).

In the spring of 2003 both avian flu and SARS struck, and Osterhaus became closely involved with the science, policymaking and communication on both of these outbreaks (see also Enserink 2003). When SARS struck, the pandemic preparedness plans that were developed before came into effect. Under the direction of the WHO a small selection of laboratories, including Osterhaus's own lab in Rotterdam, were on the hunt for the cause; and on 16 April 2003 the Osterhaus lab managed to find the final and most rewarding piece of the puzzle, the confirmation of the virus type. A press meeting was held at the WHO headquarters in Geneva that same afternoon; a letter in *Nature* (Fouchier et al. 2003) and a Royal decoration followed. Osterhaus reaped the rewards for the discovery and noticed that his credibility, authority and power in science, politics

and society skyrocketed (Osterhaus 6 March 2008). But what is more, the WHO prevented a SARS pandemic. This marks the SARS crisis as a moment when virologists could control a crisis, indicating that the WHO organisation of disease control was effective.

The Avian Flu story was more dramatic. Under the direction of the Outbreak Management Team (OMT), the Dutch policy against flu contamination was developed. But still, a veterinarian contracted flu and died, some (like Goudsmit) say as a result of the complex and failing executive organisation. It led to a debate on the infectious diseases infrastructure, and also showed the danger of novel viruses.

In these two crises Osterhaus's scientific and political responsibilities called for scientific and strategic statements and he spoke in both a personal and collective capacity. The many 'hats' he wore and the responsibilities he had during these events, both nationally and internationally, confounded his expert role[54]. *He* says it was manageable to know when to speak from which position and responsibility, but outsiders saw this same person in quite different settings, taking up both scientific and political roles in one and the same interview (Netwerk 21 February 2003). The confusion was such that even a Ministerial letter to Parliament had to justify the way Osterhaus's view was accommodated in policy (Veerman 23 April 2003).

In terms of focusing events, it is remarkable that Osterhaus was both handling the outbreaks and using them for agenda setting purposes. Below is his reflection on both outbreaks, in which SARS is presented as the innocent little brother of the pandemic flu.

> Personally, I am far more concerned about the influenza virus, which is far more contagious than SARS. If a new influenza strain starts circulating, and that threat is there constantly, we could soon have a far more dangerous pandemic. (…) With SARS we actually were lucky. Had the disease been a case of an influenza virus, the world's fate would have been far graver. (Becker 26 June 2003)

Referring to SARS as a mild threat compared to an influenza outbreak not only fits in with Osterhaus's preceding and subsequent pleas for more preparedness for pandemic influenza. It also puts things in a novel, and perhaps shocking, perspective for those who were alarmed by SARS. The narrative more or less says that 'if you think SARS was a problem, wait until you get pandemic influenza'. He was playing emotions and politicians by pointing out its enormity by playing up the relative harmlessness of SARS. Osterhaus's strategy blended well with those of Coutinho and Goudsmit.

Jaap Goudsmit

Jaap Goudsmit stands apart somewhat in the collection of experts discussed here, for he is someone who has little interactions with policymaking. His main objection is that the

[54] In (Van Rijswoud 2010) I have described him in these circumstances as an 'entangled expert', being tied to different roles and positions.

policymaking process involves too many compromises, that the scientist is not valued purely for his expertise. In policy, the expert is compromised, says Goudsmit (Goudsmit 19 May 2008). The 'Buck affair', a 1990 controversy in which Goudsmit falsely verified the functioning of an AIDS vaccine (Hagendijk and Meeus 1993), as well as the slow realization that vaccine development is a much longer journey than Goudsmit had anticipated, left marks on him (Goudsmit 2 April 2008; 19 May 2008). Added to that are his experiences from the 1980s. Having lost control over his interactions with the media during the 1980s, from the mid-1990s onwards he has became more prudent, choosing strategies that safeguard his public statements. Despite this lack of active involvement with policymaking, Goudsmit is someone who eagerly follows the debates, and who shares his cut-and-dry opinion on topics that relate to his interests or expertise. But he shuns the face to face debates; rather, he writes or talks about these issues in a unidirectional way.

In 2003 he was following the SARS and avian flu with interest and from the sideline had analysed what was going wrong. The death of the veterinarian was the immediate cause, the focusing event that motivated him to go public. Goudsmit chose to write an open letter to a Dutch newspaper with the edgy title *The Netherlands unprepared for a viral attack*. The message was that the government fails to take responsibility for the control of epidemics and public communication; people like Osterhaus were doing what the government should take responsibility for. We should, he said, be less concerned with committees, advisory bodies and meetings, and develop a public health structure that has defined responsibilities, central governance and sufficient funds. He was pleading for a stable governance structure, warning: "In case we don't adopt such a centrally governed structure, the next epidemic could have far more serious consequences" (Goudsmit 5 July 2003).

This harsh criticism and doom scenario did not go unnoticed, and triggered many responses, one of which merits discussion here. The Director-General of the Ministry of Public Health replied acknowledging part of the critique and supported the claims that a new public health structure was needed (De Goeij 17 July 2003). Looking back, Goudsmit was content with this response.

> Q: Was it an effective intervention?
> A: Yes! I thought so. I thought so, because as soon as things, things start happening, like a secretary general who writes such an article, that it is all fine, then he incorporated [my] opinion. That's when I say it was effective. (Goudsmit 2 April 2008)

Later that year Goudsmit gave extra force to this early intervention, by repeating his arguments in a nationally broadcasted documentary on the death of the veterinarian (Zembla 2 October 2003). As someone who is both outsider and insider, he was in a position to be informed and critical without any direct accountability. That granted him

a greater freedom of speech, for he, unlike Osterhaus or Coutinho, did not have to maintain a position toward politics as a credible expert.

Roel Coutinho

As public health director and academic in Amsterdam in the early 1980s, Roel Coutinho, like Goudsmit, witnessed the outbreak of AIDS in the Netherlands. He conducted epidemiological research, and together with homosexuals was developing public health policy, giving public talks for the benefit of high risk populations. In public communication, he tried to deal with the sensitivities of gay emancipation, and his crisis narrative therefore had to be rather different from Osterhaus's, not overstating and dramatizing developments, not using crises as focusing events, but giving a factual, clear and almost technocratic story about what the problems were, for whom, and how they could be handled. The experiences from the 1980s, although not always easy, strengthened this narrative and were tied to the character of Coutinho (Coutinho 13 May 2008).

Then, after a period of relative withdrawal from public involvement in the 1990s, as scientific director of the entire Amsterdam public health services in 2000 he returned to the public arena. At that point, he was not just responsible for infectious diseases, but for all public health issues. Also, he again became a spokesperson on behalf of the institute, which was, he says, an exciting and educational experience (Coutinho 25 July 2008). In this role he was developing preparedness plans, for example, for bioterrorist attacks, something a major and internationally oriented city like Amsterdam had to prepare for. Closer to home, viral threats were on his radar screen and he felt a concern about the quality of the Dutch infrastructure for infectious disease control.

So when SARS broke out, the otherwise matter-of-fact-ish Coutinho came out with a new and alarming narrative, forming an advocacy coalition with Osterhaus, Goudsmit and others. In a national newspaper he for example said:

> A flu virus could suddenly emerge that infects a lot of people, one against which there is no cure or vaccine. Thousands of people will die. A case of SARS in Amsterdam would confront everybody with the facts, says director Roel Coutinho. "People have no idea what risks we may have to face." (Van den Broek 5 June 2003)

For Coutinho, this was a very strong statement, contrary to earlier crisis narratives. Being somewhat surprised by this kind of statements coming from Coutinho, I asked him why he had made them, why he had departed from his usual narrative.

> A: Well yeah, people had the impression nothing of importance was happening, it wasn't that serious. But if you took into account what the real consequences would be… So I thought we needed a better organisation (…). Because if they don't do that, and we are being confronted with it, then we aren't prepared. And I don't think people are aware of that.

> Q: I thought it was a rather firm claim.
> A: Yes! But that was the background (…). As a consequence of all these crises it was said that we needed a better organisation. So in the end, the message did arrive, which is a good thing. But one should be careful, because you don't want to create a panic. That's somewhat tricky; Scylla and Charibdes do play a role here. (Coutinho 25 July 2008)

The agenda setting work, work of the ad hoc advocacy coalition that was concerned about the infrastructure for infectious disease control, and therefore used SARS and Avian flu as focusing events, proved effective. In the course of 2004 the decision was taken to establish a National Centre for Infectious Disease Control at the National Institute for Public Health and the Environment. This Centre, under the Ministry of Health, would communicate to the public at large, and would be responsible for developing and executing public health policy for infectious diseases, novel and existing ones (Ministry of Health 7 December 2004). Coutinho was asked to direct it, after Osterhaus turned down the offer (Osterhaus 6 March 2008). Upon his arrival, in newspaper interviews he publicly reflected on the Centre's origins.

> … Experts have to sound the alarm *en masse* for a long time, before politics gets moving. (…) In this case, SARS had been an important catalyst. That, combined with avian flu and 9/11 definitely was politics' wake-up call. (Kok 15 March 2005)

> … In the last couple of years people realized that were a serious [threat] to arrive, we absolutely wouldn't be prepared for that. Also in The Hague [the country's political heart]. The diseases [SARS] got political value. Funds were available on a wide scale.(Meershoek 29 January 2005)

As director of the CIDC Coutinho has now handled various outbreaks, from Q fever to the 2009 Swine flu pandemic. What is interesting in relation to his agenda setting work and the use of SARS as a focusing event is that in these later outbreaks he returned to the older, matter-of-fact crisis narrative. As such, he sometimes is out of tune with societal concerns over infectious diseases (Van Rijswoud 2010). It also resulted in the somewhat confusing situation in 2009, when Osterhaus was highly alarmist about the Swine flu, and Coutinho publicly contrasted Osterhaus with his timid approach.

5.5.3 Virology summary

One important observation of the case of virology is that the field was suffering from a noted lack of organisation; in fact, this was identified as the problem by the experts discussed here. The status of actors, like the Ministry of Health, was not clearly defined and the relations between actors, for example between Osterhaus and the same ministry, not formalized. As a result, Dutch government was deemed incapable in handling new and emerging infectious diseases, and SARS and Avian Influenza were presented by the three experts as clear examples of this incompetence.

Among the three virologists, I have described three different roles: Osterhaus was on numerous committees and experienced in policymaking. But formally, he was an academic with no official relations to Dutch politics. Coutinho, however, represented the Amsterdam public health services, and his role was defined as such[55]. Goudsmit, in turn, was an outsider to politics and policymaking. What is striking is that they had different ideas on their own roles in policy and public debate. Osterhaus was well practiced in crisis communication and political handiwork, and using crises as agenda setting was not foreign to him. Coutinho was more matter-of-fact-ish, and perhaps even technocratic. Goudsmit was observing and commenting from his sideline position. As the three of them were also active scientific researchers on infectious diseases, they were well acquainted with one another. Despite these different positions and styles of communication, they effectively formed an advocacy coalition and used SARS and Avian Influenza to sound the alarm.

I will now turn to the case of water security, and analyze how water experts, coming from an entirely different scientific and political tradition, interacted with Hurricane Katrina.

5.5.4 Crisis events and policy responses in water security

As with the previous case, this section will start with sketching the important crisis events and their impacts on policy arrangements. The dramatic flooding of the South Western region of the Netherlands in 1953 and the resulting death of some 1800 civilians stimulated a delta policy, in which the political foundations of the Delta works was laid. What resulted in practice, was an organisation in which Rijkswaterstaat (comparable to the American Corps of Engineers), contracting firms and engineers from the Technical University of Delft, cooperated in building the engineering masterpieces of the Delta works between 1953 until 1997 (Bijker 2002).

During the construction of the Delta works the so-called ecological turn manifested itself in 1974, when the closure of a sea arm was disputed on environmental and economic grounds (Disco 2002; Bijker 2002, p. 582). This resulted in the political decision not to close off the Oosterschelde estuary, but to install highly innovative storm surge barrier that both preserved ecological and economic values, as well as ensuring the region's protection against the North Sea.

Two other crisis events took place in water security in the 1990s. In 1993 and 1995 peak water discharges in the Rhine and Meuse rivers threatened the safety of hundreds of thousands. Mass evacuation, ad hoc reinforcement of the dykes and the temporary loss of land to the water demonstrated that although protection against sea has had its due attention after 1953, inland flood protection suffered from political negligence. The

[55] During the H1N1 pandemic, they both were heavily criticized for their roles, the first for having too much conflicting interests, the latter for being too much of a political spokesman (Van Rijswoud 2010).

scientific and political response to this crisis in the river delta was twofold, and paradoxical. On the one hand, action was taken to catch up with maintenance and to raise the dykes along the rivers, anticipating future high water discharges. On the other hand, this policy was criticized, for it used the same instruments of river management that in fact produced the crisis during high water discharges. So 'new approaches' were developed to create safe, navigable and environmentally valuable rivers (Smits, Nienhuis, and Leuven 2000).

Not so much as an actual disaster, but as an example of what might happen in the Netherlands, Hurricane Katrina and the subsequent failure of dykes and floodwalls protecting New Orleans in October 2005 re-ignited the debate on protection against the rising sea levels and peak discharges in rivers. The Dutch response was instantaneous and in two locations: Dutch expertise was sent to New Orleans to study and explain the situation at hand; and on home turf a debate was fuelled about what New Orleans meant for the geographically comparable Netherlands.

Two recent developments directly affected Katrina's reception by the experts discussed here. The first is the debate on dyke security. Following the river floods of the 1990s, in 2003 results from 2001 were published that demonstrated that the Dutch dykes were not as safe as required by law (Schultz van Haegen 13 February 2003). The second development was the change of the advisory level of engineers. Between 2003 and 2005 the existing arrangement (the Technical Advisory committee on Waterworks, TAW) was dismantled and a new one was composed (the Expertise Network on Water security). From then on, experts would advise a senior civil servant, not the State Secretary (Staatscourant 28 June 2005).

5.5.5 The individual experts (water security)

The engineers whom we will study in order here are Huib de Vriend, Han Vrijling, Marcel Stive and Pier Vellinga. All of them were trained in hydraulic engineering at the Technical University of Delft, and all but Vellinga had a career in this particular field. The three now occupy senior positions as professors and chairs of several committees of the Expertise Network for Water security. Vellinga had a somewhat different career. He exchanged the field of engineering for that of climate policy in 1988, but in 2003 returned to the field of water security by coupling it to sea level rise and climate change.

Huib de Vriend

In this community of engineers we find rather different interactions with Katrina. The first actor, Huib de Vriend, took a modest stance. As director of the most prestigious engineering research organisation *Delft Hydraulics*, he was well acquainted with the circumstances in Louisiana.

On invitation from *America's Wetlands*, an environmental organisation, he had visited the area two years before Katrina. Wetlands are ecological areas that also play a crucial role

in the protection of Louisiana against hurricanes; hurricanes decrease in force once they reach wetlands or land. The demise of the wetlands right outside New Orleans therefore implies an increase of hurricane flood risks. Being invited for his expertise in engineering and ecosystems, he gave talks on wetlands in the Netherlands and Venice, and saw how *America's Wetlands* was building up its case, predicting a Katrina-like scenario. In this scenario, political and environmental neglect coalesced with the unfavourable geographical position of New Orleans. According to Huib de Vriend, unfortunately, in 2003 the Iraq war occupied the minds in Washington, and inland water security had low priority. He continues:

> And uhm, yeah, they had built the entire case, with historical records on New Orleans and the development of wetlands. And they were blowing the whistle on the developments: 'Look at New Orleans, look at the state it is in. That's a bathtub, out and open towards the ocean. If a strong hurricane passes by, it means trouble. (de Vriend 6 July 2009)

When Hurricane Katrina struck in August 2005 and this scenario became a dark reality, American media, politics, the Corps of Engineers and affected citizens were happy to use expertise from the Netherlands to explain what happened. Being director of *Delft Hydraulics* and familiar with the local circumstances, he represented the Dutch solution to the Americans: showing the Delta works to international media and a large delegation with Senator Landrieu. New Orleans should do the same, was the verdict.
But he was not solely praising it as a once and for all solution. It was one that needed readjustment in face of recurring events. In the following lengthy quote, one reads how he criticizes, in the context of a newspaper article on Katrina, the Dutch way of calculating safety, and the negligence with respect to developments like climate change. Although he does not directly couple Katrina to the Netherlands, he smoothly integrates his concerns for the Netherlands with the reality of Katrina.

> "Our level of safety is higher than anywhere else in the world," said Huib de Vriend, director of science and technology for Delft Hydraulics, an independent foundation that advises governments and companies around the world and is offering to assist the U.S. Army Corps of Engineers in draining and disposing of the polluted waters in New Orleans. A satellite photograph of southern Louisiana is tacked to his wall.
> But de Vriend and others caution that the storm probability figures are based on computer models rather than data. In addition, climate changes are skewing the calculations. Severe river flooding in the mid-1990s that came close to breaching levees made experts start to doubt the one-in-1,250-years storm capability of their defences, he said. (Moore 8 September 2005)

Following his critical ambassadorship, de Vriend was invited to serve on the Katrina evaluation committee. Although he was willing to sit on *The American Society of Civil*

Engineers Hurricane Katrina External Review Panel, his director needed de Vriend at home, and a professor emeritus was sent to New Orleans. The Dutch also provided expertise and firms to rebuild Katrina, but de Vriend was not involved in that either: the Dutch response had been taken over by Rijkswaterstaat. For de Vriend the Louisiana involvement ended here.

But Katrina also came to the Netherlands. When the Dutch government was praising the American way of handling the flooding of New Orleans (rather than learning from the poor hydraulic infrastructure), it was Vrijling and Stive who sounded the alarm. De Vriend, as did the others in the ENW, supported this criticism (de Vriend 6 July 2009). He did not, however, embed the meaning of Katrina in a long-term Netherlands oriented policy agenda. The reason behind that is his outlook on policymaking processes. In contrast to others, in 2005 he was less upset by the change of the TAW into the ENW. De Vriend was therefore not as 'worked up' over the crisis of political legitimacy, he did not experience it as a crisis *tout court*, but as a blessing in disguise; indeed, he estimates that the ENW's influence on Dutch politics is greater than before (de Vriend 6 July 2009).

In addition to an absent sense of urgency, another element inhibited de Vriend's full blown use of Katrina as a focusing event. When he was interviewed in 2009 by the author he expressed disapproval of the media route to policy. Rather than entering an "unpredictable process with the media" (de Vriend 6 July 2009), issues should be handled between experts, with a clear view on the longer term processes and relations. He values the long-term effectiveness more than short-term successes, for they come at a price. Interestingly however, he supports Vrijling and Stive in their uptake and embedding of Katrina in the Netherlands. So while he and the members of the ENW share a policy agenda, the route Vrijling and Stive took did not match de Vriend's view on policymaking. But, as Stive says, de Vriend occupies a position that is too political to allow him to take that route.

Han Vrijling

Of the water engineers discussed here, Vrijling is the most critical one, and nearly the opposite of ambassador Huib de Vriend. Contrary to de Vriend, Vrijling experienced the 'degradation' of the expert advice as a drama. Rather than abiding, he made it clear that now that expert advice was not embedded in the traditional domain of power, he would change his way of communicating on risk issues, something he would not have even thought of before.

> … 'cause we said, that's true, at the moment we were removed from the centre of power, we said, 'Now we're also going to publish in the papers'. Because in earlier days it was an unwritten rule that we did not give our opinion to the papers. We gave our opinion to the Minister of the highest civil servant, but that was it. (Vrijling 24 June 2009)

This informs us that the existing policy arrangement and the role of experts was heavily disturbed by the demotion of advisory level. Vrijling is also cynical and concerned about the developments in engineering, most notably the ecological strand of water management. Not because he defies ecology, but because this leads to shaky policymaking. Publications or interviews in the newspapers, publishing analyses in magazines read by policy makers, Vrijling used these channels to make his voice heard. Added to these concerns for the role of traditional engineering in policymaking were the failure of dykes to pass the test; it is something Vrijling often picks up. It is in this context of his discomfort that Katrina came along as an event that could further his case. Katrina was embedded in his longer lasting campaign in two ways: in a *direct* sense, that he designated Katrina as an example of what might happen when the Dutch dyke system continued to be ignored. And in an *indirect* way, by attacking the Dutch political response to Katrina.

