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Nr. V.15e (2009)

Willingly *and* Knowingly

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ruimtelijk, milieu- en natuuronderzoek

The roles of knowledge
about nature and the
environment in policy
processes

Prof.dr. R.J. in 't Veld

PRELIMINARY STUDY

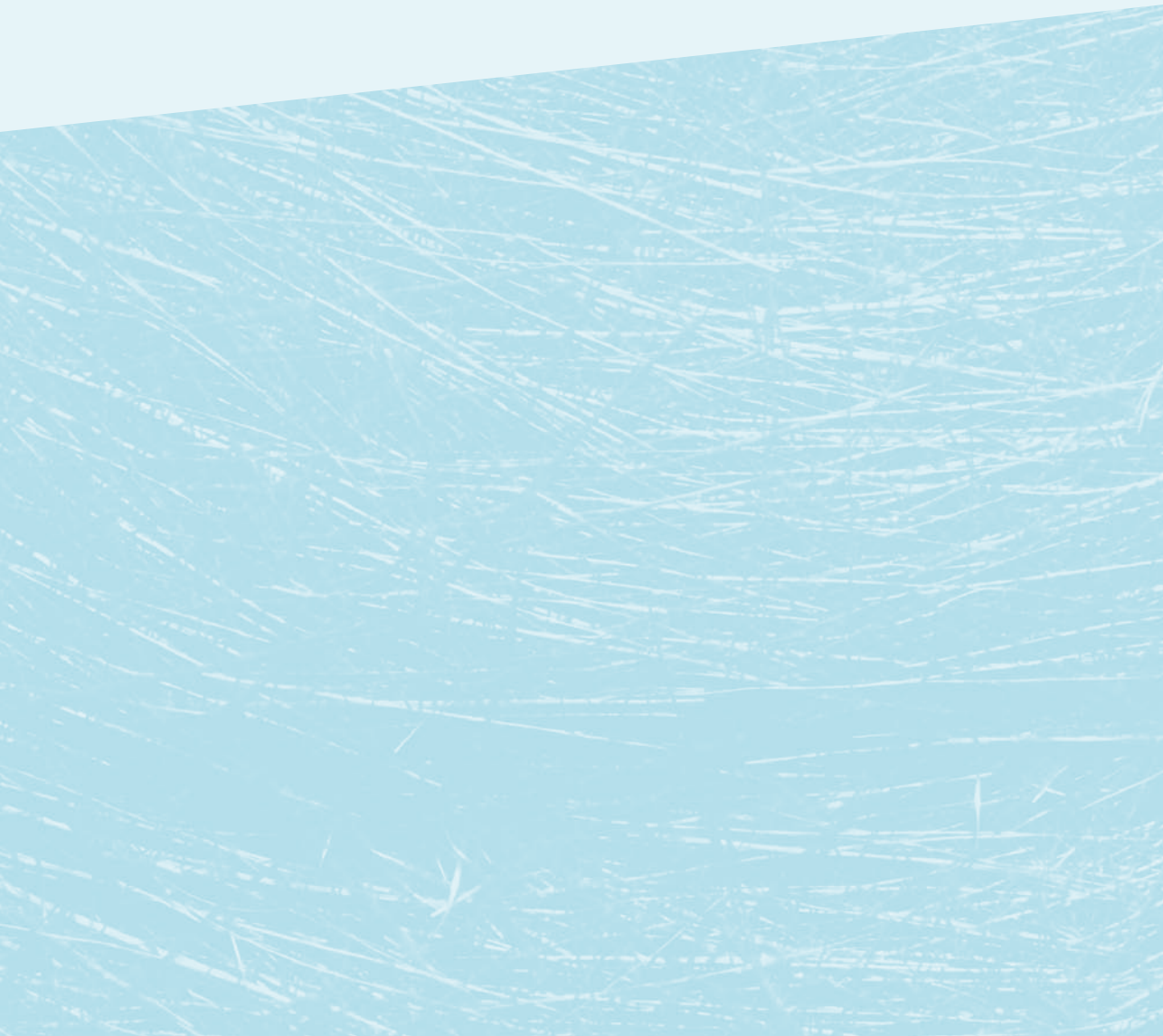
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Willingly *and* Knowingly



Colophon (second edition)

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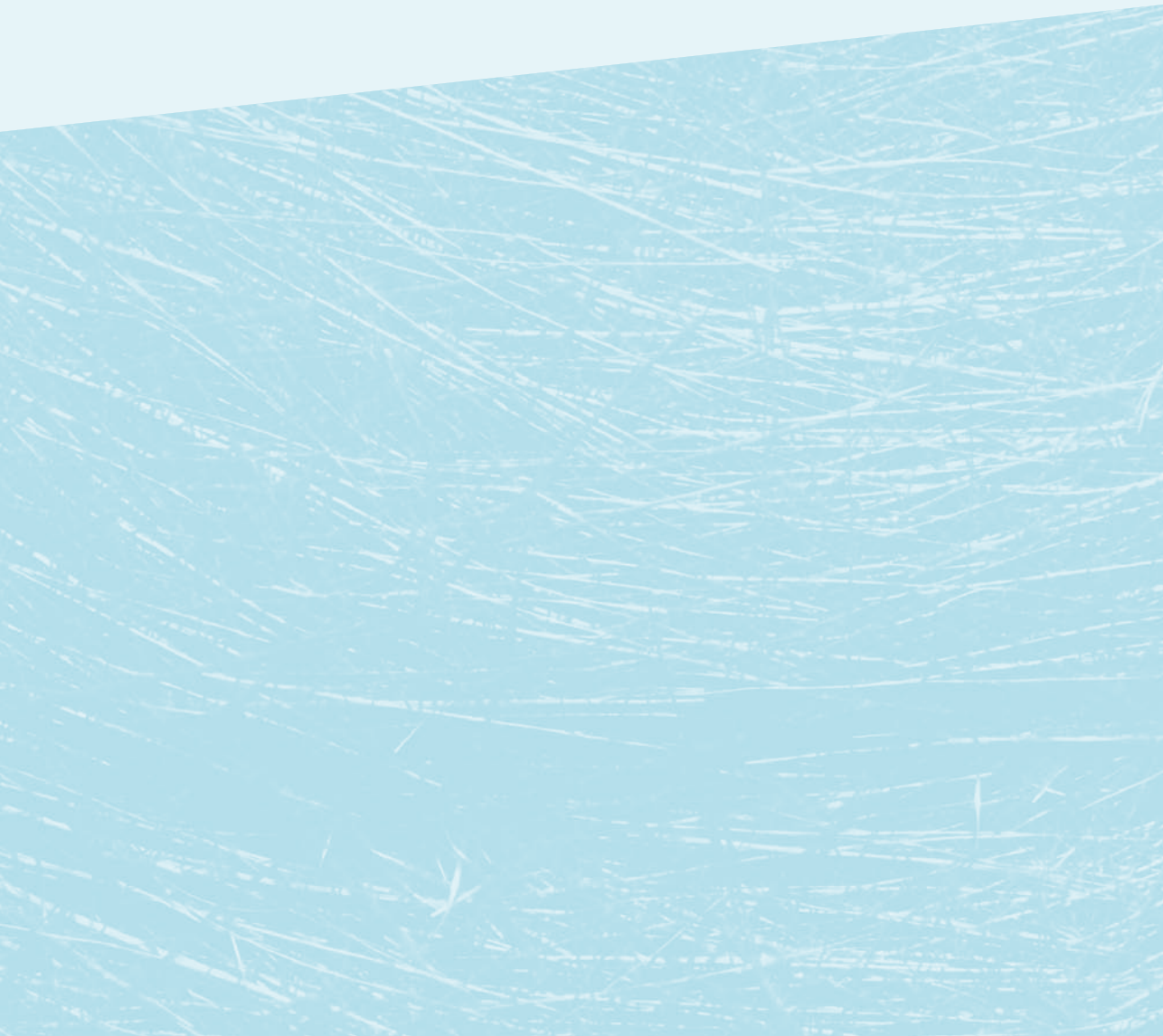
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Willingly *and* Knowingly

The roles of knowledge about nature and the environment in policy processes



About the RMNO publications

The Advisory Council for Research on Spatial Planning, Nature and the Environment (RMNO) offers two series of publications:

- A** Advice
- V** Preliminary studies and background studies.

These series were launched in October 2003.

The Preliminary study **Willingly and Knowingly – The roles of knowledge about nature and the environment in policy processes** belongs to the V series.

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June, 2009

Foreword to the second edition

published on the occasion of the three-day international conference Toward Knowledge Democracy, August 2009

The issue of knowledge creation and knowledge exploitation in policy-making within the Netherlands has long been the focus of attention among certain groups. Some politicians, many senior officials and a substantial number of scientists are concerned about these issues. On the one hand, there is a clear need for knowledge to be generated which can be used in policy-making. On the other hand, new problems continue to arise as a result of unwelcome new knowledge which does not suit the policy-makers. It is almost ten years ago that the first edition of *Willingly and Knowingly* was published, a document that caused considerable commotion in the world of knowledge development and exploitation in policy-making for major projects. At the time, RMNO examined four specific cases: the Betuwe route, the fifth runway for Schiphol, VINEX-Leidsche Rijn and policies on the use of fertilisers. Particular attention was paid to the misuse of knowledge about the environment and nature in the decision-making. The title ‘*Willingly and Knowingly*’ says a great deal about the results of this study. Now, ten years later, it is possible to review what policy-makers have done with the conclusions and recommendations made at that time. The projects examined have since been completed, but are still of current relevance. The knowledge function of government departments is increasingly under discussion. The official reaction of the government was to discontinue the system of sector councils and to revamp the knowledge chambers within each separate department. It is too early to comment on the effectiveness of this policy.

Our council continued its work on methodology; we published two volumes on handling risk, produced a manual on the methodology of boundary work, and organised a conference and published a book on interdisciplinarity, *Building Bridges*, and a book on transdisciplinarity, *Knowledge Co-creation – Interaction between Science and Practice*. RMNO representatives have also been speakers at many international conferences on bridging the gap between the world of knowing and the world of willing.

All this in the understanding that an infrastructure has to be developed that can handle the faster rate of knowledge accumulation. Digitisation of knowledge and information has also undergone an enormous upsurge, resulting in a huge increase in the speed of numerous learning processes. We see turbulent developments in all areas on a daily basis. The way policy-makers handle knowledge stands out in sharp contrast to this. The credo of ‘*willingly and knowingly*’ can be applied as regularly as clockwork. Too little seems to have changed, in spite of all the commotion. How tangible the problem still is, is apparent from the tensions surrounding knowledge and information within parliament.

In preparing the international conference on 'Towards Knowledge Democracy' we felt it would be useful to publish a new edition of *Willingly and Knowingly*. This work contains many of the starting points for the debate on the tensions between knowledge, policy and the media. *Willingly and Knowingly* can also play a role in seeking possible paths towards a knowledge democracy, as have other more recent RMNO publications, such as *Building Bridges* and *Knowledge Co-creation – Interaction between Science and Practice*. The conference on 'Towards Knowledge Democracy' will bring together old and new insights and experiences. Participants will have experience of the tensions involved in this issue and will seek solutions in order eventually to arrive at a 10-step plan for the realisation of a knowledge democracy. For them and for many others, *Willingly and Knowingly* is a 'must'.

Once again, I hope you will enjoy reading this publication.

The Hague, March 2009

Roel in 't Veld
Chairman RMNO

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1. Preface

The book you are holding now is the crystallisation of a number of studies, workshops and discussions initiated by the rmno [advisory council for research on nature and the environment] in the past two years about the use of knowledge of the environment and of nature in the making of policies. The council wished to know how knowledge of the environmental and nature aspects is used in practice in particularly the national state policy. By this the council proved to possess a good foresight, for in 1999 heated discussions erupted around this subject, first around the rivm [national institute of public health and the environment] and later around the alleged corruption of a number of environmental advice agencies.

Some people see knowledge production particularly as the collection of facts that should play an important role in the making of complex decisions. Other people are of the opinion that research will help in developing instruments to facilitate processes of decision-making; especially where it concerns complex problems and where various interests are involved. Thus various decision-making supporting systems have been developed in the field of the environment. But also more general ideas in the field of process management and interactive development of policies have been developed in a specific way for policies in the field of the environment and nature. Not all knowledge that has been developed has been actually used.

Against the background of these developments it makes sense to get a more accurate picture of the circumstances around the use, non-use, or partial use of knowledge about the environment and nature in policy-making. If a plausible explanation is available, then one could conclude from this whether and under which conditions the energy used for the development of such instruments and other knowledge has been used well.

Many policy-makers and scientists still assume that there is a linear relationship between policy and knowledge, a 1:1 relationship. All knowledge available is used, and that objective knowledge is the point of departure for a policy. Within such a naive rational model of the use of knowledge in policy-making thinking about auxiliaries is a further step towards making the scientific basis of the policy more perfect.

However, it has already been known for a long time in the science of administration and the philosophy of science that this rational model of the relationship between knowledge and policy is not adequate. In recently developed views knowledge is seen as a social construction and the way in which knowledge is used in complex questions can better be expressed in terms of a political struggle, or at least in terms of differences in the perception of problems, the conducting of negotiations, the forming of alliances and such. The council has ordered an investigation into how knowledge about the environment and nature is used in the case of various large projects. Case studies have been carried out concerning the use of knowledge about the environment and nature in the policy-making around the betuwe track, schiphol

(amsterdam) airport's fifth strip, vinex-leidsche rijm and the manure policy. Various authors have been asked to state their views with respect to the role played by knowledge about the environment and nature in policy-making. Four essays about the cases have been included in this book.

Also on the basis of the information and insights collected in this way subsequent articles were written to clarify the core problems, but also to establish a link with knowledge already present elsewhere. On the one hand the choice has been made for a stimulating, provocative presentation of the results, that evokes questions and confronts the readers with conclusions that perhaps he will not share in the first instance. On the other hand this publication also includes a more theoretical-analytical view. For this purpose a case study around the contribution of knowledge to the discussion about the future national aviation infrastructure was taken as an example. What is the meaning of the application of theoretical insights to this case? This exposé links up with discussions around a post-normal science, trans science and interactive policy-making.

A provocative summary, a number of in-depth articles and a more theoretical exposé concerning what policy-making is about in practice as such are not sufficient for an advisory council as the rmno. The reader will also ask which are the observations of the council, and where links with the work of policy-makers and researchers can be formulated. What was learned by the members of the council, by the policy-makers and the scientists that have been dealing with these problems in the recent past? Of course these observations and suggestions, which form the conclusion of the book, are not intended to provide the definite answer to the problem, but the council however does see them as an important first step towards a qualitatively more satisfying use of knowledge in policy-making.

With this publication in which the various contributions have been bundled the council wishes to rouse the interest of three different target groups: policy-makers, scientists and social groups that all have to do with knowledge and decision-making. The council hopes that each of these groups of readers may benefit from the analyses and more general observations and that as a result the relationship between knowledge about nature and the environment and its application in policy-making will improve.

Prof. Dr. R.J. in 't veld
Chairman RMNO

2. Taboos, paradigms and steering

By mrs. Drs. A. van der Aa¹

¹ Mrs. Drs. A. van der Aa is employed by Alons en Partners Consultancy B.V.

Introduction

This part of the book is not aimed at nuances or deep-going argumentation, but at the formulation of essential conclusions around a number of fascinating cases. The Betuwe track, the Fifth Runway Schiphol, the VINEX building location Leidsche Rijn and the Manure Policy. Four controversial projects, the one more so than the other, about which the final word has not yet been said. They will remain the subject of study and discussion for a long time.

In 1998 the RMNO (Advisory Council for Research on Nature and the Environment) had research carried out into the role and appreciation of environmental and nature knowledge in the decision-making process around these four projects. In spite of the many differences between the projects the use of knowledge and the decision-making show resemblances in a number of aspects. This part of our book wishes to give an impression of the outcome of the research. The most important reflections have been put in order, grouped consecutively around the following themes:

- *The perception of the central problems;*
- *The patterns of norms and values or paradigms;*
- *The characteristics of the decision-making process; and*
- *The nature and significance of environmental and nature knowledge.*

Each chapter ends with some quotations from a workshop held by the RMNO on 7 September 1998. Passages from essays that have been written about the projects by dr. B.J.M. Ale, prof. Dr. P.H.A. Frissen, dr. J. Frouws and prof. Ing. Dr. G.R. Teisman are quoted throughout the text. Finally an overview is given of reflections and considerations with respect to the position of knowledge in decision-making processes.

Before you read the following chapters, a brief description of the projects studied will be given:

Fifth Runway Schiphol: the extension of Schiphol by a fifth runway has already been the subject of discussion and decision-making for ten years. The fifth runway must meet the growth of air traffic. Characteristic of the debate is the double objective: reinforcement of the mainport function of the airport and improvement of the quality of the living environment.

The VINEX-location Leidsche Rijn: the decision to build 20,000 houses at the location Leidsche Rijn falls within the framework of the Fourth Memorandum Spatial Planning EXTRA (VINEX). The ambitious building location is situated between the town of Utrecht and the villages Vleuten and De Meern. In the choice of this location various nature and environmental interests and a variety of knowledge in this field play a role, such as compact town and affectation of the Green Heart.

The Manure Policy: the road towards measures to limit the production of manure in agriculture is long. The problem of the excess quantity of manure was only recognised as late as in the eighties. Until the middle of the nineties, shrinking of the live stock was left out of the discussion. The Green Front dominated the manure discussion for a long time, also because of a close affiliation between the world of agriculture and the responsible ministry.

The Betuwe track: the idea of a new hinterland connection for the mainport Rotterdam was included in the governments policy in 1989. In the discussions about the necessity of a railway connection between the Rotterdam port and the hinterland, primarily the upgrading of the existing railway track was considered. Later one began thinking about a new connection. In 1994 a Key National Physical Planning Decision (PKB) was approved by parliament.

The following applies to all these projects: the decision-making was extraordinarily complex and involved untransparent processes, complex procedures and many parties with various aims and interests. The political-administrative and social context was varied. Most projects still are the subject of discussion and decision-making. This contribution therefore does not pretend to be complete, but only clarifying and thorough.

The pitfalls of selective perception

In all projects knowledge appears to be developed within the framework of a selective problem definition. The need for knowledge and the nature of the knowledge are particularly seen within the framework of the dominant problem definition. The extent to which a solution is available, too, determines the need for knowledge.

Hesitant or steered problem recognition

There is no project without the recognition of a problem: there must be a cause in order to start a project. That cause also generates the need for knowledge. What is striking in the projects that have been studied is that the moment at which and the extent to which the problems are recognised are diffuse. It can not be indicated exactly when a problem is recognised as such in the policy process and neither can it be indicated exactly how the problem then is described.

The nature and the size of the problems in projects are not recognised for a long time or are pushed forward by the policy-makers again and again. In particular when the warnings come from outside, they tend not to be taken seriously. This is most obvious in the case of the manure policy. The manure problem had already been signalled by scientists in the sixties, but it will be another thirty years before it is recognised to its full extent as an environmental problem.

“Farmers found it very difficult to see manure as waste and to see themselves as polluting the environment instead of maintaining the fertility of the soil and ‘nature’, on which they depend for their living. If too much manure was spread out, this was done by the bunglers, by irresponsible farmers who dumped manure, but certainly not in the regular agricultural sector.”

J. Frouws

Once a problem has been identified and described, every party attempts to get its own ‘truth’ to be the central subject of discussion. A nice example is the Betuwe track. The advocates of the new railway connection, the Rotterdam administration, port and transport lobby (“The Netherlands Distribution Country”) formulate it as a transport problem. The Ministry of Transport, Public Works and Water Management adopts this problem definition and the necessity of the railway connection is no longer a point of discussion.

No integral problem analysis and problem defining

In the projects studied there also exist different problem conceptions side by side with each other. In none of the four cases is there a broadly shared problem recognition. In the case of the Betuwe track it is still questionable whether there is any problem at all. Complicating the discussion is often the

fact that problems and risks are intertwined. Risks are possible problems and as a result of this are quickly seen as less relevant.

The problem definition is strongly coloured from the problem conception of one of the actors. In the development of the growth of Schiphol the most recent growth figures are ignored and the growth of air traffic is reduced to a local noise nuisance problem. This narrowing of the problem definition fits in with the double objective: both the growth of Schiphol and an improvement of the quality of the environment.

Again and again, politics play an inconspicuous but crucial role. The dominant players in the force fields around projects succeed in transferring their conception of a problem to the political arena. The latter subsequently makes this conception legitimate and welcomes the problem definition by starting up the formal decision-making procedure. Problem and solution are on the political agenda. The outcome seems to be certain.

Technical solutions as problem approach

It is also remarkable with respect to the projects that the problems are mainly approached as problems that can be solved in a technical way. Noise nuisance can be solved by more silent jet planes, the transport problems by the railway and the excess quantity of manure by industrial manure processing. In general it is thought that problems are technical questions that require a technical solution, the knowledge for which only the experts possess.

In the opinion of politicians a problem is only a real problem when there is a solution for it. Solution-oriented thinking prevails and the fixation on one single solution is great. This orientation leads to the fact that some research questions are not posed, that problems are not fully placed in a social context, that choices are not made explicit and that alternatives sometimes are excluded without any apparent reason for this being given. The solution direction enormously manipulates the demand for knowledge.

Autonomous developments as point of departure

In all projects social developments are considered to be fixed phenomena upon which no influence can be exercised that have to be supervised by policy. The need for houses in the case of VINEX is a given fact, the reinforcement of the position of The Netherlands as Distribution Country is a self-evident need just as the increase of air traffic. Only in the case of the manure policy one has become aware at a given moment that the excess quantity of manure has strong effects on the environment and nature.

More building of houses, more traffic and transport, more air traffic and more live stock, seem to be independent developments in all projects or trends that can not be stopped or reversed. The fact that these developments can or must occur in a different way, however, is not a subject for discussion. The reflexive capacity of society (read: of organisations and citizens) is not an item and is therefore not included in the definition of the problem and the solution.

“Policy-makers attempt to go against inevitable developments, whereas they pay relatively little attention to the question of how these inevitable developments may be given shape inspired by knowledge of the environment and nature. This can be observed both in the environmental departments of the governments and outside that context. The latter seems not to occur because of fear that this attitude is seen as a capitulation beforehand.”

G.R. Teisman

Ignoring of problem levels and problem owners

If the problems are recognised at a national level, the policy mostly originates from a national level. The transport and manure problems, however, are also items on the agenda of the provinces and water control authorities. The aviation question is also a global problem. The choosing of the local VINEX locations is a national affair. The problems are positioned at a high scale level in all projects, and the need for knowledge is centred there.

The national government acts as main problem owner in all projects, even if more problem levels and problem owners can be distinguished. The lower scale levels must implement and execute the policy. But the regional authorities and organisation are only given an opportunity to ventilate their own problem definitions and needs for knowledge at a very late point of time. At such a late moment the problem definitions and needs for knowledge prove to vary enormously.

“On different scale levels decisions can be made with respect to problems that have been distinguished on the basis of the available environmental and nature knowledge, that yield important unforeseen and undesirable effects on the environment and on nature at an adjacent scale level or problem level.”

G.R. Teisman

Furthermore, in the projects the attention is highly concentrated on formal knowledge that is particularly in the possession of policy-makers and researchers. The knowledge of pressure groups is not used actively (“tacit knowledge”). Neither are advice agencies and political parties always seen as knowledge owners. Later, at the occasion of the political decision-making, the distinction between types of knowledge owners is, however, a lot less clear and local and implicit knowledge play an important role.

Some statements from the workshop:

“In the beginning different problem perceptions must be allowed.”

“The problem definition must be established in a clear way, without a mixing of interests”.

“The solution directions should be made explicit as choices.”

Unbalanced interests and dominant paradigms

In the four projects it appears that the presence and appreciation of environmental and nature knowledge is coupled with the norms and values of the major players. In the policy arena a number of direction-providing policy and steering paradigms can be distinguished again and again.

Social or shared view is absent

Agriculture in the manure policy, the need for houses in the case of VINEX, the expansion of air traffic and the position of the Mainport Rotterdam in the project Betuwe track. The dominant policy paradigm often appears to be the beginning and the end of the policy reasoning. To a much lesser extent an integral vision, an ambitious or attractive future perspective or a new course can be distinguished as point of departure.

In the case of Schiphol a double objective is departed from, but the Integral Environmental Impact Assessment report is not used by the civil servants in the preparation of the decision-making. In the case of the Manure Policy growth or shrinkage of the live stock is initially left out of the discussion. In the case of the VINEX policy the causes of the increasing needs for growth are not placed in a social context. In spite of this, the VINEX project Leidsche Rijn starts with a coherent regional vision.

The higher abstraction level does not become a subject of discussion at a later point of time either. Right from the start of a discussion about a proposal an attempt is made to remove questions and uncertainties on a low abstraction level. The consequence of this is that the discussion becomes too technocratic and as a result also the need for knowledge. This leads to large flow research, aimed at producing operational and technical knowledge. The usefulness and the necessity of the proposals are no longer discussed after this.

Social-economic interests are dominant

Social-economic interests are the dominant motifs in the projects. The business-economic possibilities and competitive power of agriculture in the case of the manure policy. The significance of Schiphol as motor of the economy. The European competitive position of Schiphol. The strengthening of the position of the Rotterdam port. Working for more employment opportunities. Again and again, these are the main motifs in the discussions.

Nature and the environment and the knowledge about them are under-appreciated or criticised in three out of the four projects. The thinking in terms of economic growth always seems to prevail over the environmental and nature perspective. The actors that represent the environment often end up in an

opposition role. Only in the case of Leidsche Rijn are the environmental and nature interests and knowledge integrated in the decision-making. This as a result of working with integral concepts such as gradual urbanisation and compact town, that have also been based on environmental considerations.

Dominant concepts and fixed points of departure for policy

Fixed concepts and points of departure for policy are of large influence on the shaping of ideas and the production of plans in the four projects. Thus the thinking in terms of asphalt, concrete and railway tracks has been persistently internalised amongst the policy-makers of the Ministry of Transport, Public Works and Water Management. Sometimes even useful marketing strategies are integrated in policy concepts. The fifth runway for Schiphol is presented as a fifth runway, but actually it will be the sixth.

An overview of the dominant concepts and principles that are involved in the four projects:

- *The concept of “building in a compact way” in the case of the VINEX policy;*
- *“The Netherlands Distribution Country” in the case of the Betuwe track;*
- *“Mainport Schiphol” (an elaboration of “The Netherlands Distribution Country”) where it concerns Schiphol and*
- *The principle of “balanced manuring” from 1993 onwards in the case of the Manure Policy.*

It is not always clear what these policy concepts stand for and if they are concerned with profitable and desirable concepts. They prove to be vague, poly-interpretable and any evidence for them is missing. However, this does not prevent them from being presented as truths for which there are no alternatives. Furthermore it is very remarkable that there are no competing policy concepts that could make the political and policy discussion dynamic.

“The views about the importance of Rotterdam as mainport are similarly rooted in a hidden nostalgia concerning The Netherlands as a see-going nation and in the remarkable desire to be the largest port in the world. The ambitions of ‘The Netherlands Distribution Country’ are based more on the protection of interests than on any historical awareness: there was a time that The Netherlands was a textile country, a coal country, a leather country, a pig country....”

P.H.A. Frissen

Because attuning between the different fields of policy has not been organised, there is not much exchange of interdisciplinary knowledge at a policy level either. In the case of Leidsche Rijn there is a distinction between the knowledge that is available regionally and that which is available nationally. In the case of Schiphol, attempts are being made to integrate the varied

policy knowledge. The spatial plans for the surroundings of Schiphol have led to the arrival of an integral plan of approach.

Hierarchical steering role of the government

The state government determines the policy in the projects, the provinces and municipalities are responsible for the execution of the policy and the politicians act as arbitrators. This division of roles is a given fixed fact. In decision-making other actors at different levels are only taken into account to a limited extent. The proposals appear in the form of draught versions of plans and communication on them takes place in conformity with the legal public enquiry procedures.

An environment-specific steering instrument of the state government is the obligatory Environmental Impact Assessment in the execution phase at a local level. The environment reports are carried out by civil servants who are themselves interested parties in the decision-making process. The reports are subsequently submitted to the independent EIA committee. The EIA generates important environmental and nature knowledge, but not at the usefulness and necessity level. The municipality of Utrecht deviates from this division of roles and tasks in the case of the VINEX policy. On its own initiative the municipality develops a regional vision and orders also an extensive study into the effects on the environment and on nature. This results in a preference for a location that is submitted to the national VINEX project supervisor. This is done successfully so, the choice of the location is adopted, although in a slightly changed form.

Natural science paradigm is favoured most

Quantitative knowledge plays a large role in decision-making. The parties involved in the projects prefer “definite” data. The environment, nature and the economy are treated as objective entities and also their quality is mostly expressed in quantitative variables. The more figures and mathematics, the more definite the data, seems to be the leading thought. And the more definite the data, the more valid these are considered to be.

Everyone enjoys figures. The environmental movement, too, uses them and in the media the ‘clear’ research results are also favoured most. Paradoxically, this form of environmental and nature knowledge does not guarantee success. Unfavourable ‘definite’ information sometimes proves to be very tentative in the projects. Disputed knowledge is not revealed or is stamped unrealistic if it originates from the environmental movement.

The engineer’s rationality is a dominant and influential knowledge paradigm in all projects. Models and calculations yield building stones for policy. New methods and computation models are developed, the validity of which is not always clear. In the case of Schiphol the discussion about the reduction of emissions and noise are not integrated as a result of this.

“The myth of knowing – more knowledge leads to better decision-making – plays a strong role. The natural science paradigm has everyone in its grip – from mainport lobby to the environmental movement.”

P.H.A. Frissen

Some statements from the workshop:

“A certain method is applied that belongs to the problem.”

“A solution is also the decentralisation of a problem.”

“Unwelcome information is ignored as much as possible.”

Taboos and polarisations in the decision-making process

The use of nature and environmental knowledge in decision-making can not been seen as separate from the characteristics of the decision-making process itself. What is striking in the projects studied?

Solution-oriented policy phases and decision trees

The decision-making in the projects appears as follows: there is an intended decision, the platform of support is organised at a civil servant level and a political level and after this at a social level. The latter involves a limited period for giving information about the proposals followed by the formal procedures with the prescribed public enquiry procedures. The moment of political decision-making is determined by the procedure, not by the legitimacy of the proposals.

The phasing of the decision-making in the projects proves to depend strongly on the progress of the elaboration of the desired solution-direction. In the starting phase proposals are tested with respect to their feasibility in conformity with the decision trees. This phase of the decision-making has a great deal of influence on the outcome of the entire decision-making process. The subsequent usefulness and necessity discussions are sometimes no more than a ritual.

“At the start of a decision-making process there is a more or less clearly formulated and definite proposal from some initiator. At the end of the decision-making there is a decision. In that decision is laid down whether the original plan is to be carried out and to what extent it has been changed as compared to the first proposal.”

B.J.M. Ale

The taboos are persistent

Some subjects are no items for discussion in the decision-making process or are systematically excluded from the discussion: the taboos. The more taboos in the policy discussion, the more unbalanced the force field around the projects. These taboos often focus on radical alternatives of opponents of the proposed solution, but also on the extent to which the proposals can be executed, controlled and maintained.

The most striking taboos in the four projects are:

- *The shrinking of live stock numbers in the manure discussion;*
- *The demolition of houses and the harm done to the Green Heart within the framework of the VINEX policy;*
- *The closing of a runway and the reduction of air traffic in the Schiphol debate; and*
- *The transport by waterways and other alternative forms of transport in the discussion about the Betuwe track.*

In some cases taboos are dealt with in a creative way. Thus the choice of location for Leidsche Rijn was disputed in the first instance because it harmed the Green Heart on the western side of the town of Utrecht. This was controversial and could not be discussed. But the problem was solved in a simple way by shifting the boundary of the Green Heart in a westerly direction. In this way one could no longer speak of harm done to the Green Heart.

Polarisation in the policy discussion

The debate in the projects often resembles a discussion between deaf persons and the policy field resembles an arena of wrestlers. The debate is a yes-no discussion between advocates and opponents of the propagated solution. In such a polarised policy arena environmental and nature knowledge are used in a strategic way. Knowledge is mainly used to provide arguments for one's own (policy) views and to convince other parties of one's being in the right.

The media are the most important discussion platform for the opponents of a policy proposal. The actors who represent an environmental interest often prove to be incapable of transferring their views and perceptions to the political arena or have not proper access to policy-makers. Through the press attempts are made to exercise influence on public opinion and on politics. This leads to public conflicts that seem to make the distance with respect to policy-makers even larger.

Conflicts are also created within the government at the moment when the adjacent policy fields and other government layers are confronted with solutions that are in contravention of their plans or interests. This is clearly so in the case of the Betuwe track. Local administrations oppose the plans of the national government and together with social organisations form one front against the plans of the state government.

“The social and political polarisation around the manure issue and its great significance amongst farmers reinforce each other and lead to thinking and acting in terms of stereotypes and enemy images.”

J. Frouws

Interwoven policy and research system

Whoever does not fit in with the dominant view forms no part of the policy network and therefore is not a serious discussion partner either. In the case of the manure issue the Green Front and the department have formed a strong network for years. Similar relationships can also be seen in the aviation sector. The exchange of expertise and knowledge seem to result in the rapid building up of long standing relationships. Only when old networks fall apart can a new division of roles and networks be created.

“There seems to exist an analogy between the participants in a large scale decision-making process and organisations that for instance control complex chemical processes that leads to the fact that one becomes less sensitive to information that might give rise to facing the possibility that one must change the course already taken.”

B.J.M. Ale

The policy fields and research institutions, too, are closely interwoven. Departments especially use research institutions with which they traditionally have a good relationship. Knowledge and policy infrastructures show many similarities. The research field is often just as divided along sectarian lines as the government. As a result of this it often happens that in controversial situations an institution is quickly associated with the points of view of the principal.

In the projects studied this can be seen very clearly in the case of the manure issue. Arguments in favour of ‘doing nothing’ with respect to the manure issue are mainly provided by the research organisations within or closely linked to the (policy) sector. At a certain moment in the project Betuwe track, an agency is even especially chosen because it has not profiled itself as being in favour of or against the railway track and thus is not “contaminated” in the eyes of the environmental movement.

The having or not having close ties with the principal has little to do with the independence of the position of the research institutions. More determining factors are the market and competitive position. The different stocks of knowledge sometimes hardly compete, and there is little productive or reflective collaboration between the research institutions. The checking of the quality of policy research is organised internally.

Closed policy arenas and negotiation circuits

The decision-making in the projects is specifically a discussion at a civil servants level. In the beginning of the policy development there is little communication with the outside world. The discussions are characterised by negotiations and a limited publicity. The decision-making takes place within a limited circle and is of a closed nature. Possible solutions and alternatives are not presented to the outside world.

In the four projects no joint negotiations or consultation structures have been used in which all parties can participate. The outsiders get their turn in the public enquiry rounds. In the case of the Betuwe track it was attempted after the first publications about co-production of policy to do more by way of collaboration. However, it has not led to anything more than the joint identification and description of research question in the case of the Betuwe track. The regional vision for the choice of the building location Leidsche Rijn forms a noticeable exception. Scientists, policy actors and groups jointly formulated this vision. Later, on the occasion of the actual decision-making about the location at a national level, the involvement of the surroundings actors was much smaller. The definite decision was almost exclusively the work of the National Physical Planning Agency.

Some statements from the workshop:

“Decision-making must be structured in such a way that it is adjusted to social problems.”

“Normative and irrational aspects play a role in the decision-making process.”

The designing is important instead of the reacting role of input of knowledge.”

Selective steering and use of environmental knowledge

In the projects studied (f)actors can be distinguished that influence the availability and role of nature and environmental knowledge in the decision-making process. This has a lot to do with the steering of the research and the need for certainties.

Every party its own research

The use of knowledge and the steering of knowledge development through research prove mainly to be aimed in the projects at convincing the opponents and for the provision of arguments supporting one's own stance. The knowledge supply is based on limitations of the subject that are relevant during the starting phase. The fact that one needs to have a well-argued case during the public enquiry rounds also plays a role: as long as the policy is based on arguments resulting from research everything is okay.

Studies into the effects of the proposed policy seldom occur and the call for other research by the opponents is not always complied with. The opponents therefore order their own research to be carried out in order to influence the decision-making. This again leads to new research on the part of the advocates. The total research process in the projects is reactive, isolated, fragmented, and as a logical consequence increases the uncertainties.

“When uncertainties are established a Pavlov reaction occurs. Answers from earlier research again lead to new questions. As a result of this a spiral of accumulation of facts is created. This research proves that..... other research proves that.....that research proves that.....The reverse effect occurs: research increases uncertainty.”

P.H.A. Frissen

The parties steering and using research subject the research results to their own interpretations and political and departmental intuitions. That is why the question of whether the knowledge is sufficient is much less relevant than the strategic role and function of knowledge. For knowledge is never absolute and it always functions within a context. That context is a broad field of forces in which the interests, and therefore also the need for knowledge, are diverse.

Technical research and quantifiable norms

An important part of the research efforts in the projects aims at finding technical solutions for limited problems. In the case of manure policy this is arriving at a large scale manure processing and export to foreign countries. This solution still awaited and until such time as it appears no strict measures will be taken. One places one's confidence in solutions that as yet are non-existent and the scope and function of which are unknown.

Apart from this the emphasis in the projects is on the development of knowledge in the form of quantifiable and generic norms. The effects of the proposals, the processes and the context are not given much attention. The

preference for 'definite' knowledge originates from the idea that this knowledge has absolute value and from the need for certainties. Choices are made preferably on the basis of certainties instead of uncertainties.

A discussion about the figures is mostly followed by a discussion about the appreciation of the data. The data are not placed within a context and therefore there are always problems in arriving at acceptable and practical norms. There is also a lack of knowledge in establishing norms. In many cases the discussion about norms appears to resemble most a derivative of the structuring of the polarised decision-making process.

Late and static input of environmental knowledge

The input of nature and environmental knowledge in the decision-making is often late. Only after the solution stage are the environmental aspects discussed. Thus when the problem definition has already been laid down or when the solution directions are already clear. Nature and environmental knowledge are mostly put in to the decision-making process through the Environmental Impact Assessment report. Sometimes it does not come this far. In the decision-making around Schiphol, the results of the integral EIA were not waited for at all.

All projects show that during the decision-making extra questions must be answered. The research already carried out results again and again in new uncertainties and new research questions. Only in the case of the Betuwe track was it systematically investigated which research questions still had to be answered. After answering these questions the definite decision about the Betuwe track was to be taken.

The use of knowledge in the decision-making has a rather static nature. The input of the researchers has mainly an effect on paper. Knowledge is always contributed in the form of reports. Interpersonal communication and interaction between the suppliers of knowledge and the parties who have a demand for knowledge is limited. Rarely have any arrangements been made beforehand about the presentation and application of research in the decision-making.

"As a project progresses there is a continued 'ritualisation' of the use of knowledge. Each point of view has a report, each position is based on figures. According to one report the Betuwe track is an evident contribution to permanency and environmental protection, whereas other reports mention clearly negative effects."

P.H.A. Frissen

The Gyro Gearloose Syndrome

In the case of the Betuwe track one spoke of the 'Gyro Gearloose Syndrome' because of the technical-scientific content of the reports produced. The complexity of knowledge and the large amount of data make much knowledge

poorly accessible. A complicating factor is that knowledge is under development and that there are progressing insights as a result of which the demand for knowledge changes and increases.

Environmental and nature knowledge are used mainly defensively, and are not very offensive and innovative. The research into innovative and environment-friendly solutions is limited. In the case of the transport question little research takes place with respect to a more intelligent use of the existing infrastructure or the reduction of the need for transport. The research is mainly aimed at providing arguments for a known solution for the dominant problem.

Lack of integration and synthesis

The integration of knowledge is limited. The creation of a synthesis from research does not take place and an overview of the research results is usually missing. The fragmented research is never made into a whole. Only when the decision-makers in the case of the Betuwe track got confused by the many instances of knowledge, an ordering and summary of the research took place, carried out by an advice agency.

A major problem is that researchers use their own problem definitions, models, methods and points of departure in research. Any attuning between the principal and the researcher and mutually between researchers is limited. The routes taken by the many instances of research and by research and policy-making are separate. Neither are any relations made afterwards. Knowledge transfer to each other and to other parties remains rare. Scenarios have also been used in two projects. Through scenarios the qualitative and quantitative effects of the location Leidsche Rijn were chartered. In the Schiphol discussion various growth scenarios have been computed. Scenarios prove to be a sensible instrument to make links between different types of knowledge. In both projects they have created more clarity in the discussion.

The use of knowledge also appears to depend on the way in which knowledge is presented and on the person who presents this knowledge, as well as on the extent of openness of the receiving parties to new knowledge. An understandable explanation of the method and an adequate presentation of the results prevent a 'black box'. Have all angles of approach been included or are there any gaps and questions that are still open?

Some statements from the workshop:

"All parties deal with environmental information in a selective way or even manipulate it."

"Research should be steered more in a problem-oriented way."

"The correct synthesis of the available knowledge, focused on the new problems, is missing."

Finally

In the preceding paragraphs the role of nature and environmental knowledge in the four projects in relation to the decision-making process was the subject of a number of reflections. Here finally some perspectives for change will be indicated.

The characteristics outlined with respect to problems, paradigms, the decision-making process and the steering of research have a mutual relationship. If a narrow problem definition is formulated, the dominant interests and concepts will play a large role, there will be taboos in the discussion and the steering of research will be selective. In such a case there is also a big chance that the policy and research routes are divided along sectarian lines. If you wish to realise another role for nature and environmental knowledge in the decision-making, first of all the meaning thereof will have to be made explicit in the definition of the problem, in the policy points of departure, the process of decision-making and research routes. In what follows some perspectives are mentioned that can be thought of in this respect. In annex 1 you will find an overview of the perspectives in relation to the reflections from the previous chapters.

First of all policy routes and projects could take as their point of departure *an integral problem analysis* instead of a very selective and solution-oriented analysis. It is essential to distinguish at this stage also *all problem levels and problem owners*. Problems are social constructions often in dynamic force fields: truths, interests and actors differ and keep shifting during the course of a project or route.

Signalled problems can also be considered more emphatically than is done now in their relationship to society and the near future. The solutions of this moment have to be more permanent and have a sustainable *social relevance*. The context of a problem, the social developments and trends, is no autonomous given fact. Problems must be considered as social steering problems.

Early openness and interaction about a problem and solution formulation is recommendable. In the beginning everything should be kept as broad as possible, one should start in an optional way and one should not immediately focus on a solution. One should steer and work in accordance with the principles of process management: not beginning but ending with a solution and one should see political decision-making as a conclusion of an open process in which politics functions in the role of linesman.

“If the project of the Betuwe track learns anything about the underuse of knowledge, it is that knowledge about administrative processes, about process architecture, about interactive policy development, about co-production was missing. All insights that have meanwhile been generated by administration science were missing at least in this project.”

P.H.A. Frissen

At the moment, the process of the production, processing and use of environmental and nature knowledge in decision-making often occurs at an indicated and fixed moment somewhere late in the decision-making process. However, there are many moments and situations in which environmental and nature knowledge must play a role. Also because knowledge may change, and is just as dynamic as the processes around it. This suggests that knowledge should not be brought in too late but *continuously* and especially *at the beginning*. As it is, existing environmental and nature knowledge in policy development can be used more and more often. *Environmental and nature researchers* should be able to *participate* more often in interactive policy processes than now is the case. Environmental and nature knowledge that is already available can be communicated very well. Environmental and nature knowledge as the subject of interpersonal communication is also a way of dealing with that knowledge in the decision-making process.

Knowledge management is also uncertainty management: dealing with unknown risks and uncertainties. The uncertainties and dilemmas could be made more explicit so that discussions on usefulness and necessity can also deal with them. This implies more *qualitative and interdisciplinary* research, more research aimed at the *social and environmental effects* of policy and more use of *practical and intuitive knowledge*.

The knowledge supplied must be useable and must have added value for decision-making. Knowledge must have been adjusted to the needs for knowledge and the target groups aimed at. The knowledge collected must be *understandable and accessible* for a broad group of persons and in any case the decision-makers and must be *coherent* as far as possible. A retrospective test as to whether knowledge has complied with these quality requirements may realise this.

“Little thought is spent on the behaviour of people and on the effects of the desired developments. Citizens will always find new ways to satisfy their needs. All policies aiming to restrict these needs will sooner or later be faced with new forms and appearances of these needs. Knowledge about precisely this phenomenon should increase.”

G.R. Teisman

In view of the above it might be useful for the steering of research for decision-making to be composed of a *knowledge platform* that collects all research themes and questions and makes a selection together with social actors. A platform that sets up a *coherent research programme* that ensures that the research results are presented in a transparent and understandable way and that the quality of policy research is monitored systematically.

Annex: overview of reflections and perspectives

In the following tables a list of the explained reflections and perspectives is given. You may use the schedule as frame of reference for defining and positioning environmental and nature knowledge/research in decision-making processes.

	REFLECTIONS	PERSPECTIVES
Perception of problem	Late signalling and recognition of problems as a result of which problems are only dealt with at a late stage	Active problem signalling and trend analysis so that risks and problems are signalled on time
	Selective problem defining that results in the fact that only a part of the problem receives attention	Integral problem analysis that sheds light on all sides of the problem and the context of the problem
	In the case of problems where the focus is on technical aspects for which only the experts possess the knowledge	Problems are approached as integral solution systems that require interdisciplinary knowledge
	One solution is made explicit and this solution is presented and defended	Make strategic choices explicit and make them the subject of a discussion
	Developments are considered as given facts that can not be reversed	The influence of trends and developments is seen as a possibility
	In the decision-making one problem owner (the state government) and some knowledge owners are distinguished	In the decision-making all problem owners and many knowledge owners are distinguished

	REFLECTIONS	PERSPECTIVES
Interests and paradigms	Sectored and categorical angles of approach as starting point of the policy process	Integral social vision(s) as point of departure for searching for solutions
	Social-economic interests mental interest	Environmental interest carries as much weight as all other interests
	Fixed policy points of departure and concepts of leading importance in the discussion	The removing of fixed concepts and frameworks becomes a point of departure
	Particularly a demand for knowledge in the form of facts and figures	Also a demand for practical and intuitive knowledge
	The role division and procedures of the government / authorities are self-evident	Role of government/ authorities is made explicit since it may differ
	Politics is an arbiter, weighs the interests in question	Politics is a linesman, monitors a balanced weighing of interests

	SOLUTION-ORIENTED DECISION TREES STRUCTURE THE DECISION-MAKING PROCESS	INTERACTIVE AND CREATIVE DECISION-MAKING WITH AN UNPREDICTABLE OUTCOME
Decision-making and policy system	Taboos are excluded	Making taboos explicit
	One way traffic and polarisation in the policy discussion by focussing on one solution	Confrontations and catalysts in the policy discussion to find a solution together
	Policy system and research system are interwoven	More competition and reflection between knowledge institutions
	Closed policy circuits and negotiation circuits	Open and broad decision-making processes
	Divided government: divided policy fields and departments	Transparent government: interdisciplinary exchange of knowledge

	SELECTIVE STEERING OF RESEARCH FROM A STRATEGY OF CONVINCING	INDEPENDENT AND INTERACTIVE STEERING OF RESEARCH IN RELATION TO POLICY DEVELOPMENT
Steering of research	Research must limit uncertainties and is mainly technical	Interdisciplinary studies, also with respect to unknown risks and uncertainties
	Production of 'new' knowledge and models again and again	More use of existing and available knowledge
	Late and passive input of environmental and nature knowledge in decision-making	Continuous knowledge input; also communicatively and interactively
	The Gyro Gearloose Syndrome: research is not always usable and "good"	Understandable and accessible knowledge and quality checking
	No integration and synthesis of research outcome in relation to policy development	Linking of research results to the policy under development

3. Four essays on the use of knowledge in four cases

Knowledge and the fifth runway

By dr. B.J.M. Ale

Knowledge and the Betuwe track

By prof. Dr. P.H.A. Frissen

Knowledge in the margins of the manure policy

By dr. J. Frouws

Knowledge and the VINEX location policy

By prof. Dr. Ing. G.R. Teisman

Knowledge and the fifth runway

By dr. B.J.M. Ale²

² *dr. B.J.M. Ale, Ph. D., is working for the RIVM, The National Institute of Public Health and Environmental Protection, and is acting as a private individual with this contribution*

Introduction

Within the framework of the theme “the role and the valuation of knowledge in integral considerations” the Advisory Council for Research on Nature and the Environment requested that I review the decision-making process about the construction of the fifth runway near Schiphol (Amsterdam) Airport, and analyse the role of knowledge in this, whether present or absent. The Dutch adage “when ‘would have been’ enters, ‘has been’ has already gone”, well describes how difficult it is to make hindsight judgement on what ‘would have been’ possible and on what apparently ‘has been’ impossible.

There is a huge amount of material about, and as a result of, the decision on the construction of the fifth runway. However, a full survey was not possible within the limited time, and may therefore distort the picture somewhat. Nevertheless, history may still teach us something, and if this report is contributory to it, it was worthwhile writing it.

RMNO’s questions

The RMNO requested me to find an answer to the questions about the role and the valuation of knowledge in the integral considerations. These questions were:

1. *At which point of time and on which scale level was knowledge of nature and the environment contributed to the process of decision making (calculated from the phase of exploration up to and including the phase of implementation)?*
2. *Which part of this knowledge has been used, which part has not been used and can it be indicated why it has not been used?*
3. *Was there sufficient knowledge of nature and the environment available, or was certain knowledge missing? Was lack of knowledge signalled in evaluations of processes of decision making or by certain actors, and were they justified in doing so?*
4. *How did one deal with the uncertainties in knowledge (both in the field of nature and the environment, and with respect to other sectors)?*
5. *Did the (extent of) quantification of environmental and other (specifically economic) information play a role in the decision-making?*
6. *How did the communication of knowledge from the various disciplines go (e.g. were there any problems because of technical jargon, aggregation level of the information)?*
7. *How was the knowledge from the various disciplinary approaches valued in the decision-making? Can it be indicated where emotional valuation was decisive?*
8. *In which way did the weighing of different aspects take place in the decision-making? (Methods, instruments)*

The answer to these questions must be sought in a retrospective analysis of the decision-making process and in the role knowledge played in a number of

specific cases, such as in the Betuwe track, in Schiphol's 5th runway, in the Manure Policy and in the VINEX locations. TNO/STB, the Dutch Institute for Applied Scientific Research, was commissioned to carry out the retrospective analysis. The Advisory Council for Research on Nature and the Environment also requested others to shed light on these cases to supplement this analysis³.

This study will deal with the use of knowledge in the decision-making process on the 5th runway near Schiphol in the period from the mid-1980s up to 1995, the year in which the Key Decision on Planning part 4 was endorsed.

The question more closely examined

The answer to the question whether knowledge has played a part in the decision-making may be interesting and challenging but not easy to find. In what way could one find out whether knowledge was used?

In order to examine this question more closely in relation to the case at hand – Schiphol Airport – the generality of the decision-making was restricted to the following situation.

At the beginning of a decision-making process, there is a more or less clearly formulated and well-defined proposal from one or other initiator. At the end of the decision-making process, there is a decision. This decision describes whether the original plan can be realised and where or how the plan, when compared to the first proposal, was changed. Not uncommonly does a plan often refer to reports and studies. Hence, it may appear that knowledge was indeed used to support the decision-making.

However, this conclusion was less obvious than it seemed at first glance. If it was a decision to the effect that the original plan was to be realised unaltered, was it because the original plan was supported with knowledge to the extent that it could be accepted unaltered? Or was it because further examination proved that the original plan was indeed a good plan?

There is also the possibility that the plan was accepted in spite of information that supported the conclusion that the original plan was not good at all, or perhaps because the preconditions could not be met. A justification of the decision, an explicit review of the preconditions or a disqualification of a report or a study could then prove whether the available knowledge was indeed used.

However, if, on the other hand, a decision includes a considerable change or even a rejection of the original plan, one could wonder whether it was changed or rejected because the plan had been poorly underpinned from the very start. Did later investigation confirm that the plan was in fact not good at all, or that it had to be changed considerably?

In principle, the quality of the available research and presented reports must also be looked at if we want to investigate whether knowledge played a role in a concrete decision. Was it justified that a certain report was used in sup-

3 Slob, A. Et Al: *de rol van milieukennis in besluitvorming*. STB-98-11, TNO Apeldoorn, februari 1998

port of the decision, or was it perhaps poor research that was used to legitimise a decision with quasi-scientific arguments? Or was the study not used because of its poor quality, or were the results perhaps not so convenient for the decision-maker?

And finally there is the question whether the decision was a good decision in the light of the available knowledge. This question can hardly be replied to objectively. As it is, almost every decision is the result of political value judgements of which, in hindsight, the correctness is not fully open to objectification.

Even in retrospect is it therefore not always possible to give a univocal answer to all questions to which the RMNO advisory council wants to have a reply.

Exploration

Hence, the exploration of the answer was begun by finding out what information was available at what time, whether the use of knowledge is documented somewhere, or whether the use of knowledge can be deduced from the circumstances. Although the investigation by bureau oranjewoud⁴ mainly concentrated on comparing the two alternatives of the Schiphol section (the so-called 5P and 5G variants), this investigation had already made a reference to the available knowledge and the decision-making.

The “Schiphol’s Fifth Runway” case has already existed for 10 years. Though an exhaustive investigation of all archives was beyond the scope of this essay, the available material was still quite suitable for an explorative investigation. After a short description of the case, the next chapters will deal with three subjects that were the centre of interest in the discussions on Schiphol: the growth figures, the external safety and the noise nuisance. Further investigations and knowledge of these subjects are dealt with in the light of the Advisory Council’s questions and will be outlined. In closing this discourse, attempts will be made to draw conclusions and to reply to the questions. In this paper, it is not the point whether it was justified that the choice was made, but whether there was sufficient information to make the decision and whether this information played a role in the decision-making process.

⁴ Oranjewoud: onderzoek naar het kabinetsstandpunt inzake PKB-Schiphol en omgeving. Report no. 26710, May 1995

The decision

The policy on Schiphol was laid down in the 1988 SBL Master Plan for Civil Aviation Premises (Structuurschema Burger Luchtvaartterreinen, 1988). In this Master Plan, the objectives were laid down for the aviation policy, the function of the airport, the location of the runway system, the size of the airport premises and the number of aircraft movements. It also gave an indicative noise zone. However, even before the indicative noise zone in the Master Plan could be confirmed, it appeared that the growth prognoses were already outdated. On the basis of new forecasts, the Action Plan Schiphol and Environs (Plan van Aanpak Schiphol en Omgeving, PASO)⁵ was drawn up and had a double objective:

- *Strengthening the main port function of Schiphol*
- *Increasing the quality of the living environment in the area around Schiphol.*

In order to achieve this double objective, a plan was reintroduced that had already existed since the mid-1970s: the expansion of Schiphol with a 5th runway parallel to the Zwanenburg runway. The alternative plan that was considered during the course of the Action Plan - to make a bend in the Zwanenburg runway, thus keeping the 4-runway system – was rejected as it would not provide sufficient capacity.

A definitive choice between this proposal and possible alternatives, a choice that was to be laid down in a key decision on planning, had to be made after making the Environmental Impact Assessment. The final decision was set down in the key decision planning Schiphol and Environs, part 4 (planologische kernbeslissing Schiphol en omgeving part 4 (PKB4))⁶. The conclusion was that the original plan as presented in the Action Plan, was to be implemented.

The questions

In the light of the request made by the advisory council, two questions are important here:

- *Was it foreseeable or thinkable with the information available in 1990 - the year when the Action Plan Schiphol and Environs commenced - that the plan could be carried out while adhering to the double objectives set?*
- *Was this still the case in 1995, after the Environmental Impact Assessment had been made?*

Here the feedback from the PMMS Steering Group of April 1993 was important, because it indicated that the 5P option of adding the Parallel Kaag runway, seemed to be definite ⁷.

5 Plan van aanpak Schiphol en omgeving [Action Plan Schiphol & Environs]. Staatsdrukkerij, Den Haag, 16 April 1992

6 Planologische kernbeslissing Schiphol en omgeving deel 4 .Tweede Kamer vergaderjaar 1994-1995, nr 23 552 dd 20 december 1995

7 Verslag stuurgroep PMMS 27 maart 1993

Themes

In the discussions about the key decision planning and the possible further expansion of Schiphol, a number of themes keep coming back:

- *The reality value of the growth figures*
- *The increase of risks*
- *The increase of noise nuisance*

This does not mean that other aspects, such as air pollution and expected economic advantages, were not important. In the period that the decision was made, there was neither any misunderstanding nor any difference of opinion about the expected developments of the air quality close to Schiphol and about the global effects of increasing air traffic. But there was at times contradictory information about some aspects. The parties also had different opinions about the weight that must be given to these aspects in the evaluation leading to the decision.

The prognoses of the growth

The Action Plan Schiphol and Environs indicated an expectation of 50 million passengers in the year 2015. The necessary number of aircraft movements was an estimated 415000. This expectation was the re-adjustment of earlier prognoses made by the committee for the planning of airport premises (commissie planologie luchtvaartterreinen). This committee anticipated that in the year 2000 some 63 million passengers would be carried to and from Schiphol Airport with 390,000 aircraft movements.

The Action Plan Schiphol and Environs PASO readjusted the prognosis of the expected number of passengers downward and adjusted the necessary aircraft movements upward. It was thought to be more likely that there would be more frequent services with smaller aircraft, than less frequent services with bigger aircraft.