The direct approach is to present the damage caused by Katrina as a 1:1 scale model of the damage the Netherlands would experience, were the sea dykes to collapse during a storm. If one takes into account that some 65 % of the GNP is produced in the Western part of the Netherlands, the economic damage would be even larger. In this context Katrina grants evidence that that dyke safety problem is an utterly serious one. In a *Science* article on Katrina on 16 September 2005 (Bohannon and Enserink 2005), besides a report on how to rebuilt New Orleans, interviews are reported with four water managers, among whom Vrijling and de Vriend. Vrijling here opposes the 'romantic idea' of giving space to the water, and expresses his belief in building higher dykes. So he started the scientific-political campaign quite early on. And in the following quote from an opinion article in elite national newspaper, published only a few days after Katrina, it becomes clear that without batting an eye Vrijling used the flooding of New Orleans as a focusing event for Dutch policy.

> Attention for the events in New Orleans is of importance, for Dutch Water policy is heading into American directions, investigating the reduction of damage, for example with individual insurances and an improvement of evacuation and disaster management. The reduction of flood risk deserves minor attention. The New Orleans damage raises the question whether we should focus on the mitigation of damage (…) or if a reduction of flood risk is preferred. (Jonkman and Vrijling 1 September 2005)

In the same Washington Post article of 8 September 2005 in which de Vriend was quoted, he expresses his concern for both water security, and the credibility of engineers in policymaking and his own credibility: "New Orleans is a good lesson for us. It has illustrated the real case of a flooded city. Now people will be more ready to believe us than before" (Moore 8 September 2005). The weeks and months after this he would make similar claims on numerous occasions, translating New Orleans as a lesson to the Dutch.

Besides this direct media campaign, Vrijling also invoked Katrina in his attack on the lessons others drew from it (see also his article cited above)—the marvellous evacuation plans and the insurance scheme the Americans had used.

> Well, we were actually shocked, 'cause with New Orleans we thought that this had explained everything, that it was irresponsible to test [the primary waterworks], and to say "oh well 24 % doesn't comply with the norm, what a pity". But the reverse was the case; they started shouting "look at what we can learn from New Orleans. They are evacuating, they at least have insurance. There's so much we can learn from the Americans!" So it was taken as evidence that dykes alone are insufficient, they'll break anyway (Vrijling 24 June 2009).

His intervention towards political enthusiasm for evacuation schemes and safety chains was an article in a policy journal for professionals, entitled Administrators tied by the safety chain (Jongejan, Vrijling, and Jonkman February 2008). With references to the crisis of New Orleans, Vrijling's comment on the safety chain is that safety should not be regarded as a chain, with links that could fail, but as a series of layers. To his surprise, the Dutch Government then dropped the idea of the safety chain, and the responsible civil servants blamed Vrijling for torpedoing their plans (Vrijling 24 June 2009).
The debate on flood insurance had a similar strategy: being banned from the centre of the discussion Vrijling and associates had no other alternative but in his words to target the discussion "from behind the horizon" with an ENW letter (ENW 5 March 2008). Vrijling wrote an accompanying study (Vrijling 2008). Interestingly, what had seemed a positive example of flood insurance in the US, was similarly countered with a study of flood insurance following Katrina, demonstrating that the system was far from flawless (Kok et al. 2007). The concerted action of the ENW, Kok and Vrijling was effective and is said to have resulted in the dropping of the plans (Vrijling 28 June 2010). Nevertheless, although the political response to the safety model and flood insurance seems encouraging, Vrijling is far from confident the situation has changed for the better; it is not just about changing policy, but about really understanding what the problems are.
Vrijling's involvement with Katrina was not restricted to using it as a focusing event for the Netherlands. He was also a key expert witness for the plaintiffs in one of the trials (the MRGO trial[56]), in which flood victims successfully sued the American Corps of Engineers. This venue falls outside the scope of this article[57]. Concluding Vrijling's case study, I find that Katrina was taken up in his agenda setting activities as soon as the

[56] Mississippi River-Golf Outlet (MRGO): as the Corps of engineers is immune for legal prosecution when it concerns floodwalls, sluices, and the like, this trial aimed a proving negligence on the maintenance of the MRGO canal, for which it isn't immune. It was successfully proven that lack of maintenance in the MRGO canal caused some floodwalls to break, and hence that the Corps was liable.
[57] For those who are interested in the Katrina trials, see www.katrinadocs.com. The extensive database provides all of the expert reports and transcripts of the cross examinations [29 October 2010].

event took place, and that he compensated his loss of influence in the traditional policy channels by publishing articles for various media and over a period of several years.

Marcel Stive

Marcel Stive is a close colleague of Vrijling. They work in the same department, three doors away from each other. In terms of the uptake of Katrina and in translating it to the Dutch circumstances, he took a middle position between Huib de Vriend and Han Vrijling. Although both Vrijling and Stive embedded Katrina in their Dutch policy agenda, their approaches differed, for their outlooks on policy differed. First of all, Stive is less negative about the transition to the ENW, although it is said he was furious when it happened (Vellinga 26 May 2009). The 'degradation' of the ENW from a top political to a lower policymaking level was compensated for somewhat by the informal invitation from the State Secretary to Vrijling and Stive to approach her when they had issues. Stive wanted to stay loyal, and gave it a shot. But he also, albeit modestly, started to channel things through the media by giving interviews here and there as a way of compensating for the loss of influence. In March of 2005, he for example created a stir by going public with data that indicated a number of weak spots in the Dutch coastal protection (Stive 23 June 2009).

Another reason for not taking up Katrina as fiercely as Vrijling is Stive's view on policy processes. On numerous occasions he decries them as a contingent part of history, as something that cannot be directed. This sets limits to the expectation of effectiveness of agenda setting work. "You don't direct it, but it is a moment that gives an impulse to change" (Stive 23 June 2009). The sentence is characteristic for Stive's understanding of change processes in policy. Rather than a strategic policy entrepreneur, who consciously intervenes to attain specific goals, Stive's attitude is far from calculating. Although in retrospect he usually able to identify specific factors that led to any particular change, before the fact he does not seem to manage these contingent processes. A final reason for Stive's more modest, use of Katrina in agenda setting is the way he perceives himself as lacking the qualities of crossing boundaries, of covering different disciplines. 'Vrijling is better at that', he said. Let me can recall that the discussion was not just on flood risk, but also on economic issues like insurance. His perception of the complexity and contingency of the problem field and the demands for multidisciplinary experts shapes the less obvious way he chooses to intervene.

Despite these reservations, Stive did use Katrina as an event that could get his issues on the political agenda. Stive and Vrijling, for example, co-authored an editorial in a journal where Stive is editor (*Journal of Coastal Research*), entitled *New Orleans is a Lesson to the Dutch* (Jonkman, Stive, and Vrijling November 2005). And on national television he is said to have claimed, including during Katrina, that The Netherlands is not yet Delta safe.

Just weeks after Katrina, Stive also used the opportunity to make another (in his terms) 'impulse to change', one which seemed to have actual consequences. At a meeting for governors of the Western part of the Netherlands (Regio Randstad, 16 September 2005) he gave a lecture in which he plugged his earlier concern for coastal protection:

> In those days I had said something like 'There should be a new Delta committee'. So I think, I think, without any direct communication the idea did find its destiny, and that politics itself said 'well, we're going ahead with it' (Stive 23 June 2009).

Indeed, when the new Delta committee was formed by the State Secretary[58], Marcel Stive was the only hydraulic engineer invited to be a member. In his assessment of what led to the decision to set up this committee, he explains that often there are shocks in society, like Katrina, that stimulate this. It was the agenda setting work by him and Vrijling that stimulated the political interpretation of Katrina as a shock, rather than as a shining example. In his own words, "See, I think that what Katrina, and Al Gore and we [Vrijling and Stive] unleashed indoors was what led to the Delta committee" (Stive 23 June 2009). One should not underestimate the broadness of this claim: he more or less says that the lobby had been effective with the installation of the Delta committee. Stive's membership was the cherry on the pie.

Pier Vellinga

Pier Vellinga occupies a rather different position from the previous three, for he, as a civil engineer, in 1988 exchanged this discipline for climate science and policy, only to return to water issues in 2003. In the meantime, he was a high Dutch civil servant for the IPCC and its forerunners (1987-1993), and a climate professor at a renowned Dutch institute (1993-present). The years at the Dutch Ministry of the Environment made him a politically experienced scientist, even meeting the US president. On the basis of these and other examples, which exceed the scope of this article, Vellinga can be characterized as a policy entrepreneur. First for climate change, but since 2003 also in his alma mater of civil engineering.

He returned to the theme of water security and sea level rise when he was invited to give a lecture in 2003. In this lecture, he combined his engineering and climate change expertise with his skills in politics. In preparing for it he studied the state of affairs of the field he had abandoned years before, and was shocked by the deplorable state of the physical dyke system, as well by the weak political position of Delft engineers Vrijling, Stive and de Vriend (Vellinga 26 May 2009). In the narrative interview, he talked about how he felt it was his calling to do something about it, casts him as a maverick who, unburdened by direct interests in the relation between the ENW-Rijkswaterstaat-

[58] The previous was the one that responded to the 1953 floods and drew the plans for the Delta works.

Ministry could have a go at politics. The IPCC experience had given him the weight and skills to do that. He coupled these concerns with an agenda that more directly related to his view on climate change: that of climate proofing, the art of preparing for issues like increased precipitation and sea level rise. In the years before Katrina, the politically experienced Pier Vellinga had re-entered the field with a double agenda: getting engineers back in power, and promoting climate proofing. He used his outsider-insider position to push things to extremes, but it also should be noted that according to some, he may have overstated his role:

> And my Delft colleagues in some respects were grateful, but also jealous, that I fluttered the dovecotes. And I was successful at that. I found a hearing, and you just continue. And that was 50 years after [the 1953 flooding], and Katrina came along as well. And then I really thought: this could happen in the Netherlands. Maybe not as fast as over there, we are better organized. But not everything is all right. So I once said that if this were to happen in the Netherlands, the Minister should resign. Well, you'll never hear my Delft colleagues say that, 'cause that is their employer. So because I had an independent position at a renowned environmental institute, I could spot these faults. Thus my reasoning was that I should say something on the subject. (Pier Vellinga 2009)

As Vrijling used Katrina in his plea for better dyke protection in the Netherlands, Vellinga used it to promote climate proofing. In a *Nature* article he and colleagues write: "Since Hurricane Katrina hit New Orleans last summer, many have advocated increasing levee protections for New Orleans and even for the entire Louisiana coast. However, a broader climate-proofing approach may be a better long-term solution than simply reinforcing and raising the levees" (Kabat et al. 17 November 2005, p. 283). Although the human failure factor was the same as in Vrijling's use (dyke failure), the outlook for the future focused on the climatological nature of this event, and implied a move away from traditional engineering practices. In the years after, and also in the interview, he used the force of Hurricane Katrina to argue that climatological problems are of a different magnitude than for example some infectious diseases (De Boer 22 May 2007).

In Vellinga's view, Katrina made governmental climate scientists more aware of the consequences of climate change and sea level rise for the Netherlands; it was the disaster that promoted a change of strategy. He was concerned about the traditional response to Katrina with dyke reinforcement, and about the general course of the public discourse on flood security.

> … So Katrina was the disaster. More than 1995. '95 did push the dyke reinforcements; a [river] delta plan was produced instantaneously. But that was more of the same. And after Katrina politics got really interesting. And once the National Institute for Public Health and the Environment produced these sea level rise scenarios and advised everybody to move east

> (…) Then I thought everybody had gone mad, so I decided it was time to make clear this was all nonsense. (Vellinga 26 May 2009)

He thus widely advertised the idea of a broad dyke, one that could flood, but would never breach, and set up a research project on the design of unbreachable dykes.
In 2006, in a commissioned report, Vellinga, Vrijling, Stive and others made suggestions for a new structure of funding for dyke maintenance, expecting this would improve the dyke system's quality. In the political response to their plans I find clear traces of the agenda setting work the three had conducted before. It was said that funds for water security shouldn't compete with other claims on funding: in the words of the Dutch State Secretary at the time, "That's the lesson from New Orleans... Budget for water security had to compete with the war in Iraq and the war against terror. There was none left for flood protection" (Schreuder 20 December 2006).
I come conclude that Vellinga's ideas for climate-proofing, unbreachable dykes and alternatives for financing the maintenance of dykes were inspired by the example of Katrina, and that he had a good reputation and the position to put a finger on the sore spot. He however used Katrina not to reinforce practices of traditional engineering, as Vrijling and Stive did, but to present new horizons and concepts for a flood prone country like the Netherlands.

5.5.6 Water safety summary

In this study of water experts, and their use of Hurricane Katrina as a focusing event for agenda setting, the four experts acted in different ways. It is clear that the demotion of the main advisory committee constituted a breach in the otherwise structured organisational network. Before that, the relations between the different actors in the water field were defined, either as a professional practice or as a political rule. But the demotion created a situation as when new actors, such as ecologists, entered the scene, and where relations between politicians and water experts changed.
What is striking is among these four experts is that they responded differently. Some, like de Vriend, saw the benefits of this demotion, and in combination with an outlook on policy processes that dictated him to not go public with agenda setting, he refrained from using public communication as an agenda setting instrument. Han Vrijling took an opposite stance: he clearly states that the demotion led to the choice to go public with his concerns, that this was his way to compensate for the loss of influence. Vellinga and Stive also used the media and Hurricane Katrina for agenda setting purposes; Vellinga, a relative outsider, expresses his motivation as an urgency to crack open a deadlock. Stive describes how he expressed his concerns, but not with the idea that he could make calculated strategic moves: policy processes are too contingent to be able to be strategic policy entrepreneurs.

Finally, the case of water security demonstrates that in a knowledge society apparently remote crisis like Hurricane Katrina can be put service in other geographical areas and political arenas. Katrina occurred in the US, but it was used symbolically in the politics of the Netherlands.

5.6 Conclusion

In the last few decades, new crises have posed challenges for scientists, who were deprived of their scientific routines, knowledge, methods and legitimacy. A situation arose that can be characterized as post-normal science (Funtowicz and Ravetz 1993). Although effects of new crises, such as HIV/AIDS, onto science can be described along the scientific, political and communicative dimensions, this article has focused on the later two. Using a biographical-narrative method, I have analyzed the interactions between scientists, crises and the policy and communication dimensions from an agenda setting perspective (Birkland 1997). More precise, I studied how virologists used the SARS and Avian Influenza crises in their agenda setting activities (sections 5.1 – 5.3), and how water engineers transferred Hurricane Katrina to the Dutch political arena (sections 5. 4 – 5.6). Besides a general perspective on agenda setting, the comparing of the two cases of virology and water security invited to look at the degree to which relations between actors were structured (Birkland 1997, pp. 36-37). I will return to this below.

From analyzing the seven accounts of scientists and their agenda setting work, I come to identify four themes that manifest themselves. The first is the *identification of the issue* that should be addressed, the second is the *necessity and urgency* one attaches to the issues, and hence the suitability of the crisis as an event that could 'focus' political attention towards these issues. The third theme is the *capacity* one ascribes to himself to be successful in using the crises to address the issue; the fourth is the consequent *strategy* to do agenda setting work.

In the two cases and seven expert studies, the first two themes do not diverge a great deal; in both virology and water security the issues were not subject of dissensus. Virologists claimed for an improved structure for infectious disease control, and the perceived urgency was illustrated by the outbreaks of SARS and Avian Influenza. In water security the issues was also clear: the poor state of dyke system. After floods in the 1990s and the worrisome governmental reports on dyke safety, it was an urgent issue for engineers.

Between the cases and experts there is more variation when we look at perceived individual capacity and the strategy chosen. Marcel Stive (water) ascribed himself little capacity in changing the course of history, but this did not prevent him from using Katrina in campaigning for more security and a solid policy. Someone like Jaap Goudsmit (virology) was not hesitant over his capacity, but avoided the policy room as a

possible location for agenda setting work; Huib de Vriend (water) is an example of the opposite: he avoided agenda setting through the media, and restricted himself to the policy networks. Among the four that were quite explicit in using media for agenda setting purposes, policy entrepreneurs like Ab Osterhaus (virology) and Pier Vellinga (water) were actively pushing the policy agenda in media and in policy. Experienced policy experts like Roel Coutinho (virology) and Han Vrijling (water) only did so when the formal routes were insufficient for the urgency of the issue (virology) or cut off in the wake of reorganisations (water).

A general observation of the two cases then is that the seven experts were quite conscious in choosing strategies that suited their capacities and understanding of the problem. In this respect we cannot discern any significant differences between the two cases. From looking at the organisational aspects of the cases, we do see significant differences between the two cases that relate to the degree of organisation (as hypothesized in section 5.3). In water security, a field that in the course of history developed into a field with clearly defined relations between actors, experts demonstrated a great hesitance in using public communication for agenda setting purposes. The demotion of the main advisory committee created a new situation to which some responded differently than others. Virology, which has a different history and where relations between science and government were only loosely defined at the time of SARS and Avian Influenza, created an environment for experts in which they were not bound by political relations. Public communication for them was a common attribute of their work as experts. In conclusion, I observe that a clear organisation channels the communication between experts and policy; not just because experts have easy access to policymaking, but also because the organisation created and reproduced norms on how to communicate.

In the work on agenda setting, this channelling aspect merits further attention. When these norms are disturbed or absent, when experts do not have guaranteed political legitimacy and work under the conditions of post-normal science, public communication is a valuable resource. What these case studies have also demonstrated is that in this agenda setting work the geographic distance could be crossed by creating symbolic proximity. The water case is the clearest example, although this element is not absent from the virology case. Hurricane Katrina was transferred to the Dutch discourse by making it a symbolic example for the Dutch. And although SARS never crossed the Dutch borders, experts did not refrain from presenting it as if that was about to happen.

Beside this work on the geographical boundaries, other boundaries were managed as well. In responding to challenges to their expertise, knowledge and political influence, they were challenged to handle the boundaries between science and politics, between what is known and what is uncertain, between communication as a public and as a political activity, between the risks and benefits of agenda setting. In trying to understand the role of experts in the knowledge society, this array of boundary work is at the core.

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Chapter 6. Making advice (not) work: Science based policy advice as a boundary object

6.1 Introduction

In the previous chapters I have studied biographies of virologists (Chapter 3) and engineers (Chapter 4) , and compared them on the topic of agenda setting (Chapter 5). In those chapters, I have shown how the individual experts interacted with their surroundings, and how this not just shaped their role as experts, but also how the experts developed over the course of years, seeking to find a public and political position that suited them. We have also seen that what they may find a suitable position for themselves sometimes diverges from what publics or politicians take to be a good or credible expert. In the present chapter the study of the interplay between scientists seeking a suitable position in the political and public domains and actors responding continues. However, by studying the same topic with a different unit of analysis, I will insert some contrast fluid in this thesis.

This chapter, in which the advisory trajectories of the Health Council advice on vaccination against cervical cancer (Gezondheidsraad 2008), and the report by the ad hoc Delta Committee Working together with water: A living land builds for its future (Deltacommittee 2008) are analysed, has a dual aim. First, it presents the political and public frame for the scientists discussed in this thesis, without them being central to the analyses. By studying a similar theme but with a different unit of analysis, I come to compare the level of the biography with that of the scientific committee and its embedding in an advisory trajectory. The level of the scientific committee and the trajectory of a policy advice displays interactions and processes that also shape the biographies of the individuals working in those fields, and this study therefore elaborates our understanding of the frame or context that shapes the role of scientific experts. Like the biographies, this also entails a long term perspective. Such a long term perspective on science related themes in policy is promoted in the study of the science-policy boundary (the most prominent examples are Jasanoff 1990; Hilgartner 2000; Bijker, Bal, and Hendriks 2009). In policy studies long term perspectives are also used, but then in combination with specific perspective on ‘streams’ (Kingdon 1995), advocacy coalitions (Sabatier and Jenkins-Smith 1993) or policy instabilities (Baumgartner and Jones 1993).

Secondly, by studying two advisory trajectories of more recent date, this chapter is an example of how, in addition to the other chapters, scientific advisory reports perform the role of boundary object between science, policy and public debate. Referring to these reports as boundary object infers a specific role for the report, as "[b]oundary objects are objects which are both plastic enough to adapt to local needs and the constraints of the several parties employing them, yet robust enough to maintain a common identity across sites" (Star and Griesemer 1989, p. 393). We will see that although the reports indeed were both plastic and robust, this did not guarantee the success of their implementation in policy and practice. Both the Health Council report and the report of the Delta Committee were published in 2008, and in the period between their publications and the writing of this chapter, the recommendations of the reports have been debated in parliament, science, professional practice and in society; and, depending on the outcome of these debates, the recommendations have been put to practice or not, or are still in the deliberative stage. This chapter will study not how individual scientists or institutes acted on the science-policy boundary, but how advisory reports fulfilled such a boundary position, and how, in turn, scientists and politicians interpreted, discussed and acted on the basis of the advice. The two reports are, as we will see, examples of science based advice that was, and still is, subject of heated debates.