After the Action Plan Schiphol and Environs was released, the Central Planning Bureau (CPB)⁸ developed three scenarios for The Netherlands: a low growth scenario, named the Global Shift (GS), a medial scenario called the European Renaissance (ER) and a scenario with high economic growth, indicated as Balanced Growth (BG). Related to these scenarios, three scenarios for aviation were developed in the Inventory of Economic Effects (IEE)⁹. The lowest scenario, Business as Usual (BAU), expected 38 million passengers in 2015, in the medial scenario, European Liberalisation (EL), 39 million and the high scenario, Global Liberalisation (GL), 58 million. From these figures, the inventory economic effects drew the conclusion that the prognosis of 50 million passengers, on which the Action Plan was based, was a realistic possibi-

8 *Centraal Plan Bureau: Nederland in drievoud, een scenariostudie van de Nederlandse economie 1990-2015. Den Haag, 1992*

9 *Inventarisatie economische effecten. PMMS, Den Haag, december 1993*

lity. In other words, there would certainly be a growth, and investments could therefore be based on growth. According to the inventory of economic effects, the growth rates connected to the expected growth, were 3.5% For the low scenario, 3.6% For the medial and 5.2% For the highest scenario.

SCENARIO	YEAR	PASSENGERS (*1000)	.COMPARED TO 1960	COMPARED TO 1980	COMPARED TO 1985
CPL	2000	63000	9.9	9.8	11.9
PASO	2015	50000	6.7	4.8	5.0
GS	2015	38000	6.1	4.0	4.0
ER	2015	39000	6.2	4.1	4.1
BG	2015	56000	6.9	5.2	5.4
In reality	1990	16471	8.5	5.4	7.1
In reality	1993	21274	8.5	6.2	7.7
In reality	1997	31570	8.7	7.2	8.6
Continuation of realised growth	2015	Passengers ,1000	142000	110000	140000

Table 1: Growth Rate in % of the number of passengers

Table 1 shows the average growth rates compared to 1960, 1980 and 1985, for each prognoses of number of passengers. Realistic figures are given for 1990, the year in which the Action Plan was presented, and for 1993, when the Environmental Impact Assessment was published, and for the year 1997. In 1993, the year in which the inventory of economic effect was published, the average growth rate, calculated from 1960, from 1981 and from 1985, had already risen far above the high scenario, and the growth rate increased even faster than expected. Only in the former expectation of the Committee for Planning Airport Premises was the growth rate still higher.

Table 1 also indicates the number of passengers in the year 2015, if growth should continue at the indicated rate. The three aviation scenarios drawn up by the Inventory of Economic Effects expected 370,000; 432,000 and 582,000 aircraft movements in 2015 for the low scenario (GS), the medial scenario (ER) and the high scenario (BG) respectively.

Table 1 gives the real growth of the number of aircraft movements^{10 11}, and indicates the development if the average growth rate should continue as calculated for 1960, 1980 and 1985. At the end of the 1970s, growth stagnated due to the oil crisis, but in the early 1980s, the growth rate recovered with over 5%, which was the average growth as of 1960. Since 1985, the number of movements have grown even faster: 7.2% A year on average.

Analogous to what is indicated in table 1 for the number of passengers, table 2 gives the growth rates compared to 1960, 1980 and 1985 related to the various scenarios; these average growth rates have been materialised. Though the materialised growth rates in 1990 compared to 1980 were 3.5% Lower

¹⁰ Jaarverslagen Schiphol alsmede de statistical annual reviews

¹¹ Thanks are due to F. van Deventer for providing these figures.

than the growth in the bg scenario, all other years showed actual growth rates that were higher than the scenario growth, regardless of the period for which the growth rate was calculated. The table also indicates the number of movements to be reached in the year 2015 if materialised growth continues.

SCENARIO	YEAR	MOVEMENTS	COMPARED TO 1960	COMPARED TO 1980	COMPARED TO 1985
CPL	2000	390000	5.2	5.1	6.5
PASO	2015	415000	4.2	3.1	3.4
GS	2015	370000	3.7	2.7	3.0
ER	2015	432000	4.0	3.2	3.6
BG	2015	582000	4.5	4.1	4.6
In reality	1990	202347	4.7	3.5	6.0
In reality	1993	259675	5.1	4.7	6.9
In reality	1997	349476	5.3	5.4	7.2
Continuation of realised growth	2015	bewegingen	891000	895000	1227000

Table 2: Growth of the number of movements

On 27th November 1992, there was a meeting to discuss the possibilities to reconfigure the runway system. The discussions covered, among other things, the relocation of the Buitenveldert runway in southward direction, the Parallel Kaag runway and a total reconstruction. In that meeting it showed that aviation circles assumed a number of movements of 570,000 in the year 2015, instead of the approximate 420,000 movements that were anticipated in the Action Plan and in the Environmental Impact Assessment.

It was therefore no surprise that the Advisory Committee in the inventory of economic effects, in its letter to the chairman of the PMMS Steering Committee¹² in 1993, asked attention for the fact that the growth rate was faster than assumed in the highest scenario, and that the rate of growth was even increasing.

Nevertheless, the Environmental Impact Assessment and the considerations in the key decision PKB took mainly the medial scenario as point of departure, together with the related comparatively low growth rate prognosis.

¹² Kohnstamm, P.P. Brief dd 20 september 1993

The continuous line indicates the realised growth; the dashed line shows the growth rate of 5.4% As of 1981; the dotted line shows the growth rate of 5.3% As of 1960, and the continuous line shows the growth rate of 7.2% As of 1985.

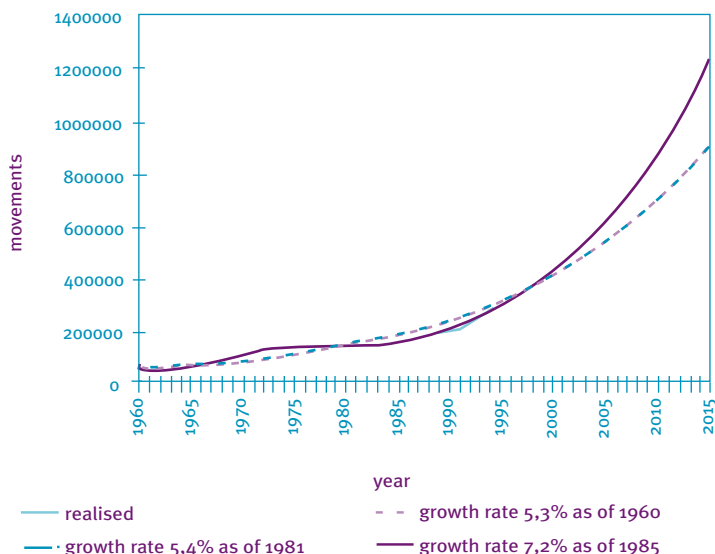


Chart 1: growth of the number of aircraft movements

External safety

The development of the phrasing of the external safety is for the purpose of this study all the more interesting, as it was, in a sense, new and unexpected that air traffic risks for the people living in the neighbourhood would play a more than minor role in the decision-making.

In the development of thinking about the safety around Schiphol, one can distinguish three periods: the period until the completion of the Action Plan Schiphol & Environs; the period as of the Action Plan until 4th October 1992 - the day on which a Boeing 747 crashed into the Bijlmermeer residential area - and the period from 4th October 1992 until December 1995, when the planning key decision Schiphol & Environs was approved.

At the end of the 1980s, the air traffic risks for the area surrounding the airport was a subject that had hardly been taken into consideration. There were only incidental studies into the risks of a plane crashing into nuclear stations¹³ and into chemical process installations¹⁴.

In the United Kingdom, so-called Public Safety Zones were allocated for airports with over 45,000 aircraft movements a year. These zones were based

¹³ Ortiz A., de Vincente Y.: Probability of an aeroplane crashing into a nuclear installation. *Energia nuclear* 26 (135): 1982, pp. 19-47

¹⁴ Srd: criteria for the rapid assessment of the aircraft crash rate onto major hazards installations according to their location, srd, r436, juli 1987

on a study of the area where most aeroplanes crashed¹⁵. However, this study dates back to the propeller era and new ways were investigated in the United Kingdom¹⁶.

In the ICAO, external safety was no point of consideration. No method was known by which risks could be expressed in parameters, as was the case for other risks for surrounding areas, both in The Netherlands and abroad and in government policies: the risks for the individual and the risks for the group. The risks for the individual (IR) are defined in 'Coping with Risks' (Omgaan met Risico's)¹⁷. This government document described the policy on risks in the environmental policy as well as the individual risk and was defined as the chance per year that a person who stays permanently in a certain place, will perish as the result of an accident. The individual risk rate measures to what extent an activity causes risks for the surroundings, and the dimensions of the range of influence.

The risks involved for a group is defined as the connection between the number of persons that meets with an accident at the same time, and the chance that this number is exceeded. The group risk is a measure for the disaster potential of an activity and is the outcome of the inherent danger of the activity and of the layout of the surroundings.

Within the framework of the preparations for the Action Plan Schiphol & Environs, a method was looked for to make the necessary calculations.

The Technica reports

It became clear that a totally new method had to be thought up. The National Aerospace Laboratory (NLR) was fully occupied with calculations of the noise levels. They therefore asked bureau Technica to make the risks analyses. This bureau had acquired ample experience, both nationally and internationally, in calculating the risks for chemical companies, and had, on the other hand, good contacts with the institutes engaged with this problem in the United Kingdom. Technica was prepared to develop a method and to make the risk analyses. This resulted in three reports on the external safety around Schiphol^{18 19 20}.

The first report only dealt with the individual risks outlines. The second report included group risks, a dissertation on the possibility that pilots in trouble still had sufficient control over the engine to avoid residential areas, and a first exploration of the sensitiveness of the results of assumptions.

¹⁵ Le maitre A.S. (Voorzitter): report of departemental committee on safeguarding policy. Ministry of Transport and Civil Aviation: 1957

¹⁶ Davies, E.: A review of aircraft accidents between 1984 and 1988 relating to Public Safety Zones. Caa dora report 8924, 1989

¹⁷ Omgaan met risico's, Tweede Kamer, vergaderjaar 1988-1989, 21137, nr 5

¹⁸ Technica, 1884/ejs/lib: risk analysis of aircraft impacts at Schiphol Airport. 1990

¹⁹ Technica c2475/ejs: extension to risk analysis of aircraft impact at Schiphol Airports. 1991

²⁰ Technica c2475: extension to risk analysis of aircraft impacts at Schiphol Airport, fifth runway. 1991

The third report dealt with the option of bending the Zwanenburg runway instead of constructing a fifth runway.

The results verified that risks around Schiphol were high in comparison with e.g. the standards used by the chemical industries, and that it was not expected that risks would decrease, considering the anticipated traffic increase. The results of this report were a nasty blow in the sense that the risks were so much higher than expected. If the policy frameworks that were then applicable to the chemical industry were directly upheld for Schiphol, not only would it jeopardise Schiphol's extension, but, in its current size, it would also entail considerable reorganisation in the surroundings of Schiphol to stay within the standards of the 'Coping with Risks' report. A discussion about the risks would therefore not only deal with the possible increase of risks but also about the current risks.

It was also evident that the results of a risk analysis, and hence the risks, strongly depended on the precise configuration of the runway system and airways. As the Technica analyses were conducted on the basis of what, at that point of time, was the actual state-of-the-art in the discussions, an analysis of the definitive configuration would at least be necessary to draw a definitive picture of the consequences.

Moreover, the method was quite new, particularly for those involved in the aviation sector, and there was little understanding of the extent to which the results were sensitive to changes in other parameters. It must be mentioned here that the applied method was a very common statistic management of the available facts. In all kinds of disciplines, from biology to economics, there was ample experience in these methods, and assessment of the reliability was very well possible at that time. Nevertheless, aviation circles claimed that understanding was insufficient for any form of testing the results against current standards, or against standards to be newly developed. For the latter, a reasonable accuracy was a prerequisite.

Countercheck

Subsequently, the Dutch Civil Aviation Authority commissioned a countercheck. The countercheck report stated that there was more to it than testing the calculated risks against the calculated risks as set forth in the 'coping with risks' report, as it posed again another question: what policy must be pursued. This prompted one of the policy-makers to remark²¹ "that both in and outside politics, one is generally tempted to look upon risks much more lightly before a disaster has taken place, than after."

As a result of the disappointing figures of the risk assessment and the lack of a matching policy framework, they could see no possibility for solving the safety problem within the Action Plan framework while still maintaining the original plan of the construction of a fifth runway. A public discussion about the external safety around Schiphol was bypassed by not including the reports in the Action Plan Schiphol & Environs, and the subject was handled

21 Nota sr 2770252 juli 1990

with extreme vagueness. Therefore, the Technica reports were not published. In “Measure 53” they only hinted at the development of a policy on the risks at and around the airport.

Thereupon, the Central Council for Environmental Protection expressed in its advice on the Action Plan Schiphol & Environs its astonishment²²:

“For the Action Plan, there was no report that covered the external safety. Neither did the Action Plan describe the aspect of external safety in the problem analysis. The standard for external safety, as included in table 2 of this advice, is based on the NMP standard [the National Environmental Policy Plan] that applies both to enterprises and to transport activities. According to the most recent calculations, the risks aviation involves for the surroundings are too high when tested against the NMP standards. Based on the quantitative developments as announced in the Action Plan Schiphol & Environs, there will be even higher risks, especially in parts of the region (Aalsmeer, Buitenveldert/Amstelveen). The Central Council expects that the advocated development will result in exceeding the NMP standards. For this point, the Action Plan only holds out the prospect of new investigations and a new standard, and The Council deems a prompt realisation necessary. The Central Council is of the opinion that the Action Plan did not come up to the mark as the aspect of external safety was not included”.

The reaction of the Ministry of Housing, Spatial Planning and the Environment on this was:

“The calculations indicate that, if the standards that apply to (chemical) enterprises are in their whole applied to Schiphol, an expansion of Schiphol will be impossible. Indeed, part of Amstelveen will have to be pulled down. It goes without saying that this is a sensitive point. This sensitiveness is behind the vagueness of the passages in the Action Plan”²³.

Standstill

Nevertheless, the Action Plan contained a statement that would have a major impact on handling the later discussions about Schiphol and the way in which the results of calculations were dealt with. The statement said that the improvement of the environment would be assessed in terms of reaching a standstill in the field of external safety.

As described above, the results of Technica’s analysis showed that the risks would increase. From the available reports, it could therefore not be expected that the standstill requirement would be met. If they had opted for a formulation in terms of standards that possibly would be defined later, it would

²² Advies over het Plan van Aanpak Schiphol en Omgeving. Centrale raad voor de milieuhygiene, 23 december 1991

²³ Nota aan minister van VROM dd 5 februari 1992

leave open the possibility to determine or to adjust the safety standards for Schiphol in the light of feasibility and weighing up the factors. However, they would have to defend the standards for the government policy laid down in ‘coping with risks’. But now they had tied themselves down on a risk level that was known to be infeasible. The policy framework for external safety of airports, announced in the Action Plan Schiphol & Environs, proved to be difficult to develop before the publication of the results of the new calculations. These calculations were to be made within the framework of the Environmental Impact Assessment. As a result, further actions remained forthcoming²⁴.

This is a marking moment for answering the questions put by RMNO Advisory Council for Research on Nature and the Environment: the value of the available research was doubted and the course open to them was continued, whereby the results of the available research were ignored.

In 1991, the Environmental Impact Assessment report drawn up for the purpose of the construction of the fifth runway was published, as anticipated in the Action Plan. The line of the Technica reports was not continued, but now the National Aerospace Laboratory was found ready to develop yet a new method.

The Bijlmer disaster

On 4th October 1992, a Boeing 747 crashed into a block of flats in the densely populated Bijlmermeer. The number of lives lost (42) matched Technica reports about the expected lethality of this kind of disasters. As a result of information in the Dutch and foreign media²⁵, the Clerk of the Court of the Dutch Lower Chamber requested the Technica reports on 8th October 1992²⁶. On 13th October, the Minister of Public Housing, Spatial Planning and the Environment, also on behalf of the Minister of Transport and Communications, sent the Technica reports to the Lower Chamber²⁷.

The Ministers of Transport and Communications, and of Public Housing, Spatial Planning and the Environment, and of Economic Affairs, informed the chamber as follows:

“Within the framework of further details of the Action Plan Schiphol & Environs (PASO) by the project organisation main port and the environment of Schiphol (PMMS), the current investigations into external safety, as provided in the Environmental Impact Assessment, will be intensified”.

Subsequently, two lines of action were started. The first line was under the heading of the Environmental Impact Assessment, in which the Ministry of Transport and Communications, and the Ministry of Public Housing, Spatial

24 Hev/0516, dd 11 juni 1992

25 The European, 8 oktober 1992

26 Tweede Kamer 30/29 mb;92/23 vw dd 8 oktober 1992

27 DGM/svs 12092007 dd 13 oktober 1992

Planning and the Environment participated. The factual realisation of the investigation was contracted out to the National Aerospace Laboratory. This line of action produced a report with methods for calculating the external risks in the vicinity of an airport²⁸ and a report on Schiphol's external safety in the referential situation and on the alternative future developments set forth in the Environmental Impact Assessment reports²⁹.

Environmental Impact Assessment reports

These reports, which were, after all, part of the Environmental Impact Assessment, were presented to the Environmental Impact Assessment committee for comments. To side-step the possibility that in the Environmental Impact Assessment line of action calculations were made with a method that was to be rejected later, the committee subjected the methods report to an interim judgement³⁰. As to the applied method, the committee regretted that a so-called causal model was lacking; this model relates accident causes to the chance of avoiding them. The National Aerospace Laboratory reacted with the remark that a causal model provides more qualitative insight in the causes of aircraft disasters, but that it was very doubtful whether such a model could be realised within the short or medium term. A causal model would not be necessary for the (qualitative) calculation of the risks; a statistics-based model would suffice if the characteristics of the target location were taken into account in selecting the data³¹.

The Rand study

The second line of action was steered solely by the Ministry of Transport and Communications. Though in official statements it was not related to external safety, this line of action also furnished a report on methods about external safety³², and a report on the external safety in the referential situation as well as in future situations³³. This report was presented to a panel of experts. If there was any comment at all, it was not included in the report.

One conclusion from the rand report was often to be cited henceforth:

“Schiphol is a modern and safe airport”.

About the method and figures presented by the National Aerospace Laboratory, the Ministry of Transport & Communications remarked:

“...The Aerospace Laboratory's model with which the calculations are made, has only recently been developed, and is the first model in

28 *The Development of a Method for the Analysis of Societal and Individual Risk Due to Aircraft Accidents in the Vicinity of Airports. NLR cr 93372 I, Nationaal Lucht en Ruimtevaart Laboratorium, 1993*

29 *Externe Veiligheid, bijlage bij het Integraal Milieu Effectrapport Schiphol en omgeving. PMMS, Den Haag, december 1993*

30 *Ciemer: Advies over de bruikbaarheid van het rapport dd 28 mei 1993. ISBN 90-5237-517-8*

31 *NLR: Commentaar op de beoordeling van het rekenvoorschrift door de MER commissie, dd 29 juli 1993*

32 *Rand, modeling the external risks of airports for policy analysis, 1995*

33 *Rand: airport growth and safety, a study of the external risks of Schiphol Airport and possible safety-enhancement measures. Rand corporation, juni 1993*

the world specifically tailored to aviation, explicitly meant for policy-supporting calculations of external risk assessments of air traffic”³⁴.

Technica’s model was meanwhile applied, among other things, to a study into risk assessment of Manchester Airport³⁵. The national air transport service (nats) of the United Kingdom had also developed a model. So, at that time, there were at least three models for risk assessments of airports, and another one was still on the way.

The models did not differ much about the way in which historical data were integrated. In all cases, a theoretical statistic model of the division of the accident site around runways and flying routes were calibrated with the available historic material. In all cases, the chance that an aeroplane crashes at take-off, during flight or while landing– the accident ratio – is determined by dividing the number of accidents by the total number of aircraft movements. To illustrate this, the chance of crashing per movement as used in the above-mentioned methods is given in table 3. These chances are not very far apart:

Report	Date	CHANCES PER MILLION MOVEMENTS		
		1990 Landing	1990 Take-off	1990 Total
TECHNICA	May 1990	0.22	0.57	0.79
TECHNICA	Jan 1991	0.21	0.37	0.58
Aerospace lab	Nov 1993	0.65	0.43	1.08
TECHNICA	Jan 1994	0.13	0.082	0.21
RAND	1995	0.32	0.95	1.28

Table 3: accident ratios

However, Technica’s re-adjustment of the chances between its 1990 Schiphol report and its Heathrow report is remarkable. The explanation was that its 1990 report still included propeller aircraft and the 1991 report only covered jets, albeit that the east European jets were also included. The figures of the National Aerospace Laboratory and rand were five point higher, despite the fact that these organisations claimed to have included only the accidents and accident sites that were representative for Schiphol. The guidelines for the Environmental Impact Assessment stipulated that the improvement of the living environment as to safety would be tested against the number of inhabitants within the 10^{-5} , 10^{-6} , 10^{-7} and 10^{-8} contour and against the development of group risk assessment³⁶. The criteria, against which the generally formulated environmental objectives of the Action Plan Schiphol & Environs concerning the external safety were to be tested, were made clear.

This was interpreted by project organisation main port and the environment of Schiphol as the development of the number of residents and residences according to the 1990 housing stock, in other words, the houses that were

34 Brief db/l 93.009855 Dd 1 oktober 1993

35 Technica: risk assessment of Heathrow Airport for surrey county council. January 1994

36 Commissie MER: richtlijnen voor de MER Schiphol. Februari 1992

located there in 1990. Regarding both the risks and the noise, the urban developments after 1990 were to be ignored until 1996, when the figures in the environmental balance^{37 38} would also take the developments into account for the first time.

The IMER (Integral Environmental Impact Assessment) showed that the testing conditions within the 10^{-6} contour had been satisfied. After correcting the figures based on the testing advice of the Environmental Impact Assessment committee^{39 40}, none of the conditions were satisfied. The growth of the number of houses/residents is given in table 4. The effects of the correction were not publicly announced⁴¹, which was regretted by the Environmental Impact Assessment committee. In addition, the risks of accidents with several casualties increased for all accident proportions:

YEAR	REPORT	CONTOUR		
		10^{-5}	10^{-6}	10^{-7}
1990 (S4S1)	IMER*)	212	9300	99800
1990 (S4S1)	AMER*)	230	7400	98000
2015 (5P)	AMER	1170	8500	158000

Table 4: development of the number of houses within the risk contours

IMER: Integral Environmental Impact Assessment

AMER: Additional Environmental Impact Assessment

Aggregated weighed risk

The problems that came up in the light of criteria set earlier were acknowledged by policymakers⁴². Instead of the group risks, a new quantity was introduced in the discussions: the aggregated weighed risk. The aggregated weighed risk is the sum of all houses in a certain area, multiplied by the individual risk in each house. This number corresponds to the expectation value of the number of deaths per year if each house were occupied by exactly one individual⁴³. For the first time, the Environmental Impact Assessment UMER-5P⁴⁴ worked out the aggregated weighed risk. It then showed, that the aggre-

37 Milieubalans 1997, RIVM, Bilthoven 1997, isbn 90-422 0099-5

38 Ale, B.J.M. Et Al: het milieu rond Schiphol in 1996. RIVM rapport 610066008, november 1997

39 Commissie MER: toetsingsadvies over het integrale milieu-effectrapport Schiphol en omgeving. augustus 1994

40 Aanvullend milieu effect rapport Schiphol en omgeving. PMMS, Den Haag, december 1994

41 Brief van gs Noord-Holland u270-94/sc/nm/334-428, dd 3 juni 1994

42 DGM/svs/14793007 dd 14/7/93: stand still groepsrisico onhaalbaar

43 This, and the introduced steering mechanism with the help of a density policy, the Ministry of Economic Affairs saw its hopes answered. (21/9/93: Ministry of Economic Affairs to the steering group: no Weighed Risk, but restriction of the residents per km2 - also induced by the wish to abolish the Weighed Risk.

44 UMER 5P: milieu effectrapport voor de besluiten tot aanleg en gebruik van de parallelle vijfde baan en tot vaststelling van de daarmee samenhangende geluidszones van de luchthaven. Schiphol, PMMS, Den Haag, mei 1995

gated weighed risk increased (table 5) and it proved that this increase could not be counterbalanced by easy means:

Year	Report	AWR (*10 ⁻³)	
		contour	
		10 ⁻⁵	10 ⁻⁶
1990	UMER 5P	2.1	10.9
2015	UMER 5P	8.0	15.2

Table 5: development aggregated weighed risk

The key decision on planning reacted in guarded terms. It announced:
“The aim is to reach a standstill, which means that there is no increase of unsafety, which will be measured by the development of the aggregated weighed risk...”.

Noise

In the calculations for noise nuisance, a number of starting-points and assumptions were important, which so far have played a role in the discussions.

The ke method

There was an extensive discussion about the correctness of the assumed relationship between the value of the noise produced by air traffic expressed in ke and the percentage of people troubled by the noise. The core of the problem was an agreement made in the late seventies and the decision of 12th January 1984 about the calculation conditions for air traffic noise⁴⁵. For practical reasons, it was decided to take 65 db(a) as the lower limit. From the curve included in the explanation of the calculation conditions⁴⁶ can be deduced how the difference between real noise hindrance increases when the ratio of number of flights (the number of times a plane comes) over with a noise level higher than 65 db(a) and the number that is just below this level. The magnitude of this difference was confirmed by measuring it several times⁴⁷. The differences are most obvious when the noise hindrance are caused by many aircraft movements of relatively quiet aeroplanes. This is exactly the situation aimed at for Schiphol by, among other things, the policy on the so-called chapter 2 aircraft⁴⁸, which was also pointed out by officials⁴⁹. From

⁴⁵ Staatsblad van het koninkrijk der Nederlanden, jaargang 1994, nr 715

⁴⁶ NLR: toelichting bij de voorschriften voor de berekening van de geluidsbelasting in kosteneenheden (ke) ten gevolge van het vliegverkeer. NLR cr 96650 I, 199

⁴⁷ Vergelijking tussen gemeten en berekende geluidsniveaus. NLR rapport NLR cr 97263 I, NLR, Amsterdam, 1997

⁴⁸ 12-10-93 Commentaar DGM op IMER: ke in huidige vorm niet bruikbaar

⁴⁹ 2-10-93 Commentaar DGM op IMER: ke in huidige vorm niet bruikbaar

the growing discrepancy between the development of the number of residents in the 35 ke contour and the increase of the number of complaints, can be deduced that the number of complaints increased, whereas the number of noise-polluted houses decreased.

Moot points

During the entire course, and even now, there are a number of points about which experts have a difference of opinion and about which there is no definitive information. This applies, among other things, to the accuracy with which the routes are followed in actual practice, the expected reductions of the noise production of the engines, and the possibility to put one or more runways out of use⁵⁰.

Flying routes

In order to curb noise nuisance as much as possible, the flying routes of aircraft were optimised. In the calculations of the expected noise nuisance according to the directions, it was assumed that these planes would follow these flying routes quite accurately. However, in actual practice this was not always possible, as was subsequently proven, among other things, with the help of flight data from the evaluations of the registration of flight data with the so-called fanomos system. No evidence was found that the estimations of the feasibility of the assumed accuracy were tested against the practical operability.

Emission calculations

The noise emission values to be employed for various types of aeroplanes have already been described in the afore-mentioned calculation rules. However, the parties remained at odds about the rate at which the emission reductions can be expected. The problem is not whether these reductions would in principle be technically possible, but whether, in actual practice, these reductions, given the international context and the market, would be realisable while maintaining the 'double objective'. If it is the objective to encourage and speed up the development and the introduction of new technologies with levies or other measures, the question rises to what extent this objective can be realised. The next chapters will deal with these aspects.

Development of quieter aircraft

Engines have become much quieter in the last twenty years. However, this development has reached a standstill, as further technical improvements to reduce noise emission could only be realised at extreme costs. According to the Chairman of Boeing Board⁵¹, improvements greater than anticipated (0.7 Db gain in 2010 for the average air fleet) were not likely. Moreover, other experts claimed that quieter engines were not available now, and it would

⁵⁰ Expert meeting 9 januari 1998

⁵¹ Volkskrant, 5 december 1997

more likely take decades than years to develop them⁵². Considering the fact that the air fleet was inevitably developing towards craft with more seats, the required engine capacity and the resultant noise emission would increase. In addition, the air current along the plane causes an extra increase of the noise production while landing. This noise production cannot be reduced, which makes the technical end of the line come near.

Small wonder that Boeing is strongly opposed to tightening up the ICAO noise emission requirements. The 747-400 amply satisfied the requirements of “chapter 3”. Future bigger aircraft types will also satisfy the “chapter 3” requirements, albeit not so easily.

By autonomous development, the whole fleet will be quieter with an average of 1.5db(a) per 10 years.

The only way to make the fleet become quieter at an earlier date than the time needed for autonomous development, would be by steering the purchase and replacement policy.

Using quieter aircraft

Aeroplanes of one class may still differ greatly in noise production. For example, the Airbus XXX, an aircraft that has not yet gone into production and will not come onto the market before 2004, has a noise production of about 3db(a), but is nevertheless lower than the B 737-700, which comes within the same category. So, here is a possibility to influence the noise emission of an air fleet by steering the acquisition policy of the companies in the direction of the quietest craft in a certain category.