Both Hilgartner and Bijker et al. have provided similar studies of science advice as boundary objects, drawing upon Erving Goffman's stage metaphor (Goffman 1959). The two studies demonstrate the rhetorical and performative work that is needed to uphold the credibility of the report. In Hilgartner's case "the narrative strength of reports, the degree of dramaturgical cooperation achieved, and the public identities of the critics play a crucial role in shaping outcomes" (Hilgartner 2000, p. 148). And in the case of the Dutch Health Council, Bijker, Bal and Hendriks conclude that the institute's authority builds on a refined front stage presentation of being authoritative and impartial, and a backstage performance of being responsive to what happens in policy and society. Maintaining this paradox is what grants the Health Council its authority, they explain (Bijker, Bal, and Hendriks 2009, pp. 138-9). What does this chapter has to offer in addition to these conclusions of comparable cases?

By studying these two reports and the role of scientific advice, I will demonstrate that although the reports are of a very different nature and in different policy domains, the controversy in which they found themselves in shows some instructive similarities. By paying explicit attention to what happened before the committee sat down to its task, and by analysing developments in politics and society, I provide a somewhat different perspective on boundary work and boundary objects than Hilgartner and Bijker et al. This allows me to discuss the role of science advice in more general terms. In tandem with the biographical chapters and the chapter on agenda setting, this will add up to an analysis of the contemporary role of experts and expertise in policy and public debate, and the development in this role.

6.2 The two advisory trajectories

To ensure that the stage I am sketching in this chapter is also the stage upon which the scientists discussed in the previous chapters perform (first aim), and that the study of reports as boundary object is an extension of the other case studies (second aim), I have taken care in selecting the policy advices and the responsible committees.

For the case of virology I have selected the HPV advice because the theme discussed there, vaccination against cervical cancer, for various reasons is a landmark event in contemporary virology. First of all, both the responsible Health Council and the committee's chairman are central figures in the relation between Dutch virology and politics. Their interactions with politics and the public therefore are key to understanding the stage for the virologists. Furthermore, the theme of HPV vaccination itself of course ties this chapter to the case and careers of the virologists. HPV vaccination resulted from the discovery of the human papilloma virus by Harald Zur Hausen in the late 1970s. The virologists, and Jaap Goudsmit in particular, have witnessed this 30 year development of a prime vaccine as an example of how slow and difficult vaccine development actually is. This reality of vaccine production affected him in his understanding of the role of the virologist, made him more modest in what to expect from science. The HPV advice and the resulting debates also stirred virologists and placed them in arena in which their credibility and integrity had to be defended. It not just demonstrates public distrust towards the expertise of Roel Coutinho (once the report was accepted and the vaccination executed), but also fired up the debate over industry's influence over the scientific advice. This report followed up upon and precluded the debate over Osterhaus's many and, according to some, conflicting roles. To conclude, the HPV advice is a valuable and prime candidate in further understanding the many interactions between virology, policy and public debate.

The same conclusion goes for the analysis of the Delta report, although for different reasons. This committee and the themes it addressed are tied closely to the biographies of the engineers studied here. Not just practically (in Chapter 4 I describe how each of them was involved with the work of the Delta Committee), but also symbolically and politically. Having a 'Delta Committee,' a direct reference to the Delta Committee that planned the construction of the imposing high tech dams after the 1953 floodings, means to say that a problem is to be tackled by the roots with an ambition that exceeds one's imagination. The phrase 'we need a delta plan' is a way to indicate the way a societal problem needs to be addressed, and is often used as a rhetorical device. However, having an actual Delta Committee, and having it in the policy domain from which the phrase originated, is not a symbolic extract but 'the real thing'. For engineers, the installation of the Delta Committee thus meant that this historic committee, which shaped the country and their careers, would find its continuation. The political link between the biographies and the Delta Committee is obvious: many of the issues the committee would address have been on the agendas of the engineers. As Chapters 4 and 5 demonstrate, the

challenges for water security were serious, and Hurricane Katrina gave force to the agenda setting work of the engineers to address these problems (some even explicitly advised to install a Delta Committee). The second Delta Committee partly resulted from these events, and for these biographical, symbolic and political reasons the Delta Committee is an obvious, perhaps even sole candidate for the analysis I want to present in this chapter.

6.3 Science-based advice in a policy context

The process through which advisory reports to government are produced is guided by formalisations of how that trajectory should be organized. The Dutch have the Framework Act on Advisory Councils, an act that arranges different aspects of the advisory process (Sorgdrager 3 July 1996). Interestingly, the Health Council and the Delta Committee do not follow the Framework Act; the Health Council's work is mandated by the Health Act (Suurhoff 18 January 1956), the Delta Committee is a state committee and installed by means of a Regulation for appointment (Huizinga-Heringa 7 September 2007) and does not fall under the Framework Act. Members to the Delta Committee have been appointed by the Minister (or State Secretary), and both the Delta Committee and the HPV committee are formally supported by a secretary and its staff. The Health Council's position vis-à-vis politics is also clearly defined. It is to produce solicited and unsolicited advice upon the latest research, but not be involved in any policymaking itself. The solicitations for advice to both committees studied here are formulated in letters from the Minister or State Secretary, and in principle the committee's task is limited to this advice. After receiving the advice, the Minister will reply to it within three months, and both this response and the original report are discussed in parliament, after which the Minister continues to draw up his policy.

The Delta Committee was an ad hoc state committee, installed to produce this particular report. Unlike the Health Council, it was not asked to present the current state of science with regard to a clearly defined topic and following a tight format, but to present a perspective for the coming 100 to 200 years on how the Dutch could manage the consequences of climate change and sea level rise. Because of this broad assignment in temporal and political terms, its effects or demands on policy and politics were potentially great and the Delta Committee thus was more politicized than the Health Council committee. These different orientations with respect to the science-policy boundary are embodied in the choice of committee chairmen. Jan van der Noordaa, professor emeritus in virology and member of the Health Council, was chair of various committees and knows the ropes of this type of scientific advice. The Delta Committee was chaired by professor and former Minister of Agriculture Veerman, a veteran in politically and societally sensitive issues.

In analyzing the reports, I first divided the periods of investigation into phases that partly follow the formal approach to policy advice: starting with the run up towards the report (1), then the solicitation for advice and the appointment of the committee (2). The essential parts of the reports are described (3), after which the debate over the report itself (5) and its translation in policy (6) are analyzed. In practice however, this neat separation only describes half the story; political and public debate in relation to the report was also vivid during the report, and included here as section (4). Besides the sources that are directly present in the reports as they were published (the advice itself, the solicitation for advice and in case of the Delta report: an integral translation into English), for both reports I have collected additional research material from national elite newspapers and parliamentary sources. Articles in national newspapers were retrieved by selecting articles that contained relevant phrase (e.g. cervical cancer, vaccine; Delta Committee) and resulted in a large body of articles from the early 1990s to December 2010. Parliamentary sources were consulted through the official website[59]. Secondary sources and research findings (i.e. from the other chapters/articles) were also included when and where appropriate with respect to the aims of this chapter. This perspective on the scientific advise differs from, for example, study of the Health Council by Bijker et al. (Bijker, Bal, and Hendriks 2009). They present a separation between scientific advice and public discussion over this advice (p. 1), whereas this chapter studies the many interactions between the two, including how scientific advice is grounded upon public and political demands.

6.4 The 2008 HPV advice from the Health Council

6.4.1 HPV vaccination as a female health issue

What marks the run up towards the solicitation for advice are scientific developments in trying to tackle cervical cancer. Since the discovery of the Human Papilloma Virus in 1976 by Harald Zur Hausen, efforts were made to develop both therapeutic and preventive HPV vaccines. Although during the 1990s serious advances were made in testing therapeutic vaccines (Anonymous 28 December 1994, 9 April 1992, 1 december 1993, 29 December 1994)[60], it still was in the early stages of clinical experimentation. The development of preventive vaccines was potentially more successful. In 2000, the National Vaccine Institute (NVI) already identified the preventive HPV vaccine as a candidate for the National Immunisation Programme (NIP; (van der Zeijst et al. 2000). Since 2002 the prospects for vaccines that produced antibodies against the most common (70%) kinds of high risk HPV (hrHPV 16 and 18) were advancing, and public optimism

[59] Portal to government information and service, www.overheid.nl, last visited 22 June 2011.
[60] Of the many newspaper articles available on HPV vaccination, only a selection that illustrates the course of the debate is presented here. Many newspaper article refer to similar developments, and listing them all here would make the text a struggle to read.

was fed in the newspapers (Koutsky et al. 2002; Becker 22 June 2002, 3 December 2002). Although this would not make population screening superfluous, it was a serious advancement in the prevention of cervical cancer. In 2004, the director of the NVI again expected that in 2007 or 2008 the HPV vaccine could be included in the NIP (Anonymous 2 November 2004; NOVA 1 November 2004). By making this assessment, and by making it in public, the NVI took a dual stance: it not only spotted the scientific horizon for new developments, it also carried the HPV vaccine over the mandatory advisory trajectory by suggesting it for the NIP.

In April 2005 more of these promising signals appeared (Anonymous 9 April 2005), and although the Minister retained the position that, after registration, the Health Council should first advise on it, scientists and the NVI were again campaigning for the admission of the vaccine to the NIP (Van Geenen 7 April 2005). In October 2005, pharmaceutical giant MSD-Sonafi Pasteur applied for the admission of their HPV vaccine to the European and American markets, and in summer 2006 their product Gardasil was registered with the American Food and Drug Agency and with the EMA, the European Medicines Agency (Anonymous 8 October 2005). In 2007 GlaxoSmithKline brought its HPV vaccine Cervarix to the market. These two competitors then engaged in a battle over the HPV vaccinations (Scholtens 25 March 2006); with blockbusters nearing the end of the patent terms, these new vaccines that could used with millions of women and men were important products for the pharmaceutical industry (Maarsen 22 June 2006).

With the availability of first Gardasil and later Cervarix, it was believed that the prevention of cervical cancer in women could be improved drastically: the screening programme does not prevent infections and the newly available vaccines thus created the prospect for the early prevention of cervical cancer. The availability of the vaccines met with wide support in scientific and political circles, and TV campaigns were to create awareness of cervical cancer and the possibility to get vaccination. Gynaecologists and again the NVI were publicly supportive (Anonymous 11 September 2006), and members of parliament urged the Minister to study if and when Gardasil could be provided to the Dutch population through the NIP (Arib 1 August 2006). Although the questions from Labour MP Khadija Arib and the answers from the Minister express an awareness of formal procedures for admission to the NIP, in particular the successful registration by the EMA, a positive Health Council advice and a cost-benefit analysis, Arib wondered if the Minister shared the opinion that it should be clear as soon as possible if Gardasil could be included in the NIP.

Although the vaccine was not perceived as a magic bullet that could replace population screening, in the years before the Health Council was asked for advice HPV was thus framed and politicized as a female health issue. Vaccination against cervical cancer was welcomed by scientists and politicians alike, it was perceived as a new tool in promoting female health and healthcare, and almost all parties created as little room for doubt on

the implementation as possible (Anonymous 11 September 2006). These promoters of HPV vaccination knew the Health Council's advice was mandatory, and thus the Minister of Health was pressed for inclusion of HPV vaccination in the NIP; it was his role to ask the Health Council for advice, and to decide on the basis of that advice. Lobbying the Minister implied that the Health Council's role as provider of neutral and sound advice was under pressure at both the head (commissioning advice) and tail (deciding on vaccination) of the advisory trajectory.

6.4.2 Appointing the committee and defining its tasks

The Health Council advice on HPV is spread over two reports. The first study, published early 2007, is a general study that, as a follow-up of the earlier reports on the NIP, shortlisted vaccines for admission to the state-run NIP. As in the earlier reports (e.g. van der Zeijst et al. 2000), HPV vaccination was one of them. The availability of HPV vaccines itself is typified as "a very important development", and HPV vaccination was "very well suited for inclusion in the NIP" (Gezondheidsraad 2007, p. 153; p. 139). In addition, the report not just presented candidates, but also seven knockout criteria according to which the candidates should be assessed. Backed by this report, MPs continued to put pressure on the Minister to speed up with including HPV vaccination in the NIP (Schippers 6 February 2007). Following the positive economic and qualitative appraisal of the HPV vaccine, in March 2007 the Minister solicited for a Health Council advice specifically on HPV vaccination, and he requested the advice to be completed by the end of 2007 (Klink 20 March 2007). Although the Minister explicitly asked advice on new technological developments in both HPV screening and the vaccination, the committee, under pressure to make haste with the advice on vaccination, informed the Minister that it limited itself to HPV vaccination for women alone[61]. The screening aspects would be handled later. In general, the problem definition and request for advice are the results of mutual coordination between the Health Council and the Minister (Bijker, Bal, and Hendriks 2009, p. 47) and usually not visible in the report itself. Presenting the vaccination and screening aspects as technically related, but separated due to societal urgency, is a means to demonstrate to the public how technical and political aspects were negotiated in the advisory work.

6.4.3 The committee at work and its advice

One of the first peculiarities of the report is its position in medicine, being on the edge between virology and oncology. This means that the committee required mixed expertises, and thus issues were raised that were new to the appointed chairman and

[61] Vaccination of men was also considered, as this could prevent a spread of HPV 16 and 18 with woman and prevent other HPV infections such as genital and anal warts.

experienced virologist Jan van der Noordaa (Van der Noordaa May 7 2008[62]). Notwithstanding the fact that this did not impede a committee consensus, it took quite some work and time, as reflected in the three month delay in the production of the report. Next to the disciplinary challenges, part of the challenge was assessing the available HPV vaccines according to the criteria developed by its predecessor, the NIP advisory committee (Gezondheidsraad 2007). The seven criteria are formulated such that if one is not met, then the ones following fail consequently (for the elaborate criteria see Gezondheidsraad 2008, p. 30).

1. The target disease is a serious health problem;
2. the vaccination prevents or reduces the target disease significantly;
3. possible negative side-effects do not affect the population's health more than the disease prevented;
4. the burden of individual vaccination is acceptable;
5. the burden of the entire vaccination programme is acceptable;
6. the balance between costs and health gain is positive in comparison to other means to reduce illness;
7. the vaccination programme serves an urgent public health interest.

The fact that the committee reached an unanimous conclusion, is far from implying that there was full certainty on each of these seven criteria. The first criterion was discussed to the committee's conviction that cervical cancer, genital warts and related HPV afflicted illnesses were serious, and that in addition to the screening programme preventive vaccination of 12 year old girls promised a further reduction of cervical cancer. Criterion 2, the efficacy, was more challenging. The vaccine could not have been tested for prevention of cervical cancer, as it takes twenty-five to thirty years to see if the incidence of cancer drops. Only based on short term results and indirect signs, HPV vaccination proved to be effective. The committee had calculated and recalculated an average efficacy of 54%[63], and that is not 100%, as may be desired. In face of the societal urgency, the committee decided to accept the mere 54% protection and judge positive on criterion 2. The safety of the vaccines was also discussed (criterion 3). The known side effects provided no grounds for concerns, but it was advised to set up a monitoring programme once mass vaccination had commenced. The discussion of the fourth and fifth criterion, societal acceptability, addressed a key aspect: the admission of vaccination against a sexually transmitted infection (STI) in the NIP. The vaccination was deemed medically acceptable on the level of the individual and the entire vaccination scheme.

[62] I had the opportunity to interview Jan van der Noordaa, the chairman of the Health Council committee, at his home in early May 2008. This was only one month after the report was issued, and two months before the Minister gave his conditional approval.
[63] A prevention against HPV 16 and 18, 70% of all HPV infections, multiplied with the expected vaccination uptake of 85% and a vaccination efficacy of 90%.

But the fact that 12-year-olds were to be vaccinated against an STI was regarded as problematic. It was expected to result in a lower vaccination uptake in comparison to other vaccinations in the NIP, and information campaigns should address this aspect with care. In addition, since Dutch 12-year-olds are medically autonomous, information should address both the parents and the girls. Based on cost-benefit analyses the committee studied the sixth criterion and concluded that a combination of screening and vaccination was effective, but at high costs. A sharp decrease of the purchase price of the vaccine was required. Finally, the committee needed only two pages to conclude that vaccination against HPV served public health issue interests (criterion 7). In the conclusion of the report the committee lists the arguments for vaccination, what remains uncertain and what pleas against vaccination, and comes to advise for the admission of HPV vaccination in the NIP, with a catch up programme for girls between thirteen and sixteen. What becomes clear from the committee discussion of the seven criteria is that it was explicit about the pro's and con's of vaccination, in particular regarding the efficacy and the fact that vaccinating against a STI was a sensitive issue.

6.4.4 Societal debate during the committee at work

During the twelve months which the Health Council committee needed to make this assessment of HPV vaccination, the public debate over the HPV vaccination itself continued. Proponents, from gynaecologists to interest groups, thought it was ridiculous that the Minister of Health was so slow in adopting HPV vaccination (e.g. Spong 7 April 2007; Suters and Houweling 19 April 2007; Kleyngeld 17 September 2007; Kruyswijk 9 November 2007; Anonymous 10 November 2007). Gynaecologists in particular believed the Health Council should speed up its advice. The vaccine's safety was accepted by the European Medicines Agency (EMA), so why would the Health Council have doubts about that?, wondered Gemma Kenter, as gynaecologist involved in the development of therapeutic HPV vaccines (Becker 30 march 2007; Scholtens 19 May 2007; Kenter 13 June 2007). A special issue devoted to HPV vaccination by the prestigious New England Journal of Medicine (10 May 2007) granted support to the efficacy of vaccination, and this was also reported in the major newspapers (e.g. Anonymous 10 May 2007). MPs again asked questions to the Minister, suggesting they wanted not only a quick inclusion of vaccination in the NIP and the health care insurance, but also that parliament was somewhat impatient with the Health Council advice (Arib and Van der Veen 25 May 2007). Although it was known that the Health Council would advise the Minister, MPs still urged him to decide upon admission in the NIP before the advice was completed (Koser Kaya 8 November 2007). Opponents, however, pointed out the negative pressure from industry, the insufficient efficacy of the vaccine and possible side effects from the vaccine's ingredients (Boot 11 April 2007; Suters and Houweling 19 April 2007). A renowned science journalist also argued against cervical cancer as serious health threat (Van Maanen 2 June 2007).

In the same period MSD-Sanofi Pasteur had a TV personality and a website online to educate the public and to increase awareness for cervical cancer. A Dutch antivaccination movement (Nederlandse Vereniging voor Kritisch Prikken) sued the firm for using illegal advertising to put pressure on the Health Council (Bouma 3 april 2007). MPs picked up this quarrel, and in response to parliamentary questions (Ouwehand 12 april 2007) the Minister stated that he would rely on the judgement of the body that enforces the Code of Conduct for Pharmaceutical Advertising[64]. In July 2007, it ruled in favour of Sonafi (Anonymous 7 July 2007), but in March 2008 the Health Care Inspection and the Media Committee decided to investigate both Sonafi and competitor GSK for any illegal advertising, reported widely by a science journalist (Bouma 21 March 2008, 28 March 2008, 28 March 2008).

Despite the complaints, industry's campaign was effective and general practitioners were facing an increase in questions on cervical cancer and vaccination. Further support for admission of Gardasil (or any equivalent) to the NIP came from the Health Care Insurance Board. In May 2007 the HCIB advised negative over the reimbursement of Gardasil, pointing out that the NIP would be the most natural way to fund the vaccine, as the vaccine's effectiveness was proven with young girls alone (Scholtens 23 May 2007).

Thus, during the production of the Health Council advice MPs and medical professionals were still pressing the Minister for HPV vaccination, but now opponents manifested themselves more explicitly. Information campaigns from producers not just increased public awareness of HPV, but also concerns over illegal advertising. According to the proponents the Health Council was too prudent about the insecurities of the vaccine and child vaccination, and according to opponents vaccination implied a carelessness for these doubts. In this period, we see a shifting of the balance: HPV was not just regarded as a female health issue, but it was also received with public concern over child vaccination. In the midst of these debates the Health Council defended its position by explaining its thorough and scientific procedures, which was to result in a sound advice (Suters and Houweling 19 April 2007; Anonymous 10 November 2007). The Minister endorsed that positioning.

6.4.5 After the report: manifold contestations

When on April 1st 2008 the Health Council committee presented its positive HPV advice (Gezondheidsraad 2008), the advice not just landed in a fertile political and medical soil in favour of admission to the NIP (e.g. Kenter 5 April 2008), but also in a societal soil with fierce debates between proponents, opponents (a fine example is Van Maanen 3 april 2008) and clandestine pharmaceutical advertising. In media, a plethora of arguments hit the printed paper.