Most airline companies have only one type of aeroplane per size category, which is rated according to the number of chairs. Moreover, most airline companies stand on having one supplier. The advantage of it is that the version or model of the cockpit is the same for all types, which makes it easier for pilots to switch planes; the electronic devices are the same, including the flight management systems behaviour; and the spare parts stock can be limited. For the aim of deploying quieter aeroplane types, it is necessary that the airline company is encouraged to acquire them and to give them preference for the Schiphol route. It is not known by what agency the airline companies can be spurred to overcome their hesitation to make the switchover to other types of engines. This applies in particular to the other 100 airlines for which Schiphol Airport is not the only and often not the most important destination.

Autonomous development

There is an interrelationship between the expected growth of the number of aircraft movements and the necessary decrease of the noise emission of aeroplanes. This interrelationship can be deduced from the calculation instructions and is illustrated in chart 2. This chart shows that for a growth rate of the number of aircraft movements with 3.6% A year, it is necessary to have a noise emission reduction of about 2 db(a) per ten years. The techno-

52 Jess, E., C. De lezanne coulander, a. Vegter: *milieubelasting en technologie. TNI rapport 97-ej/RLD01*

logical development in the Action Plan Schiphol & Environs scenarios and the subsequent Environmental Impact Assessment is therefore not adequate to compensate the total noise burden of the growing number of aircraft movements. With a much higher realised growth of about 5% a year, a reduction is needed of 3 dB(a) per 10 years. Technological development alone is therefore inadequate to reach a standstill in noise nuisance.

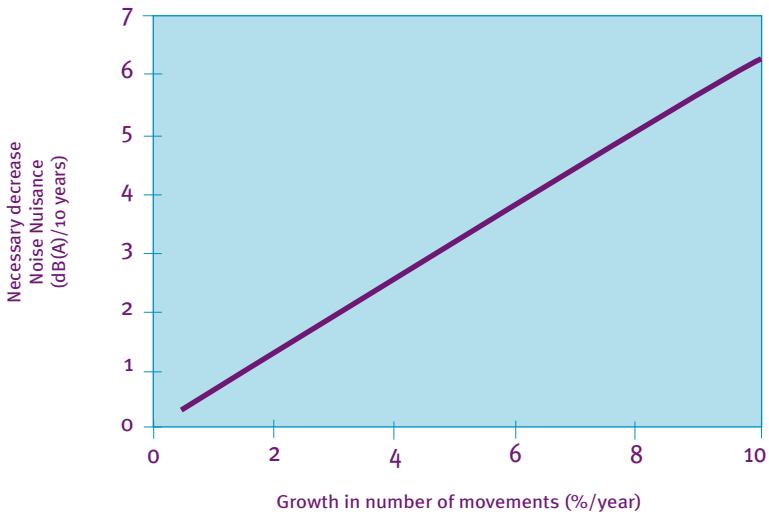


Chart 2: required decrease of noise emission as a function of growth

Closing the runways

An important reduction of the number of people affected by the noise nuisance could be reached if the Buitenveldert runway was closed. However, from the Environmental Impact Assessment until now, the parties have held different views on realising this in actual practice.

Counting the number of houses

The criteria for improving the quality of the living environment are mainly specified in terms of the number of exposed people or of the number of houses. Regarding the question of how these counts should be made, various arguments that are important for the results were put forward. The number of exposed persons are influenced by changes in risks, the noise production and the emission of combustion gases on the one hand, and by the changes in spatial planning on the other hand.

Population in 1990

In the key decision on planning, it was decided to describe the developments of the environmental parameters in terms of number of houses and residents according to the housing stock of 1990. This means that only the changes in the environmental aspects caused by changes at Schiphol Airport were taken into consideration. Nevertheless, the government was worried about the fast

spatial development of the area around Schiphol Airport. There are hardly any instruments to reverse the development, and for this reason the Noord-Holland provincial executive was in 1992 of the opinion that the National Aerospace Laboratory had to examine a runway system that was fundamentally different⁵³.

By describing the developments in this way, the consequences of developments in spatial planning could not be included until e.g. a plan had to be drawn up for a housing improvement measure against noise nuisance. Indeed, the expenses for such measures include all houses and not only the houses that were built in the past until a certain date.

Meteorological margin

Another complication was caused by the way in which the noise zoning was decided in relation with the number of practically exposed persons. Apart from the aspects of the ke method, which has already been dealt with in an earlier section, there will always be a difference between the number of houses in a zone in which the so-called meteorological margin is taken into account, and the reality. This meteorological margin is included to make sure that non-insulated houses are not exposed to the higher level of noise that is produced when, due to weather conditions, a certain runway must be used more intensively. This would make the number of aircraft movements and hence the noise level from this runway above average. A higher noise level around the one runway is of course coupled with a lower noise level around another runway. This makes that in a certain year the number of houses exposed to a certain level of noise are always less than formally calculated. This difference is about 20%, as was discussed in PMMS connection⁵⁴. If the zone was defined with 15,100 houses, the number of houses exposed to 35 ke would not be higher than 12000.

For determining the reference, it means that it must be based on the average situation, and not on the count of movement patterns that deviate from the average due to chance weather conditions. The Action Plan indicated that 16,000 houses were in the 35 ke contour zone in 1989. This was the real exposure, without meteorological margin. The IMER took the 1990 real aircraft movements, increased by the meteorological margin, which made the zone contours to be 19,400 houses, corresponding with 14,000 houses that were in reality exposed to 35 ke in 1990. The AMER calculated the zoning for aircraft movements that tallies with the average meteorological margin, increased by the meteorological extra. That is why the number of houses within the 35 ke zone in the AMER calculations is not 19,400 but 15,100 houses. According to the AMER, the number of house expected to be located within the zone was unaltered, and would amount to 12,600 in the year 2015. The key decision on planning did not enter at length into the discrepancy between this number

⁵³ *Verslag van gesprek tussen onder andere minister VROM en gs Noord-Holland, 16 oktober 1992*

⁵⁴ *Memo DGM dd 28 september 1993: betekenis cijfers geluidsbelasting: zoneringsberekening overschat totale hinder met 20%*

and the 10,000 mentioned in the key decision. Neither were any reactions found by the other discussion partners.

Nevertheless, the environmental report drawn up by Amsterdam Schiphol Airport⁵⁵ announced that the number of exposed people of 13,656 was within the legally required maximum. This shows that it was not generally known how the meteorological margin had to be calculated. As the difference between the 1990 situation and the present situation is increasing as times goes on, and as the population of The Netherlands is still growing, one can expect that the number of residents and residences within the relevant areas will be more than predicted, and that the gap between reality and prediction will become ever greater.

The environmental balance report for the year 1996 gave a description of the real situation for both the noise and the external safety, but not all policy-makers were pleased with the outcome⁵⁶.

Conclusion

The description in the chapters above can give the answers to the questions in chapter 1. The description also shows that much knowledge and research was generated in the early stage of planning the extension of Schiphol, the Action Plan for Schiphol & Environs.

However, to some people, the basic plan - the construction of the 5th runway parallel to the Zwanenburg runway - was a plan that already existed.

From generated knowledge it could already be postulated in 1992 that the intended growth could be realised within the environmental preconditions and within the anticipated capacity in the air at the present location only if the growth would be at the lowest minimum of the known range of the estimations given in the iee.

Nevertheless, in the economic considerations, the predictions of the growth had already been characterised as minimum guarantee:

“In any case, a no-regret policy seems to make preparations for a minimum growth to about 40 million passengers in the year 2015, a level that was indicated in every scenario but combined with the general principle for long-term decisions: ‘investing for the minimum, budgeting for the maximum’. This is essential because the analysis indicated that in the bg/gli scenario there is the risk in the long term that the Action Plan will not come up to the mark. And if the choice is narrowed down to whether or not carrying out the Action Plan Schiphol & Environs, the Action Plan would be the superior strategy: in all scenarios, Schiphol and The Netherlands come off better.”

This indicates that it was not expected that this growth was the limit.

⁵⁵ Amsterdam Airport Schiphol milieu jaarverslag 1996

⁵⁶ Brief v&w aan RIVM, 20 augustus 1997

The investigations carried out later for the Environmental Impact Assessment supported this conclusion. Worse still, it became clear that the majority of the environmental objectives would not be achieved.

Ignoring this conclusion, it led to the 1998 situation as described in the In 't Veld report⁵⁷: the situation in which, as a result of the faster than expected aviation growth, the preconditions in the key decision on planning about the environment are not likely to be met, the double objective is not likely to be realised, and even great policy and technical efforts must be made to keep the noise nuisance within reasonable limits in the short term.

The generated knowledge was then used to reformulate the objectives whenever possible. As to the external safety, the generated knowledge that could jeopardise the plan was concealed for some time.

For some results, a lack of basis or knowledge was posited. However, for taking the decisions, the available knowledge seemed to be adequate and sufficiently underpinned. Indeed, the difference between the desired and the developing situation was so big that additional knowledge to be acquired would not have changed it.

Each of the investigations presented ranges. However, in the decision-making process, the lowest estimated range of aviation developments (which were the most favourable for the environment) were combined with likewise convenient population figures instead of the more likely developments that were indicated in the reports.

The generated knowledge did not result in a change of plans.

The valuation of knowledge was approximately proportionate to the degree in which the acquired knowledge seemed to support the plan.

There are no indications that weighing had taken place to such extent that the results of the agreed weighing method and the alternatives to be considered would have been different from the final result.

Still, an analysis of the risks was lacking. As it was, the decision on the construction of the fifth runway was characterised as a “no regret” decision. An analysis of the consequences of a development that deviated from assumptions, of the possibilities to actually influence them in a realistic assessment of the political and economic context, could have more tersely put forward the already available ranges in studies.

However, there seems to be an analogy between participants in a large-scaled decision making process and organisations that control e.g. complicated chemical processes⁵⁸, which means that one may become less susceptible to information that gives rise to facing the possibility that the line already embarked upon has to be changed.

57 Prof dr R.J. in 't Veld: een verstandshuwelijk tussen luchtvaart en milieu. Eindrapport commissie van deskundigen, 27 januari 1998

58 A.J. Smith et al: human factors in management and organisation., international conference on hazard identification and risk analysis, ccps, orlando, florida, January 1992

Knowledge and the Betuwe track

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Introduction

This contribution follows the questions posed by the RMNO as closely as possible. The most important source is the report that was drawn up under my supervision “het project Betuweroute: spoorlijn of bestuurlijke co-productie?” (Huigen, Tops & Frissen, 1993). In addition I consulted “slag om de Betuweroute” (Boom & Metze, 1997) and the report of the Hermans commission⁵⁹ (23 January 1995).

First of all I wish to remark that the concept of ‘knowledge’ is very diffuse, also in the questions formulated by the RMNO. It is not clear what knowledge must be distinguished from. Is there real knowledge versus uncertainty and obscurity? Is there any other valuation of knowledge than an emotional valuation?

In view of the nature of the institute that has given the assignment I assume that knowledge especially is meant to be knowledge based on scientific research. I will specify the concept or put it into perspective in answering the questions concerned.

Question 1: *at which point of time and on which scale level was knowledge about the environment and nature contributed to the process of decision making (calculated from the phase of exploration up to and including the phase of execution)?*

Knowledge about nature and the environment was contributed during all phases of the process of decision-making. Somewhat ominously Boom and Metze mention the figure of one hundred and forty reports that have been produced during the entire project. The knowledge industry certainly profited from the Betuwe track. Knowledge about nature and the environment is an item of discussion in many reports. This is very explicitly so in the Environmental Impact Assessments (EIA's). But nature and the environment is also taken into account in many scenarios and economic analyses. During the phase of the drawing up of the agenda, that certainly lasted about ten years, thinking in terms of economy and infrastructure initially dominated: Rotterdam, mainport, hinterland connections, national economy, etc.. Gradually nature and the environment were taken into account more and more. This was done particularly for reasons of coalition forming, on the one hand towards the Ministry of Housing, Spatial Planning and Environment, on the other hand towards environmental organisations and advisory councils. It is therefore remarkable that initially the project Betuwe track can be seen as a successful coalition of economic and nature and environmental interests. Remarkable since this coalition has fallen apart during the further progress of affairs.

That has also to do with the scale level. At the start of the drawing up of the agenda the project Betuwe track was particularly an idea of local and provin-

⁵⁹ The Hermans Commission gave advice on the necessity and usefulness of the planned Betuwe Railway track in 1995, after a new coalition came into power. The coalition parties had agreed to ask for this advice.

cial organisations. At that time nature and the environment only play a limited role. After the project reaches a national level, nature and the environment are discussed more explicitly, since then the discourse of ‘sustainability’ can be invoked and the formation of a platform of support (between the departments and with environmental organisations) is urgent.

Upon the further development and determination of the policy, the project again descends to ‘lower’ levels and nature and the environment are filled in differently. Then nuisance and hinder dominate the debate and coalitions are formed between administrators, parties directly interested / parties that suffer damage and environmental organisations.

As such, this is interesting, since it shows that also knowledge about nature and the environment is context-bound and therefore political and negotiable. As the project progresses, there is an ever increasing ‘ritualisation’ of the use of knowledge. Each point of view has its own report and each stance can be based on figures. According to one report the Betuwe track is an evident contribution to sustainability and protection of the environment, while other reports mention clearly negative environmental effects of the same railway track. A bizarre highlight is of course the bomhoff report and the CPB calculations. According to boom and metze figures can even be provided showing that the complete asphaltation of the island of texel will have strong multiplier effects.

Question 2: *which part of this knowledge has been used, which part has not been used and can it be indicated why it has not been used?*

In as far as I know effective use of knowledge of nature and the environment particularly occurs in the EIA’s and also, albeit to a lesser degree, in the case of the hermans commission. As I perceive it this had to do more with the formal status of the reports in the case of the EIA’s (prescribed during specific phases of the process of decision-making) than with the intrinsic value of the knowledge about nature and the environment. Knowledge about nature and the environment for the remainder especially has a meaning as a factor in the construction of a platform of support. If something that is desirable from an economic point of view also has positive environmental effects then this is an advantage that can convince other parties to support that view. Other knowledge too, specifically economic knowledge, has rather a strategic than an objective scientific meaning. Ironically in particular the suggested objective scientific stature of that kind of knowledge represents the most clear strategic value. In the quasi-rational policy discourse ‘hard’ facts and figures of the economists usually convince many people. I call this the sacral side of economy.

The reason why knowledge about nature and the environment has not been used or has only been used insufficiently is of a political-social nature. Where it concerns economic values – however ill founded – ‘nature and the environment’ are a weak and soft power factor. And where it concerns considerations of hinder and nuisance for people living in the vicinity, the “nimby” register is opened quickly. Listening to the passing of freight trains with a high fre-

quency and during twenty-four hours a day is not a thing to enjoy (the sound simulator used during a campaign was very effective), but the higher interest of national well-being requires sacrifices.

Question 3: *was there sufficient knowledge about nature and the environment available, or was certain knowledge missing? Was lack of knowledge signalled in evaluations of processes of decision-making or by certain actors and were they justified in doing so?*

In my opinion there was sufficient knowledge about nature and the environment available. This could hardly be otherwise given such a massive production of knowledge. Still environmental organisations and pressure groups undoubtedly will say that not enough knowledge was used. Very frequently actors insisted on additional research. The hermans commission also ordered this additional research to take place. Interesting is that almost all parties involved apparently are thoroughly convinced that additional research will support their positions. The ‘myth of knowledge’ – more knowledge will lead to a better decision-making – plays a major role. Everyone is captured by the scientific paradigm – from the mainport lobby up to and including the environmentalists.

Contrary to this, knowledge about processes of decision-making played a much less prominent role. As we showed in our report (huigen, Frissen & tops, 1993) the course of the process of decision-making was mainly directed by the dominance of specific routines, the prevalence of a limited number of professions and the wish to maintain the political primacy. As a result the process became strongly linear and effective participation was only possible by adopting a contrary attitude. The administrative damage caused by the process of decision-making (mayors who were required to lead campaigns) is directly linked to the logic and dynamics of the process, as it was given shape. Remarkable is that defective administrative knowledge applied to almost all parties involved. However, it can be stated that as the process continued and after the arrival of minister jorritsma more administrative sensitivity was developed, specifically also as a consequence of learning experience gained by the project group.

Question 4: *how did one deal with the uncertainties in knowledge (both in the field of nature and the environment, and with respect to other sectors)?*

Upon the establishment of uncertainties in knowledge – both in the field of nature and the environment and regarding other domains – a pavlov reaction always occurred: reduction of uncertainty is required and for this purpose more research and collection of more information is necessary. This quickly results in a spiral of accumulation of facts. This research shows that.....That research shows that.....Other research in its turn shows that..... every social scientist knows that research, by intelligent manipulation of the questions, can show anything that is desired. Here again the pre-occupation of almost all parties involved with science plays a role. Research is used to reduce uncer-

tainty. However the reverse effect is inevitably created: research increases uncertainty. This has to do with the fundamental reflexivity of knowledge. Not only does every production of knowledge lead to learning behaviour on the part of the parties involved and therefore to context changes, but every production of knowledge also changes the empirical reality to which it relates, because of the simple fact that the production of knowledge has been added to that reality and therefore the conditions of its validity have changed. Therefore production of knowledge must be seen much more often as a process to arrive at 'negotiated knowledge'. This means that more attention must be paid to the process of the production, processing and use of knowledge in processes of decision-making; that the production of knowledge must be seen a possible strategy (next to many others) to arrive at an enrichment (conform teisman) of the process. In that light it is recommended to see knowledge not as a form of reduction of uncertainty, but rather as the reverse: as an attempt to increase the uncertainty and thus to prevent that the process of decision-making too quickly has a specific variant as intended outcome. For the chance that such a variant is a less intelligent one is greater when more variants are available. Other arguments in favour of this approach can be given. A project of decision-making that aims at an intended outcome runs a high risk of promoting technologically sub-optimal choices. In the case of too early an agreement about the desired outcome (the Betuwe track is a railway track) one quickly chooses for the technology of the past. As a result of this a variant that is unprofitable as yet at the moment of decision-making (the drilling method) is swept from the table too quickly. It would have been wiser if the definite decision-making about variants and methods of lay-out had been shifted to a point of time in the process that was as late as possible. For what we now have is a false certainty: a railway track that will cost ten thousand million guilders (ever heard of costs overrun in infrastructure?). An alternative scenario would have been imaginable: one should state a vague policy aim (improvement of the hinterland connection of Rotterdam), one should reserve an amount of ten thousand million and one should invite the parties involved and ask them to generate as much creativity as possible. Given the fact that the initial budget was more than two thousand million, it seems to be quite certain that all parties involved would have worked out a plan with much ambition and much creativity. However, a necessary condition is then that political testing in particular is related to the quality of the process and of the outcome. The political primacy then would not concern the exact route of a railway track, but the democratic and social carefulness and accurateness of the process of decision-making.

Question 5: *did the (extent of) quantification of environmental and other (specifically economic) information play a role in the decision-making?*

The extent of quantification of information concerning the environment, nature and economy played a very large role. The harder the facts, the more valid they are apparently deemed to be. The fact that all this hardness always was based on butter soft axioms is only a point of discussion when the facts

are found to be unfavourable. The numerous economic reports show this in a sobering way. Economic science of course in its essence is a behavioural science, the assumptions of which with respect to individual and collective acting are much more interesting and at the same time more questionable than the outcome calculated mathematically. Still it is this outcome that dominates the debate.

The counter-strategy of the environmental and nature organisations is caught in a similar paradigm. We could call this the air pollution detector obsession of the environment devotees. The environment and nature are seen as objective entities and their quality can be measured in quantitative variables. Just like this is not the case in economics, the primary objects of knowledge are not seen as cultural constructions that are context-bound and therefore are not at all values-neutral. Noise pollution can not be measured. Only noise can be measured. What pollution is, is a construction, a collective arrangement. And even that arrangement in its turn is context-specific, for under strict maintenance of the noise standards the Amsterdam Leidseplein should be closed. The fact that we do not do this, is not so much a concession to the standard as well as recognition of the negotiating and fragmented nature of social reality.

The position of quantitative environmental and nature information is furthermore a tragic one. When the economic discourse is dominant, hard data that are met unfavourably are swept from the table easily. The non-valuation of such data then is presented, remarkably enough, as a form of realism, while the environment devotees are pictured as idealistic dreamers and soft complainants. The extent of quantification of information must be mainly appreciated as a rhetoric element. A certain kind of definitiveness convinces a certain kind of actors; the actual decision-making is mainly a question of specific coalitions that have succeeded in making their discourse authoritative. It is ironic that even now the only definitiveness that is certain is that of the ten thousand million guilders that will be the minimal (!) Costs of the Betuwe track. Apart from this, everything is uncertain. The increase in containers in the Rotterdam port will, it is true, increase the port duties received there, but in terms of added value there will be not much to realise if the advantages of the Betuwe track mainly consist of faster transportation possibilities and an uninterrupted transportation.

Question 6: *how did the communication of knowledge from the various disciplines go (e.g. were there any problems because of technical jargon, aggregation level of the information)?*

The communication of different kinds of knowledge from various disciplines in my opinion on the one hand offered no problems at all and on the other hand offered especially many problems. That communication offered no problems in so far as all interests involved based their various positions on quasi-hard figures and facts from research carried out by their orders. I have already remarked that almost all parties paradigmatically were one-dimensional: what can be measured is true. In the case of disappointing results the

reaction is obvious: the assumptions of the research were not sound. Still this never leads to the conclusion to concentrate the debate and deliberations on those assumptions.

The communication was problematic in as far as the use of knowledge must be seen mainly as a rhetoric strategy. The reports of agencies such as mckinsey and knight wendling are convincing for those who were already convinced of the usefulness of the relocation of atoms as core of the Dutch economy. The nuisance figures are convincing for people living in the immediate vicinity and for protectors of toads. Remarkable is that really only the CPB (Central Planning Office) has attempted to arrive at some debunking of all euphoria with respect to the hardness of the economic prognoses.

In retrospective it is remarkable that hardly any explicit strategy has been followed with respect to communication. Of course information was given (initially even very defectively by the NS (Dutch railway), with “false” maps and “dubious” data) and participation was organised. There was no communication in the sense of a process of coproduction of the policy, of negotiation, of exchange and of arriving at negotiated knowledge. The strong focus on the intended outcome (a railway track), the unnegotiability of alternative economic scenarios and the preoccupation with the political primacy are the most important explanations for this. Also the dominance of the juridical and engineering rationality have played an important role. What seems logical on the drawing table, is soon met with objections, but those objections can easily be called irrational. What has been developed on the drawing table is subsequently transferred to the linear logic of legislation and regulations. In a procedural respect the communication then is limited automatically: the party who wishes to join the discussion must declare itself to be an opponent. The offering of alternative possibilities has little effect and quickly is met by reproaches regarding obstruction of the process or typical behaviour of a querulous person.

Question 7: *how was the knowledge from the various disciplinary approaches valued in the decision-making? Can it be indicated where emotional valuation was decisive?*

The valuation of the knowledge from the various disciplinary approaches has been balanced and unbalanced.

It has been balanced in as far as all knowledge – from whatever domain – that met the requirements of quantification and adjustment to the model has been used in the decision-making. It has been unbalanced in as far it concerns the a priori's of the project. The decision making project always had the desired outcome as its point of departure: there must be a railway track, because Rotterdam is and must remain a mainport and the importance of the transportation economy is beyond any doubt. As a result the use of knowledge was always limited to this context. The reasoning of the hermans commission shows this quite clearly. Flows of transport increase – Holland is a Distribution Country – road transport has adverse effects on nature, the environment and on mobility – water is no adequate alternative – then the

railway track remains – the railway has positive environmental effects – ergo: the choice in favour of the Betuwe track is inevitable.

The nature of the routines in large infrastructure projects, the filling in of the political primacy, the dominance of the transport and port lobbies, the thinking in terms of asphalt, concrete and railway tracks on the part of the large decision-makers – this all prevented that the decision-making project Betuwe track would have any other subject of attention than a west-east railway track for the benefit of Rotterdam.

It is remarkable that during the project no alternative coalition has been created in favour of a completely different use of the money for the Betuwe track. Eckart Wintzen has made an attempt in this direction: put the ten thousand million in the glazing of the electronic infrastructure. A coalition between ICT companies and environmental organisations, based on the sustainability effects of investments in the economics of knowledge however did not occur. Not even today. Perhaps the average president-director of an ICT company is more annoyed by traffic jams than by the curious preoccupation with classical infrastructure that the remainder of the companies and political civil servants have.

From the above it can be concluded that I think that the question when an emotional valuation has been decisive is rather tendentious. In my opinion all valuation of knowledge is determined culturally and therefore to a certain extent irrational or emotional. A dichotomy between emotional and rational valuation can only be made from a supposed superiority of the rational scientific paradigm. Any form of valuation is rational within its own context. The African rain dancer who causally relates the rain to his dancing is as equally rational as the professor who computes that investments in infrastructure have led to positive economic effects. Any reconstruction of social processes shows that in social reality causality can hardly ever be proven to exist. The views about the importance of Rotterdam as a mainport are rooted as much in a hidden nostalgia about Holland as a sea sailing nation as in the remarkable desire to be the largest port in the world. The ambitions of “Holland, Distribution Country” are more based on the protection of interests than on a historical awareness: there was a time that Holland was a textile country, coal country, leather country, pig country..... There is nothing wrong with this, but in this context the scheme rational-irrational seems to me to be only fruitful in a rhetorical way.

Question 8: *in which way did the weighing of different aspects take place in the decision-making (methods, instruments)?*

The weighing of various aspects took place in the production of knowledge in varied ways. The research reports and studies use strongly varying methods and instruments.

In the decision-making project itself the weighing was more ‘classical’. After the drawing up of the agenda – the lobby to get the Betuwe track – we see a traditional policy process. There exists an intended decision; first a platform

of support amongst politicians and civil servants is formed and subsequently a social platform; subsequently there is a period of information about the intended plans (that is, by the way, of such a nature that immediately much opposition is mobilised); this is followed by the formal procedures (EIA, key national planning decision, legislation etc.) With the participation rounds described in them. There has not been much deviating process architecture. There has been no invitation for enrichment through the formulation of alternatives. Methods of interactive policy development have hardly been used in the project. The formation of a consensus suffered from the intrinsic logic of the process that had only adherents and opponents.

Conclusion

If the project Betuwe track teaches anything about under-use of knowledge, it is the fact that there was no knowledge about administrative processes, about process architecture, about interactive policy development, about co-production. All insights that have meanwhile been generated by public administration science were absent at least in this project. With as its consequence: large administrative damage, pseudo-certainties about costs and feasibility; no openness towards the development of technological alternatives; fixation on a very narrow perception of economic interests and developments; loss of legitimacy of the central government towards other authorities and social organisations. It is ironical that the initial environmental image of the Betuwe track almost entirely disappeared and that nuisance and hinder perceptions have come to dominate. The possibility to arrive at a permanent internalisation of environmental knowledge in large infrastructure projects is damaged rather than made use of in this project.

Those who would wish to promote such an internalisation should however not stare themselves blind on the scientific paradigm. However many air pollution detectors are placed, an authoritative position of environmental knowledge could be acquired sooner by a recognition of all forms of knowledge being culture-bound and by an institutionalisation of such a recognition in structures and processes of decision-making. Another structuring of decision-making projects about large scale infrastructure seems more obvious than a further intensification of the counting and measuring.

Environmental experts and economists often resemble each other much more than they are willing to acknowledge. The tragic thing is then that the immediate interest and the monetary gain is so much more concrete and appealing than the soft values of sustainability.

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Environmental knowledge in the margin of the manure policy

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Introduction

In the first half of the 1970s, a number of soil experts and agricultural scientists that were involved in a study into solid and liquid manure and stench, became more and more convinced that there were serious manure problems, which threatened to affect the quality of soil, surface water and groundwater (termeer, 1993). For a long time, these warnings had not been taken seriously by agricultural policy-makers and the organised agricultural enterprises. When there were local manure surpluses, they could simply be removed by spreading – with the help of manure banks, among other things. The message that minerals were accumulating in the environment with possibly irreversible consequences for the environment, was generally ignored or disregarded (Frouws, 1994).

The recognition of a problem

A first, tentative recognition by the agricultural enterprises of a structural manure surplus on operational level and the necessity to set standards for using animal manure on cultivated land, came from the so-called latijnhousers committee in 1984 (Advisory Committee, 1984). Agricultural use of the soil, the quality of agricultural produce and the fertility of the soil in the long term, formed the point of departure for this committee of agricultural civil servants, agricultural researchers and Agricultural Board representatives. Worries about groundwater quality with a view to drinking-water supplies or its value to nature were beyond the scope of this committee. They were more concerned about the quality of the manure, and agricultural research had to focus on application possibilities, processing and converting manure and limiting mineral deposition; in short: on technical solutions of the manure issue. Hence, an important portion of research efforts was focused on these technical solutions. Large scale processing of manure and the export of minerals that was linked to this, was the ultimate solution that the agricultural policy-makers had in mind. Until then, it was no use saddling agriculture with stringent standards on applying manure and banning animal manure spreading. These measures would put the sector to unnecessary expense for selling and storing manure, which, of course, would be arranged via central, industrial manure processing within the foreseeable time. From this perspective, there was little need for knowledge of the environment and nature that could give insight into the nature and the extent of damage caused by over-fertilisation, and insight into manure standards to curb the damage and to meet the target figures for groundwater and surface water quality. If all manure from livestock farms without or with little land would go to manure-processing factories, all environmental problems would soon belong to the past.