[64] See the website of the Stichting Code Geneesmiddelenreclame, http://www.cgr.nl/150911/HOME.html, last visited 22 June 2011.

In his initial response, the Minister accepted the positive advice, and shared the concerns over the costs. Although he would prepare for the implementation of HPV vaccination, the costs would have to be covered before it could be executed (Klink 14 April 2008). After a tender, GSK came out as the winner (Klink 19 November 2008). The executive organization for vaccination, the Community Health Services and the National Institute for Public Health (RIVM) planned the catch-up campaign for 13 to 16 year olds for March 2009, and for the actual vaccination of 12-year-olds in September 2009.
After the decision to proceed with vaccination, the public balance definitely shifted towards vaccine scepticism, rather than vaccine promotion. Between summer 2008 and September 2009, the Health Council and the RIVM had to face major contestations of HPV vaccination, which centred around concerns over the scientific underpinnings of the HPV advice and the scientific integrity of the Health Council committee.

Questioning the scientific underpinnings
Despite the self-presentation of the Health Council report as thorough and scientific, and despite the public and scientific support to HPV vaccination, in August 2008 cancer researchers questioned the positive advice for HPV vaccination and argued it arrived too soon. The authors, two of whom provided a background study for the HPV advice, argued that the committee had paid too little attention to six aspects: the uncertain efficacy of the vaccine (1), the possible need for revaccination (2), the possibility of type replacement (another HPV virus takes the place of HPV 16 or 18) (3), the negative effects on the screening programme (4), the unknown safety of the vaccine with 12-year-olds (5), and the negative cost-benefit ratio (6). In view of the otherwise thorough and science-based decisionmaking, the authors argued that the introduction of HPV vaccination was too hasty (De Kok et al. 2008). This is diametrically opposed to the earlier complaints, that the Health Council was too slow in fighting cervical cancer. As may be expected, the chairman and secretary of the HPV committee responded (Van der Noordaa and Houweling 2008). From the Health Council's perspective they refuted all the arguments. In their reply, they concluded that Kok et. al. should reread the advice with care; all the six objections they have raised were tackled in the report. The Minister then explained to parliament that 'the same information was weighed differently by the authors and the Health Council', and hence there was no need to revise the HPV policy (Klink 15 October 2008).
Despite the Minister's move to inform parliament of the reply and to calm the affair, the publication of the critical article was picked up widely by written media (ANP 27 August 2008; Anonymous 28 August 2008; Van Santen 18 August 2008; Anonymous 28 August 2008; Schellekens 5 September 2008) and the controversy was staged in public. Again, the Council's president replied by presenting the thoroughness and hence the scientific quality of the advice (Knottnerus 3 January 2009).

Scientific integrity of the Health Council

Since admission to the European markets, Sonafi and GSK were, as noted above, in fierce competition. Although this can be set aside as business as usual, the relevance for this chapter comes in when reports were published over ties between industry and members of HPV committee. Using the Information Act to retrieve the declarations of interest, a national newspaper published on the matter under the suggestive title 'Health Council experts received pharma money; appearance of conflict of interest' (Bouma 18 October 2008, 18 October 2008). This was not a problem for the committee's chairman: these members were not voting members, the conflicts of interest were known and Van der Noordaa weighted their advice accordingly. Consequently, he was stung by doubts over his scientific and political integrity (Van der Noordaa 7 May 2008). The newspaper articles allowed for the President to express his confidence in the full integrity of the members, but as the article appeared in tandem with the raiding of the offices of both pharmaceutical firms by Health Care Inspection, that endorsement may have slipped people's attention. As if it was an orchestrated action, the day after the publication a TV documentary was broadcasted, entitled The contested cancer vaccine (Zembla 19 October 2008). The TV documentary discussed the vaccine efficacy and safety, and by reporting this scientific dispute in the same breath as discussing the aggressive industry campaigns to promote HPV vaccination, another shadow of doubt was cast over the HPV advice and the Health Council's integrity. The President and the Minister of Health defended the independence of the advice, but now MPs wanted a full, independent inquiry (Anonymous 20 October 2008). One MP who earlier pressed for urgent introduction of HPV vaccination now asked critical question about the integrity of the HPV committee (Klink 31 October 2008). To make things worse for the Health Council, in November 2008 the Dutch Association of General Practitioners published an article that lend further support to doubts over the scientific underpinnings of the HPV advice and the integrity of the committee (Boomsma, Drenthen, and In 't Veld 21 November 2008). It was misinterpreted by media as 'Vaccinating girls leads to more deaths' (Beek and Van Geenen 20 November 2008).

When parliament finally got to debate the HPV vaccination report itself in December 2008 (Anonymous 9 December 2008), the effects of these debates and the turn from proponents to opponents among MPs were openly visible and debated. Although the plan previously had been promoted by MPs as a way to prevent a female health problem, it was now disputed for being introduced too fast with too many assumptions about efficacy. Some addressed the pressure from politics to start vaccination and appreciated that the Health Council report was given full consideration. A fine example of remorse comes from the green-left party: "Colleagues already referred to parliament being a fellow-initiator in the introduction of this vaccine. Back then, also the Groenlinks faction gave its support. I can be brief: we terrible regret that and honestly, would like to see that decision reconsidered" (Anonymous 9 December 2008). A motion for an independent

'second opinion on HPV vaccination' was filed by the Socialist Party (Kant 18 December 2008), and after its parliamentary rejection the Minister could continue with the vaccination programme. Nevertheless, these debates over scientific quality and integrity created a fertile soil for further contestations of scientific expertise in the public realm.

6.4.6 Executing the Advice: HPV vaccination and public distrust

On March 2nd 2009, after the manufacturing of the vaccine, the scientific assessment and political decisionmaking processes were completed, the catch-up vaccination of girls between 13 and 16 years old started. According to the HPV advice, communication to parents and girls was one of the items that was to be treated with diligence and moral sensitivity. Not just because it concerned a STI, but also because the users were medically autonomous from their parents. However, in the weeks before the actual vaccination, it turned out that not just the communication was erroneous, but that grass root initiatives were capable of undermining the vaccination programme. These initiatives not just sprung from pre-existing antivaccination movements. A concerned mother and florist, Anneke Bleeker, found worrying information over HPV vaccination while surfing the internet, and started a fierce and successful campaign against HPV vaccination (Effing 24 November 2009). Within weeks, this mother was on the prime news programmes, and managed to become the public opponent of Roel Coutinho, director of the HPV vaccination programme. Using social media, this mother and numerous of others built forth on the doubts cast over the HPV vaccination, and the effects were enormous: despite the long preparations by the RIVM and the NVI, of the expected 70% a mere 50% of the girls collected their shots. According to the RIVM, and many shared this viewpoint, it was a failure (Anonymous 2 april 2009).

Besides the successful campaign of the opponents of HPV vaccination, there were two additional problems with the official information campaigns. The first is that according to communication experts the RIVM was using outdated methods and communication channels, failing to appreciate the role of social media and the social world of adolescent girls (Brockhoven 28 March 2009; Van Zanten 16 April 2004). This was acknowledged, and after the first round of vaccination a new communication campaign was developed, for which an advertising agency was hired (Sahadat 29 December 2009). Meanwhile, the RIVM started its own study to understand why the campaign had failed (Rondy et al. 2010). The second problem had to do with the main spokesman regarding HPV, Roel Coutinho. He took up a role that was natural to him (see Chapter 3) but that was out of tune with the type of issue: vaccination against an STI with girls. He was culturally discordant with the issue and the target group (see also Kahan et al. 2010), and perhaps that is why a mother like Anneke Bleeker had such success with becoming his opponent. He later reflected on his problematic position, but does not seem to take any blame: "We could not alter the tide. Of the 400.000 girls between 13 and 16 years of age that were

invited for HPV vaccination, only 50% turned up. Our opinion did not seem to outweigh than that of a florist [Anneke Bleeker] and other self appointed experts" (Coutinho 2 February 2010).
A final explanation of the failure of HPV vaccination, and one that was discussed in public as well, was that there was a general distrust towards formal expertise (Van der Bles and Lucas 27 March 2009). This distrust not just manifested itself in the case of HPV, but also in the Swine flu pandemic and the debate over the IPCC's credibility.

6.4.7 Conclusion on the Health Council report

The advisory trajectory of the HPV advice and the underlying scientific expertise has a varied history. Before the Health Council was commissioned for advice, signals for a preventive HPV vaccine were promising, and scientists, politicians and pressure groups were promoting the uptake of HPV vaccination in the National Immunisation Programme. Admission to the market by the EMA and a Health Council assessment were hurdles some wanted to bypass in the promotion of female health care. While the report was being produced, critical voices in the public and political domains were manifesting themselves, and uncanny industry promotion created distrust towards HPV vaccination. Once the HPV report was published, the scientific assessment was contested, in terms of both scientific quality and scientific integrity. The balance had now clearly shifted from health care promotion to child protection against hazardous vaccination, and this trend seemed unstoppable. In the actual vaccine uptake of 50%, the public doubt over the usefulness and safety of HPV vaccination finds clear expression. What is striking is that the attacks on scientific integrity came from fellow scientists, and this fed suspicion. Furthermore, the Health Council's response was to hammer on their correct, sound and thorough procedures, and to repeat what had been discussed in the report. Interestingly, the committee's correct assessment that besides addressing HPV vaccination as a female health issue it also could be framed as the sensitive issue of vaccinating 12-year-olds against a STI, did not make a difference to these debates.

6.5 The 2008 Delta Committee

After the study of the HPV report, I now turn to the analysis of the advisory trajectory of the Delta report, an entirely different scene. The structure is the same, starting with the run up towards the report, the report and the public debates during the report, and thereafter the reception of the report and the debate over scientific expertise.

6.5.1 Urgency for an integral policy vision

In the years leading up to the Delta Committee the domain of water policy was very dynamic, and certainly not in want of political attention. River floodings in the 1990s following increased precipitation and peak discharges, were not just an invitation to

better evacuation plans and an instant dyke improvement programme, but also to a new philosophy and policy of managing rivers; rivers as narrow logistic arteries had to make space, literally, for the meandering rivers (Smits, Nienhuis, and Leuven 2000). Large programmes, such as the Room for Rivers and Maaswerken were to make the river delta not just more ecologically in balance, but also to prepare the Rhine and Meuse Delta for more extreme circumstances.

Besides giving room to rivers, the 1993/95 floodings also instigated a legal framework for monitoring the safety of the dyke, the hydraulic boundary conditions. Shockingly, when in 2003 the results for the 2001 assessment were published, it turned out that many (35%) of the primary water works failed the test, and that of 15% it could not be determined (Schultz van Haegen 13 February 2003). In 2003, exactly 50 years after the great flood by the sea, that was a symbol nobody was waiting for. So new repair works (for example addressing ten coastal 'weak spots') were immediately initiated. As if the failing of 50% of the primary waterworks was still unconvincing, in August 2005 Hurricane Katrina presented the scenario of dykes and sluices giving way to the restless water. Although some presented the events in New Orleans as a text book exercise in having good evacuation schemes in place, others, as I demonstrate in Chapter 5, were not hesitant in presenting New Orleans as a 1:1 scale model of what could happen to the Netherlands.

In addition, three consequences of climate change were feared: sea level rise, increase precipitation and hence peak discharges, and the opposite: increased drought. Whereas sea level rise for long has been an identified issue (Vellinga 1989), and 1993/95 made peak discharges a convincing problem, 2003 was the year of drought, causing the spontaneous collapse of a dyke and serious problems at the rivers, for example for ships and powerplants. The scientific community then initiated large climate change and spatial planning programmes, and the Royal Netherlands Meteorological Institute (KNMI) and the Intergovernmental Panel on Climate Change (IPCC) gave further attention to the tackling of climate change.

In accordance with these developments the Ministry of Spatial planning tried to get authority over water management, as water management was more and more part of spatial planning (Roth, Warner, and Winnubst 2006). According to some, that instigated the Ministry of Water Management, until then 'owner' of water policy, to seize it by coming up with a rough remedy: a Delta Committee. Another way to view this decision is that a patchwork of many policy programmes, legislations and initiatives at various political levels developed in response to the various problems, crises and changing philosophies of water management, but that this patchwork lacked coherence, let alone a clearly articulated and integral vision for the future of the Netherlands. This reading that appears between the lines of the Regulation for appointment for the Delta Committee.

6.5.2 Appointing the committee and defining its tasks

This apparent lack of a particular policy vision for the future of the Dutch way of living with water and climate change was addressed in a policy initiative of the newly appointed State Secretary Huizinga (Christian Union). She developed an agenda for water: the Water vision (Huizinga-Heringa 7 September 2007). The Water vision not only ties together different existing policy programmes, but also various forthcoming exploratory programmes, all planned to result in the National Water Plan in 2009 (Huizinga-Heringa 7 September 2007, p. 17). The same day the Cabinet decided to install a Committee on sustainable coastal development, the Delta Committee for short (Huizinga-Heringa 7 September 2007). This temporary ad hoc committee had to advise the State Secretary on:

a. expected sea level rise, the interaction between that rise and the discharge in the major rivers in the Netherlands and such other developments, climatological and societal, until 2100–2200 as are important for the coast of the Netherlands;
b. the consequences of such developments for the Dutch coast;
c. possible strategies for an integral approach leading to sustainable development of the Dutch coast, based on a) and b) and
d. to indicate the additional value to society of such strategies, in addition to the safety of the hinterland, in both the short and long term.
(Huizinga-Heringa, 7 September 2007, article 2)

In the explanatory note it is striking that the assignment of the committee is placed against the backdrop of two ongoing developments: 1) the development of a national policy with which government wants to make preventive steps against climatological sea level rise. This policy should be sustainable, and combine concern for safety and water management with users function like residential and industrial planning, nature, recreation, landscape, infrastructure and energy production. 2) The execution of a large policy programme on river management, Room for Rivers. Read in this way, the Committee on sustainable coastal development, was a continuation of existing approaches on integral water management, Room for Rivers, and the related interdisciplinary approach to water safety. But now the focus would shift to the coastal regions and to the future. Also, the problems to which the Committee should come up with answers were not novel, but aired and discussed in the years before. With installing the committee, therefore, existing approaches and existing problem identifications were transferred to coastal policy. With the aim to lay a foundation for the projected National Water Plan in 2009, the committee's role in the political process became clearly articulated.

6.5.3 The committee at work and its science based recommendations

In view of the political aims and the specific questions for the Delta Committee, the composition of the committee, and the process through which the advice was produced, was more interactive with society than the HPV committee: it not only included members who were active scientists, but also a manager of a private waterworks company and people from politics and government[65]. The Delta Committee also asked subcommittees to provide knowledge on specific scientific issues. In addition, the committee also relied on hearings with experts and stakeholders and received many spontaneous responses. Unlike the Health Council committee, whose adagium it is to present the state of the art of scientific knowledge and does not interfere with decisionmaking, the boundaries between science and policy were consciously blurred in the Delta Committee. It presented a science based advice with the input of many stakeholders, did not hesitate to share some of that well before the report was completed (see for example Korevaar 17 September 2007; Veerman and Fresco 24 May 2008).
The science based elements, in particular the sea level rise scenarios, are of prime concern here. The new sea level rise scenarios were not presented as bare figures, but the credentials of the subcommittee members and the scientific resources were listed in support of the scientific credibility of the Delta report.

> The Delta Committee has sought to base its advice on the most recent scientific insights into a plausible upper limit to global and regional sea level rise, changed storm conditions above the North Sea, and precipitation changes leading to altered discharge in the major rivers. The Committee has therefore commissioned additional research to provide a systematic survey of the most recent information on climate scenarios (see Appendix 3). A score of prominent national and international climate experts, including several IPCC authors, has been commissioned by the Delta Committee to produce scenarios for 2100, supplementary to the IPCC 2007 and KNMI 2006 scenarios. (Deltacommittee 2008, p. 23)

The scientific sea level rise scenarios facilitated the presentation of three time horizons with related policy relevance: the concrete measures to be taken up to 2050; a clear vision for the period up to 2100; and reflections for the very long term after 2100. These scenarios, which overlap with the KNMI scenarios for the period up to 2050, are taken as clear guidance for the coming 50 years and serve as a source for extrapolation for the period after 2050: this means that the scientific horizon as provided by the sea level rise scenarios is 50 years, with an educated guess for the second period (pp. 45-46). In the remaining discussion of the Delta report, I focus on the concrete measures that are proposed for the first scenario-based period. The contrast with the KNMI scenarios, and

[65] Besides chairman and former Minister of Agriculture Cees Veerman, only three of the remaining eight members were active scientists. Other members were mainly from politics or industry. Of the four scientists, only one was civil engineer (Marcel Stive).

grounding some far-reaching recommendations upon new scenarios, proved to be the Delta Committee's Achilles heel.

The first of the recommendations is that the security norms for dykes areas are increased with a factor 10. Many existing dykes may not meet these new norms, in such circumstances delta dykes[66] could be constructed (recommendation 1, p. 49). Based on the subcommittee, the Delta Committee takes a maximum sea level rise of 1.3 meter in 2100 as the projected level for safety calculation, and the way to accommodate this is to 'build with nature', in a step by step or adaptive manner (recommendation 4, p. 55). Other measures up to 2050 are to try to tackle the negative impacts of the Oosterschelde storm surge barrier, to create water storage capacity in time of peak discharged from the rivers, and the possibility of salinizing the Delta area (recommendations 6, p. 57 & 8, p. 59). Although the committee is asked to look at the coastal zone, it also proposes that the Room for Rivers and the Maaswerken programmes are continued, and, if cost effective, to prepare rivers for an increased flow (recommendation 9, p. 63). In addition, the Rotterdam region needs to be adapted (Recommendation 10, p. 65). The most concrete (and later most contested) measure up to 2050 is to increase the water level of the IJsselmeer with a maximum of 1,5 meters. This not only creates a fresh water reservoir in case of drought, it also ensures free discharge of freshwater onto the Waddensea.

After these and other recommendations, the committee proposed how to put to these plans into practice: the financial and governmental requirements for a successful tackling of the problems created by climate change and water safety. A Delta fund should provide an annual 1,2 to 1,9 billion Euros up to 2050, and a Delta director manages the Delta programme against the backdrop of a 'Delta Act' (Deltacommittee 2008, p. 79)[67]. These measures were founded in the new, science based scenarios for sea level rise.

6.5.4 Societal debate during the committee at work

During the production of the report, there was political struggle over ownership of the prestigious report. The Committee chair, Cees Veerman, was a Christian Democrat, as was the Dutch PM; the commissioning State Secretary was of the more conservative Christian Union (CU). While the report was being produced, the CDA appropriated the report by being the most ambitious boy in the class: the CDA wanted to create artificial islands right off the Dutch coast. As soon as the committee was appointed, the CDA islands were presented as the target for the committee. The opening shot came from Veerman, a former CDA Minister and a party lion.

[66] Dykes which are so strong that a sudden, uncontrollable burst is avoided.

[67] See p. 83 of the Delta report for an overviews of the proposed governing structure. The fact that every new instrument has 'delta' as the adjective illustrates the symbolic value of this phrase I referred to in the introduction to this chapter.

> I am thinking of a lagoon right off the coast, so that heavier storms, which will come with climate change, hit the shores with less force. Or making artificial islands at the coastline. That could be combined with windmills, producing sustainable energy, or we could make the island suited for recreational purposes. (Korevaar 17 September 2007)

Not long after, a CDA MP gathered a majority for a motion to study land reclamation at sea, and CDA Minister of Agriculture Gerda Verburg thought it was an interesting idea for the Delta Committee to discuss (Schreuder 7 November 2007). To add to the ambitions, the CDA prime Minister launched the idea for a tulip shaped island to demonstrate the skills and prestige of Dutch engineering (ANP 4 Februari 2008), and later that year the chair of the CDA faction in parliament endorsed the idea of islands. The tulip shaped island became the icon of CDA ambitions for water management.
However, in June 2008 the State Secretary who installed the Delta Committee stated that islands do not contribute to safety (Van Keken 9 June 2008; Anonymous 9 June 2008). Sand suppletion and the use of natural dynamics was to be preferred, she said, and with her statement, she reflected the exact position the committee would later hold (see also Veerman and Fresco 24 May 2008). Engineers from Deltares, the renowned engineering institute that also provided scientific advice to the Delta Committee, also expressed their concerns: islands would not contribute to safety (Engels 18 July 2008). An influential engineer and provincial politician for the liberal VVD castigated the idea immediately after its launch (Elzenga 17 November 2007).
In the days leading up to the presentation of the Delta report on the 2nd of September 2008, the political quarrel again became visible with the CDA holding all the cards for coastal development and making the Delta report its prestige object (Anonymous 29 August 2008). According to a financial newspaper this led to tension in the cabinet coalition; coalition partners were 'fed up with the CDA powerplay' and its monopolizing of the new Delta plan (Anonymous 29 August 2008). In a long discussion all the opponents, from the liberals, Deltares to engineering firms, believed coastal extension was more fruitful than islands; that was mainly a political item (Van Kalles 29 August 2008). When the report was published, the positive recommendation for islands was missing and as this absence was explained with diligence in the science based Annex 5 (see Chapter 4), the sting was taken out of the debate. The CDA could shelve its plans and ambition for islands. For Tineke Huizinga, the State Secretary, this closed the debate (Van Keken 3 September 2008).