When, in the early 1990s, it became more and more obvious that the required manure processing capacity would not be met in 1995, when the third and last phase of the manure policy was to be started, the issue of the real nature and extent of the phosphate, nitrogen and ammonia problems became more and more pressing. This, of course, also applied to the issue of how and to what

extent the mineral problems could be abated. These questions were relatively poorly dealt with as compared to the research efforts into the composition and utilisation of cattle feed, and into the distribution, the processing and conversion and application of manure. When in 1995, within the framework of preparing the ‘integral memorandum on manure and ammonia policy’ (IN) the question was asked what minimum manure dressing was needed from an agricultural viewpoint, and how much manure could maximally be applied from an environmental viewpoint, it appeared that know-how was inadequate to reply to these questions. Until that point of time, there had been a “poor underpinning of both quantities” (Ministry of Agriculture, Nature Management and Fisheries, 1995). For the political decisions on the manure policy that were to be made at the end of the year, there was, in fact, insufficient know-how about the relationship between the established standards for phosphate and nitrogen losses and about the requirements set for groundwater in view of *drinking water* supplies. Knowledge about quality requirements for groundwater related to its worth in *nature* did not play any part at all in the decision-making. The inadequacy of the “present insights” to which the integral memorandum repeatedly referred (pom, 1995), indicated that knowledge on nature and the environment was basically of little importance. The only message extracted from it was that “restricting the environmental burden” (idem) was called for. The methods and the extent of the restriction, however, were mainly determined by what was deemed necessary from the agricultural viewpoint and from the interest of the socio-economic sector.

The primacy of the agricultural approach

The latijnhouwer committee, which played an important role in the agricultural sector’s recognition of the manure surplus problem, took the standards of the institute for soil fertility (ib) as their starting point in setting the surpluses. These standards indicated the “quantity of manure that can be utilised without having harmful effects on crops and without expecting direct harmful effects on the environment (Advisory Committee, 1984, appendix iia). As long as the crop grows and as long as it does not cause *direct* damage to the environment. Though this starting point went way too far for agricultural representatives in 1985 (Frouws, 1994, page 95), it indicates in brief and to the point the agricultural point of view, which was to put so great a mark on the manure policy development dominated by the agricultural department and the organised agricultural world between 1984 and 1995. Its popular form is the ‘farmers’ approach’ that says that there is no big deal as long as the crops and the animals are thriving and as long as the trees in the yard look fine. Environmental quality, animal welfare or the quality of nature function as derivatives; the primacy lies with agricultural performance. In essence, this was also the case with the ‘early warners’ from the quarters of agricultural research, such as the consultative board for soil, water and manure/fertilisation affairs, albeit they generally employed a wider time perspective. They

were convinced that it was in the interest of the agricultural world itself to combat over-fertilisation, since this was a threat to the production capacity of the soil (termeer, 1993, page 119).

The primacy of the agricultural approach implies that an agricultural minimum is fixed to each administrative standard for the use of manure or losses of minerals. The standard requirements should never be so strict that these (could) give a decrease in yield or in the production capacity of the soil. In the period between 1984 and 1995, 'sub-optimal' agriculture had never been a serious option in the discussions about manure policy. This option clashes so much with farmwork ethics that it is practically unimaginable, and in any case not open to discussion. Though it is indicated in the initial official papers for the integral memorandum that the most radical option for nitrogen and phosphate standards in the year 2000 are "below the agriculturally-feasible level and more in the region of what was environmentally desirable" (Ministry of Agriculture, Nature Management and Fisheries, 1995, page 15), this variant had never been considered to be a serious option and was only mentioned for the sake of being theoretically thorough. The formulation of '*more in the region of what was environmentally desirable*' tells its own story. It tells that knowledge about nature and the environment does not matter so much and that it is irrelevant as far it relates to all that is below the "agriculturally feasible" level. As a matter of fact, it appeared from the 'project losses standards' that even this agricultural minimum had not been a relevant subject of research. Or, as one of the policy officials put it: "in fact, agricultural research had not done the job, they had never done studies into how *little* one could manage with" ⁶⁰.

Where slowing down or 'restricting' eutrophication and acidification appears to be an enormous policy effort, know-how about what happens in soils, groundwater and natural ecosystems seems of little importance, just as little as defining the environmental quality requirements to be pursued. Then it simply suffices to state that "the extent to which the phosphate saturation of the soils increases, will be curbed" (pom, 1995). What the effects of this – though curbed - *increase* of phosphate saturation are on nature and the environment was irrelevant (and does therefore not play any part in decision-making about manure policy) as long as it only deals with curbing the environmental burden 'within or at the bottom of the range of the agricultural feasibility'.

A clean-up operation based on environmental considerations of the 'most seriously phosphate-saturated soils', not to speak of the "other phosphate-saturated soils" as advocated by the joint nature and environmental organisations for the purpose of drinking-water supplies and eutrophication of the surface waters (Ministry of Agriculture, Nature Management and Fisheries, 1993), fell beyond the relevant horizons of the manure policy-makers in the studied period (1984-1995).

60 Personal interview for RMNO-study, dated 2-6-1998

Environmental knowledge as a background variable

Where the agricultural approach is the first matter of importance, the relationship between manure policy measures and specific environmental and nature purposes is of secondary importance. Making a generic ‘environmental profit’ will then suffice. The memorandum to the Lower Chamber about the measures for the third phase under the chapter “consequences for the policy on the environment” did not say anything about the state of the environment and nature, or about the development of the environmental quality (Ministry of Agriculture, Nature Management and Fisheries, 1993). It only mentioned that the nitrogen surplus of Dutch agriculture was decreasing, that the rate of phosphate saturation was declining and that the ammonia emission would be further reduced. Here, the know-how about nature and the environment, especially the harmful effects to them, only had a role as a broad background variable (‘things are looking bad, and must look better’), and no ‘role of their own’ was awarded.

The primacy of the agricultural approach was also striking in the case of policy plans based on primary environmental considerations. In 1985, for example, the option for a differentiated standard was quietly dropped (Frouws, 1994, page 105), whereas the differentiation for manure standards was as a matter of course based on (knowledge about) the quality differences of nature and the environment in the rural areas. On the basis of an agricultural ratio, the distinction between clean and unclean areas was not important, and because, in arable farming, no more fertilisers would be used than agriculturally necessary in ‘clean’ areas, over-fertilisation would not get that bad. Adding to that the problems with the legal and technical implementation, the dispute was settled.

A case in point was also the way in which the (European) environmental guidelines and environmental quality targets were handled in decision-making. The ec-nitrate guideline – a quality target for groundwater related to the drinking-water supplies – was a matter that was not taken seriously at all during the implementation of the third-phase manure policy. The conclusion that the nitrogen levels for animal manure as mentioned in the nitrate guidelines, were under the level that agrees with the average phosphate losses in grasslands in The Netherlands and that was still ‘agriculturally feasible’ (Ministry of Agriculture, Nature Management and Fisheries, 1995), meant the end of the discussion. The difference with the Dutch agricultural practice is too big. A discussion on e.g. groundwater supplies including the nitrate guidelines (at 0 or at 2 metres under the water table) was no longer important. In the final policy document there was the simple information that the relationship between the intended policy and the objectives of the ec nitrate guidelines was tense (pom, 1995).

Neither could the objectives for quality in surface water be traced in the decision-making about the third phase of the manure policy. The primacy of the agricultural approach was also in this respect decisive. Nitrogen fertilisation levels adjusted to the surface water objectives may result in “adjusting the agriculturally optimum fertilisation level ... downward” (Ministry of Agriculture, Nature Management and Fisheries, 1993, page 24). This did not

take place. The integral memorandum only mentioned an emission reduction objective within the framework of the rhine and North Sea Action Plans. With the intended losses standards, this objective could be met later on (after the year 2005). However, the nitrogen fertilisation level that goes with it, lies far above 'reasonable' manure additions to meet the objectives for surface water (ibidem).

Ignoring or miscalculating the harmful environmental effects of processes like continued effects, mineralization and deposition within the framework of loss standards, also typifies the predominance of the agricultural line of approach. They relate to processes that, from the agricultural line of approach, cannot easily be influenced, and if they can, only by making additional efforts. Continued effects of over-fertilisation will lead to a gradual wash-out of minerals accumulated in the soil, and will thus determine also the extent to which the quality standards for groundwater and surface water can be met. Mineralization from organic matter and atmospheric deposition form a supply of nitrate wash-out. Ignoring this so-called basis wash-out (biernans et al., 1988) Means that the nitrate load of the groundwater is systematically underestimated. Therefore, knowledge about this environmental effect does not play any role in the decision making on the manure policy.

The primacy of the agricultural line of approach means that agricultural practice (whether it is the current, the good or the optimal practice) is the starting and ending point of policy argumentation. It is not the desired quality of nature that is the point of departure from which consequences for agricultural policy will be derived, but it is the agricultural possibilities for emission reduction that determine the scope of the policy measures. The objective of the acidification policy related to agriculture is therefore not formulated in the 'positive' terms of nature values striven for, but in 'negative' terms of "prevention of the most serious effects on wooded and nature areas" (Ministry of Agriculture, Nature Management and Fisheries, 1993, page 35).

Socio-economic preconditions

The socio-economic conditioning of the manure policy can be summarised in the adage of 'feasible and affordable'. Policy measures that cannot bear the test of feasibility and affordability on business farm management level, or that, at a higher aggregation level, are seen as an encroachment of the 'interests of the sector' or 'international competitiveness' may seem very desirable on the basis of knowledge about nature and the environment. They were nevertheless systematically blocked in the political-administrative decision-making of the 1984-1995 period.

The manure policy has a phasing that was meant to allow enterprises sufficient time to find and to effect solutions. In the first phase (1987-1990) the matter of a cutback of the environmental burden was hardly raised. This phase was considered to be a 'brake path', focussed on 'stabilisation of the

manure issue'. The sector had to have the time to work on improving animal feed (utilisation), manure transport and dispersion and on manure processing. In anticipation of things to come, the fertilisation standards were stretched so far that all manure was 'realistically disposable'. The manure surpluses were thus temporarily dealt with, because maintaining a 'socio-economically healthy agriculture' and 'prospect-offering cattle or stock farms' were the first matters of importance. This meant that the existing livestock, including the considerable expansion that followed the restriction of pig breeding and poultry farms interim act of November 1984, had to remain and that the farmers were not to be put to great expense for storing and transporting manure.

1994: "Feasible and affordable" still the starting point

Ten years later, when it had become clear that progress was absolutely inadequate, particularly in prescribing the solution to manure processing, the socio-economic preconditions were nonetheless still adhered to. From the fact that the required manure processing capacity had not been reached in 1994 for balancing the manure production with manure outlet possibilities, the conclusion that the time had come to apply the sanctions of volume measures to curb manure production was not drawn. Instead, the intended restriction of the environmental taxation to a level of 'balanced fertilisation' was postponed for 10 years, from the year 2000 to the year 2010. After more than ten years of manure policy, the deliberations in the integral memorandum between the 'necessity to restore the quality of our living environment at a high rate' and 'the interests of the agrarian sector' turned out to be in favour of the latter (pom, 1995). The '*starting-points for the policy*' as formulated in the integral memorandum, showed in the first place the importance that was attached to the economic possibilities and the competitive power of agriculture. Attention was given to creativity and proper entrepreneurship of farmers, joining in with the dynamics and innovative power of agriculture, practical implementation and feasibility of measures, business development and technological innovation as driving forces for clean production, and there was much concern about encouraging and increasing awareness of farmers, and especially preventing that farmers became discouraged and dejected. Conspicuously little attention was given to starting-points for the policy based more on the interests of nature and less on socio-economic interests. No words were devoted to the characteristics of a 'clean' or 'ecologically responsible' production, to quality requirements for soil, for surface water or for groundwater, or to the principle of 'the polluter pays' or to the relationship between agriculture and other economic sectors in their aim at a sustainable economy in The Netherlands.

"No outlets for manure surpluses": under no circumstance

The most decisive socio-economic precondition was the 'outlet possibilities' of the manure surpluses. Under no circumstance was the manure policy to result in 'no outlets for manure surpluses'. Quantification of this 'no outlet for manure surpluses' has always played a crucial role in the manure policy. In all policy memorandums and regulations on the manure issue, the phrasing

of the policy depended on the progress of finding a solution. If, for insufficient progress, there was the threat that there would not be sufficient outlet for manure surpluses, then time should be marked. Too much 'pressure on the manure market' would force farmers either to dodge the rules, or to pay very high prices for selling the manure or for taxation, and this could lead to 'cold reorganisation'. Such 'socially and legally unacceptable' development (Ministry of Agriculture, Nature Management and Fisheries, 1993, page 31) has always been avoided in decision-making, at the expense of reducing the environmental burden, of course. The constant and extensive quantification of non-marketed manure contrasts sharply with the near-absence of the quantification of environmental effects.

In decision-making on the manure policy, knowledge about these effects did not really make any difference, since the limitations of the policy possibilities were determined by the outlet possibilities of the manure surpluses. That was the reason why the standards for applying animal manure, and later, the initial standards for mineral losses were set at an environmentally unacceptably high level.

Besides legal and implementation problems, the extra non-marketed manure surpluses that would be the result of a regulation for phosphate-saturated soils, were also an important reason to abandon the special policy for phosphate-saturated soils, even where that could have harmful effects on valuable brook systems. That was why knowledge on the possible damage to brook valleys, on the seriousness and the extent of the expected phosphate dispersion and its effects on the quality of the surface water (connected with groundwater) and on the costs of extraction of drinking-water from polluted groundwater, hardly had policy-making relevance and know-how on these issues did not play any substantial role in the decision-making.

The ban on dispersing manure

The ban on dispersing manure is a typical example in which policy-makers and decision-makers made the environmental-technical know-how subordinate to management-technical and enterprise-economic considerations. Intervention by a committee of experts greatly liberalised the original proposal for a regulation on dispersing manure, so much that especially fertilising before and after the growing season and dispersion of nitrate in late season were less restricted than would otherwise have been the case (Frouws, 1994). In order to spare the sector in enterprise-economic respect, the recommendations of institutes like the union of water boards, the vewin drinking water supplies and the centre for agriculture and the environment were relegated to a next policy phase. In no less than 10 years, such subordination of almost generally accepted environmental viewpoints to enterprise-technical considerations was repeated: in this case it was related to applying animal manure to pastures in September. The memorandum on manure and ammonia policy third phase declared that there was no agricultural necessity for applying manure to grasslands in September, and that this would lead to harmful environmental effects, in this case the wash-out of nitrogen (Ministry

of Agriculture, Nature Management and Fisheries, 1993, page 33). The ban on applying emission-poor manure to grasslands in September was presented as “one of the few measures that may compensate the n/p-connection” (ibidem). Despite the knowledge on the environmental-technical desirability which was put forward in a public policy memorandum, the ban on applying manure to grassland did not pass the integral memorandum undamaged. In this case, it was the pressure by farmers’ protests based on management-technical arguments that brought about the socio-economic conditioning of this environmental measure.

Mineral losses standards

In the decision-making about the most important and most controversial part of the manure and ammonia policy for the third and last phase, the ‘programme’ with mineral losses standards until the year 2010, social-economic considerations were the decisive factors. During the joint desk study by government and business circles into acceptable phosphate losses in case of balanced manure application rates, they were faced with a lack of knowledge about the possibilities for bridging the difference between the phosphate loss that was maximally permissible from the then valid environmental viewpoint (around 10 kg phosphate per hectare per year) on the one hand, and the phosphate loss that was, again according to the then valid (limited) views from the agricultural angle, minimally possible on the other hand (around 20 kg phosphate per hectare per year). On the basis of the available know-how, it was therefore not possible to make a decision about the conclusive level of balanced manure application (Ministry of Agriculture, Nature Management and Fisheries, 1995, page 15). But when studies into the socio-economic consequences proved that implementation of the ‘agricultural’ losses standards of 20 kg in the year 2000 would lead to a very substantial non-marketable manure surplus, and that elimination of the manure would entail a 50% cut-back in the number of hogs in The Netherlands, it was a foregone conclusion. Such socio-economic consequences were unacceptable, balanced manure application was not feasible for the time being, and may be reached only well beyond the year 2000. The socio-economic conditioning was exactly what they needed; they were, for the time being, no longer saddled with the much-feared gigantic manure surpluses, and there was now time for further research to determine the levels of balanced manure application for phosphates and especially for nitrates, about which so little was known.

The project practical standards, which was set up for evaluating the manure policy to be organised in the year 2000, fitted into both the socio-economic conditioning and the primacy of the agricultural approach as described above. Both the ‘optimum soil fertility’ and a ‘broad social support’ from farmers were important starting-points (van leusden, 1996). The latter also meant that feasibility and affordability were preconditions, not only for the 240 demonstration farms with a ‘proper agricultural way of working’, but also for the majority of the farmers. The representatives of agrarian stakeholders had already announced that the results of the project practical standards must

be major determinants in case of possible modifications in losses standards in the year 2000. Thus ammunition had been made ready for a progressing socio-economic conditioning of the decision involving the manure policy (Frouws, 1998). The previous history of the project practical standards, one of the results of the intemperate fight for the manure policy guaranteed that the insights to be generated would get the strategic role of knowledge in a process of controversial policy.

Policy in conflict

The first policy initiatives to tackle manure surpluses already dated back to 1970, when a committee of agricultural officials released a report proposing to disperse manure surplus by transporting the fertiliser (to the northern provinces), dumping it into the sea and drying and burning animal manure (Frouws, 1994, page 78). Meanwhile, the ‘final’ solution to the problem – apart from the continued effects until far into the next century – is expected in the year 2010, when the ‘mineral losses standards’ will apply. In other words, the total process of the policy was taking at least twice as long as the period in which intensive livestock farming in The Netherlands developed from an insignificant side branch into an important agrarian sector (1960-1980).

It is clear that tackling this persistent problem passed very laboriously. And then, there was more to it than the ‘usual’ unequal fight in many economic sectors between environmental interests and vested economic interests. It was, in the first place, the specific institutional point of departure of the powerful ‘Green Front’ that had dominated the policy developments for a long time. A second complicating factor was the fired emotions around the manure policy by farmers, circles which caused much and constant attention to be drawn to the ‘social basis’ and which led to considerable delays in the development of the manure policy.

The Green Front

The Green Front, in which the agricultural Ministry and the Agricultural Board had a central place, formed a relatively closed entity of policy-makers, farmers’ representatives and agricultural politicians, and were more or less holding a monopoly on all policies in the agrarian sector (Frouws, 1994). In this relation, it particularly involved the monopoly on technical-economical knowledge about this economic sector and all forms of farming. This was fed and maintained by an important entity of research institutes, headed by the Ministry of Agriculture. The Green Front had an own knowledge system, with ‘own’ definitions of problems and approaches to problems. Illustrative for this relatively isolated ‘agricultural policy community’ (Frouws & van tatenhove, 1993) was a *technological-deterministic* outlook on Dutch agricultural development. In this outlook, science and technology determined the optimum development of agricultural enterprises, and in the final analysis it was the

technical-scientific solutions that should give relief when agricultural development stumbled across problems of whatever kind. The members of the agrarian policy community got used to developing and implementing these solutions ‘among themselves’. And not without success either, as shown by the impressive growth curve of Dutch agriculture ever since the post-war reconstruction of The Netherlands. Against this background, meddling with handling manure surpluses, which were seen as an agricultural problem, was not or was hardly tolerable for researchers and policy-makers without knowledge about agricultural matters. That is why a 15-year inter-departmental competence battle about the legislation on soil protection and fertilisers had preceded this issue, and that is why this battle had also left deep marks when legislation was drawn up (Frouws, 1994, pages 82-85). However, not only was the ‘agricultural inclination’ to solve the problems at home blamed for the inter-departmental deadlocks and conflicts, also the ‘institutional strategy’ of an environmental department that had to get hold of a good position (van tatenhoven, 1993).

The dominant institutional position of the Green Front and its technological-deterministic viewpoints were also prone to disregard those that dared to doubt the perspective of technical solutions as serious discussion partners. This was, of course, a large obstacle to bringing in knowledge about nature and the environment, and to seriously considering suggestions for policy-making. In the first few years of manure policy-making (1986-1990) it was not only the foundation for the environment and nature that was hit by this ‘excommunication’; it also happened to the ‘Advisory Committee for perspectives for the agrarian sector in The Netherlands’, a ‘heavy-weight’ committee set up by the Agricultural Board itself (Cie van der Stee). This committee warned that “manure processing will only to a limited degree be contributory to the solution of the manure problem” (van Dijk, 1989, page 158) and concluded that the ‘volume policy’ was unavoidable, in combination with restructuring the intensive live-stock farming focused on integration with vegetative production. In the light of later developments when these conclusions were proved to be of the utmost relevance, the committee was blamed for ‘lack of expertise’ and disqualification of (that part of) their work (Frouws, 1994, page 236). The Green Front’s close (exchange) structure, in which the Agricultural Board gained influence on the policy-making in exchange for legitimising the policy for the supporters, made it clear that the Agricultural Board as the representative of the farmers, played a restraining role as a ‘monitor’ making “outflanking movements”⁶¹, which also was the reason why knowledge on nature and the environment could never have played more than a small role in decision making on the manure policy.

⁶¹ Thus spoke retrospectively a top-ranking official who was involved in the manure policy development for both the Department of Agriculture and for the organised agricultural enterprises sector in the period 1974-1995; interview for RMNO-research dated 26 May 1998

A defensive attitude and polarisation

The predominantly defensive and reactive attitude of the Agricultural Board did not only reinforce polarisation between agrarian stakeholders and environmental organisations in the manure case, but also contributed to the renewal of the above-mentioned emotions about the manure policy in farmer circles. These emotions, which very much hampered both a 'rational' weighing of knowledge and interests regarding the manure problems and vigorous measures, can be traced back to a number of factors. Firstly, there was a reluctant recognition of the problem; farmers found it hard to consider fertilisers to be waste matter, and found it even harder to consider themselves to be environmental polluters instead of guardians of soil fertility and 'nature', on which they were so dependent for their existence. And even if over-fertilisation did take place, it was caused by bunglers and by irresponsible farmers who simply dumped manure, but this was certainly not common agricultural practice. A second factor is about the extent of the fertilising problem. By denying and postponing it for so long, an effective tackling of the problem got started only when the manure surpluses had already grown into a major problem. The relatively late start of the policy and development of knowledge on the subject had as result that gradually more and more became known about the seriousness and the extent of the problem and that the already initiated course of policy had to be tightened up time and again. The effect was that government measures on the manure policy often were seen as excessive, too many demands in too short a time, ever demanding more and going too far. What is more, and this was a third important factor, the manure and ammonia policy caused a rather radical rift with the growth-incentive policy and the entrepreneur logic in the past. In this period (until the mid-1980s), agricultural policy – consisting of a market and price policy and a structure policy – was always aimed at encouraging the growth and lowering the cost price, whereas the manure and ammonia policy curbed extension and increased the cost price. Moreover, unlike the price and structure policy, it was partly prescriptive: manure application standards and manure spreading rules were a form of direct government intervention in the freedom of practising agriculture. After all, the manure policy became more politically and emotionally charged because the enforced restrictions fuelled infighting and division amongst themselves, as happened between the farmers in areas with surplus and areas without surplus, and between intensive livestock farming and arable farming (Bolsius & Frouws, 1996).

Selective use of knowledge

The emotionally charged character of the manure policy process made knowledge and arguments into instruments with which one had to deal selectively and strategically. If one argues or even calculates that a given solution may not hold any prospects within the set time, the good name of the messenger will be blackened and the message itself will become unmentionable or even taboo. The taboo of reduction of livestock and the conflict between the believers and disbelievers of industrial manure processing were of an almost

proverbial meaning (termeer, 1993; bloemendaal, 1995). Just as emotionally charged were the minimum manure applications or ‘zero-applications’, which, from the viewpoint of environmental protection and nature conservation, would be necessary on phosphate saturated or wash-out prone soils. Such ‘malicious’ lowering of the soil’s productivity ‘cannot be explained’, ‘was taboo’, especially in an area like the peel, where, thanks to the manure, maize and grass now grow very well on the poor soil which had formerly been quite useless.

The relative closeness of the Green Front and its strong orientation on growth, competitiveness and economic sector interests, were diametrically opposed to the viewpoints of the ecological movement. The latter considered the high growth demands of intensive livestock farming to be exactly the core of the manure problems (termeer, 1993, page 169). In these views, the size of livestock farming had to match the manure production that could be applied to Dutch agriculture in an environmentally sound way, which made a 50% decrease in livestock necessary. Phasing manure policy until the year 2000, and the set manure application standards were a disaster in the views of environment protectors and even drinking-water suppliers (termeer, 1993, pages 170-171). From the very start, the ‘manure debate’ and the manure policy process were characterised by polarisation. That was why the ‘debate’ was a discussion for deaf ears, and why the policy field was initially an arena for wrestlers. In the second half of the 1980’s, pleas for e.g. structure and volume policy, restructuring of intensive livestock farming, development of animal-friendly and extensive production systems, legislation for establishing a business and meat quotas, found absolutely no response in the agricultural world. In the policy arena, literally each part of the manure policy, whether it involved the setting of standards, the levies, the ban on dispersing manure, the manure registration or the transport decree, was subjected to inter-departmental conflicts (Frouws, 1994).

The Green Front erodes

Social and political polarisation around the manure problems and the emotions among the farmers reinforced each other, and resulted in thinking and acting in terms of standard images of enemies. In the course of the manure policy process, institutional positions had changed, and dividing lines and borders of the arena had shifted. The Green Front, for example, eroded in the period 1984-1995, among other things as a result of the alienation of the agricultural department and the organised business world, differences of opinion within the organised agriculture and the legitimacy of the Agricultural Board being called into question by its supporters (Frouws, 1996). The inter-relationship of agricultural and environmental departments became more co-operative; a new, federative agricultural organisation (lto) developed and had to prove itself, and this also applied to new disciplines that were formed within the lto for various sectors; there were competing farmers’ organisations, including the Dutch association for pig breeders, and farmers’ pressure groups emerged; and from 1994, the obvious access of agricultural lobby to

the agricultural minister and the cabinet was halted. These socio-political and administrative changes meant that a new division of roles and decision-making patterns was created. These transitions were inevitably coupled with turbulence and confusion, and in the case of so an emotionally charged topic as the manure issue, this was all the more so. The revocation of the ‘central manure agreement’ of May 1993 between the government and the Agricultural Board pressed by farmers’ protests and skirmishes and ultimate failure of the *manure bank*, are striking examples (Frouws, 1997). In this transition, old ‘reflexes’ from the time of the hegemony of the Green Front competed for priority with new initiatives to reinforce social acceptability of agriculture. Therefore, the Green Front’s considerable debilitation did not necessarily mean that all obstacles for a more flexible and more balanced (from the viewpoint of weighing up the agricultural and environmental interests) manure policy forming, disappeared. The manure and ammonia problems were still way too extensive and ‘threatening’, and ‘victories’ and ‘defeats’ in the manure conflict still had too much strategic importance (Frouws, 1998), as became very clear during the preparation of and the decision making on the third phase of the manure policy.

Knowledge of strategic importance

During the entire 1984-1995 period, the manure policy was ‘a policy in conflict’. Both using the knowledge and aiming at development of knowledge through research were of strategic importance in this conflict. Knowledge is never absolute, it always functions in a context, and knowledge users always shade knowledge with their own interpretations and political and official intuition. This context and conditioning of knowledge in the policy process obtained in the case of such a polarised and emotionally charged context as the manure and ammonia problem, a very special pregnancy, an extra dimension. Then the question of whether there is ‘sufficient’ knowledge available is much less important than the question of what knowledge at what time may play a strategic role in the decision-making. It then appears that the know-how of factors that determine the amount of nitrate losses is much less decisive than the strategic moment at which government officials inform the members of parliament that the proposed losses standards set for the year 2000 had already been reached by so many enterprises in 1992/93.

It is not the metaphor of a rationally directed process but the arena that best typifies the manure policy development from 1984 to 1995. In this light one must understand the “surprise that scientific efforts had so little influence on the policy of the Ministry of Agriculture and Fisheries” (auditor’s office, 1990, page 127).

Knowledge and policy in retrospect

In the preceding pages, we indicated that in the period between 1984 and 1995, knowledge about nature and the environment only played a marginal role in the manure policy. The agricultural approach to the manure problems prevailed and the socio-economic preconditions that were the first matter of importance did not let the opted regulations and standards come even 'somewhere close' to what was 'environmentally' desirable.