6.5.5 After the report: sea level rise scenarios as the Achilles heel

The presentation of the Delta report was orchestrated with a lot of to-do: an airplane trip with the Chair, a video, a carefully planned presentation to the PM. The sea level rise was presented by Veerman to be 1.3 meters in 2100. The initial responses spoke highly of

the report, but as soon as people had time to carefully read the report criticism rose. Not just the concrete measures, such as the ones for the IJsselmeer, were questioned by politician and citizens alike, but also the funding mechanism (natural gas revenues) was questioned on its viability, particular from the side of the liberal VVD (Weel 4 September 2008). Nevertheless, the political tug of war over the islands was set aside in face of the urgency and challenges (Van Keken 4 September 2008).

It soon turned out that the sea level rise scenarios themselves were subject of fierce debate: many, including committee members, were disturbed by Veerman's claim that sea level rise would be 1.3 meters; the report itself said it was the most extreme scenario, not the scenario. This was an entirely different message. Pier Vellinga, the chair of the sea level scenario subcommittee, was pressed by his subcommittee members to correct Veerman, but refused, arguing that the findings of the subcommittee were in the Annex and available for people to read (Interview Vellinga 26 May 2008; see also Chapter 4).

With the ink of the report still wet, the public debate over sea level rise started with a journalist comparing different scenarios; the Delta report scenarios were not science-based but the result of political pressure, he claimed.

> Hence, the assumption on the flood risk is politically enforced, not scientifically founded:
>
> - the Delta Committee stick to a rise between 0.65 to 1.3 meters in 2100, and four meters in 2200;
> - rijkswaterstaat takes 60 cm for the coming century as starting point for its day to day dyke maintenance;
> - the KNMI sees things yet differently, and expects a rise between 35 and 85 centimetres by 2100;
> - the IPPC, the UN's climate committee, sticks to 59 centimetres. The IPCC recently reduced its earlier projection of 88 centimetres.
>
> (Laan 6 September 2008)

Shortly after, other scientists mingled in the debate over sea level rise, saying the estimates are far too high, and the result of 'educated guess work'. For one scientist this was an invitation to openly speculate over the committee's interests and political handiwork (Huisman 8 September 2008). A week after the Delta report was published the KNMI, which had produced its own scenarios, unlocked the door for a dispute over the 1.3 meters, as it framed the 'more dramatic scenarios' as a political, not a scientific, assessment (Schreuder 10 September 2008). Han Vrijling was the first civil engineer to crack the Delta report on numerous accounts, including the sea level rise (Vrijling 13 September 2008). The comments and analysis on the scenarios intensified (Knip 13 September 2008), and the dispute between scientists was staged with the inclusion of one of the members of the subcommittee. He castigated the connection between the scientific scenarios and the politics of Veerman (Didde 13 September 2008). That an individual

member started spilling beans was a worrisome signal, disastrous for the credibility of the committee.

Then, following a few weeks of warm, lukewarm and cold responses chair and vice chair Veerman and Fresco addressed the four most important issues in a newspaper opinion article (Fresco and Veerman 24 September 2008): the urgency of climate change, the 1.30 meter sea level rise, the finances and the IJsselmeer, trying to sooth these concerns. After explaining the process through which the 1.3 meters was calculated and the political meaning were explained, they re-emphasized the science-based nature of the recommendations: "The core of the advice of the Delta Committee is that the Netherlands can cope with even the most extreme sea level rise and river discharge, that science, with present-day's knowledge, holds possible for the coming centuries" (Fresco and Veerman 24 September 2008, emphasis added). But this could not alter the tide. In October 2008 the most prominent international member of the subcommittee, Hans von Storch, together with Dutch member Roderik van der Wal, expressed his discontent over the course of things: "We've been asked what could be the worse that could happen in the Netherlands in the coming two centuries. We've been asked which scenarios, due to the lack of knowledge, we cannot exclude. The committee in turn presented our findings as likely, that is unfair" (Schreuder 9 October 2008). Von Storch feels he has been part of political fumbling, and does not believe the Annex will repair the matter, as Vellinga said it would. In the same article, climate scientist and member of the Delta Committee Pavel Kabat puts the criticism in a different perspective: even if the scenarios were used unfairly, the policy measures are adaptive and not harmful, following actual sea level rise (Schreuder 9 October 2008). But on a following account (9 November 2008) Von Storch's irritation is repeated without any reservations, and the conflict grew. Presenting the high-end scenario as likely projection, according to Von Storch "is a scandal. What we said is that this value cannot be excluded, it is a high end projection. It is the highest imaginable upper limit if all unfavourable conditions are very unfavourable at the same time" (Knip 8 November 2008). His second point of contention was that he, as an internationally renowned scientist, could not defend the subcommittee's position, for the full subcommittee report, not the sort Annex, remained unpublished pending a review process with the scientific journal Nature[68]. His irritation thus is dual: about the way scientific advice was used in politics, and about his concerns over his reputation as a scientist (Knip 8 November 2008). The science journalist who wrote the last article with Von Storch continued to write about the scenarios in the Delta report. The committee's reluctance to defend the science underlying the report was undermining the recommendations, he suggested (Knip 15 November 2008). Another co-author of the subcommittee's report, KNMI climatologist Wilco Hazeleger, did break his silence. In a letter to a newspaper he presents similar surprise and concerns as Von Storch: "all of a

[68] The full article was eventually accepted for publication in *Climate Science* in January 2011 (forthcoming, DOI 10.1007/s10584-011-0037-5).

sudden, I found myself located in a political arena and not a lecture room. Scientific nuance was subordinate" (Hazeleger 11 December 2008).
Summarising the debate over the scenarios, it is striking to see that not just journalists spotted the problems with sea level rise scenarios, but that members from within the subcommittee were uneasy with the course of things. The complaint was that an internationally renowned scientific committee was used for political purposes and without publications to defend itself; it was in discordance with their norms for good scientific practice. These complainants expressed a Mertonian ideal of political disinterestedness and communal knowledge. The problems with the scenarios (period 2050-2100) cast a shadow over the entire scenarios, also for the period in which there was overlap with the KNMI scenarios. The credibility of both the committee and the subcommittee was affected. In the next section I will demonstrate how the Delta Committee scenarios disappeared from the political stage it was supposed to perform on.

6.5.6 Executing the advice: back to the future with the KNMI scenarios

None of that 'fading out' was visible when Parliament debated with the State Secretary over the Delta report. In response to written parliamentary questions on how the Delta report scenarios related to the KNMI scenarios, the State Secretary answered that "the plausible upperlimit [of the Delta report scenarios] is only relevant in view of the investments that have 2100 as the horizon. A good example of this is a solid design for the Afsluitdijk" (Huizinga-Heringa 5 March 2009, p. 2). For some MP's, including one from the CDA, this was still too modest: Government should really go for 1.3 meters at least (Anonymous 31 March 2009). In the same parliamentary debate the State Secretary said for the short term she would use the modest KNMI scenarios, for the long term the Delta Committee scenarios. She used a similar argument as Veerman, but with significant differences.

> In the National Water Plan I am using the KNMI projections up to 2050. However, I am taking things one step further and for the period after 2050 I am using the Delta Committee scenarios to determine what is needed in the most extreme case, a kind of worst case scenario. That is not an odd approach at all. (…) Consequently, we have to see how we are taking the appropriate measures. (Anonymous 31 March 2009, p. 25)

This is a remarkable message: she reduced the Veerman scenarios to worst case scenarios, framing them in precisely the way that was criticized by friend and foe. In December of that same year, this chasm between 'worst case scenarios' and 'realistic scenarios' was further stressed in the National Water Plan, the follow up of the Delta Committee: "[a]fter the mid-term review of 2009 of Climate change in the Netherlands, supplements to the KNMI 2006 scenarios, the KNMI 2006 scenarios still describe the

most plausible climatological changes in the Netherlands" (Rijksoverheid 22 December 2009, p. 25). This is a careful way to say that the Delta Committee scenarios are not plausible, and besides this short comparison, the Delta Committee scenarios are not taken into account. This was masked by continuing with the other recommendations made by the Delta Committee: on February 1st 2010 Delta commissioner Wim Kuijken was appointed, and he would direct the actual policy implementation of the recommendations of the Delta report. In the Deltaprogramme the Delta commissioner abandoned the scenario of the Delta Committee (Deltacommissioner 24 September 2010, p. 32), and in the similar phrases as in the National Water Plan believes that the "four 2006 scenarios jointly present the most likely changes in the Netherlands, including the adjoining uncertainties" (Deltacommissioner 24 September 2010, p. 34). He also stressed that it was important that global climate scenarios are downscaled to the Netherlands and he plans to integrate climate scenarios with socio-economic scenarios to come to 'Delta Scenarios' (p. 83). He seems to suggest that the Delta Committee scenarios are unfit, not realistic in both the end points and the interpretation of uncertainties. His public statements underline this interpretation: to a newspaper he explains he does not want to rely on the 'panicky' worst case scenario, but in practical way wishes to tackle short term problems first (Schreuder 22 September 2010). In another interview Kuijken explained why he discarded the Delta Committee scenarios: "I don't start with extreme scenarios, I am very commensensual at that. I don't want spooky figures" (Koot and Verbraeken 5 October 2010). In addition, the debate over the errors in the 2007 IPCC Assessment report that took off in 2010, and critical responses to the Delta report made the Delta Committee scenarios unfit for political decisionmaking (Koot and Verbraeken 5 October 2010). The unscarred KNMI scenarios hence were the scenarios for politics. That this implied that the contested water level rise in the IJsselmeer of 1.5 meters was unnecessary, was only for the better.

6.5.7 Conclusion on the Delta Committee report

The analysis of the Delta report focused on the use of sea level rise scenarios, which were presented as the report's scientific basis, and the foundation for daring recommendations by the Delta Committee. This case of the Delta report thus demonstrates how policy advice can be discredited when the scientific foundations supporting the recommendations are disputed. The source of this dispute however did not depend on the scientific nature of the scenarios, although this was also discussed (what factors to include and how to weigh uncertainties), but on their position vis-à-vis other scenarios: in comparison to other scenarios the Delta Committee scenarios were very sombre and costly. In a timeframe that contested sombre projections (the controversy over the IPCC 2007 Assessment report was at full force) that mattered. In addition, the presentation by Veerman, who presented the maximum level of sea level rise as the scenario, impeded a nuanced reading of the scenarios, and the scientific scenarios were framed as political

tools. Consequently, some renowned national and international experts who sat on the scenario subcommittee objected to being a political plaything. Their scientific integrity was at stake, and without a scientific publication they could refer to, they could not counter attacks on their integrity.
Governors in response took the Delta Committee scenarios as disputable worst case scenarios for the long run to which they not need pay much attention. For the short run they relied on other, similar scenarios that were not taunted by scientific and public dispute: later documents stressed that the KNMI scenarios have been corroborated, and thus suitable for policymaking. Thus, the scientific founding of water policy shifted back to the KNMI scenarios, which were produced before the Delta Committee scenarios.

6.6 Science-policy boundaries in government advice: shifting frames and Mertonian norms

This chapter set out to do two things. First, to sketch the stage or frame of the experts studied in this thesis by analysing the trajectories of two exemplary reports: the HPV (Human Papilloma Virus) advice of the Health Council and the Delta Committee's report. Secondly, this was also to the role of scientific advice as a boundary object, plastic yet robust object at the intersection of different domains. The scientific nature of the reports (both were founded upon the most recent or even newly produced scientific findings) and the appropriation in policy and the public domain is instructive for understanding the role of expertise in contemporary society. As such, this chapter presents both a stage and its play, and in this conclusion I will integrate them.
What do these four observations yield with respect to the seven engineers studied here? As explained in the beginning of this chapter, the scientists studied in this thesis were closely involved with the topics of these two reports, or the reports themselves. These two policy trajectories have demonstrated them how the relations between science advice and the political and public domains were developing, making these experts both participants in, and observers of these developments. These policy trajectories have provided learning experiences for the communities of scientists involved in both domains, and the study of them broadened our understanding of how the role of experts has been evolving, directly in relation to these seven experts, and indirectly for science advice in general. As the conclusions to sections 4 and 5 addressed the separate policy trajectories, here I will take stock from that and see what instructive differences and similarities this provides regarding both trajectories. I will present four related observations: on the problem frames (1), the appreciation of scientific uncertainty (2), the speed of production (3) and the means to defend one's credibility (4).
A first observation of both studies of advisory trajectories is that the meanings or frames of the reports changed, without the respective reports themselves changing. There are clear differences between the period that preceded the reports, and the period following

them. Either during (in case of HPV) or shortly after (the Delta Committee) the reports were produced, the public and political appraisal of the issue to be addressed shifted. HPV vaccination shifted from a positive contribution to female health to a danger of child well-being, and this shift was openly addressed and promoted in the Houses of Parliament. The promise of HPV vaccination turned into a fear, and the vaccination programme subsequently failed. In the case of the Delta Committee's frame, the politically required policy horizon of at least hundred years (Huizinga-Heringa 7 September 2007) was reduced to clear cut planning for the next decades – and not any longer. Although the Delta Committee has procreated itself in key policy instruments (a Delta Act, Delta Commissioner and Delta Fund) the essence of the report, a science-based perspective for the coming centuries, has been lost in the translation from advice to policy.

A second observation is that in concordance with these radically shifting political and public meanings of these reports, the appraisal of their scientific underpinnings changed. In particular the understandings of how scientific uncertainty is to be included in policy and policy advice shifted almost diametrically. In case of HPV, uncertainties over efficacy and safety were weaved away before the report was published; FDA (Food and Drug Administration) and EMA (European Medicines Agency) admissions were to be taken as the prime criteria for assessing the two vaccines available, and the mandatory Health Council advice was perceived by some as unnecessary and delaying hurdle rather than a safety check. The Health Council in turn carefully assessed the certainties and uncertainties, and the public pressure for HPV vaccination geared the committee towards a lean interpretation of, for example, the efficacy of the vaccine. Already while the report was produced the balance shifted and the science supporting the positive advice was attacked using both scientific arguments and questioning the committee's scientific integrity. This opened the sluice gates and HPV vaccination gained public familiarity as a child experiment, next to being a promotion for health.

The problem regarding scientific certainty that occurred with the Delta Committee is threefold, and centred around the newly produced sea level rise scenarios. First, there are different ways to calculate sea level rise, depending on which variables are included, and which are not. In the years before the Delta Committee the KNMI and the IPCC had also calculated the possible sea level rise, but in a different manner. Despite the explicitly mentioned credentials of these scientists, coming from both the IPCC and the KNMI, the Delta report scenarios were perceived as remote from these other scenarios, and that created friction: why were some elements included, and others excluded? How should one appreciate uncertainties in the different models? Science journalists could not find satisfactory answers to these questions, and that alone somewhat discredited the Delta report. Second, right after the report was published the chairman presented the scenarios, in which the bandwidth of possible sea level rise is coupled to a probability, in a very unlucky way: he presented the improbable high end scenario of 1.3 meters in 2100 as a

political *fact*, and amazed the scientists who had worked on these scenarios. In addition to the existence of different sea level rise scenarios, this move led to a further questioning of the Delta Committee scenarios. Third, the fact that some of the measures that were proposed on the basis of these scenarios were (highly) unpopular, costly, or both, added further weight to the side of the scale that discredited the Delta Committee scenarios.

The third observation relates to the shifting frames and appreciations of uncertainty, and is a shift in the timeframe of the policy trajectory. In the initial stages, both committees were to come up speedily with reports that answered urgent questions. The reports' trajectories and advices were fitted to that frame of urgency. Afterwards, the word was that the advices were too ambitious, that tackling the scientific uncertainties required more time and more data. The critics of the scientific underpinnings therefore seemed to have promoted a slower, more scientific process as a solid soil for science based advice; the process that was conducted was framed as a rush job.

These shifting public and political frames and assessment of the scientific basis of the advice occurred in largely isolation from both these committees, and the members of the scientific committees had to – suddenly – adopt to these shifting frames (see also Bijker, Bal, and Hendriks 2009, p. 140). Without going into the concrete different responses, a fourth observation from both these committees is that they defended their credibility, or expressed the desire to do so, with means that go back to Mertonian norms on goods scientific practice (Merton 1996 [1942]). This refers to the universalism, or the impersonal criteria for truth claims; the communism or common ownership of knowledge; demanding disinterestedness as means to control scientists motives; and organized scepticism, the suspension of judgement and the scrutiny of beliefs.

The Health Council's President and the committee's chair stood up for the advice by referring to the procedures that ensured that both the report was as scientific as possible (implying organized scepticism), and that any conflict of interest was made public (ensuring disinteredness of voting members). These general Health Council procedures had been applied to this particular advice as well, and thus there was no need to doubt the scientific quality.

Referring back to a tradition of committee procedures was not an option for the scientists who sat on the sea level rise subcommittee. So instead, they referred to other scientific norms which reflect a Mertonian ideal. First of all, they wished to defend their scenarios by being open (presenting communal knowledge) about the way they had arrived at the final results. This would make explicit how the scenarios were produced and why they differed from the other scenarios. To the subcommittee's chair the Annex to the Delta report sufficed, but others, like international expert Hans von Storch, wanted to defend their position with reference to the full report. Being in a review process for *Nature*, that however was not an option and this fed his annoyance. Another Mertonian norm that was expressed is that the subcommittee had no political interests. This disinterestedness then was violated when Veerman went on tour with the scenarios.

Despite these defences to good scientific practice, both science based advices could not stand up to the shifting frames and related appraisal of scientific uncertainty. The HPV advice was rejected by 50 % of the girls open to vaccination, and the Delta advice watered down drastically. The conclusion here is that the shifting of problems frames, and the related shift in how uncertainty should be appreciated, was so drastic that referring to internalistic norms on scientific quality were insufficient. A public defence of these reports required more than reinstating the ethos of scientific quality, yet such a defence was not undertaken: both committees were unable to redefine their roles, according to Bijker et al. a strategy to be successful as a scientific institution (Bijker, Bal, and Hendriks 2009, p. 140). They demonstrated that "it takes a great amount of highly sophisticated work, employing varied coordination and boundary mechanisms, to maintain scientists in a position such that they can speak 'truth to power'. This historical stability of this form of scientific advice is not self evident" (Bijker, Bal, and Hendriks 2009, p. 163). As the socio-political complexity of both advisory trajectories had been immense, reflecting more explicit on this complexity, and directing the defence of the science advice more towards the key elements in controversy, rather than to internalistic notion of good scientific practice, would have contributed more to the public and political credibility of both reports than currently is the case.

7. Conclusions: The narrative of experts

7.1 Introduction: on being an expert

In her article *Transgressive Competence: The Narrative of Expertise*, Helga Nowotny presents a view on the contemporary role of scientists who transgress the boundaries and constraints of their disciplinary knowledge. Collectively, they develop a narrative for prediction that not only exceeds the issues they face within their disciplines, but entails a perspective broader than the scientific and the technological alone. In her words: "[n]arratives are one of the central ways in which the individual voices of experts are orchestrated to help produce more wide-ranging epistemic, social, political or legal authority" (Nowotny 2000, p. 16).

As examples of 'the experts' who were referred to in Nowotny's article, I have asked scientists in virology and engineering to tell *their* narratives on being an expert. Selected for their elite position in both science and politics, their biographies were of value to me in coming to understand how the role of scientific experts has evolved in a socio-political context that both requires and contests their expertise. With some, the invitation to participate in this study was routinely answered with an OK: telling narratives of experts was daily business for them; at least, that is what they believed. Others were more reluctant, but eventually agreed. For a third scientist, the interview was a means to air his discontent over current affairs in water policy, and another found it was time that the history of virology in the Netherlands was recorded, so he was more than willing to participate. To cut things short, the experts who I have studied here[69], whose narratives I have analysed, all had their own expectations of the purpose of this study, of the interview, of what 'narratives of experts' meant for them, and for my study. And so did I. My research agenda was, as I have explained in the Introduction, to answer the following question.

> *How has the role of scientific experts in policy and public debate evolved in a society in which this expertise is both indispensable and highly contested?*

[69] For the readers who have just tuned in, these are Roel Coutinho, Albert Osterhaus and Jaap Goudsmit in the virology case, and Han Vrijling, Huib de Vriend, Pier Vellinga and Marcel Stive for the case of water engineering.

Building forth on this general question, the four empirical chapters have presented different perspectives on the role of scientific experts. The first three are grounded in the biographical-narrative study of seven experts. Chapters 3 and 4 deal specifically with the two scientific fields under investigation, virology and water engineering, and Chapter 5 provides an in-depth comparison of the two. The last empirical study in Chapter 6 provides context and 'contrast fluid' by focussing on exemplary advisory trajectories in both fields. Collectively, these chapters provide parts of a general answer to the research question. Now, after having presented the studies of the scientists in the form of expert narratives, it is time to present an integral answer to my research question and to present my 'narrative of experts', as it developed in the course of the last four years. In this narrative, the identity work of experts is the core theme, directing the way they fulfil their role.

7.2 The narrative of experts: themes and dynamics

My research on experts is grounded in a biographical-narrative approach that is unique in its field of application: contemporary experts. The particular focus on their long-term development (the biography) and their own interpretations of that biography (the narrative) provides an intriguing perspective on experts, which is of great value in understanding the role of scientific experts in present-day knowledge society. The narrative of experts is composed of a number of themes and their dynamics, which are most pertinent to the shaping of expert roles. The themes I will present were not found by accident: the specific research approach and the nature of the cases (fields of science that are immensely concerned with safeguarding public security) direct the narrative towards a particular type of understanding of experts. From the perspective of this thesis, the role of experts cannot be analysed in static terms. Rather, an analysis of the role of experts should be organised in such a way that it accounts for the dynamic nature of the expert role as it evolves over time. The presented narrative of experts therefore can be read as an analytic storyline on the role of experts, empirically grounded in the two cases (and their comparison), and illustrated with examples from this thesis. As one will notice, all these themes are verbs, precisely showing their active and dynamic nature. They are the following:

1. building your expertise;
2. facing your crisis;
3. broadening your scope;
4. engaging with policymaking and public debate;
5. gaining credibility;
6. doing identity work.

The analyses of themes is inspired by grounded theory (Corbin and Strauss 2008), in such a way that in analysing and integrating the separate conclusions, I will present general *themes*, topics that can be found among any of the experts, and *variations on themes* as they manifest themselves in the biographies of experts. It should also be noted that the analysis presented here is an explanatory model that can offer tools for a critical analysis and understanding of the roles of experts in other areas, where scientific expertise and societal dynamics meet. As such, the outcomes of my work may be relevant for various audiences: for colleagues involved in studying the dynamics of science, for scientific experts themselves who are interested in reflecting on their societal roles and, finally, for those who engage with experts, seeking expert advice or advising experts on how to shape their role. I will return to the practical relevance in section 7.3.

7.2.1 Building your expertise

The first theme I identified is that a scientist's expertise embodies a range of experiences that have been collected during a career or lifetime. This involves not only scientific expertise in the strict sense of the term, i.e. the knowledge and technology of a particular research field of science that is relevant for the question at hand, but also experiences in, for example, public communication and policy development. The learning experiences of the past certainly contribute to the way in which experts handle the problems and challenges they are confronted with. Previous experiences can be either enriching, when earlier experiences speed up a solution, or an impediment, when a formula that was successful in the past is no longer working, but is still continuously forced onto new problems.

The studies in this thesis bear witness to the various ways in which a scientist's expertise is built up. Not just individual routes were found. Expertise can also broaden in a collective sense, as the expertise of a community of scientists, built up across generations; in addition, experts also learn from the experiences of others (transferred learning). Let me illustrate each of these four ways of broadening expertise with some examples. The differences between the four are in the details, and they are not mutually exclusive.

A clear example of how expertise is built in the course of an individual life is provided by Pier Vellinga. Throughout his career, he has moved in and out of different academic and governmental positions. This provided him with a thorough understanding of policy processes through a unique combination of expertise and experience. In his view, this has given him a comparative advantage in understanding problems in climate change and water engineering.

The experiences of the virologists in Amsterdam are a clear example of how, as a community, they were collectively building up their expertise in diagnosing, treating and preventing HIV/AIDS. Jan van der Noordaa, Jaap Goudsmit and Roel Coutinho were among a group of researchers who aimed to understand this virus, and to contain the

epidemic. This collective experience of intense cooperation, frustration and competition shaped their individual developments as experts.

A fine example of how an 'older' generation can provide lessons to a 'younger' generation is provided by Han Vrijling. He grounds most, if not all assessments of contemporary water management in the expertise and experience he gained while working on the construction of the Oosterschelde Storm Surge Barrier. As one of the last academic engineers who possess this experience, he is unique in a biographical sense, belonging to a past generation. For him, that produces a personal motivation to insert these experiences in present-day water engineering, educating his audience on the lessons of his generation.

Goudsmit also exemplifies what I call transferred learning: building up expertise by looking at the work of others. Up until the mid 1990s he was very optimistic about the possibilities for developing a vaccine against HIV. In addition to his personal frustrations in failing to develop a vaccine, he then learned from more experienced vaccine researchers about the long developmental path for vaccines. Those experiences from other vaccine researchers greatly impacted his outlook on vaccine development for HIV. Indeed, it changed his outlook on his personal capacities and public role as a virologist.

Thus, this thesis provides evidence for each of these four ways of building up expertise and experience in a particular domain. I will now turn to the context of application of this accumulated expertise and experience.

7.2.2 Facing your crisis

The second theme in the biographies is the dual role of crisis events. In the Introduction I have defined crises in virology and water engineering as situations when existing routines, knowledge and methodologies to tackle a problem proved insufficient, as the problem itself transgressed existing expertise and crossed boundaries between science, politics and society in an unexpected manner. For whatever reason, the experts studied here thus have been confronted with situations that were unfamiliar to them, in epistemological, political or societal senses, and one way or the other they had to respond to those situations. In the virology of the 1980s, the crises constituted a serious epistemological concern for the scientists under study: the new viruses were making casualties by the day, and contemporary virology had no routine answer to HIV/AIDS or BSE. The same situation occurred in 1997, when Avian Influenza migrated from animals to humans. As Osterhaus referred to this event, it literally went against textbook information, exceeding the normal science of virology of that time and age. And yet, it was up to the virologists to provide answers and policies for containment and treatment.

But crises are not just epistemological: lack of political and public acknowledgement of the expert's assessment of a problem can equally well cause situations of crisis. The problem is not the lack of scientific or political instruments, but rather the lack of public and political will-power or competence to implement these instruments. In trying to

prevent this political and social 'incompetence' from becoming a real catastrophe, events that could induce socio-political change are used to place the scientific assessment on the political agenda. Engineers who point to the necessity of raising the dykes in face of failing maintenance, virologists urging politicians to order vaccines to protect the public against H1N1: these examples from this thesis illustrate this dynamic. In water security, for example, the river floods in 1993 and 1995 did not pose real epistemological problems to the engineers, as they had the tools and knowledge to tackle them. Indeed, that was their instant response. For the water engineers the problem predominantly resided in the political response, in a new governance paradigm: that of creating Room for Rivers. That implied that their existing hegemony over both the types of intervention in the river delta and the ease with which this was guided through the policy processes had lost its natural legitimacy. Some of the engineers were greatly inconvenienced by these affairs. Han Vrijling, for example, explains in Chapter 4 that the rearrangement of the relations in the science—policy sector urged him to change the way he addressed politics and the media. When Hurricane Katrina demonstrated the consequences of failing dyke maintenance in New Orleans, his concern for political influence instigated him to use this focusing event as a 1:1 scale model for the Netherlands, trying to shape the political agenda.

An implication of this dual nature of the crises experts have to relate to is that it ties together their actions in the socio-political domain. Hence, a proper study of the role of scientific experts should really focus on the boundary zone of science, policy and public debate, rather than limit itself to either science—policy or science—public interfaces.

7.2.3 Broadening your scope

A third theme that marks the role of these experts is related to the way their expertise was built up beyond their disciplinary knowledge: the broadening of their scope. Crisis events that transgressed their original expertise, or their perspective on policy or public, can broaden the experts' scope on the affairs they interact with. I have found two routes for such broadening: the sheer experience of having handled events that were transgressing, and the way scientists learn from these and other events.

Having faced crises in their fields of work is a first means in which scope can be broadened. The experts transgress their original skills and knowledge through the crises that pose epistemological, political or societal challenges. Facing such a transgression, the experiencing and perhaps even taming of a crisis is a broadening of scope by default. One example is the strategy that led to the discovery of the virus causing SARS. The type of scientific cooperation coordinated by the WHO was new to the field of virology, but necessary under the pressure of the SARS outbreak. For Dutch virologists participating in this race against time, this was equally the case, and they had to adapt the routine policies of governing science to this urgency (e.g., the procedures for getting permission for experimentation with primates). Osterhaus played an important role in this, and with

primate testing his lab made the final contribution to the identification of the SARS virus. This experience then demonstrated to many, including Osterhaus, the way crises like SARS could be handled effectively, but also that routine animal experimentation policy is not designed for such calamities (Simon et al. 2005). That in turn was also discussed in Parliament.

In addition to the broadening effect of facing crises, what matters specifically here are the more personal characteristics of what stimulates or limits an expert's capacity for learning. The issue of reflexivity concerns the extent to which one is able to question one's status, expertise and expert position in problematic situations. In some examples, a scientist grew very familiar and comfortable in a particular role; in the past this role was effective, suited the expert's professional ethos and entertained solid credibility and authority. For the experts in this instance, it proved to be very hard to accept challenges to their expertise, and to adopt their strategies accordingly. It was nearly impossible to see themselves in a role different to the one they had always had, and demonstrated an incapacity to reflect critically on their role, to broaden their scope.

It furthermore became clear that, in some biographies, particular experiences and reflections acted as turning points. For example: Jaap Goudsmit who ceased to perceive himself as an hubristic expert after some painful events; Pier Vellinga who reinterpreted his role as his analysis of the climate problem changed; and Marcel Stive, whose experiences with the Delta Committee transformed him from a scientific rationalist into a political realist.

It is important to note that, although experiences in handling crises are clearly of value when it comes to broadening one's scope, the capacity to reflect critically on these experiences is even more important. If someone succinctly tries to handle transgressive problems without recognising that these problems require an approach that deviates from normal science, or from the scientist's existing expertise, his or her expertise is not broadened.

7.2.4 Engaging with policymaking and public debate

The fourth theme describes the material and immaterial factors that shape the engagement of scientific experts with policymaking and public debate: the nature of the relations between science and politics; and the way problems for experts are framed in the socio-political domain.

On a material level, the policy arrangements, understood as the relations between science, policy and the executive organisations, matter a great deal. The policy arrangements have a normative function in shaping the role of experts, both in an enabling and in a restricting sense. I have demonstrated that when the relations between science and policy are explicitly defined in routines and regulations, and are lasting for a longer period of time, this not just means that science's access to politics is enhanced, and that the relations between science and policy are more articulated, but it also means

that the scientist's freedom to act outside this institutional frame is limited. Such was the case in engineering when the Technical Advisory Committee on Waterworks (TAW) was still in place in its old form. Up until a certain moment in time, water engineers could only be effective in politics when they remained within these policy arrangements. Later, when the relations between engineering science and politicians were redressed, and access to politicians became more difficult, this encouraged the experts to develop novel strategies in getting their ideas effectively on the political agenda.

Whereas in engineering these relations were more institutionalised, in the case of virology it was more up to the individual scientists to sustain effective relations with policy and politicians. In virology, policy arrangements were not as strict as in engineering, and a lack thereof was actually regarded as a problem. Because political access and the strategies for involvement in politics were properly formalised only in the case of the Health Council, virologists had to go to great lengths to create and maintain relations with policy and politicians; indeed, I believe the establishment and maintenance of the personal relations between science and politicians is what has made the positions of Osterhaus and Coutinho so persistent.

The second element that shapes engagement in an equally important sense is the role of political and public problem analyses. Next to the experts' analysis of, and approach to, a particular issue, other actors in politics and society likewise develop such perspectives. Important for the role of experts is whether these alternative framings diverge a great deal from the experts' own assessment, and consequently how the different actors evaluate the role of scientific experts. As Chapter 6 on advisory committees demonstrates, the public and political framings are not constant; indeed, they may shift diametrically. This means that whenever an intervention is made (a report is written, or a policy is developed), it may turn out that what previously was seen as a good strategy for solving a problem in the public domain suddenly appears to be a recipe for disaster. The most daunting example comes from the study on the Health Council Committee in Chapter 6. The advice on vaccination against cervical cancer took a lean interpretation of the criterion of vaccine efficacy, as there was great public and political pressure to approve HPV vaccination in order to improve women's protection against cervical cancer. But later, once the report had been completed and was issued, the public and political evaluation of HPV changed and it was felt that protecting girls against poorly tested vaccines was a greater concern than before, demanding a much more careful assessment of the vaccine against cervical cancer than the Health Council had provided. This fed public distrust towards the Health Council advice.

Through these two processes (the institutional arrangement and the public framings) the engagement of experts is shaped, challenged even. To varying degrees, the scientific experts take notice of these processes and anticipate or respond to them, broadening their scope and facing crises as they proceed. The way they chose to do so is related to the next theme.

7.2.5 Gaining credibility

The expert's aim is to be successful in handling a particular problem. The criterion for success is dual: the final aim is to have influence, but influence, understood as a positive effect on for example policy development or public opinion, depends on the extent to which the expert is regarded as credible — the more credible one is, the more influence one has. At least, that is how scientists tend to explain it. The stake of experts therefore is to be regarded as credible by those whom they identify as the relevant actors, and in interviews the topic of credibility was often discussed. This composes the fifth theme.

How does one become credible? This depends not just on the expert's strategy aimed at becoming credible, but also on the public reception of the expert, as illustrated by the HPV committee discussed above. The struggle for credibility thus takes many shapes and forms. Let me illustrate this with a few examples. In the wake of the outbreak of H5N1 in 1997, Osterhaus was part of a network residing under the WHO to prevent pandemic outbreaks of Avian Influenza. He had great concerns over H5N1 and its pandemic potential, and wanted to get pandemic preparedness plans installed at a European level. This was the basic aim of his strategy. He thus needed to organise things in such a way that the pandemic preparedness plans were regarded as a credible solution. The strategy to do so was to organise a meeting within the ranks of the European Committee to mobilise his network of fellow virologists, and what is more, to make the issue not a personal but a political affair. He thus involved an EU official as the champion for the meeting, turning his personal opinion into a credible EU event.

Goudsmit demonstrates how presenting one's assessment as credible may also follow an opposite strategy. Rather than mobilising a network, he believes staying within the boundaries of one's direct expertise or experience is the way to proceed. That guides his strategies for making interventions into two arenas. The first one, though not often used, is the courtroom, for example when virologists are consulted in criminal court cases on HIV infections. He presents this as a site where the boundaries of scientific expertise are respected most, and it thus grants scientists a credibility purely based on what they know. The second direction for remaining credible, and thus potentially remaining influential, is by writing down what he has to say independently from others, such as committee members pressing for compromises, or a journalist trying to get that one-liner. He thus often writes books and newspaper articles in which he carefully articulates his analyses and opinions, presenting them as his personal expert views.

Huib de Vriend has yet a different understanding of credibility: in his view, one is regarded as credible when a discussion of policy problems is kept indoors, as a conversation between equal experts. He realises that going public with concerns, for example in the media, can harm one's cause. So although he might be blowing the whistle, such a role remains out of sight for the general public.

Besides the different ambitions of experts to have influence and credibility, the public and political criteria for credibility matter a great deal as well. These criteria are detached

from the content of the actual issue, and are cultural rather than epistemological. As a consequence, they do not express themselves in lines of argumentation experts can take notice of, but in public behaviour or statements that seem illogical, emotional and non-scientific to them. These changing cultural notions on what makes an expert credible act as a public selection environment for experts who can mutate from context to context. In one instance an expert is regarded as credible, whereas in the next he is disposed of as a charlatan. This is experienced by experts themselves, who may seek to accommodate themselves to these shifting notions of credibility. Not just the diverse cultural criteria, but also the expert's anticipations of these criteria shape their reception as credible or not credible. In some instances, these cultural interpretations of the scientists shaped their strategies and their expectations on what to expect. But in other cases, the experts waged war with these cultural perceptions of credibility.

Examples of how experts interpret the cultural timeframe that shapes their credibility abound in our seven biographies. Why has the traditional authority and credibility of engineers waned? Vrijling explains that we live in a time and place that is troubled by Rousseauian romanticism, which does not enjoy the strict rationality of good old engineering experts. Coutinho thinks contemporary doom scenarios have gained popularity, at the cost of a kind of scientific sobriety he identifies himself with. Stive and de Vriend have experienced that more truths than Scientific Truth play a role in decision-making processes, and thus that science's epistemic authority and credibility has competitors. If they want to be credible, they have to accept this plurality of truths as part of the game and play along.

An example that demonstrates the difficulty here is provided by Osterhaus, who advises both government and industry. There was great public and political unease over potential conflicts of interest, a feeling that these different advisory roles could not be anything else but suspect. He was accused of leading the 'flu mafia', advising governments to purchase antiviral drugs while there was no need for them. Was he earning money from these government purchases? Did he hold shares in the firms that were producing vaccines? These questions and suggestive remarks threatened his credibility. Osterhaus took notice of these political, public and often journalistic criticisms and the underlying demands for disinterested experts when it comes to advising government (a cultural norm for credibility). At the same time, he argued that so-called disinterested scientists were usually second-rank experts, and that this did not serve the public case at all. He balanced the potential decrease of his cultural credibility with the increased chance of getting the best scientists to share their expertise, and concluded that despite the attacks on his credibility, he should continue his advisory work for both government and industry.

7.2.6 Doing identity work

So far, we have described the building up of expertise, of facing crises, the broadening of scope, the engagement with policy and public debate, and the struggle for credibility. The final theme that shapes the expert's role, doing identity work, is the one most closely related to the biographical-narrative research approach. This theme is somewhat different from the other five. It is an overarching theme, which is present in all the others and cannot be detached from them. It pervades the other themes in various ways.

Identity work is the way in which one's identity as a scientist and as an expert is translated into actions through which one wants to realise a specific role in politics and society. It entails much more than merely creating a certain image of oneself or managing an impression, as understood in the work of Goffman (Goffman 1959). It pervades virtually everything experts do once they enter the public domain (learning, giving advice, contributing to debate, engaging with politicians and policymakers, media performances etc.). In identity work, a broad spectrum of components – the experiences and lessons from past interactions, the perspective of the role of science in society in general, the view of oneself as an individual scientist in particular, the scientific ethos one holds – add up to actions that compose the role an expert wants to play. Nonetheless, three vital dimensions can be distinguished.

The first dimension of identity work consists of efforts of experts to reconfirm their identity in the work they do. In line with the theory discussed in Chapter 2, it was found that one's biography is the process of building a particular image of oneself, and that one reconfirms that self-image in new situations. Experts present themselves as a particular type of scientist, and try to reconfirm that role by re-enacting a particular presentation. In addition, for some experts, reinforcing their identity as credible expert is more important than for others. The ability to let go of an identity that has been established in previous situations implies that one is more open to other approaches and interpretations of an event, and may be taken as a sign of reflexivity (the ability to take one's self-image as relative, as open to change and reinterpretation). Others, on the other hand, may rather remain loyal to their traditional identity come what may. The case of Vrijling may stand as an example here. When I introduced the case study to him during the first interview, he demarcated a boundary between himself and his direct colleagues. He was one of the last builders of the Delta Works, a fossil, and in public he referred to his perspective as belonging to old engineering (Vrijling 13 September 2008). This is an experience that embodies more than merely stressing the relevance of one's expertise; for Vrijling this has a moral connotation, expressing a necessity to have more of this old engineering, of this identity. Interestingly enough, members from the subcommittee that produced the sea level rise scenarios for the Delta Committee also tried to reconfirm themselves in a particular way: as disinterested scientists who adhere to norms for proper scientific conduct. Several subcommittee members were outraged when their scientific advice was merged with political handiwork, and felt this harmed their scientific identity.