The explanation for the agricultural stamp that was put on the manure regulations must be sought in the societal and political-administrative arena in which it was created. Especially in the beginning, the Green Front could manipulate the decision-making because of its historically strong institutional position.

The result was that technology was seen as the final solution for all manure and ammonia problems, and that in anticipation of things to come, a policy of excess-approach and 'stabilisation' was pursued. This meant that an effective curbing of serious problems, such as nitrate and phosphate wash-outs, had to wait as well, even till far after the year 2000. The lack of balance in weighing up the interests in the 'manure arena' was strengthened by the emotionally charged reactions of farmers and the connected polarisation between agricultural and environmental organisations.

A closed circuit of policy makers and scientists

This explanation in terms of balance of power and politico-social situation needs to be further defined for the relationship between the production and the use of knowledge on the one hand, and political-administrative developments on the other. We have already pointed out that knowledge gave the agrarian sector the (initial) head start, and so did the Ministry of Agriculture, Nature Management and Fisheries' own knowledge system. This knowledge system, covering a great number of research institutes, including universities, testing stations, educational institutes and agricultural advice, was an important driving-force for economic growth and modernisation of Dutch agriculture and horticulture. This was the primary 'raison d'être' of this agricultural knowledge system: it was part of the *agro-Nederland Ltd.*. They worked for the good of a sector that was an important pillar of national prosperity, and not for doing research that the *Ltd.* Did not need or that might have harmed it. This sectorial, production-oriented reference had a natural dominance from which research programmes and individual researchers did not easily - and often not with impunity - exclude themselves. For the policy development at the Ministry, and for the research institutes headed by the Ministry the Culture and Communication were marked by hierarchy, by closeness and by insufficient attention and appreciation for deviating opinions, which were often regarded as 'disloyal' (cie kroes, 1992), as experienced by several researchers in the case of manure problems (and manure processing). In general, the straitjacket of the interests of the sector was taken for granted in the circles of agricultural researchers, where it was quite common to feel a

certain solidarity with the ups and downs in the agrarian sector; a sector that was paramount for funding the research.

Then, research into the ‘animal fodder track’, among other things, as long as this was considered to be an impossibility and the deathblow for livestock farming (termeer, 1993, page 79) was not so obvious. Nor was development of knowledge where target values for nature and the environment, and the ‘care principle’ were more important than encouraging optimum production circumstances. That is why extensive means were employed for research into manure processing, whereas, on the other hand, it was concluded on the basis of desk studies into mineral losses that more knowledge about nitrogen behaviour in soil was needed, which had so far been studied mainly from the angle of optimum crop growth.

It was, of course, this same knowledge system to which the Ministry of Agriculture, Nature Management and Fisheries directed itself, with which it was familiar, which was, in short, ‘policy relevant’ for the manure policy of its key department. If you have research machinery of your own and it is financed by yourself, ‘you don’t go to others’ (Frouws, 1994, page 219). Calling in their ‘own’ research institutes also gave occasion for inter-departmental conflicts, because an environmental regulation was ‘soon’ identified with toughening, cost price increase or far-reaching restriction (idem, page 106).

Three filters

The interweaving and common interests of the agricultural-political and agricultural knowledge system make that much of the policy-relevant knowledge production yields specific knowledge, whereby, at the most, the quality of nature and the environment is derivative, and can be regarded as the first filter.

The socio-economic conditioning of knowledge input in the policy process itself, as outlined above, based on the watchdog function of the Agricultural Board and the department of agriculture before even the change of ‘sector-department’ into ‘department of executives’ (bekke et al., 1994) Was put into effect, can be seen as a second filter.

Finally, the way in which policy makers ‘picked’ agricultural and environmental knowledge for using it – or, if you want, for misusing it, - for concrete policy measures, was a third filter.

Fixation on the mineral registration system

The extent and the intensity of livestock farming in The Netherlands, and the connected pressure of manure and ammonia, did not make ‘structural’ dealing with the manure surpluses based on closing mineral cycles, maximising the use of minerals and minimising wash-out losses a real option in the studied period. Instead, a virtually fictitious administrative system was introduced based on quasi-exact quantification. Indeed, the proper parameters were lacking for a policy based on an animal-soil ratio. The way out was a mineral registration system (‘minas’), which may be useful as a management tool but

which causes problems as a regulation instrument and which is inadequate as criterion for the quality of the environment. As expected, the first experiences with the mineral registration system showed a large fluctuation of nitrogen and phosphorus contents in animal manure. The use of fixed manure supply standards seemed necessary to give certainty about the mineral supply and the connected levies on mineral surpluses. Mineral losses depend on a myriad of non-compliant factors with time and place variables, among which are the kind and composition of the soil (content of organic matter), water management, precipitation and temperature range. *Generic* loss standards are therefore based on fiction. The differences in phosphate and nitrogen wash-out figures for each crop must also be calculated, which makes it very difficult to capture the losses standards for one sector with so many different crops “in one figure” (van bergen, 1996). Considering the fluctuation of mineral losses for time and place, a loss standard expressed in a number of kilos per hectare means sham accuracy. Nevertheless, the policy discussion did focus on this figure, whereby the quantification of mineral losses played an important role in the decision-making. The result was that attention was not or hardly focused on changes in agricultural management which are or may be important for environmental objectives (methods and time of cultivating the soil, fertilising, crop rotation, harvesting, growing ‘catch’ crops, animal feed, etc.)

The government’s fixation on quantifying the mineral loss standards put questions to knowledge about agriculture, nature and the environment that can hardly be replied to and which had only limited relevancy for realising values for nature and the environment. The knowledge about nitrogen behaviour in soil, water and crops, and about preventing and the extent of phosphate wash-outs, is inadequate to quantify real environmentally responsible loss standards. That is to say; variable loss standards depending on place and time, which are related to effective improvement of the quality of nature and the environment. Even if this know-how should become available – which is not expected within the foreseeable future, surely not in the form of ‘final’ figures about which no discussion is possible -, then still the intended environmental and agricultural fine-tuning would probably not take place on the basis of such quantified data. This is only useful within the framework of an area-oriented approach, where various interests (social, economic, cultural, landscape, environmental, nature-related interests) are enforced in a qualitative way with the help of a compensation mechanism.

In other words, the fixation on a quantified administrative system implies a demand for fictitious and as yet irrelevant knowledge, which means that knowledge about nature and the environment that would be important, is not generated for policy-making purposes, let alone employed in the decision-making process.

The filtering of knowledge about nature and the environment signalled in this retrospective – i.e. The obvious orientation on the ‘sector interest’ of the policy relevant knowledge system (1), the socio-economic conditioning of

the knowledge used in this process (2) and the policy way-out of a fictitious administrative system based on selective “demand” of environmental knowledge (3) – subscribes the conclusion that in the period between 1984 and 1995 the role of environmental knowledge was limited to the margins of the manure policy.

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Knowledge and the VINEX location policy

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Introduction

In this essay I will try to sketch a picture of the role knowledge on nature and the environment plays in the decision-making process of the VINEX policy, particularly in the choice and the interpretation of the building location of Leidsche Rijn near Utrecht. With the VINEX policy, the Ministry of Housing, Spatial Planning and the Environment wanted to concentrate new houses and enterprises, necessary to satisfy demands of living and working, at several large locations, the so-called VINEX locations. The intended purpose of this policy was to prevent damage and to create synergy with existing facilities.

The RMNO was interested in the role and the valuation of knowledge of nature and the environment in the VINEX policy. However, it proved to be difficult to examine the role and the valuation of knowledge of nature and the environment. Knowledge is not an objective theme that can be looked up somewhere. It is more a 'state of mind' of individuals. Objective knowledge does not exist, or rather, 'facts' in policy processes are only important when they are brought forward by capable actors in a meaningful way. Facts and knowledge available elsewhere that do not receive any attention by actors, remain unutilised. Knowledge can get lost, which is proved by our past with the loss of advanced civilisations, including the then developed knowledge. Knowledge is all that people have in their minds about the connection of things. Of course, this knowledge may be committed to paper. Even so, it is only knowledge when it is known and understood by people that are actively involved in decision-making processes. In principle, the valuation of knowledge can be deduced from whether and how it is applied by relevant actors, from the way in which they use it to act and make decisions.

Leidsche Rijn will be the setting against which I will list a number of considerations about the utilisation of knowledge on nature and the environment. In many respects, the decision-making process of Leidsche Rijn is fascinating. To many aspects in this decision-making process I have not done proper justice in this essay. All aspects of the interesting attempts by the Ministry of Housing, Spatial Planning and the Environment to reinforce the regional responsibility for spatial planning, the relationship of the VINEX policy with the (miserably failed) administrative renewal, the controversy between municipalities and so on, all these aspects are left aside.

The phrasing of the question was: *"how did the decision-making process of the VINEX policy, and more specifically the allocation and the completion of the Leidsche Rijn location, pass off, and what were the crucial environmental decisions in this, and what role did knowledge on nature and the environment play."*

The decision-making process unfolded in three rounds. To each round, there is a specific question. First I state what was the meaning of this specific question was and how it was dealt with. The essay will be concluded with a number of considerations.

Decision-making process of the VINEX policy in three phases

VINEX locations are visible and much talked-about policy interventions in the existing spatial environment. In several of these locations construction activities have already started. It is expected that the requirements for dwellings and company premises will be largely satisfied for the coming decades.

An interesting question is how the policy-makers came to the VINEX policy, to the selection of the locations within this framework, and to working it out for the selected location. This question may easily result in a tome with interesting information about this long line of march. However, this essay is not the suitable place for this discussion. Here we should deal with a specific question: in which way knowledge on nature and the environment was applied, whereby a rough division of the three decision-making phases will suffice (outline 1).

	CENTRAL QUESTION	APPLICATION OF ENVIRONMENTAL KNOWLEDGE
Round 1	Deciding on the housing shortage and selecting the steering concept	Housing shortage is an autonomous process and is not steered by environmental knowledge. The steering concept of concentrated building in large cities is dictated by considerations of spatial quality (maintaining open areas) and mobility
Round 2	Earmarking the locations	Earmarking the exact location was done by eliminating the locations that were by no means available
Round 3	Constructing at the Locations	The Ministry of VROM issues a number of demands regarding the construction. The municipality (project organisation) and property developers complete the project. The Ministry steers through general policy projects of 'Building sustainably' and 'Urban surroundings and the environment'

Outline 1: three VINEX decision-making phases with specific questions

The first round: assessing the needs and subject-oriented steering concepts

The first round started with examining the housing shortage on the basis of which an ambitious construction programme was developed. For specifying the housing shortage, knowledge on nature and the environment had not or had hardly been used. The question is whether it should have been. Adjusting

the housing shortage downward on environmental grounds is like adjusting economic growth rates on the basis of political aspirations in the former soviet union. Though discussions about the outcome of housing shortage assessments may seem justified, it is wise to narrow the discussion down to the housing shortage itself.

But this is a different matter for the second question in the first decision-making round. As soon as there is a broad picture of the need for housing and working accommodation⁶³, the question raises in what way and to what extent this need must be accommodated. Though only somewhat implicitly, environmental considerations play an important role. With this is meant environmental knowledge and environmental considerations that have already become an integral part of spatial planning for decades:

- *Working towards maintaining the sparse open spaces*
- *Preventing fragmentation of the spaces.*

The RPD (the National Planning Service) therefore posed the question how, on the one hand, the demands for housing and business accommodations could be met, and, on the other, how open spaces could be spared. The answer to this questions was inspired by the prevailing view on spatial planning. In this view, building in the urban area was to be preferred. This ideology of compact towns was the answer to the ‘natural’ inclination of citizens and companies to find accommodation in green areas and along motorways. As a result, much renovated construction in the cities has taken place in the last decade. Examples are the ‘Kop van Zuid’ in Rotterdam, and the ‘New Centre’ in The Hague. With these kinds of projects, the density of buildings was an important point of discussion. The ideology tends towards high densities, sometimes even to 60 or 70 dwellings per hectare. Nonetheless, the consumer prefers lower densities with much greenery.

Interesting in this debate was the multiplicity of the knowledge of nature and the environment. For reasons of direct quality of life, of hygiene and also of noise nuisance, it was preferred to lower the number of houses per hectare. Environmental knowledge is here in line with the citizens’ preferences. Where it was the aim to have e.g. natural drainage systems, there was the tendency not to fill up all open space with dwellings. In other words, on a small scale in the district where houses were to be built there was also the need for open space. However, for considerations of collective and indirect living conditions, a completely different set of knowledge on nature and the environment was activated. This traditional line of thinking dictates that high densities are necessary to keep spaces open somewhere else, and it also tells that high densities create the possibility to actualise public transport in a reasonably efficient way. The aim to have public transport is again inspired by the thought/knowledge that this form of transport is less harmful to the envi-

⁶³ Especially the need for business premises is hard to predict and partly depends of the ambitions of a Cabinet that believes in work, work, work.

ronment than the private vehicle so cherished by the individual: the car. This viewpoint is translated in the NMP (Dutch environmental plan), the VINEX, and the Master Plan for Traffic and Transport II (StructuurSchema Verkeer en Vervoer II). Keeping these objectives in mind, the Dutch Planning Service RPD works towards setting the basic requirements of housing density, and building as many projects as possible in the towns.

But when the VINEX was decided, the planning service, though cherishing the idea, had to accept that for lack of space, building in the town would not solve the problem adequately. An alternative strategy, perhaps more effective from the environmental point of view, which was the large-scaled pulling down of old low-rise buildings in the towns to create place for new high-rise buildings, has never been seriously considered. Demolishing houses was a social taboo⁶⁴, particularly in the time that VINEX was approved. For this reason, they reverted to what was in the eyes of the planners the second-best solution: selecting new building sites directly on the edges of the cities. With this solution, the planning service also had hopes of realising the so revered environmental aspirations.

Has the applied knowledge been adequate?

But the question is also whether the applied knowledge had been adequate. Firstly, is it logical to think that the natural environment can be better managed by building in huge concentrated locations (say 20,000 to 30,000 dwellings) than by opting for a great number of housing locations of, say, 500 houses attached to various towns and villages? To me, it is not only difficult to underpin this choice with certainty, but neither can it be undermined convincingly. The general thought of the planning service that more building locations will result in a minor attack on open green spaces, seems quite vulnerable. As in the construction of the Leidsche Rijn, a vast and valuable area was faced with a dramatic change in function, whereas in the construction of many smaller districts, less natural areas would possibly have been lost. No transparent ideas have been developed in the environmental quarters. This is, in a sense, quite remarkable, as so much value was attached to conserving the 'Green Heart', and yet the Leidsche Rijn was built in the area where the 'Green Heart' was once located. However, the area is no longer referred to as the 'Green Heart'.

Another important environmental consideration was that the Ministry of Housing, Spatial Planning and the Environment expected that extending the urban area would have a favourable (read: downward) effect on the automobility. Then the question rises why so? Why would people that come to live in a vast expansion district with 20,000 dwellings in the peripheries of cities use their cars less than those who live in small districts in the peripheries of small

⁶⁴ This taboo is all the more understandable in the light of the large-scale demolition plans in the 1960s and 1970s, and the massive contra-reaction of city renovation in the 1970 and 1980. Only recently have proposals been made for more large-scale demolitions.

towns? It seems advisable to find out where this thought came from and in what way it was rooted in quantitative data. The thought was actually based on two suppositions:

- *Residents who live close to their work, shops and other facilities, will leave their cars at home more easily. Since many jobs, shops and other facilities are in the cities, building on the edges of the city will induce the residents to go on foot, by bike or by public transport.*
- *Large locations with dense building make it possible to devise proper public transport which, due to the direct location near a big city, is also connected to an already existing network of public transport. This induces a large number of people to leave their cars at home.*

This judgement was largely thought up by the disciplines of spatial planning and transport science. The thought was supplemented with quantitative knowledge⁶⁵. Nevertheless, one can draw a less univocal conclusion from this information. The differences in mobility development in the case of vaster locations near the city as compared to smaller locations in many municipalities are small. This does not necessarily mean that the option for large VINEX locations is a wrong choice, but the choice for reasons of mobility is less absolutely favourable than suggested. At the same time, one must conclude that the compact-city policy enjoyed ample support, and that no competitive policy alternative had been put forward that could realise the policy objectives more adequately.

Knowledge on nature and the environment: neither objective nor absolute

My general impression is that the knowledge on nature and the environment that was brought forward and utilised in this round, was more indebted to the spatial planning and traffic department, and less to the environmental sector itself. Let us leave aside whether this was good or bad. Moreover, knowledge on nature and the environment is neither objective, nor absolute. On the basis of available environmental and nature knowledge, decisions may be made on various scale levels and relevant separate questions, which may have unforeseen and undesirable impacts on nature and the environment on adjoining scale levels. Chances are that the policy is turned back and is even doubled. For example, a low-density policy and the resultant high nature value of a district (e.g. the 'green city' concept) may result in laying out all areas as green cities on national scale, as a result of which sanctuaries will disappear and bio-diversity will decrease. At the same time, one may also expect that building in high densities will induce residents to spend their time more often and longer in the country (e.g. allotment gardens, caravans and second homes) which makes that the space ultimately needed is more than in the case of a comparable population group living in a green urban district.

⁶⁵ See: *Randstadvisie [Randstad Conglomeration Viewpoints], Partial Report 2: Infrastructure and Urbanisation in the year 2010, Ministry of Transport, Public Works and Water Management*

Knowledge of nature and the environment is, like other societal knowledge, domain and time related, and therefore also partial.

I have made this remark here because it also played an important part in the second round. This particularly involves the well-known contradiction between the world of environmental and nature knowledge, which is rather strongly oriented to setting the norms, and the world of spatial planning, (VINEX, among other things), which thinks more in terms of adjusting and relative weighing. I tend to think that the choice of setting norms stems from the thought that the knowledge behind it has an absolute value. Indeed, should that not be the case, the policy makers would not easily set norms because they know that the norm set here and now would be different from the norm set elsewhere and later. This remark serves as the prelude to the second round.

The second round: from clustered building to earmarked locations

The second round of the decision-making process started with the basic principle that the expansion must be attached to existing residential nuclei. Then the question was what locations were to be preferred. One part of this question was answered in the light of the own compact-city ideology: expansion districts on the periphery of large cities. At some point there was a heated discussion about the question how many big cities there actually were in The Netherlands, but rather soon the large cities were targeted and the cities that were supposed to make a special building effort, like Amersfoort and The Hague.

The question at what locations the building must take place was mainly a process of elimination. The Ministry indicated that building was to take place at a limited number of locations, and the cities then indicated what location they had in mind. These sites were selected according to the principle of ‘ten little indians’. Most of the theoretically possible locations were out, because it was a protected nature area, a drinking-water supply area or for similar reasons. The Hague pushed ypenburg forward as a more or less logical continuation of The Hague in eastward direction (Pijnacker), Amsterdam put its cards on IJburg, and Utrecht staked on Leidsche Rijn. At first glance, it looked as if the selection of Leidsche Rijn and Ypenburg was not logical. Indeed, both projects are located between the four large cities, which is in the ‘Green Heart’.

Selection induced by lack of knowledge?

Then the question rises whether this selection was induced by a lack of knowledge of nature and the environment. If we look only at the current nature value of the areas, such judgement could easily be made. Leidsche Rijn is undeniably a typical ‘Green Heart’ area, with here and there developed area or picturesque villages. At this scale level, Leidsche Rijn can be seen as the umpteenth victory of red over green. But on a more regional scale level, the choice is understandable, also in the light of the available knowledge of nature and the environment. In the past, Utrecht had already expanded

in southward direction (the satellite towns of Houten and Nieuwegein) and was not free to move towards the east and the north as there were valuable wooded and grassland areas. This weighing process was made explicit in the regional policy process towards a regional planning programme. In this process, a 'Headlines Memorandum' was approved in which, on the basis of a great number of considerations among which environmental criteria, a comprehensive analysis was made of the various urban site possibilities around the city of Utrecht. It showed that Leidsche Rijn was the most favourite location for urban expansion, supplemented with development schemes near Houten-zuid. The Hague selected its site in a similar way. Expansion towards the south met with opposition from the market gardeners, expansion towards the north was impossible for lack of space and expansion in the coastal area was insufficiently supported to be a serious alternative. This alternative was rejected both by the municipality of The Hague and the Ministry of Housing, Spatial Planning and the Environment.

Here the interesting question is whether more explicit knowledge of nature and the environment, e.g. in the form of a national choice of location with an Environmental Impact Assessment could have led to another choice. From a procedural viewpoint, it must be stated that the region had already made an Environmental Impact Assessment for earmarking the location, and in the eyes of the national Environmental Impact Assessment committee, sufficient attention had been paid to specific environmental interests. In this light, the committee gave its assent to carry out another Environmental Impact Assessment that applied both to the location and to the development. Apparently, the committee, too, thought that two separate Environmental Impact Assessment reports in this specific case would add little or no value, and reconsidering the location while various steps had already been taken towards the lay-out, would not be advisable.

As regards content, an extra Environmental Impact Assessment seemed in any case not able to lead to the conclusion that expansion of Utrecht in eastward or northward direction was a real option. Neither did the comparison between expansion southward or westward seem to have changed anything. Now only the remaining possibility was that the extra Environmental Impact Assessment would unfurl that expansion around Utrecht could not take place at all.

From the viewpoint of norms, this seems a logical conclusion. This line of reasoning will approximately be as follows: "there is a Green Heart, we wish to keep it as the lungs of the randstad urban agglomeration where building is not allowed, and therefore we must find a place elsewhere." However, for spatial planning, this was a *fait accompli*. Their line of decision had taken another course, and was as follows: "there is the need for space to live and to work, we have to take advantage of this need as sensibly as possible, and we will do that by building at the periphery of the cities." The latter line of reasoning was the point of departure in the second round.

Choice by the RPD National Planning Service

I have the impression that in the selection of locations there was relatively little input from environmental actors at the national level. The choices were mainly the concern of the RPD National Planning Services. These services departed from the idea that locations had to be found. However, DGM Directorate-General for the Environment was mainly engaged in environmental norms and was therefore not very sympathetic towards the choice of locations. As it is, setting norms roughly means in a practical sense the rejection of building activities or setting rules and regulations for construction if building had to take place no matter what. Interim decisions about the choice of locations fall outside the scope of norm setting. In order to let knowledge of nature and the environment play a more central role, environmental actors had rather depart from the idea that housing shortage cannot be ignored and must then put the question how The Netherlands' on-going urbanisation – because that's what is going to happen if the population continues to grow – must be realised while preserving and strengthening the values of nature and the environment. This basis was or was hardly premised on in the VINEX policy-making process.

To me, it also seems an interesting question whether this orientation would have to take place in policy processes on the Fifth Memorandum on Spatial Planning (coming). It seems that there are again two separate lines in policy planning. The environmental line may establish how serious the impact is on nature and the environment, and express the wish to recover nature with the so-called 'red functions'. Departing from the norms of nature and the environment, it seems to me a consequent line of thought (compare with the concept of the logic of consistent actions in my lecture 'Steering through creative competition', Nijmegen, 1998). The Fifth Memorandum on Spatial Planning must then indicate that there is indeed the need for new dwellings, business premises and recreational facilities in the next decades, and that they must be located in places where they can function well and where they have little external impact. This, too, is a consistent line of reasoning. Subsequently, these two lines are related in the practical implementation of the policy where the choices are made. The logic of this encounter (in my lecture I focused on the logic of interactive actions) will be very much comparable with the present experiences. The National Planning Services know that if they don't indicate the location where building should take place, that other parties, like municipalities and property developers will make the decision themselves (it also seems doubtful whether a judge will forbid these building projects if a housing shortage is evident). They guide, in other words, rather autonomous developments. The Directorate-General for the Environment could say that these developments are not favourable to nature and the environment, but is, on the other hand, not able to stop the developments. Here develops a picture of policy-makers that seek to combat inevitable developments, whereas they pay relatively little attention to the question how the inevitable developments can take shape when inspired by knowledge of nature and the environ-

ment. The latter seems not to take place for fear of interpreting this approach as a surrender beforehand.

On the regional and local level, however, the contribution of knowledge of nature and the environment is quite substantial. Here the contacts between the environmental services and the spatial planning departments appear to be even more intense. At the same time, one must observe that crossing alternative locations off the list also took place on the basis of other considerations, such as the distribution of land ownership, the degree of pollution of the soil, the existing infrastructure that could open up the location, and the administrative borders of the municipalities. An example is the municipality of Utrecht, where, among other things, the position of its own city centre played an important role in the allocation of the Leidsche Rijn. The development of the towns of Houten en Nieuwegein teaches us that these new towns became quite autonomous, or, to formulate it differently, that the regional shopping and recreational functions of the Utrecht city centre eroded. For this reason, a location was selected to the north of the Utrecht-The Hague motorway, and not to the south. Leidsche Rijn is located at a reasonable distance from the centre. The question rises whether we should label this choice as an ecological consideration or as an economic. Here, too, is knowledge rather diffuse. On the one hand, maintaining big cities is good for public transport; on the other hand, developing autonomous centres where people live at cycling distance from the shopping precinct is probably even better for the environment.

Implicit environmental considerations

Finally, the conclusion seems to me justified that in the selection of the locations much use is made of (more or less) implicit environmental considerations, together with a whole range of other considerations. The involvement of environmental actors is small on the national level. This is explained from the various policy orientations of the departments for the environment and the departments for spatial planning. When applying for the allocation of the sites, the regions and the municipalities did make use of the comparative knowledge on the various locations. Here we see a mixture of considerations of the undesirability and the unfeasibility of other locations, after which the selection was made of the location that was the least undesirable and the least unfeasible. However, the regions seemed to incline themselves towards these selection processes. In Amsterdam, for example, the suggestion was made to have a location in a reclaimed lake, whereas in The Hague the location (at sea) was not seriously considered for environmental considerations and reasons of infrastructure. The reason for this could be that knowledge of nature and the environment about these kinds of locations did not provide decisive arguments against or in favour of such locations, and that it is mainly a question of whether or not important actors have sided with the alternative selection.

Was adequate knowledge available?

The question is therefore whether adequate knowledge was available. The answer is: no, it wasn't. This does not necessarily mean that there is the possibility to generate knowledge. But it can be established that there is substantial confusion about the question what the most desirable housing locations and house-building programmes were in the light of nature and the environment. In my opinion, there is also the issue of the tension between policy results on the one hand, and on the other, the policy effects after the users 'make away' with the result. It is, for one thing, still not clear whether citizens in compact cities show other patterns of mobility than citizens in areas with low densities. There is possibly a strong sense of compensation: for lack of nature in their own area, many citizens of big cities take to the countryside in the weekends (camp-sites, second home, etceteras). In other words: the VINEX policy on compact building meant to have a positive effect on keeping nature areas open and decreasing car use, could take root in terms of results (citizens live in city centres and in urban districts and have ample facilities in their neighbourhood which they visit by bike or by public transport more often than not). In terms of the effects, it is very well possible that particularly those who live in compact cities leave the city *en masse* and with their caravans, holiday parks and second homes will yet make a strong claim on the sparse space, and also generate much emission as the places they visit are by definition poorly or badly accessible, both for public transport and bicycle. The policy methods that are applied hardly take account of the reflexive capacity of citizens and entrepreneurs, whereas this capacity has so decisive an impact on the effects of government policies.

The third round: lay-out of the locations as tight process of choices

The third round started with signing the covenants. From that moment, the municipality can actually be seen as the central spider in the web. The Ministry of Housing, Spatial Planning and the Environment generally assumed that the choice of location as such would provide sufficient guarantee for implementing its own policy. For the municipalities, the VINEX covenants were mainly concluded in order to pocket substantial financial means that could be used to satisfy their own building ambitions. This, in a sense, was the kick-off of a new decision-making process, because the project organisations that were formed started again with generating information and knowledge on the basis that the Leidsche Rijn location is going to be constructed and they had now a rather open orientation towards realising the actual construction.

In my observation, it is noticeable that the mobility objectives somewhat retreated into the background. Even the project organisation took its departure from the idea that the choice of the location had created a favourable situation for a relatively low automobility, and that the concept of high-quality public transport (taking shape in the relatively easy connections to junctions like railway stations, and in relatively dense areas to the public transport stops) was favourable to these objectives. The project organisation concentrated on the question how to construct a nice and marketable residential dis-

trict. The master plan was specifically an expression of the first objective, and the agreements with the property developers, who had to generate the lion's share of the financial means, were an expression of the second objective.

Tension

Between these objectives there was a tension which has recently surfaced. A special residential district requires relatively high densities and also varieties in densities. A marketable residential district has densities that are practically the same everywhere. The development plans emphasise the specialities, but the actual building plans verge more on the marketability. In the plans, particular attention is given to the values of nature and the environment (e.g. the central park concept) and they also used the knowledge about it, or actively generated knowledge (e.g. about water management).

However, it appeared that, like in other plans, there was a tension between the proposed and the realised facilities. In Leidsche Rijn, too, there was the need for additional means, particularly for facilities for infrastructure. For parts of the public transport plans, these means are not yet available. In this respect, things will happen just as they have happened before: the district is being built, but public transport is still lacking.