The second dimension of identity work points to the way in which an identity manifests itself as a style in handling problems that experts face. When experts are confronted with a particular situation, their professional identity may close certain routes for interpretation and action, and open up others. An instructive example comes from Coutinho. As he comes to describe himself, he has developed a very factual style of communicating, and he experienced in the early years of the HIV/AIDS epidemic that this was the most effective strategy. In addition, in his current position at the Dutch Centre for Infectious Disease Control (CIb) he feels a responsibility to be intensely involved in public communication, unless the topic is too technical. Thus, he employs this factual style in communicating on almost all CIb topics, and from the interviews one learns this is not a chance shot: he sees it as his personal way of doing things, as his responsibility. That his style of operating not always works was illustrated when he was engaged with the HPV communication. His character, appearance and factual style did not match the sensitivities of the target group of adolescent girls. As his later reflections on this affair demonstrate (Coutinho 2 February 2010), he seemed more or less unaware ignorant of that.

In addition to the fact that identities are established or reconfirmed in an expert's actions, the third dimension of identity work concerns the way someone reflects upon that identity. Either during or after an interaction, one starts to see the effects of one's actions, the positions in politics, the degree to which strategies were effective; how one has been received as an expert (as credible, as biased, as outdated, et cetera), what elements of interactions were pleasant, and were not. All such elements provide opportunities for experts to improve – according to their own criteria – their future public performances, and such reflections are an important component of identity work. Marcel Stive exemplifies such a development. He has described (both in the interviews as well as in public events, such as a lecture at Radboud University) how his identity has changed during his membership of the second Delta Committee. He used to be a scientific rationalist, but shifted towards being a political realist as he discovered that the world of policymaking does not merely rely on scientific rationality. That approach is necessary, he said, when presenting policy solutions to government: they are not interested in rationality alone, but also in image, and ever since, Stive's expert identity is guided by that reality.

Interestingly enough, as was demonstrated in this thesis, advisory councils, such as the Health Council, are not really different from individual experts in this respect. Indeed, in support of what Bijker et al. (2009) have demonstrated, identity work as defined above is an important element of the functioning of such an institute as well. The process of building and upholding authority and credibility is done by upholding the paradox of on the one hand presenting itself as authoritative, while on the other paying close attention to voices in society. The study of the advisory committees shows that consensus in this respect is a crucial element: the Delta Committee and its sea level rise subcommittee did

not have a singular view on its identity. Indeed, the understanding between (sub)committee members on what the role and nature of scientific advice should be diverged to such an extent that this controversy was out in the open, damaging the credibility of the report.

These three kinds of identity work, and the examples that illustrate them, show an illuminating variety in the way experts position themselves. The way one reconfirms, manifests of reflects on his or her identity is also a way of expressing a particular view on the role of science in society. The numerous examples have demonstrated that one's credibility in the various settings not only depends on the nature of the identity work, but equally well on the 'match' between that identity work and the nature of the problems, the policy arrangements and the public framings.

7.2.7 In conclusion

By describing the major themes that compose the narrative of experts, in which the identity work of experts is at the core of how they position themselves as credible experts, the role of scientific experts is analysed from a micro level perspective. The themes that are intimately related to one another clarify the understanding of the role of scientific experts. Although some of these themes have been described in various literatures (see the Introduction to this thesis), the analysis of expert biographies integrates these themes by taking the individual scientists as the unit of analysis. As an overarching concern for scientific experts, their identity work shows that the actions of experts are not solely aimed at solving problems, becoming engaged in agenda-setting, or communicating to politicians or the public. In their work as experts, they continuously reconfirm and reinterpret their identity as an expert. This demonstrates how the identity work and their societal and political surroundings interact, and how through this interaction the socio-political role of scientific experts is shaped and is evolving. By virtue of being grounded in the biographical-narrative analysis of individual scientific experts, this analysis thus contributes to our understanding of experts in knowledge society.

7.3 Narratives of experts in the socio-political arena

The final question now is how the findings of my thesis can be of further use to others. The narrative of experts I have presented above provides a good balance between on the one hand being realistic and grounded in proper empirical research, while on the other hand being general enough to be of use in probing the roles of experts in other arenas. What lessons do the biographies of the elite experts studied here hold for academics studying experts and their roles, for scientists who assume the role of the public and for journalists, politicians and citizens who require, use and interpret experts and their

advice? How can the narrative of experts be of use to analyse the role of scientific experts?

Being able to make a nuanced analysis of experts in real time situations is of great importance. The events that confront experts with questions and problems that transgress their expertise are equally relevant to politicians, publics and journalists. How are they to deal with experts in the face of these uncertainties? Such confrontations may give rise to various questions: 'does, what the expert is telling us correspond to the facts and events as we perceive them?' 'What are the stakes that are involved, and how do the experts assess those stakes; what are their stakes?' 'What does their performance convey? Trust, arrogance, charlatanism?' 'Should we trust them, or rather contest their expertise?'

The experts, in turn, observe these debates concerning themselves and their public roles, and this may impact their future interactions. In this myriad of interactions, interpretations and responses, a more thorough understanding of the role of experts can be of great merit to the debates, both for the experts themselves and for the ways in which diverse social actors use and evaluate experts and their advice.

All too often, the evaluation of the role of experts is grounded in a technocratic analysis of the relation between scientific experts and society, in which it is believed that the experts' 'silent revolution' compromises the deliberative space for society (see Fischer 1990). But as has been demonstrated by various authors in recent years, the actual practices of science advice do not bear evidence for such boundary-drawing between science and policy (Jasanoff 1990), as this supposed tension is resolved through institutionalised paradoxes that merge scientific authority with societal responsiveness (Bijker, Bal, and Hendriks 2009). As Peter Weingart diagnosed, the growth in the importance of expert roles had not led to a technocracy or an undue influence of experts. Indeed, "the demise of the élite status of scientists (which previously gave some justification to the concerns) goes hand-in-hand with the democratization of knowledge in the political arena" (Weingart 1999, p. 152). This thesis continues this line of reasoning: this study of scientific experts in the boundary zone of science, policy and public debate shows that the identity work of experts is directed towards gaining public credibility. Their struggle for public visibility, their continuous dependence on politicians, journalists and publics to grant them credibility, safeguards them from becoming 'technocratic' in the pejorative sense of the term. The expert's role is the result of relentless negotiations between experts and their clientele, and this reduces the risk of expert power becoming excessive.

My analysis of the identity work of experts and the interactions they are engaged in may increase the opportunity for seekers and users of expert advice to make their own normative evaluation of the expert's credibility. It is commendable that academics, journalists, politicians, policymakers and members of the general public are aware of crucial aspects of the expert's role as analysed in this thesis. In the following sections, I will indicate the value of the narrative of experts for various users of expert knowledge.

7.3.1 Academics: real time expert assessment

The main topic of the thesis, the role of experts in policy and public debate, touches upon many ongoing research projects in science and technology studies, policy studies and science communication. But as I argued in the Introduction, approaching this issue from a biographical-narrative angle is a novel perspective. As such, it can direct the attention of researchers to various aspects of identity work aimed at safeguarding the credibility of scientific expertise in concrete settings.

Of further value is what I, in line with real time technology assessment, call 'real time expert assessment': the analysis of scientific experts while they are performing their role, and feeding the analysis back into the arena in question. That was for example what I did during the H1N1 pandemic. On the basis of the research for Chapter 3, I was well familiar with the main experts who handled the public communication during the pandemic. While the pandemic was developing and the key experts were at the centrepoint of the debate over H1N1, I published commentaries in national newspapers in which I presented critical analyses of the role of experts in these debates (see Rijnbout and van Rijswoud 21 November 2009; Van Rijswoud 2009, 8 June 2009, 4 July 2009, 17 March 2010).

Besides being of methodological value, the narrative of experts can be used to study other areas where scientists act as advisors to governmental organisations, such as climate change, digital security, legal science and a host of other controversial topics. In controversies in each of these areas, specific scientific 'elite' experts can be identified who perform roles similar to those of the experts studied in this thesis. In addition to the ongoing research, an analysis of these experts and the way their identity work shapes their role can add a valuable dimension to our understanding of these contested issues.

It will not have escaped the notice of the reader that all experts studied in this thesis were male. This bias is not a flaw of my methodology, but rather reflects the dominance of male elite experts in previous debates. There are indications, however, that this is changing and that female elite experts are increasingly playing a bigger role. This raises the question whether the features of identity work as studied in my thesis are typical for males, or rather gender neutral. Thus, the study of female elite experts merits much more attention in future case studies. One could for example compare the role of male and female scientists with this narrative of experts, in order to determine to what extent identity work as described here has a gender dimension. Perhaps a study of female experts will introduce more variation in the narrative of experts, perhaps the narrative themselves will display different themes and dynamics. Such a comparison, for which this study could act as back-drop, would certainly provide illuminating findings on the contemporary scientific system and the culture of experts.

7.3.2 Scientific experts: narrative methods for self-analysis

For the scientific experts themselves, the narrative of experts is a tool that has a dual purpose. First of all, it may encourage experts to critically investigate their own own role in policy and public debate, as a means of biographical self-analysis, thereby reconsidering one's own identity as an expert. But it may also encourage experts to experiment in public with new roles.

By reflecting on the way their expertise has been built up and their scope has broadened, scientists are encouraged to articulate more explicitly the content and boundaries of their expertise. Having precise knowledge of such boundaries can assist in positioning oneself when challenges and dilemmas present themselves. In addition, awareness of the boundaries of one's expertise can be translated into actions that lead to a broadening of one's scope, such as learning from the expertise and experiences of others or actively reflecting on one's interactions as an expert. For a personal reflection on one's role as expert, the key question is whether experts are aware of the nature of their own identity work, and whether they believe that it is in need of revision or not.

Experts could, as a consequence of this, experiment with their role, for example by seeking new contexts for engagement. It appears that new experiences greatly challenge existing preconceptions about one's role as an expert. In addition, by paying particular attention to the different themes and interactions that appear in the narrative of experts, understanding these aspects and anticipating them can enhance the expert's credibility. It induces awareness of the 'selection environment' for experts, allowing them to make interventions that are more attuned to the arena in which a particular problem is to be resolved or addressed.

7.3.3 Intermediaries: journalists and their representations of experts

The value and relevance for intermediaries, such as journalists reporting on science or the events in which scientific experts are involved, is that my results may have a bearing on the political and public understandings and evaluations of experts and expertises. As a consequence of writing this thesis and observing experts in the media, I noticed that there is room for improvement when it comes to mass media assessments of the performance of experts. Notably, the following suggestions may lead to improvements.

First of all, by probing the nature of the problems experts are confronted with, focussing on the epistemological, political and social elements, and by comparing this with problem perceptions that others have (including the journalists themselves), intermediaries are better able to present an analysis of science-related problems that reflects different orientations in society. This would improve the reader's capability to make a nuanced and independent assessment of issues and the roles of experts. As I argued above, the experts themselves are invited to critically reflect on their roles, and may anticipate the plurality of understandings.

A related use is that, by analysing the problems that experts face in public settings, journalists are better able to decide who should count as an 'expert' and why, and who is not an expert but rather an important public stakeholder. Too often, stakeholders and experts are conflated, and this hinders the possibility of readers to analyse the epistemological, political and normative aspects of expert advice. Although experts and stakeholders cannot be segregated entirely, more analytic differentiation is necessary in order to present a nuanced image of experts and their problems, creating more opportunities for audiences to make their own assessment.

A third use of the narrative of experts is that it provides a perspective through which journalists can describe and analyse the development of experts and their expertise. Journalists probe the careers of scientists when they assume visibility due to events that require their involvement. By focussing on the process through which expertise was built up and broadened, and the (crisis) events that the expert has dealt with previously, journalists are better able to develop representations and analyses that, together with a better understanding of problems and a clearer separation of experts and stakeholders, may focus attention on those characteristics of experts that matter most with respect to their public role.

7.3.4 Policymakers and politicians negotiating expert advice

In integrating the scientific advice from committees or individual experts into their political agendas, policymakers and politicians have to balance the advice and policy alternatives put forward by experts with other policy concerns (such as budgetary constraints). For them, the narrative of experts facilitates the means to produce a nuanced analysis of the expert advice, and to understand what shapes their role in policymaking and public debate. The capacity of policymakers and politicians to fully grasp the nature and meaning of scientific advice is enhanced by understanding the nature of someone's expertise, of the scientific, political and social elements that compose the issue an expert is responding to, the strategies for engagement, and the way experts express their identity in the work they do.. This is not just relevant in case of scientific advisory committees, but even more so when individual scientists advise government.

Furthermore, politicians, in particular Members of Parliament, closely follow the representations in the media of experts and the issues they are concerned with. Besides the identified need for improvements in such representations, politicians can benefit from the narrative analysis by placing such representations in a critical perspective. In recent controversies over vaccination, for example, politicians seemed to copy the representations of experts and the HPV vaccine from the media, and hence political debate was guided by the way the media reported on the issue. Enhancing the capacities of politicians and policymakers to improve their personal assessment of today's experts thus would make them more independent of the media.

Such an improved understanding would work in two ways. First of all, by using the narrative of experts as suggested, policymakers and politicians can enter a discussion with experts aimed at tailoring the experts' advice to the needs and concerns of policy and politicians. This will change the relationship between scientists, policymakers and politicians. Not just because the scientists are approached with more probing questions, but also because they, in turn, will anticipate such probing in their communications towards politicians. This mutual process of building up a relation could, perhaps, counter the negative effects of job rotation among civil servants and politicians, as it gives both parties the tools to speed up the development of constructive relations.

7.3.5 Citizens as critical consumers of expert advice

Constantly, citizens observe experts presenting themselves, read representations of those experts in the papers and are confronted with policies that relate to the issues that experts have been discussing. At the same time, citizens are not passive groups, waiting to receive the wisdom from above. Their responses to policies and experts, their 'voting with their feet', are powerful tools to make themselves heard: no matter what experts advise, no matter what politicians suggest, if citizens distrust it, they will not collect their vaccination, reduce their carbon footprint or move out of areas that are likely to be inundated.

With the narrative of experts, citizens may come to understand aspects of expert advice that thus far remained obscure. We have seen that the public communication of experts often is a means to attract political attention, and that this strategic purpose leads to a specific kind of communication, in which dangers are stressed and risks slightly overstated. Although this style of expert behaviour may be politically effective, it is often discomforting for citizens who do not understand the strategic nature of such communications. The narrative of experts allows them to frame expert communication in a broader political context, knowing they are not the sole and perhaps even not the prime addressee, as the experts involved are actually addressing politicians and policymakers through communications that apparently are directed to mass audiences.

Second, by taking a critical look at the problems for experts, their transgressive nature and diverse makeup, citizens may come to appreciate the fact that contemporary problems pertaining to science and technology cannot be described in simple dichotomies of truths and falsehoods, and hence that the role of experts is more multifaceted than public audiences are often aware of. Such an enhanced understanding has two merits. First of all, it would allow citizens to approach and assess the expert's advice more critically. The same would go for controversies between various groups of experts, and between experts and stakeholders. They would be more able to view the representations of experts in the media and the resulting policies with a critical eye, and gain more autonomy in deciding how to handle the choices such policies offer. In addition, understanding the interactions that surround experts and expert advice would

provide citizens with a better appreciation of the nature of such debates, enabling them to participate in them more effectively themselves. I do not wish to imply that citizens are ignorant or as yet incapable of understanding these affairs, but merely wish to stress that contemporary techno-scientific problems have assumed such a complexity that is often difficult for lay voices to assume a role in the debates. And this not only goes for citizens, of course, as the complexity of the issues may also intimidate (potential) experts themselves when it comes to taking the floor.

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Annex I: Interviews

Albert Osterhaus: 6 March 2008; 29 July 2009
Jaap Goudsmit: 2 April 2008; 19 May 2008
Roel Coutinho: 13 May 2008; 25 July 2008
Huib de Vriend: 6 July 2009
Han Vrijling: 24 June 2009; 28 June 2010
Marcel Stive: 23 June 2009
Pier Vellinga: 26 May 2009
André Knottnerus & Marianne Visser: 30 January 2006
Jan van der Noordaa (informant): 7 May 2008
Pieter Leroy (informant): 4 March 2010
Wiebe Bijker (informant): 24 March 2010

Summary

We are all familiar with the image of the scientist who repeatedly makes his or her appearance in the media whenever a major dramatic event has taken place and there is a need for a scientific explanation. The scientist then acts as an expert who provides us with an interpretation of the event, and calls for a particular policy response. He or she acts as an authority who tells use us what to fear, and what not to fear. Although some scientists developed a certain a routine in fulfilling such a public role, often the questions they are faced with exceed their scientific knowledge, and the best they can do is to provide a fair and reasonable assessment. In addition, when scientists play their role as experts, this is welcomed by some, but fiercely contested by others. Credibility and authority in the public and political domains are never guaranteed, and part of the scientist's work is aimed at presenting themselves as credible, as having the right expertise and experience required to stand as expert. This thesis aims to understand this complicated role of scientific experts in policymaking and public debate. In the Introduction, I outline the focus and framework for this research. My thesis addresses the following question:

> *How has the role of scientific experts in policy and public debate evolved in a society in which this expertise is both indispensable and highly contested?*

This question is answered by using a biographical-narrative approach to study exemplary scientific experts, selected on the basis of their public visibility and the size of their track record as public expert (their biography). I use not only their biographies in a factual sense, but also their own interpretations of that biography (their narratives). I regard expertise as a relational concept, which means that 'being an expert' is a label, an attribute which someone receives (or loses) in social interaction. Being an expert thus entails a series of efforts oriented at maintaining and strengthening that position. Part of the work of experts is devoted to building good relationships between oneself as an expert and the clientele that requires the expertise. This requires that the boundaries between science and non-science are maintained in the interactions between experts and their clientele. Rather than studying boundary work between science and policy on the

one hand and science and the public on the other, I have studied the scientific experts in their natural contexts: the boundary zone between science, policy and public debate. Furthermore, this research focuses on two particular kinds of scientific expert: those who are concerned with safeguarding public well-being against infectious agents (virology) and those who are concerned with safeguarding the public from damage caused by major floods (hydraulic engineering).

Chapter 2 presents the methodology of this study. Besides explaining the concepts and procedures that constitute my biographical-narrative approach, I also discuss the criteria for the selection of the 'elite scientists' who are studied. Interviewing and studying elite scientific experts has various intricacies that had to be addressed in the day-to-day practice of doing the research, and I therefore reflect on how I have anticipated those intricacies during the research process. By explicating these methodological issues, this chapter is especially relevant for those who are interested in using the biographical-narrative approach themselves. Furthermore, it elucidates the way in which the results should be appreciated. As some of the empirical chapters (Chapters 3, 4 and 5) have been written as journal articles, they also contain brief methodological sections that address the essentials of my methodology.

Chapter 3, the case study on virology, centres around three scientists: Roel Coutinho, Ab Osterhaus, and Jaap Goudsmit. The chapter demonstrates that the emergence of new viral infections in the 1980s created a context in which scientists were needed who could tackle outbreaks under circumstances of great practical and scientific uncertainty. In the scientific domain, they had to develop the kind of research and knowledge that would not only provide factual information on these new outbreaks, but also produce knowledge relevant for the policy domain. Given the fact that combatting these outbreaks could not be met with existing policy directives, new policy frameworks had to be developed to contain and combat these infectious agents. Finally, they entered the public domain in order to inform the public on latest developments, and to stimulate compliance to science-based policy recommendations.

This triple assignment marks the role of the three virologists. A first conclusion on their role is that their involvement with these crises, and the consequences this has had for the course of their careers, demonstrates how such events create what I will refer to as 'springboards to visibility'. In addition, over the years, each of them developed a particular style of handling these challenges. As will be shown, certain elements of this style may either enhance or compromise their public credibility. And whereas some may further develop a chosen style, other experts show how one can radically alter one's style and role in policymaking and public debate.

The second case (Chapter 4) studied the roles of Huib de Vriend, Han Vrijling, Pier Vellinga and Marcel Stive in water policy. Hydraulic engineering, and hence the roles of these engineers, fits in the tradition of protecting the Netherlands (literally: low lands) against floods. But in recent decades, that tradition has met with opposition from

ecological approaches to engineering. This development entailed more than just a different political, societal and scientific orientation towards engineering; it also threatened the well-established political position of traditional engineers, who suddenly had to compete with other forms of expertise and participate in more open decision-making processes over water policy. The chapter analyses how the four engineers I have studied responded to these epistemological and socio-political challenges for engineering expertise through what I have called the 'appropriation of the ecological turn in engineering'.

I have found three kinds of response among these engineers: that of accepting these developments, and taking them a step further by adding the concern of climate changes and flood protection (as demonstrated by Pier Vellinga); that of integrating them in one's scientific activities and outlook on how scientific expertise relates to more open decision-making processes (Marcel Stive and Huib de Vriend); and that of criticising them for producing unstable water policy (Han Vrijling). Despite these different responses, they have one remarkable thing in common: through their interactions with the ecological turn, they contributed to its advancement as an engineering approach. These four engineers therefore did not just passively respond to the ecological turn; they also reshaped its scientific content and socio-political boundaries, and thus tried to safeguard their positions as scientific authorities.

Chapters 3 and 4 thus analyse the interactions between scientific experts and their socio-political context. The fact that both these scientific domains are shaped by the task to prevent crises (epidemics, floods) shapes the public role of the science involved. In Chapter 5, the perspective shifts to a comparative approach. In order to further understand the role of the seven scientific experts studied in Chapter 3 and 4, Chapter 5 compares their narrative, notably when policy agendas are being redesigned in moments of crisis.

By studying the virologists' comprehension of the SARS and Avian Influenza outbreaks (2003), and the water engineers' understanding of the flooding of New Orleans after Hurricane Katrina (2005), differences and similarities between individual scientists and the two policy domains are analysed. On an individual level, the study of agenda-setting shows that the identification of an issue, the urgency ascribed to this issue, the experts' self-perception of their capacity to do something about it and their consequent strategies, are basic components of the experts' approach to agenda-setting. In these two cases I have found that the first two themes, identifying the issue and its urgency, were shared by the experts in each of the two domains, and this welded forceful advocacy coalitions. A remarkable difference between the two cases (and less so between individual experts) is on the perceived capacity to change things, and the strategies that were consequently chosen. The nature and historical backdrop to the relations between science and policymaking mattered a great deal as well. The virologists were not extremely limited by tight science—policy relations to use the crisis for agenda-setting purposes, and they

easily used the media and felt quite free to put the finger on the sore point in Dutch politics. As the engineering experts relations to policy and politicians were long lasting and more institutionalised, using Katrina for agenda-setting purposes was done cautiously, avoiding to be over-dramatic. Interestingly enough, the agendas of both the engineers and virologists were realised to a significant extent.

Thus, in Chapters 3, 4 and 5, the research question is studied from an individual angle. In order to provide a more contextual perspective, however, Chapter 6 studies the trajectories of two exemplary advisory reports, one for each domain under study. The reports, which were selected for their explicit relationship to these seven experts, do not just sketch the stage or frame for these experts. They also illustrate how, with a scientific advisory report as the unit of analyses, the role of scientific advice in society has developed in recent years.

From studying the advisory trajectories (starting with the issue emerging on the policy agenda and ending with translating the advice into policy practices) of the Health Council's committee on vaccination against cervical cancer (Gezondheidsraad, 2008), and the report of the second ad hoc Delta Committee (Delta Committee, 2008), I present four observations on the interactions between the scientific advisory committee, society and politics. The first is that the socio-political problem-framing of a topic for scientific advice can change overnight, and this may suddenly alter the socio-political position of the scientific committee. The committee thus comes to deliver advice that no longer meets political and public frames and aims, and the challenge for the committee members becomes to handle this unexpected situation. The second observation is that the public and political framings of the issue under advice are linked to the appreciation of scientific uncertainty, and thus that the committee's handling of scientific uncertainty can prove to be incompetent once the frame changes. Third, the shifting of frames also has consequences for the criteria of scientific quality. In these cases, not only were concrete arguments given on what should be improved, but also the pace at which a committee delivered its advice was commented upon: the present advices were criticised for being a rush job. The final observation is that, in responding to these changes in the framing of the issue and the appreciation of the advice, members of the committees defended themselves by taking resort to arguments that reflect Mertonian norms for science.

Chapters 3 to 6 each provide a partial answer to the question how the role of scientific experts has evolved. In the Conclusion, I integrate the findings of the previous chapters, and present a 'narrative of experts', composed of six themes that are at the core of the role of experts as I have studied it. The themes highlight the dynamic and active nature of the shaping of the experts' role, and are the following: 1. building your expertise; 2. facing your crisis; 3. broadening your scope; 4. engaging with policymaking and public debate; 5. gaining credibility; 6. doing identity work. The last theme is most pertinent to the narrative of experts, and pervades the others. After presenting the narrative of experts

as such, I will indicate its value for academics, scientific experts themselves, journalists, policymakers and politicians, and citizens in general.

Samenvatting

We kennen ze allemaal wel: de beelden van de wetenschapper die zijn opwachting in de media maakt, wanneer er een dramatische gebeurtenis heeft plaatsgevonden die een wetenschappelijke duiding behoeft. De wetenschapper handelt dan als een expert, geeft een bepaalde interpretatie van de gebeurtenis en doet een oproep tot een specifiek beleidsmatig antwoord. Hij of zij is dan een autoriteit die ons vertelt wat we mogen vrezen, en wat niet. Ondanks het feit dat sommige wetenschappers deze publieke rol routinematig vervullen, schiet de wetenschappelijk kennis die ze bezitten realistisch gezien tekort ten opzichte van de vragen waarmee ze geconfronteerd worden. Ze kunnen dan hooguit een redelijke inschatting geven. Daar komt bij dat sommige burgers en politici deze rol van de wetenschapper verwelkomen, maar anderen deze grondig bediscussiëren. Geloofwaardigheid en autoriteit in de publieke en politieke domeinen zijn nooit een vast gegeven, en een deel van het werk van de wetenschapper is er dan ook op gericht om zichzelf als geloofwaardig te presenteren, als de drager van kennis en ervaring die hun rol als expert rechtvaardigt. In de Inleiding wordt de focus en het kader van het proefschrift nader uitgewerkt. Dit proefschrift heeft tot doel om deze gecompliceerde rol van wetenschappers in beleidsvorming en publiek debat te begrijpen, en doet dat aan de hand van de volgende vraag.

> *Hoe heeft de rol van de wetenschappelijk expert in beleid en publiek debat zich ontwikkeld in een samenleving voor wie deze expertise enerzijds onmisbaar is, maar die deze tevens ter discussie stelt?*

Deze vraag wordt beantwoord door middel van een biografisch-narratieve benadering van exemplarische wetenschappers, die zijn geselecteerd op basis van hun publieke zichtbaarheid en hun ruime ervaring als publieke expert (hun biografie). Biografieën worden echter niet alleen in een feitelijke zin gebruikt; ook de interpretaties van de eigen biografie (de narratieven) spelen een rol. Expertise wordt vervolgens bezien als een relationeel concept. Dat wil zeggen dat ‘expert-zijn’ een label is, een toevoeging of attribuut die iemand kan verkrijgen of verliezen in sociale interactie. Het zijn van een experts behelst dan ook een reeks van inspanningen die gericht zijn op het behouden en

versterken van die positie, en een onderdeel daarvan is het goed onderhouden van relaties met een clientèle die dergelijke expertise goed kan gebruiken. Daartoe is het belangrijk om de grenzen van wat als wetenschap geldt en wat niet te handhaven in de interacties tussen de experts en hun clientèle. In plaats van dit grenzenwerk te bestuderen tussen enerzijds wetenschap en beleid, en anderzijds wetenschap en het publiek, gaat dit onderzoek over wetenschappelijke experts in hun natuurlijk context: het grensgebied tussen wetenschap, beleid en publiek debat. Meer specifiek staan twee typen wetenschappelijk experts in dit onderzoek centraal: zij die belast zijn met het beschermen van het publieke gezondheid tegen infectieziekten (virologen), en zij die belast zijn met het beschermen van het publieke welzijn tegen schade van grote overstromingen (waterbouwkundigen).

In Hoofdstuk 2 zal ik de methodologie van deze studie nader toelichten. De concepten en procedures die mijn biografisch narratieve benadering vormgeven worden uiteengezet, alsmede de criteria die zijn gehanteerd bij het selecteren van mijn studieobjecten, de 'elite' wetenschappers. Het interviewen en onderzoeken van elite wetenschappelijk experts bevat een aantal netelige kwesties, die in de dagelijkse praktijk van het onderzoek doen, behandeld moeten worden. Daarom reflecteer ik ook op de wijze waarop ik gedurende het onderzoek met dergelijke kwesties ben omgegaan, en Hoofdstuk 2 is dan ook relevant voor degenen die geïnteresseerd zijn in het toepassen van de biografisch-narratieve methode. Daarnaast geeft het aanwijzingen voor de manier waarop de resultaten gewaardeerd moeten worden. Omdat sommige van de empirische hoofdstukken (Hoofdstukken 3, 4 en 5) ook als wetenschappelijke artikelen zijn geschreven, bevatten deze korte methodologische secties die de kern van mijn methodiek weergeven.

De case studie over de virologie, Hoofdstuk 3, draait om de drie wetenschappers Roel Coutinho, Ab Osterhaus en Jaap Goudsmit. In dit hoofdstuk laat ik zien dat de opkomst van nieuwe virale infecties in de jaren '80 een uitdaging vormde: in een context van grote praktische en wetenschappelijke onzekerheid waren wetenschappers nodig die dergelijke uitbraken konden aanpakken. In het wetenschappelijke domein moesten deze wetenschappers niet alleen feitelijke informatie over deze uitbraken produceren, maar ook kennis ontwikkelen die relevant was voor het politieke domein. Aangezien bestaande beleidsmatige richtlijnen ongeschikt waren in de aanpak van nieuwe virale uitbraken, moesten er tevens nieuwe beleidskaders ontwikkeld worden om infectieziekten in te dammen en te bestrijden. Daarnaast bewogen deze wetenschappers zich ook in het publieke domein, om zo burgers te informeren over de laatste ontwikkelingen, en een bereidheid te kweken om met de wetenschappelijke gefundeerde beleidsadviezen mee te gaan.

Deze drieledige opdracht aan de virologen kenmerkt hun rol. Een eerste conclusie die aan de betrokkenheid van deze virologen verbonden kan worden, is dat het demonstreert hoe dergelijke gebeurtenissen een springplank naar zichtbaarheid zijn. Daar komt bij dat

door de jaren heen ze, ieder voor zichzelf, een specifieke stijl hebben ontwikkeld in het omgaan met de uitdagingen die hier om de hoek komen kijken. Ik zal laten zien welke elementen van de verschillende stijlen de publieke geloofwaardigheid kunnen versterken of juist verzwakken. Daarnaast zijn er experts die een bepaalde stijl aanhouden en verder ontwikkelen, terwijl anderen de stijl en rol van hun expert-zijn richting politiek en publiek radicaal hebben omgegooid.

De tweede casus (Hoofdstuk 4) bestudeerd de rollen van experts Huib de Vriend, Han Vrijling, Pier Vellinga en Marcel Stive in water beleid. De Nederlandse waterbouw, en daarmee de rol van deze ingenieurs, past in de traditie het beschermen van het land tegen overstromingen. Gedurende de afgelopen decennia heeft deze benadering echter concurrentie te duchten van ecologische benaderingen, een ontwikkeling die verder gaat dan het presenteren van een andere politieke, maatschappelijke en wetenschappelijke benadering van waterbouwkunde. De ontwikkeling van een ecologische benadering vormde en vormt nog steeds een uitdaging voor de gevestigde politieke positie van traditionele ingenieurs. Zij zagen zich geconfronteerd met andere vormen van expertise, en moesten deelnemen aan meer open besluitvormingsprocessen in waterbeleid. In hoofdstuk vier analyseer ik hoe de vier genoemde ingenieurs reageerde op deze epistemologische en sociaal-politieke uitdagingen, een proces dat ik de 'inpassing van de ecologische wending in de waterbouw' noem.

Onder de ingenieurs zijn drie vormen van inpassing gevonden. De eerste is het accepteren dat deze ontwikkelingen plaatsvinden, en er vervolgens een schepje bovenop doen door het onderwerp van klimaatverandering en hoogwaterbescherming er aan toe te voegen (Pier Vellinga is hier het voorbeeld). De tweede respons is het integreren van de ecologische wending in iemands wetenschappelijke werk en perspectief op hoe wetenschappelijke expertise zich verhoudt tot meer open besluitvormingprocessen (Marcel Stive en Huib de Vriend). Tot slot kunnen dergelijke ontwikkelingen bekritiseerd worden, omdat het beleid dat er uit volgt op wankele grond is gebouwd (Han Vrijling). Het verbindende element in deze drie verschillende antwoorden is dat door hun interacties met de ecologische wending, deze experts hebben bijgedragen aan haar inbedding als benadering in de waterbouw. Deze vier ingenieurs hebben dan ook niet louter passief gereageerd op de ecologische wending; ze hebben ook haar wetenschappelijke inhoud en sociaal-politieke grenzen geherdefinieerd. Op deze wijze hebben ze tevens geprobeerd hun posities als wetenschappelijke autoriteiten te verstevigen.

Op deze manier bestuderen hoofdstukken 3 en 4 de interacties tussen wetenschappelijk experts en hun sociaal-politieke context, en laten zien hoe de taak van deze wetenschapsgebieden om crises als epidemieën en overstromingen te voorkomen, de publieke rol van de experts vormgeeft. In Hoofdstuk 5 verschuift het perspectief naar een vergelijkende benadering. Met een vergelijking van het narratief van experts, in het

bijzonder op momenten dat crises vragen om een herdefiniëring van de politieke agenda's, wordt ons begrip van deze zeven experts verder verdiept.
De verschillen en overeenkomsten tussen de individuele wetenschappers en de twee domeinen worden onderzocht door te bestuderen hoe virologen omgingen met de uitbraken van SARS en vogelgriep in 2003, en waterbouwkundigen met de overstroming van New Orleans volgend op orkaan Katrina (augustus 2005). Op een individueel niveau laat de studie van 'agenda setting' zien dat het identificeren van een kwestie, het daaraan verbinden van urgentie, het zelfbeeld van de experts over hun capaciteiten om daar iets aan te doen en de uiteindelijke handelingsstrategie de basiselementen zijn in hun benadering van agenda setting. In beide casussen bleek dat de eerste twee thema's, het identificeren van de kwestie en het inschatten van urgentie, gedeeld werden door de experts in ieder van de twee domeinen en zodoende een belangrijke rol speelde in het smeden van coalities. De waargenomen capaciteit om dingen te veranderen en de strategieën die gekozen werden bleken evenwel te verschillen tussen de twee casussen, en in mindere mate tussen de individuele experts. De aard en historische achtergrond van de relaties tussen wetenschap en beleid speelden eens te meer een rol. De virologen waren niet al te zeer beperkt door hechte relaties tussen wetenschap en beleid, en gebruikten deze crises voor agenda setting, voelden zich vrij om de media daarin te betrekken en zodoende de vinger op de zere plek van de politiek te leggen. Omdat de relaties tussen de ingenieurs, beleidsambtenaren en politiek al langer bestonden en meer geïnstitutionaliseerd waren, werd orkaan Katrina met meer voorzichtigheid gebruikt voor de doeleinden van agenda setting. Dat gezien dergelijke verschillen de agenda's van zowel de virologen als de ingenieurs grotendeels gerealiseerd worden is dan opmerkelijk.
Hoofdstukken 3, 4 en 5 richten zich dus op het individuele perspectief van de expert. Om hier wat meer context aan te geven bestudeert Hoofdstuk 6 de trajecten van twee kenmerkende adviesrapporten, voor ieder domein één. De rapporten zijn geselecteerd vanwege de expliciete relaties met de zeven experts, en behelsen meer dan alleen een schets van het toneel. Met wetenschappelijke adviesrapporten als eenheid van analyse laat dit hoofdstuk zien hoe de rol van wetenschappelijk advies zich de laatste jaren in de samenleving heeft ontwikkeld.
De studie van de trajecten baken ik af door te beginnen met de opkomst van de kwesties op de politieke agenda, en besluit ik met de aanvang van een vertaling in beleid. Op basis van de adviestrajecten over vaccinatie tegen baarmoederhalskanker van de Gezondheidsraad (Gezondheidsraad, 2008) en het rapport van de ad hoc Deltacommissie (Deltacommissie, 2008) bespreek ik vier observaties met betrekking tot de interacties tussen de wetenschappelijke adviescommissie, de samenleving en de politiek. De eerste is dat de sociaal-politieke kadering van het probleem plotsklaps kan veranderen, en zodoende de politieke en maatschappelijke positie van de wetenschappelijke commissie verandert. Het advies dat de commissie aflevert sluit dan niet meer aan op de politieke en publieke kaders en doelstelling, hetgeen een uitdagende

situatie creëert voor de commissieleden. De tweede observatie is dat de publieke en politieke 'framings' van de kwestie gekoppeld zijn aan de wijze waarop onzekerheden in de wetenschappelijke onderbouwing worden gewaardeerd. Het kan dan ook gebeuren dat de wijze waarop een commissie met wetenschappelijke onzekerheden omgaat, tekort schiet wanneer het kader is gewijzigd. Ten derde kan de verschuiving van de kaders consequenties hebben voor de wijze waarop wetenschappelijke kwaliteit wordt beoordeeld. In de hier bestudeerde casussen werden niet alleen argumenten voor verbeteringen gegeven, ook werd het tempo waarmee de rapporten waren geproduceerd door de respectievelijke commissies afgedaan als haastwerk. De laatste observatie is dat leden van deze commissies zich verdedigden tegen dergelijke veranderingen in de kadering van de kwestie en de waardering van het advies door zich te beroepen op de klassieke, Mertoniaanse normen voor wetenschapsbeoefening.

Zodoende geven de hoofdstukken 3 tot en met 6 ieder een antwoord op de vraag hoe de rol van wetenschappelijk experts zich ontwikkeld heeft. In de Conclusie worden de deelconclusies samengebracht in een 'narratief van experts', die de kern van de rol van experts samenbrengt in zes thema's. De thema's, die de dynamische aard demonstreren van de wijze waarop de rol van een expert wordt vormgegeven, zijn de volgende: 1. het opbouwen van expertise; 2. de confrontatie met je crisises aangaan; 3. je blikveld verbreden; 4. je met beleidsontwikkeling en publiek debat bezig houden; 5. geloofwaardigheid verwerven; 6. aan 'identiteitswerk' doen. Het narratief van experts is het meest doordrongen van het laatste thema, en werkt ook door in de andere thema's. Nadat ik dit narratief van experts als zodanig hebt heb gepresenteerd zal ik het nut ervan aanduiden voor academici, wetenschappelijk experts, journalisten, beleidsmakers en politici, en burgers in het algemeen.

Curriculum Vitae & publications

Erwin van Rijswoud (1979) grew up in Rotterdam, where he completed his secondary education (Athenaeum) at Hugo de Groot Scholengemeenschap. Between 1998 and 2002 he studied at the University for Humanist studies. In 2001 he went to the University of Hull (UK) as part of the Erasmus exchange programme, and in 2002 he transferred to a Bachelor in Philosophy, which resulted in a B.A. with first class honours. In September 2003 he was admitted to the research master in the History and Philosophy of Natural Sciences and Mathematics at Utrecht University, and graduated with a thesis on the history of science policy and innovation policy in the Netherlands (cum laude). After this historical perspective he shifted his focus to the future. From 2005 until 2007 he was junior researcher at University of Twente for the Centre for Society & Genomics, and executed a project in which the future of genetics and genomics in health care was explored using interactive technology assessment. In 2007 he took up a position as PhD researcher with Prof. dr. Hub Zwart at the Radboud University in Nijmegen on the role of scientific experts in policymaking and public debate (Science & Society working group grant), of which this thesis is the result. In addition to his academic work he was involved in the science communication Master track at the Faculty of Science, and was elected member of the Works Council on behalf of the Nijmegen PhD Council (2009-2011). In October 2011 he was appointed assistant professor in Science Communication at Twente University (Faculty of Behavioural Sciences), and continues his study of the interactions between scientific experts and society. He is married to Marjan and together they have two kids, Hannah and Jonathan.

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Public Faces of Science

Scientific experts are common figures in the public domain. Besides communicating on developments in science in general, experts often face the daunting task of providing a science-based answer to crises, such as floods and epidemics. Some scientists frequently perform such roles, and this has made them public faces of science. They are familiar and not undisputed faces for politicians, journalists and members of the public.

This study addresses the question how scientific experts have developed over the last decades. The careers of elite experts in two scientific disciplines with a public stake, virology and hydraulic engineering, have been studied from a biographical-narrative perspective. This book provides an in-depth understanding of the experts' dealing in policy making and public debate, and argues that identity work – expressing one's identity in both the actions and reflections on being an expert – is at the core.

By approaching these experts in this way, the book first of all contributes to the scholarly debate over experts, public communication and policy development. Secondly, this study stimulates a more reflexive understanding of experts among the scientists performing such a role, as well as among the diverse publics that interact with experts, such as journalists, politicians and citizens.

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