At present, Leidsche Rijn is being prepared for building. The first building activities have already begun. It is fascinating to observe that particularly the first residential districts are not located within the range of influence of the high-quality public transport. These residents will use their cars. There is also doubt about the financial feasibility of public transport to a planned vast district park and to a recreational lake at the northern edge. It is interesting to establish that the ecological quality of the Leidsche Rijn will largely be determined by the coming decisions. In this respect, it is important to take care of an adequate representation of nature and environmental interests till far after the year 2015. In this light, the efforts made to form buyers' groups dedicated to the case of sustainable building projects, is quite interesting

Concluding considerations

Knowledge is power, as the saying goes. In this light, it is wise to reflect upon the question whether and in what way knowledge was put to use in the decision-making processes. It is equally important to nuance the proposition of 'knowledge is power'. Our society is a knowledgeable society where indeed much knowledge is available. The proposition may also mean that much knowledge, which is even spread over various actors, means that the separate actors do not feel that their own knowledge gives them power indeed.

Especially in circles of nature and environment, the idea may take root that their own knowledge won't be of much help. When looking at the decision-making process of the VINEX locations in general, and of Leidsche Rijn in particular, there are indications that knowledge of nature and the environment is of paramount importance. However, 'of paramount importance' is

not in all cases synonymous with 'of superior importance'. It was observed, among other things, that the housing needs were found to be so important that these needs had to be met. With the question how to meet these needs, the social values are in conflict with the environmental values. It is technically feasible to construct large quantities of high-rise buildings in existing cities. But socially, this is thought to be unacceptable. For this reason, they chose to construct new estates outside the existing cities and towns. Subsequently, the values of nature and the environment are dominant for the choice of location. In the memorandum on 'headlines', all kinds of locations were dropped on the basis of this knowledge. Nevertheless, some locations had to be found ultimately at the expense of the existing values of nature and the environment, albeit at less expense than of other locations. Here decisions have been taken that are not right away labelled as logical.

Still, this choice is made as a consequence of knowledge gaps about the value of the selected locations. All locations have values and a location choice always and ever implies some loss.

Next, clusters of knowledge of urban planning, landscaping and ecology are integrated into the development plans of the locations. Various elements of the development plans are subjected to all kinds of environmental norms and regulations. Regularly, new knowledge is developed and adjustments to the building plans are made. In some respects, the integration of knowledge of nature and the environment is gratefully accepted. Its importance may just have been underestimated in circles of nature and the environment. Ecological value can surely be added to the proposals at hand in a project like the Leidsche Rijn. Extensively cultured grassland and greenhouse areas will disappear at the Leidsche Rijn location, but then, an urban area may rise in which new nature and ecological values are created. Especially the proposed municipal park, the lakes that will be created and the likely reorganisation of an adjacent country estate can be seen as efforts in that direction. The appreciation of this conversion may differ, but does not necessarily exclude that the profit and loss accounts are reasonably in balance. This, however, requires a continuous and not once-only assessment of environmental added-value of projects, such as the Leidsche Rijn.

Decision making and uncertainty

Decision-making processes are great imponderables. In the VINEX policy, the imponderables are also great. Concrete knowledge of the future impacts of the policy are lacking. To some extent, the housing need can be concretely assessed, albeit with a broad margin. No one knows when the housing demand has reached its saturation point. Various VINEX districts are going to be built promptly in order to come onto the market in time. Neither can one be certain whether a concentration of houses is better than spreading them over various municipalities and locations. And finally, it is doubtful whether there is a significant connection between the choice of location and the mobility effects.

In this respect, it deserves a strong plea in favour of more knowledge, including knowledge of nature and the environment. There are no strong indications that the knowledge of nature and the environment is of a lower quality than the knowledge of other aspects of life. When insufficient use of knowledge is made, this is mainly because the parties do not involve each others knowledge and are not willing to bring their own views (knowledge paradigms) up for discussion. Knowledge seems to be less and less sustainable. Especially knowledge about people's behaviour and about the effects of solutions made seems to be quite perishable. In response to policies, the people will ever find new ways to satisfy their needs. Every policy aimed at curbing these needs will therefore promptly be confronted with new manifestations of the needs. It is about this aspect that knowledge should increase.

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4. Willingly and knowingly: About the relationship between values, knowledge production and use of knowledge in environmental policy

By prof. Dr. R.J. in 't Veld and mrs. Drs. A.J.M. Verhey

Introduction

Behind the facade of politics a fierce struggle is taking place. About the use of knowledge in policy-making, about the reliability of researchers, about the quality of research institutions. As is the case in many current conflicts it is not immediately clear how the struggling parties have been grouped. Is this struggle new or more fierce than in the past? And if so, which causes can be indicated for this? For knowledge has always had a certain impact in the development of policies and in administration.

We will explain that there is something new going on indeed. Those novelties have to do with very fundamental developments in science and in society. With the replacement of normative political ideology by emphasis on effectiveness and efficiency in politics and in public administration, with a changing view on the meaning of knowledge in general, with a growing uncertainty about the truthfulness of scientific knowledge, with much more plurality –culturally and socially- as the essential characteristic of living together. The compartmentalised society has been replaced by a more open and very diverse multi-cultural national community. This also includes more diversity in the experience of reality and truth.

The way in which policy problems are formulated is also changing. Complexity, particularly in procedures that lead to social decisions, is more prominent. Scientific knowledge as a building stone for solutions of policy problems plays an increasingly more prominent role. But this knowledge is also subjected to scientific and political disputes, in mutual interwovenness. This also applies to knowledge in environmental policy. Institutions such as the RIVM [National Institute of Public Health and the Environment] and the CPB [Central Planning Office], but also advice agencies that offer (scientific) policy advice commercially play an important role as supporters of stakeholders in environmental policy processes. Centres of expertise shoot up as mushrooms within policy centres. At the same time the production of knowledge more and more often is a point of discussion. Sometimes high-running conflicts are created there where it is “discovered” that research is not free of values, but can be associated with political-social values of one of the interested parties in the policy. Bell ringers stand up and state that there exist indeed dependencies within the world of researchers with respect to politics or civil servants. More and more often there is a call for a guarantee of the independence of research for the benefit of policy-making processes. It is often far from clear what is meant by this. Apart from this also a difference of opinion about the scientific quality of research forms part of the disputes within politics.

The idea that knowledge can only be created in a monastery-like environment, in a social vacuum, is an outdated thought. It may still apply to fundamental research, but the creation and maturation of application-oriented forms of knowledge takes place within the focus of the field of social forces.

The production of knowledge for policy takes place in a context that is not equal to, but to a certain extent comparable to, the context around that of a policy. If we depart from this, theoretical exposés about policy-making can also be at least partially declared to apply to the production of knowledge: knowledge is a product of a struggle and interaction between parties with various interests, that form coalitions with shared values. In the development of scientific communities questions relating to power play a certain role, whereas they are fully central to politics. The question regarding the mutual relations between the two processes and in particular *how arenas in which production of knowledge takes place relate to policy arenas* is then particularly interesting.

For knowledge production often has a great influence on the course of the processes in the policy arenas: decision-making seems to stagnate frequently as a consequence of discussions about (provisionally) missing knowledge or because of insufficient authority of the knowledge available. The foundation of trust in objective knowledge is a search for an independent beacon in the sea of policy-making. At the same time the quest for possession and distribution of favourable knowledge is innate to every politician since this supports the quest for power. The nature of the relationship between knowledge production and policy is also worth examining since much money is spent on research, while a large part of the results never seem to be used. Available knowledge is not used. And finally the relationship between knowledge production and policy-making is interesting from the point of view of power: knowledge is power, but does power also include control over knowledge?

We will explore the relationship between the production of knowledge and the development of policy by using a number of questions:

- *What does the relationship between (values in) the policy arena(s) and (the values in) knowledge production look like?*
- *What does this mean (in a normative sense) for the relationship between science and policy?*
- *How do science and policy factually relate in the everyday practice of environmental policy and why?*
- *What can be improved with respect to the relationship between knowledge production and policy-making in the environmental policy?*

In the first part of this contribution we will attempt to find answers to these questions in the available scientific literature; subsequently we will reconsider the same questions by means of a case-study. As case we have selected an episode from the decision-making with respect to the Future National Airport Infrastructure.

We will use the comparison between theory and case to draw a number of conclusions. Although we concentrate on environmental policy, the conclusions may have a broader meaning.

Values and production of knowledge

In this paragraph we will discuss in more detail the relationship between policy arenas and arenas in which the production of knowledge takes place. We will discuss the similarities and the differences between the two kinds of arenas and we will subject the relationship between values and knowledge to a detailed examination. The insights obtained will make us able to understand better why the relationship between them often is lacking in harmony.

Arenas of policy-making

We assume that the ambitions of politicians, policy makers and scientist on the one hand strongly vary, but that on the other hand their internal social relationships show some similarity. For different regulating behavioural motifs of the various actors lead to different fixed patterns of individual behaviour. The confrontation of those varying individual behavioural patterns lead to social patterns in which the encounter with scarcity is visible. We choose here for a very broad concept of scarcity, in which scarcity exists as soon as each one of two or more mutually excluding events are desired by one or more of the parties involved. This results in the necessity of choices. On the level of national society the parliamentary democracy is such a choice mechanism. Within this the aforementioned patterns are given shape, in the form of markets in the private sector and in the public sector in the form of coalitions, of policy-making processes, of solution of conflicts. Knowledge and policy as products of intellectual effort show a mutual similarity. That is why it is as such not improbable that parts of the theory about the functioning of policy arenas also will apply to arenas in which there is production of knowledge. We will examine that relationship in closer detail. For that reason we will in the following first explain an applicable and suitable example from the series of the theories about the functioning of policy arenas that is available.

It concerns the theory of Sabatier (1988, 1993) about policy advocacy coalition frameworks. Sabatier analyses change of policy as a struggle between different advocacy coalitions (coalitions that advocate a certain alternative) on the level of a policy subsystem (that means: all parties that are studying a certain problem). An advocacy coalition consists of individuals and organisations that share a set of normative and causal beliefs, hereinafter called convictions, and that often act jointly or in a way of mutual co-operation. In their acting they display a more than usual extent of co-ordinated activity⁶⁶. Apart from the advocacy coalition there also exist policy brokers, who mediate between the coalitions to see to it that one arrives at a reasonable alternative, for this is always necessary within the context of parliamentary democracy. The struggle between the coalitions is solved by decisions by sovereign parties (political decision making) and after this results through the hierarchical line in policy programmes that are gradually executed. The

⁶⁶ See Sabatier, 1988, p. 133

actors learn again from the effects thereof and the result thereof is reflected in their pattern of values.

Many other authors have developed theories about policy-making, in which each time different emphases are laid. Thus Hajer (1993), Majone (1989), Van Twist (1997) and Hoppe (1998) much more than the others emphasise the role of language, the argumentation and the discussion in policy-making. However, in all these theories policy-making, conceptualised as a struggle between clusters of organisations and individuals with shared values about the honouring of those values, forms the leitmotiv so that one could consider these theories in a certain sense as one 'complex'.

The structure of value systems according to Sabatier

Sabatier (1988, 1993) has elaborated the structure of value systems or belief systems as they play a role in policies. Belief systems are sets of basic values, causal assumptions and problem perceptions. According to Sabatier's theory every individual and every coalition of actors in a policy network possesses a value system that consists of three layers:

- *A deep normative core: the deepest core of the position of a person that consists of fundamental, normative and ontological points of departure and convictions. These values apply to all policy areas. They are not or not easily subject to change.*
Examples of deeper lying values are views on the nature of the human being: one may see the human being as good by nature or as prone to evil by nature, the human being as an egoist or as an altruist.
Or views on the relationship between nature and the human being: 1) the human being as standing above his ecological environment (anthropocentric), 2) living creatures (man, animal and plant) stand above the rest of their ecological environment (biocentric) or 3) all components of the ecology must be in harmony with each other (ecocentric)⁶⁷. These values are of great importance for the way in which one approaches problems and solutions in society.
- *A second 'shell', that forms the core of the policy. This concerns fundamental points of view with respect to strategies to realise the deepest normative values. These points of view are not very easily changed, but may possibly be subjected to change if actors see that the values used really lead nowhere. However, Sabatier assumes that this will almost never occur, if there is no clear pressure or cause from outside the subsystem (e.g. changes in social-economic circumstances, changes in the government coalition and decisions and influences from other policy fields). The values of the second shell generally only relate to the policy field or issue in question, sometimes also to other policy fields.*

⁶⁷ See Colby, 1990

Examples of values of this near policy core are: the eligible shape of democracy, or the desired relationship between government interventions and market mechanisms; views on centralisation and decentralisation, the orientation on substantial policy conflicts, e.g. between the environment and the economy, et cetera.

- *A third layer of secondary aspects, that consist of values that relate to instrumental decisions and information that is necessary to realise the deeper lying values. These ‘values’ are very specific and exclusively apply to the policy issue in question and are relatively easily changed. This concerns the use of certain steering instruments, the procedures around budgetary decisions, administrative measures, the participation or non-participation in projects, the handling of conflicts, information about the execution of a certain programme, information about the seriousness of problems, et cetera.*

Such a system of values is also called a ‘paradigm’. In policy paradigms views about the contents of policies and about society play an important role. A policy paradigm therefore includes both institutional aspects and aspects with respect to contents and instruments. Examples of these have been mentioned above. In scientific paradigms, epistemological paradigms play an important role. These are values that relate to knowledge and the production of knowledge. We will later go into this distinction in more detail, since it is crucial to the distinction between policy arenas and knowledge arenas.

Paradigms in environmental policy

Research into specific paradigms in the environmental policy was done by a number of authors; we choose here for the approach of Colby, who has used the insights of many others. He has made a taxonomy of paradigms in environmental policy⁶⁸. He argues that a specific paradigm or a certain ‘spirit of the times’ prevails with respect to the environment, that during a certain period is valid for the entire (western) society. He describes five paradigms, two of which are extreme with respect to each other: in the one paradigm (the frontier economics paradigm) the human being is fully dominant and economic progress and growth are central to it. The other extreme paradigm (the deep ecology paradigm) is a radical concept of the world, an ‘ecotopia’ in which human beings live in harmony with nature and in which all living creatures are equal. The deep ecology paradigm is diametrically opposed to the frontier economics paradigm. They seem incompatible. Colby signals a development in time: first of all there were only the two extremes, gradually also new paradigms appeared, in which the environment and the economy can be united. As time progresses we will develop paradigms in which the environment and the economy are more and more integrated with each other and will relate more harmoniously to each other. The first of those new paradigms is environmental protection, a paradigm that was created in reaction

⁶⁸ See Colby, 1990

to the deep ecology paradigm and in which human beings and the economy still are relatively dominant and considerations from an economic point of view are compared with consideration from an ecological point of view. It is a paradigm in which ecological awareness has been introduced only recently. Colby signals that we are now still in the stage of environmental protection and that we still have a long way to go towards the paradigm in which sector approaches have been fully integrated.

One question is whether we have developed further towards a more advanced paradigm since the publication of Colby in 1990. Concepts such as decoupling seem to result from a line of thinking in which the opposition between the environment and the economy no longer is dominant. Then we are on our way to ecodevelopment, perhaps through the intermediate form of resource management.

With this an aspect of the dynamics of environmental paradigms has been explained. In the next section we will discuss the relationship between value systems and knowledge.

Knowledge and values

Post-modern theories about social phenomena have as point of departure the idea that 'reality' as such does not exist. In the social-constructivistic approach of policy and politics the interrelation between values and the (generation of) knowledge has been described extensively. Truths are established in a social context, that we call 'organisation' or 'configuarion'⁶⁹. Social reality is no objective given fact, but is seen as a construct created in interaction. Reality is perceived differently by each person since every one has his own, different, frame of reference. As for the relationship between knowledge and values this would mean that the production of knowledge in any case is influenced by 'values'. The question is whether this is all there is to say. How does this influencing work? And are value systems for instance also influenced by knowledge? It seems worth the effort to study the relationship between knowledge and values in more detail.

We consider knowledge here to be 'information generated by (semi-)scientific research'. By information we mean meaningfully arranged data. Data in themselves have no meaning. By arranging them in a certain way they acquire meaning. The arrangement of data and the interpretation of information are influenced or even determined by the values we use consciously or unconsciously. In perceiving and in the registration of our perceptions we use a value system that filters our perceptions and that consist of differing layers that also differ by the extent of the variability or as the case may be

⁶⁹ See Termeer, 1993 and Van Dongen, 1997

the susceptibility to change of the values that lie in the layer in question. Deeper rooted values would be less easy to change than superfluous values. Sometimes we learn quickly, stimulated by painful experiences or happy events, and our values change under our hands. Sometimes our habits seem persistent and our values stable. In many theories there exists a common characteristic that tells that as values are more fundamental, have a deeper layer as to their content, they also will be more stable. In that sense a 'revelation' is for instance an exception.

Not only do values exercise an influence on the creation and use of knowledge, but knowledge once acquired that has reached us from outside, also exercises a certain influence on values. We are capable of learning, also in a normative respect. It is plausible that this reciprocal relationship does not work equally quickly or equally strongly in both directions: values sometimes show much resistance to change, whereas data do not show or hardly show any resistance. Knowledge and information take midway positions: they can be changed, but not without any effort. Meaning is embedded partly normatively, just like the giving of meaning to one's life. Knowledge and information can be manipulated, but knowledge and information carriers are not defenceless.

Influencing of knowledge production largely implicit

The influencing of knowledge production by values mostly remains fully or largely implicit. Paradigms form the basis of and legitimize specifically arranged behavioural patterns. Paradigms therefore legitimize the posing of certain questions, the carrying out of specific research into precisely those questions and the using of certain assumptions in that research. The selection and the formulation of research questions and the assumptions that are used in the research are not free of any values. However, in most cases those values are not made explicit in those terms. Researchers and scientists often mention some of their assumptions explicitly, but by this the underlying values are not always made explicit. If there is a discussion about research, then it mostly concerns the outcome; much less frequently the research questions or assumptions are the subject of the discussion. In this way values form one way to be able to manipulate research. Frissen (1998) says about this:

"...every social scientist knows that research, with an intelligent manipulation of the posing of questions, can prove anything that is desired. Simultaneously the preoccupation (...) of the parties involved with natural sciences plays a role. Research is used to reduce uncertainty. However, necessarily the reverse effect occurs: research increases uncertainty."

One does not need to accept the entire exposé of Frissen to recognize that the nature of social-scientific knowledge differs from knowledge concerning the natural sciences. The reflexive nature of man makes the first one volatile⁷⁰.

⁷⁰ See with respect to this also R.J. in 't Veld, Noorderlicht, VUGA, 1997

A second way in which values influence knowledge occurs in the use and interpretation of research results. The interpretation of research results is done by people with different value systems in different ways. Processes of selection and simplification play a role in this. Eberg says, following Sabatier:

“Many aspects of a coalition’s belief system are susceptible to change on the basis of scientific and technical analysis (Sabatier & Jenkins-Smith, 1993, 41). For example, science had dramatically increased our understanding of environmental and waste problems after two decades of debates concerning the seriousness of the problems and the appropriate policy instruments to be used in addressing the issue. (...) Such learning is instrumental, that is that members of various coalitions seek to better understand the world in order to further their policy objectives. They will resist information suggesting that their basic beliefs may be invalid or unattainable, and they will use formal policy analyses primarily to buttress and elaborate those beliefs.” (Sabatier & Jenkins-Smith, 1993:19).

Values colour the interpretation and the use of knowledge once it has been acquired.

We distinguish between the demand for knowledge and the supply of knowledge. Values play a different role in the creation and articulation of the demand than in the production of the knowledge supply.

Values and the demand for knowledge

In determining the *demand for knowledge* systems concerning the contents of policy views play an active, content forming role. Values give shape to the demand for knowledge: they influence the nature, the contents and the conditioning of the questions posed. It is often so that a demand for knowledge upon closer inspection is not really a demand for knowledge but a demand with another objective, for instance for postponement or a delay of decision-making, for peace and quiet, for relativization of existing knowledge. There also exist contradictory observations: apart from the steering effect that value systems have for the demand for knowledge there is sometimes a relatively large indifference in the policy world with respect to the demand for knowledge: knowledge is always useful, therefore allow the production of knowledge to take place superfluously (provided that it is paid for by other parties). If it contains “undesired” knowledge, there will always be the possibility to eliminate it during a new “round” in which the actual use of knowledge is the subject of discussion. During the phase of the articulation of the demand many policy actors do not care much about what exactly the subject of the research is. Even if one is interested, that interest will be directed more at stopping the creation of provisionally explicit undesirable knowledge.

Values and the use of knowledge

While the actors in the policy arena allow each other ample space before knowledge is produced, the conflicts about knowledge become really acute

when the definite use thereof for the benefit of the policy is the subject of discussion. Hisschemöller (1998) remarks that the nature of the demand for knowledge also in general varies according to the phase in which a policy problem is. During the phase of problem signalling there would be a greater need for knowledge of the natural sciences, while only later there is more attention for social-scientific knowledge.

When knowledge subsequently becomes available, policy actors react to it. Values play the following roles. Firstly one attempts to emphasise the knowledge that fits in well with the realisation of the own value system concerning the contents of the policy and to promote it, and one also attempts to take the edge of or to oppose the use of knowledge that does not fit in with the realisation of one's own value system. Here it seems obvious that especially defensive reactions will occur: for it is easier to dispute the validity of knowledge than to prove its validity concretely.

Hisschemöller (1998) signals that the use of scientific knowledge increases the greater the scientific and social-political consensus about the subject is. When there is a political debate there will be, according to Hisschemöller, hardly any objective use of produced knowledge. The parties involved tend in particular to trust that knowledge, that fits one's own position in the debate.

The conclusion that follows from this all with respect to the demand for knowledge is that actors in the policy arena are not primarily driven by real 'thirst for knowledge'. This emphatically applies to policy arenas, it is different in knowledge arenas.

In the *production of knowledge* (the supply) value systems play a different role. We will discuss this extensively in the paragraph 'arenas of knowledge production'.

First a remark of a general nature. The influence of knowledge on values differs according to the theory of Sabatier according to the nature of the values in question. Values that lie at the heart of the paradigm rather have a "basic belief" nature than values in "shells" around the core; values in the heart also have a higher density, are harder and more solidified and therefore more difficult to change. More emotional investments have been made in the core of the paradigm and this has as its consequence that the knowledge carrier has to be very convincing indeed to have any effect on those values. Deep in the paradigm there is a great resistance to knowledge that destroys the 'belief' or threatens to do so. Therefore the paradigm provides a brake on the production of knowledge that is in contradiction of the paradigm and a brake on the use of such knowledge.

If we confront the supposition of Colby (who elaborated paradigms in environmental policy) that the western world is in the environmental protection paradigm, with the conclusion that paradigms make the demand for knowledge smaller, than this means that we particularly generate knowledge that

fits into this paradigm and no knowledge that has a deeply penetrated ecological awareness as its point of departure. Policy makers will ignore and reject knowledge that shows that the present economy forms a threat for us and our environment and can not continue as such.

Arenas of knowledge production

We assume that around processes of knowledge production there also exist arenas, in which parties with partly shared and partly different values struggle to realise those values. But in arenas in which knowledge production takes place the values are of a different nature than in policy arenas. Thus the scientific quality and independence of research is for example an important value for scientists, or the scientific prestige of certain achievements. But also commercial profit or the obtaining of follow-up assignments may be a motif, for policy-oriented research is carried out by order of actors from policy arenas. We here speak of regulating behavioural motifs that exercise an influence. Sometimes there is a relation of tension between those values and moral values about truth and untruth.

In arenas in which knowledge production takes place epistemological paradigms play an important role. This means that knowledge suppliers use a value system that concerns knowledge and knowledge production itself: they have ideas about their own roles and about (in)dependence of people who have a demand/principals or of suppliers/researchers, and about the content of truth and the authority of knowledge. As it is, some people who have a demand for knowledge also have ideas about the position of knowledge producers; the ideas that knowledge suppliers have and the ideas that people who have a demand for knowledge have, may differ strongly. There, where this is the case and where the produced knowledge is not in line with the expectations of the principal, sometimes large conflicts are created: principals want the knowledge suppliers to adjust to their wishes, while the knowledge suppliers attach great value to their role as independent producer of knowledge.

Many knowledge producers feel very strongly about independence. This is a very deep-lying normative value particularly for knowledge producers within the circle of university science that is closely linked with the idea of academic freedom. But also in a broader circle the view prevails that institutions that produce ((semi)scientific) knowledge for policy should be as independent as possible. This is shown by the fact that a number of research institutions for national policy, in spite of a hierarchical subordination in respect of their management, is autonomous as to the contents of the research. Also much knowledge that is obtained from outside the policy arena is recommended with the term 'independent research has proved that...', as if 'independent' stands for 'of high quality'.

Modern (commercial) knowledge producers such as advice agencies, however, attach importance to values with respect to the helpfulness for the clients, which are sometimes deemed to be more important than any other norm: for

the customer is king. According to these knowledge producers the production of knowledge must also serve the customer; not autonomy in respect of content and independence, but willingness to help has become an art and profession in such institutions.

In view of the growing dependency on the third money flow within universities and in view of the emancipation of the advisers that is sometimes occurring, it is no longer possible to formulate simple statements about the relationship between specific institutions and their relative independence; a further study is always required about the cultural orientation of the researchers in question.

Epistemological values that exist with respect to knowledge production, inclusive of the view on one's own role, play a very dominant role in knowledge arenas, but they are subordinate in policy arenas and they are often not made explicit. In practice we see frequently in policy arenas that there is a variation of different epistemological values or that they are confused: for instance if one invokes the hardness and relative objectivity of knowledge that has been produced in a principal-assignee relationship that has been embedded in values. Or if one is outraged by the fact that knowledge produced 'by an independent institution' appears to be not free of values and not objective. Frequently such variation is induced by opportunism: if it is convenient to do so, producers of knowledge are blamed for insufficient independence, and again at other moments the objective truth of knowledge produced in the same way by the same institution is invoked. This leads to great frustration amongst the producers of knowledge: for they have a very pronounced view about their own epistemological values.

Hisschemöller (1998) emphasises that scientists do not or hardly ever choose the role they play. He distinguishes between different roles for scientists according to the structuring of the problem or problems in question. On the basis of this scientists are seen as problem solvers, as advocates, as mediators or as persons clarifying the nature of the problem. We remark that these roles are not always clearly distinguished, but that there is a variation of roles or a confusion of roles.

Interaction between arenas of knowledge production and of policy-making: the two level game

Arenas in which knowledge production takes place do not stand apart from policy arenas. There is a variety of links between the two. Sometimes they partly overlap. Sometimes there is so large a distance that there are considerable transfer problems. Actors that operate in policy arenas do not only formulate knowledge requirements in the direction of knowledge suppliers, they also grant them assignments or maintain hierarchical relationships with the knowledge institutions. Thus a number of important and large knowledge producers are linked with the national government, such as the National Institute of Public Health and the Environment (RIVM), the Department of Agricultural Research (DLO), the Central Bureau of Statistics (CBS) and the

Central Planning Office (CPB). As it is, the autonomy as to content may again be placed outside the hierarchical relationship. This is the case with respect to most of the aforementioned institutions. Furthermore some knowledge institutions form coalitions with parties in policy arenas. This is the case in an evident and structural way with respect to scientific research agencies of the political parties. But also institutions that are completely independent do have these ties. Sometimes on the level of the work site (the scientist who has affinity with a certain political movement or a certain ideology or with a party in the policy process), sometimes on a higher level (the management of an institution, that has a certain paradigm, that shows similarities with the paradigm of parties in a policy process). This in itself does not mean that research is manipulated. But it does mean that no human being, not even a scientist in his capacity as scientific researcher, is completely free of values.

In any case it is useful to bear in mind that politicians, at least driven by their hunger for power, will tend to wish to also influence the struggle within knowledge arenas. They will use this struggle to realise their own objectives. They therefore will play at least a two level game, in conformity with the game that was described by Putnam in respect of international relations (Putnam, 1988). Putnam argues that politicians operating at an international level mostly attempt to realise their national objectives by means of interventions at an international level. In analogy of this it can also be observed how politicians operate in the policy arena and the knowledge arena. It seems as though they speak about the integrity of research as an independent value, but essentially it concerns the agreeability of the produced knowledge in the realisation of political aims. A well-known example of course is the discussion about the method to measure noise in aviation.

According to Rayner and Malone (1998:18) much philosophical, sociological and historical research has already been carried out in which it has been shown to which extent knowledge, also in the natural sciences and in mathematics, is developed by important processes of social acting (negotiating) and the creation of a consensus. Rayner and Malone are of the opinion that the search for the social aspects of knowledge production does not negatively affect the strength and validity of knowledge, but, as opposed to this, contributes to our understanding of sources of certainty in science, of the basis for credibility of scientific claims and their robustness when they are exposed to social challenges.

“The social work of knowledge production begins at the level of observation and experiment within a laboratory or other research environment. Even at this level the scientific community plays a crucial role in what becomes accepted as scientific knowledge” (Rayner and Malone, 1998:18).

Thus Rayner and Malone mention observation situations, for instance, in which not reality is observed, but in which use is made of models or laboratory situations. Such situations occur frequently. One may think of the discussion around the use of statistical methods in the environmental balance sheet of the RIVM or of the noise nuisance system around Dutch Airports, in

which in both cases the points of departure are model-based calculations of environmental nuisance instead of actual measuring. The functioning of such systems is based, according to Rayner and Malone, on a consensus between scientists.

We remark here that the functioning not only is based on the consensus between scientists but also on coalitions with policy arenas. If the consensus is not reached, one has to fall back on endless tests of tests of tests, or on other research methods that often are not available (as yet) or are very expensive. An alternative for models, calculations and laboratory studies is problematic particularly in specific cases: in the case of complex problems such as climate change (Rayner and Malone, 1998) the making of authoritative statements on the basis of scientific research *outside* the laboratories results in large complications in the sense of costs or too complex methods. Therefore it is very important in such cases to have such a system on the basis of a consensus function well. And this leads scientists to reach agreement about artefacts, with respect to which others say that they do not have much to do with reality (any longer) and are already to be rejected for that reason alone. Another disadvantage of complex model-based foundations of scientific claims is that the black box nature of science increases and its transparency is reduced.

We have to conclude that it is also possible that the policy-makers' reason to hinder the scientists striving after consensus is precisely the fact that this consensus would hinder them in realising their objectives. This, too, is playing the aforementioned two level game.

Knowledge production and policy-making: two different worlds?

What does this all mean for the normative relationship between science and policy-making? Different views have been formulated by social scientists on the relationship between science and policy.

The traditional view

There is a traditional view, in which the world of science is separated from the world of politics and policy. In this normative view science is pure, interest-free and impartial and therefore takes place in a world that is separated from the circles in which results of scientific activity are applied. The role of researchers and scientists in this approach is to hand over impartial knowledge to politicians and policy-makers, without mingling in their debates. The relationship between science and politics accordingly is rather one-sided: science is there to 'tell politicians and policy-makers the truth'. This fits in with an image of 'truth' (science, knowledge) versus 'values' (politics, acting). (Rayner and Malone, 1998).

To this traditional view belongs a traditional concept of scientific activity: science is a neutral and carefully checked observation of physical or social facts that can be perceived by the senses. Extensive observation may reveal regularities and patterns that, formulated as hypotheses, can further be tested systematically. Hypotheses that can be maintained can be used as parts of explaining and predicting theories, in which patterns and regularities have been expressed. In this positivistic view there is a very strong belief in objective, scientific rationality.

The postnormal view

In the second half of the previous century the philosophy of science developed a new perspective on the relationship between politics and science (see also Hoppe, 1998). Science is not an activity that takes place in a social vacuum, but is constructed socially, just like all other social activities. And therefore scientific activity, in particular scientific activity that serves to support social processes of decision-making, is also subject to influences of power and (self)interests. Habermas (1970) unmasked the so-called objective scientific rationality as one of the human mechanisms to manipulate the environment out of self-interest. That is the reason why according to him scientific rationality must not be limited to an analysis of empirical data, but the interpretation of socially constructed values and meanings and the political criticism from society must also form part of the concept of scientific rationality. Science that operates for the benefit of the solution of policy questions in a certain sense forms part of the political process. Weinberg (1972) even speaks of policy analysis as a co-production between science and politics. For: the questions that must be answered by scientific institutions are formulated by one or more stakeholders in the policy process. And research questions are not neutral but socially constructed entities that are also steering the

nature of the outcome of the research. Also for this reason science can not be seen apart from the context in which research questions are established. Apart from this there are other relationships between parties that operate in policy arenas and the knowledge institutions that provide them with information. There exist for instance principal-assignee and other financial relationships, hierarchical relationships, altruistic relationships, and such. The insight that science is a social construction makes it desirable that science and policy arrive at a different mutual relationship than in the classical way. The separation between the two according to the traditional view on science in which traditional science played the role of provider of facts and to which the motto 'let the facts decide' applied is no longer satisfying. One of the more recent approaches of science has as its motto 'let the people decide' (democratic approach of science): not only is it recognised that science never is free of values, but it is also deemed desirable that values are used and made explicit in the scientific activity. Various scientists have elaborated this modern form of scientific activity. Funtowicz and Ravetz (1992 and 1993, see Van de Kerkhof, 1999) have developed the concept of the postnormal science for this purpose, gibbons (1994, see Van de Kerkhof, 1999) has developed the comparable concept of 'mode 2 science'. Both concepts plead for a more socially responsible and reflexive way of being active as a scientist, in which the social context of research is taken into account, and scientific activity is not only done by scientific experts but is something in which also other, non-scientific experts, are involved.

Methodological consequences

Funtowicz and Ravetz (1992 and 1993, see Van der Kerkhof, 1999) argue that in the current society science more and more relates to, and has to take into account, fundamental uncertainties in policy questions about social risks and the environment. This means that the traditional styles of (normal) scientific activity are no longer suitable in such a context, for those depart from an objective knowable reality, from certainty, and from control over the natural system. The new science must be able to deal with the fact that the old dichotomies of facts and values, knowledge and ignorance disappear.

Funtowicz and Ravetz have developed a number of methods for scientific activity. They argue that the type of scientific activity must vary according to the extent of uncertainty and the nature of the interests that are involved in a specific case. To the extent in which uncertainties are more fundamental and more difficult or less routine or cannot be controlled at all, more tailor-made activity is required in science, in which also non-scientific elements such as experience and intuition will play a role. Funtowicz and Ravetz distinguish between applied science, professional consultancy and post-normal science. These three categories are related to policy situations in which uncertainties become step by step more fundamental and in which the interests in the decision-making become larger and larger. As more complex uncertainties will be involved, the control over scientific quality will extend further over a circle of assessors. Particularly in professional consultancy and in post-normal

science testing by a group of people that does not only consist of fellow scientific experts but also of interested parties without scientific expertise will become increasingly desirable.

Transdisciplinarity

Gibbons (1994, see Van der Kerkhof, 1999) argues that modern science should become especially characterised by the characteristic of transdisciplinarity. He thinks that the existing disciplinary boundaries are no longer suitable to deal with the current complex (environmental) questions. Transdisciplinarity indicates in the practice of science, including the organisation and justification of scientific activities, boundaries are crossed that in 'normal' science are generally applicable:

- *Disciplines characterised by different contents must be actually integrated (collaboration between the existing disciplines does not suffice).*
- *The production of knowledge must take place in the context in which it will be eventually applied.*
- *The research team must consist of participants with different experiences and with different skills and must be capable of being adapted according to the need for skills. Knowledge production takes place in different sorts of organisations, not only at universities.*
- *Apart from content, research also concerns the process of knowledge production, and the interpretation of the results, as well as the establishment of the research questions. All these matters must be accounted for, towards a broad social group, that uses a broad package of criteria.*

According to some, the concepts explained here are not sufficiently far-reaching, and according to them a further democratisation in science is desirable, even to the extent that knowledge of citizens, too, must be involved in the production of knowledge. This has led to the formulation of the concept of 'citizen science' in which citizens are involved in the formulation of problems as well as in the formulation of solutions. Others have pleaded for the upgrading of lay-knowledge side to side with the traditional expert knowledge as a source for wisdom in policy. This means that *all* information about a certain problem or a certain phenomenon must be seen as useful and that no distinction is made any longer between scientific knowledge, that has to comply with certain procedural requirements, and other knowledge. All that one is capable of knowing is knowledge. And the whole of that knowledge may be relevant for dealing with or solving a problem.

Therefore policy debates must no longer take place within a closed circuit of civil servants, politicians and researchers / experts, but must be moved into a much broader context, in which everyone that knows something may contribute. In lay knowledge the distinction between knowledge and values has become vague.

It remains unclear who exactly will be allowed to have the final word. “Anything goes...” of course can not be maintained in a consistent manner if at the end of the process there is the necessity to act.

An interesting interim position is taken by Jasanoff: it is true that she is using concepts concerning serviceable truth, but she certainly takes into account the intrinsic dynamics of the knowledge arenas apart from those of the policy arenas. Her recommendations for a responsible interaction between the two are not very convincing, but the statement of the challenge seems adequate: in a reasonable way, relate arenas that are relatively autonomous and see to it that there are reasonable process dynamics. At the end of this publication we will discuss this in more detail.

Provisional conclusion

In a provisional conclusion we can give answers to the first two central research questions of this contribution.

We have described that a parallel can be drawn between policy arenas and knowledge in the sense that they both can be seen as a struggle between various clusters of organisations and individuals with internally shared and externally mutually exclusive values, a struggle that concerns the honouring of a specific set of those values. In addition we have described that different values play a role in the arenas that have been distinguished: in policy arenas, values regarding the contents of the policy are concerned, and apart from this possibly also the way in which a policy must be established, in arenas of knowledge production epistemological values are concerned, which means values that relate to knowledge itself, the role of knowledge producers and the ways in which knowledge is produced. The fact that epistemological values in policy arenas play an insubordinate role and are merely instrumental, while in knowledge arenas political values often remain implicit, results in friction between policy arenas and knowledge arenas, since in the first arena those political values are dominant, whereas in the second arena epistemological value systems are of the most importance.

The nature of values in determining the *demand for knowledge* therefore differs from the nature of values in *the creation or production* of knowledge (supply).

As it is, in general it is true that actors in the policy arena never are exclusively driven by a real need for knowledge but by other needs, that they sometimes attempt to realise by means of the formulation of demand for knowledge, and even by interventions in the world of knowledge production. In the formulation of and the dealing with the demand for knowledge value systems play an active, shape-giving role. Actors in the policy arena initially allow each other the space to investigate what one is wishing for, since later, when

possibly ‘undesired’ knowledge might threaten to be used, one can always attempt to influence this. In the use of knowledge the role of these value systems is mainly that one wishes to avoid that ‘undesirable’ knowledge is used.

We have described the relationship between (values in) the policy arena and knowledge production as an asymmetrical one. The influence of values on knowledge is stronger than the influence of knowledge on values. Values direct and colour our perceptions and our acting and our interpretation thereof. This also applies to independent research institutions and the individual researchers and manager that function within those institutions: however independent, nobody is free of values. We have on the one hand deeply embedded beliefs and on the other hand superficial values and we resist the production and use of knowledge that may affect our deeper lying beliefs. The influence of knowledge on values is only then (potentially) large, when that knowledge does not form a threat to the values we adhere to. Values in the policy arena, however, always exercise a large influence on the production of knowledge, since no producer of knowledge is free of values. Furthermore there are different relationships between parties from the policy arena and knowledge producers. Thus parties in the policy arena grant assignments to research institutions, while they often also formulate the research questions, albeit that these are often the subject of discussion before the definite assignment is granted. There are also hierarchical relationships between research institutions and parties in the policy arena. Parties from the policy arena and research institutions also form coalitions, for instance on the basis of sectoral interests.

Consequences for the relationship between science and policy

What does this all mean in a normative sense for the relationship between science and policy?

It means that no strict distinction can be made between application-oriented science and policy, to which science contributes “value-free facts”. That form of science is linked up with politics in the sense that applied research is always based on arbitrary choices to be made by politics.

In the relevant literature various views have been expressed, the implication of which is that science and values must be linked up together by having the actors in the policy arena discuss and also determine research questions, research methods and assumptions, so that negotiated knowledge may be arrived at, that is not free of values, but has been negotiated in an open debate about the choices that influence the production of knowledge. Research institutions must make these choices explicit but they must not make them independent. The debate about research is not limited to professional knowledge producers, but is extended to all actors playing a role in the policy arena. This way of scientific activity is more socially responsible and reflexive. This is the core of concepts such as ‘postnormal science’ and ‘mode 2 science’.

Funtowicz and Ravetz, who introduced the concept of postnormal science, argue that to the extent in which uncertainties and the nature of the interests

involved in research are more fundamental and more difficult, more non-scientific elements such as experience and intuition are desirable. Some feel that even non-scientific knowledge and contributions of laymen are necessary for proper research ('lay knowledge' or 'citizen science').

The more radical this view becomes, the more vague the distinction between policy-making and the production of knowledge becomes and eventually it disappears. The processes that produce knowledge then as to their nature and contents can no longer be distinguished from the processes that produce policy. In the same way as in various variants of economic democracy theories the concept of collective welfare has only an exclusively procedural basis, namely in terms of decision making procedures that comply with certain criteria, in this way also the concept of knowledge gradually obtains a mere procedural nature⁷¹. This is of course indigestible for advocates of scientific paradigms, since every paradigm has a substantial basis for knowledge.

Summary:

- *Knowledge and values exercise mutual influence, in which, however, the relationship is asymmetrical. Values have a stronger influence on knowledge than knowledge on values.*
- *In policy arenas contents values with respect to policy play an important role, in knowledge arenas epistemological values play an important role.*
- *The influence of value systems is different in the case of the demand for knowledge than in the knowledge producing role of value systems in the use of knowledge.*
- *This means for the normative relationship between science and the policy arena that a strict separation between the two is not possible and perhaps not desirable. The boundaries between science and values have become vague.*
- *Knowledge production must not take place exclusively from one paradigm that is dominant in a specific policy arena, but must take place from a range of paradigms that is just as varied as the range of paradigms represented in the policy arena.*
- *There must be an open debate about choices / points of departure that form the basis of knowledge (production).*
- *In this debate also other persons than professional knowledge producers must be involved, for example all actors in the policy arena. Of course the complexity of the problem is an important variable here; not every little problem needs an extensive process of communication. Other knowledge than scientific knowledge, up to and including information from laymen that are involved, must also be used for the decision-making.*

⁷¹ K.J. Arrow, *Social Choice and Individual Values*, 1951
R.J. in 't Veld, *Meerderheidsstelsel en welvaartstheorie*, Stenfert Kroese 1975

- *Choices and points of departure with respect to research can be selected by the principal, not by the knowledge producer.*

Case study: TNLI

Up until this point a number of conclusions has been reached with respect to the research questions about the relationship between knowledge and values in environmental policy. In the following we will see if these conclusions can be upheld if we describe a case from practice.

General

In 1995 a project was started for the benefit of coherent decision-making about the aviation infrastructure throughout The Netherlands. This TNLI-project was initiated to find answers to important questions that can be posed about the development of aviation in The Netherlands, such as: do we want continued growth of aviation in The Netherlands, what is the use and the necessity for this, which are the advantages and disadvantages, what will be the costs and the proceeds, the challenges and risks? TNLI was run by an interdepartmental project organisation of the Ministry of Transport, Public Works and Water Management, the Ministry of Housing, Spatial Planning and Environment and the Ministry of Economic Affairs. This project organisation was steered by a steering group of which high civil servants of the three Ministries were members and in which furthermore another number of Ministries was represented (the Ministry of Defence, the Ministry of Finance, the Ministry of General Affairs and the Ministry of Agriculture, Nature Management and Fisheries).

The project started with an exploration phase (1995 – end of 1996), the prior description of which stated that during that phase the complexity of the question concerning the future of aviation in The Netherlands would be outlined. This phase ended with the publication of a perspectives memorandum, a starting document for the dialogue about the use and necessity of aviation in The Netherlands.

This was followed by a *dialogue phase* (1997) in which the debate about the use and the necessity of growth of Dutch aviation was discussed with the general Dutch public and in particular with a circle of 80 to 100 social organisations (companies, pressure groups, etc.). During this dialogue phase also further research was carried out with respect to questions identified during the exploration phase. The dialogue phase ended with the publication of an integral policy view (IBV) about the future of aviation in The Netherlands, in which a choice was made in favour of selective growth of aviation. There was a separate dialogue and separate research with respect to the regional and small aviation in The Netherlands. We will not discuss this in this article.

Following the IBV that also had the status of 'project decision', but actually still was about four possible projects, this project decision was further elaborated in the *prolonged IBV phase* (1998). Further research was carried out. Information meetings were held, where a broad public was welcome, about that research. An active dialogue with the general public in a broader sense was no longer conducted. The outcome of this phase was a 'strategic policy choice future aviation'. Two locations where the growth of aviation could be coped with still remained (at Schiphol or on an island in the sea).

In the following we look at the relationship between knowledge production and policy-making during the *dialogue phase* and the *prolonged IBV phase*, since during those phases the relationship between policy-making and knowledge production was expressed more clearly than during the exploration phase.

Dominant patterns of values

Many different parties with different interests participated in the decision-making around TNLI. The various ministries, the provinces and municipalities, the aviation sector (airport, Air Traffic Control, aviation companies), forwarding companies and travel organisations, employees, pressure groups such as environmental organisations, groups of inhabitants of air port areas, etcetera. A broad social debate took place, in which in principle every interested person could participate, there was a 'core process' (an intensive dialogue with 80 – 100 social organisations), there was a small part of the interdepartmental project organisation that laid down the policy view on paper, and there was a group of people who were active in having research carried out and in making the results thereof available.

Process designers (Van Eeten, 1997) carried out research by order of TNLI into underlying images and views used by the participants in the process and the consequences that such images and views would have to have for the process design of the decision-making route. By the way this by itself indicates that the project organisation TNLI reflected on its own values and that in giving shape to the mutual relationship between research, policy-making and dialogue the point of departure was not a set of traditional self-evident facts but that one thought in a conscious and active way about the relationship between politics and science.

Within the core organisations of the participants it appeared that clusters or configurations of views could be distinguished. These varied strongly. An important dimension on which, according to Van Eeten, all views could be positioned, was the controversy between economics and the environment (this points to the 'environmental protection paradigm' of Colby, mentioned earlier in this article). Almost all participants in the dialogue seemed convinced of the necessity of a compromise between (aviation) economics and the environment. Still the basic assumptions of the various parties varied strongly. There was a large number of parties (the sector) that were in favour

of imposing as few limitations on aviation as possible. There were small groups that thought that strong limitations must be imposed on aviation. Thus there was a hot debate about the limits of growth, in which these small groups stuck to the existing limit of 44 million passengers. There were many protests – or, at least, the protests in question obtained emphatic attention – against the nuisance caused by aviation. One could think for instance of violations of the noise zones. Van Eeten distinguished between the following clusters of views (Van Eeten, 1997), according to which we have categorised the various participants in the decision-making:

- *First of all there was a group that was mainly concerned about the social embedding of a growing airport. Central to the views of this group was the finding of a balance between the costs and the benefits of the social embedding of the growth of the aviation. Airports are seen as a source of income, that, however, also bring along negative effects, that must be compensated for as much as possible, inter alia by providing for the substitution by less harmful forms of mobility. In this configuration we position the Ministry of Housing, Spatial Planning and Environment, that initially took a firm stance in the promotion of environmental interests, but that eventually was forced to a more moderate stance. In that sense the Ministry of Housing, Spatial Planning and Environment can be seen as a kind of policy broker, that had to mediate between the parties with an economic interest that were involved in aviation (and the member of the purple cabinet I who felt favourably towards these economically interested parties) and the environmental movement and the inhabitants. The Ministry of Housing, Spatial Planning and Environment was forced to search for a fair compromise between economics and the environment. The municipalities and provinces around (prospective future) airports could be reckoned mainly to belong to this group (although also at that level of course two configurations can be distinguished between). Organisation of inhabitants are divided over this coalition and the following coalition.*
- *Secondly there was a group that considered extension of the infrastructure to be an ineffective use of public means. The contribution of aviation to the economy would, according to the views of this group, not be so large, but the negative effects of it would be large indeed. The government had better invest the scarcely available means in something different. In this configuration we position the various environmental organisations. During the decision-making process of TNLI they also attempted to put the demand for alternative possibilities of investment on the agenda explicitly.*
- *Directly opposed to this are the views of a group, according to which extension of the infrastructure must be seen as a necessity in the international competition struggle. According to this group, aviation*

very largely contributes to the economy (transportation forms the core competence of “The Netherlands Distribution Country”). Negative environmental effects can be compensated for at a regional and local level; globally seen it would not help if Dutch aviation decided not to expand for then the growth will be processed elsewhere. We first of all see the economically interested parties as belonging to this configuration, including the aviation sector, inclusive of the aviation-technological knowledge institutions such as the NLR. Furthermore, we reckon the Ministry of Economic Affairs and the Ministry of Transport, Public Works and Water Management as belonging to this coalition. These ministries were important supporters of the ‘mainports concept’. In this concept the mainports Schiphol and port Rotterdam form the central pillars of support of the Dutch economy. The care for the growth and prosperity of these mainports therefore was a central element in the thinking and acting of these ministries.

- *Apart from this there was a group with views to which in particular the ecological modernisation of the industrial sector is central. According to this group the government must create the prior conditions for a sustainable development of transportation in our country. Until now it has not done this. Thus, for instance, the price mechanism does not function well; not all external costs of transportation are passed on, subsidies are even granted for harmful forms of transportation. This has to change so that the sector will receive optimal incentives to make aviation less damaging for the environment. To this characterisation of van Eeten we add that within this group there is a great trust in the possibilities to make transport by air less environment-unfriendly (a different system of runways, different landing procedures, cleaner and quieter planes, etc.). This corresponds with the values of knowledge institutions such as the NLR. Because of their enormous confidence in the possibilities of technology, the aviation sector and the Ministry of Transport, Public Works and Water Management may be seen as belonging partly to this group. These latter parties, however, have more moderate views with respect to the reparation of the full functioning of the price mechanism.*
- *And finally Van Eeten distinguished a group that wished for sustainable facilities for the strongly increasing need for mobility. This group deems the possibilities for substitution of air traffic by other modalities considerable, one thinks that the government should particularly aim at realising this substitution and should make use of the aviation infrastructure in a selective way. In this group particularly those parties who have an interest in other transport modalities than aviation (therefore: road, railway and water transport) and a part of the environmental movement can be found; the knowledge producer*

National Institute of Public Health and the Environment belongs to this group.

Asymmetry in the relationship between values and knowledge

Values have a stronger influence on knowledge than knowledge has on values, thus we concluded earlier. In TNLI a number of examples of this can be found.

The fact that values have a strong influence on the production of knowledge was particularly apparent from two instances of research into the added value of transfer passengers, that were carried out in 1996-97 and that almost led to an incident in 1998.

Research into the added value of transfer passengers

In 1996 the Civil Aviation Authority (RLD) requested a research agency to investigate what the added value of transfer passengers at Schiphol was for the Dutch economy. This was an important question from various actors in the debate on the perspectives memorandum. The TNLI research route was not yet established (it was established in 1997); through TNLI the question came to be dealt with by the RLD.

The RLD had research carried out in which four variants were studied with respect to the share of transfer passengers on Schiphol: a situation in which there is a transfer of 25 %, a situation in which 75 % of the total number of passengers are transfer passengers and two subvariants thereof. The conclusion was that the cutting into the transfer segment would have large effects on Schiphol and on Dutch economy, but it was not stated that it would be disastrous to Schiphol or to Dutch economy, certainly not in the milder variant. However the following applied: *“...the idea to discourage, to assign quota’s to or to forbid transfers at Schiphol (means) the elimination of the basic principle as laid down in the first strategy (Schiphol mainport). It is therefore equal to abandoning the mainport concept.”*

According to the Cabinet Purple I⁷² this of course could not be the intention – for the heart of the policy theory of the Cabinet Purple I was formed by the mainport concept.

The research was not published. It was done anew, but this time with an even more extreme research question: what are the consequences if at moment x suddenly all transfer passengers would disappear from Schiphol? Such an extreme question almost necessarily leads to an extreme answer and that was indeed the result. The report was given the title “transfer passengers at Schiphol, the foundation of the mainport” and the main conclusion was that the added value of transfer passengers was so large that the disappearance of this category without any doubt would have disastrous consequences for Schiphol and also for the Dutch economy.

⁷² The so-called first purple cabinet is a coalition government of social democrats, liberal democrats and conservative liberals from 1994-1998. Since then, The Netherlands has its second Purple Cabinet.

Knowledge and policy theory about mainports

An example of our earlier conclusion that knowledge has a smaller influence on values than the other way around is the following. In the TNLI research route many insights were obtained that strongly relativize the basic assumptions of “purple i” with respect to Dutch economy (in short the mainport concept). If one reads the enormous stacks of results of the TNLI research, one will also find documents in which many relativizations are made with respect to the necessity of the growth of Dutch aviation. This applies particularly to research carried out during the dialogue phase of TNLI. An example of this is the Cranfield university research, that foresees, against the background of the development of strategies of airline companies, that for instance may be aiming at bundling of passenger flows into so-called “compact” flows for long routes – the hub and spoke strategy- in transportation in Europe, large uncertainties for the demand for passenger transport at Schiphol. This all is also based on an exploration of future developments in European long distance mobility, in which long term scenarios are outlined with a much more modest role for aviation.

Furthermore the large disadvantages (in terms of noise, air pollution and occupation of space) of a strong growth of aviation are emphatically outlined in various studies in respect of the environmental load caused by air traffic. Those exposés are just as ‘hard’ as the exposés the conclusion of which is that growth of the aviation is indispensable for the growth and prosperity of Dutch economy. A strong growth of aviation does not contribute to sustainability and the quality of life.

Still these insights prove to be not so convincing that they have led to any adjustment of the central policy theory of the Cabinet Purple I. The growth favouring research results are dominant in the integral policy view (IBV) of the cabinet. The insights that go against this policy theory are processed in a moderate and subordinate way. The reasoning that is put forward by the cabinet in the IBV is as follows:

“From the results of the dialogue and the additional research no absolute yes or no pro or contra any further growth of aviation can be derived. The economic importance of aviation for the Dutch economy is recognised.” (We remark here that this is not the case in all research). *“On the other hand it has been established that most solutions that give space to further growth in excess of the limitations of the PKB Schiphol and surroundings have negative effects for the environment and the scarce space in The Netherlands. (...) The cabinet wishes to use the positive effects as much as possible and to limit the negative effects as much as possible to a minimum. It therefore arrives at the answer, yes, but under certain conditions.”*

Subsequently the concept of ‘selective growth’ is introduced. This concept is the embodiment of the ‘environmental protection paradigm’: economics is relatively dominant, but an ecological awareness is clearly present. This leads to a weighing of economics against ecology. And in this we prove not to choose for ‘green growth’ (which belongs to the resource management

paradigm) but we allow ‘not-green growth’ that we, however, attempt to minimise.

An interesting fact is that the cabinet up until today has not yet taken any action to actually give shape to the concept of selective growth.

Norm versus practice: the relationship between policy-making and knowledge production in TNLI

We posed the question with respect to the normative and actual relationship between policy-making and science and earlier on answered the question with respect to the normative relationship: a separation between science and policy is not desirable. In the following we will see what that relationship looks like in practice.

The relationship between knowledge production and policy-making during the dialogue phase

During the dialogue phase the organisation of the project had been arranged along three lines:

- *Conducting a dialogue with (a core group from) society;*
- *Carrying out supplementary research;*
- *Writing a policy view.*

For all these three routes a separate project supervisor had been appointed (for the research this person was called ‘the research co-ordinator’). The steering of the research took place in a number of stages. The steering group TNLI steered the research co-ordinator, who in his turn co-ordinated ca. 12 supervising groups that carried out the day-to-day steering of all research within a research theme. The chairmen of all these supervising groups originated from all departments, to a greater extent from the Ministry of Transport, Public Works and Water Management than from the other departments. Checks and balances had been built in by means of the composition of these groups: they were composed of civil servants from all departments.

The three routes ran parallel. The link between the routes was not expressed unambiguously beforehand, among other reasons because there was no experience with preparation of the decision-making about a large project in this (interactive) way. For TNLI was the first decision-making route that was shaped in a new style, in conformity with the cabinet stance about the WWR⁷³ report decision-making about large projects⁷⁴.

There was no link or hardly any link between dialogue and research. The link between research and dialogue was only specified when the two almost been

⁷³ WRR: *Scientific Advisory Council of the Dutch Government*

⁷⁴ *The so-called first purple cabinet is a coalition government of social democrats, liberal democrats and conservative liberals from 1994-1998. Since then, The Netherlands has its second Purple Cabinet*

started already, in the spring of 1997. The knowledge production was monopolised in the sense that the TNLI project organisation steered the knowledge production. In as far as there was a link, this link was rather one-sided: research was specifically seen as input for the dialogue. It was not chosen for to have the dialogue exercise any influence on research (for instance with respect to the research questions). However, this was not clearly communicated with the dialogue partners; initially some of them were under the impression that they also had some say in the research. This was not the case. Before the dialogue started the research programme had already been fully established. The research questions were based on internal discussions between the departments, conducted in 1996. The social dialogue partners had no influence on the research questions.

When in the spring of 1997 the project supervisor ‘research’ started his function, he made a small provision to as yet have questions that originated from the dialogue be the subject of research. The steering group TNLI, however, decided that only research questions that originated from the private dialogue with the core of the social groups could be eligible for research. In view of time pressure these instances of research could not be more than quick scans, there was only a small budget available for them.

The dialogue with the core groups ran from March 1997 up to and including 2 July 1997. The research had not yet been rounded off. It was decided that in September, when the research would have been rounded off, sessions could take place in which the participants in the dialogue could take cognisance of the research results and could react to them. This took place in September and in October. In September there was an informative meeting in which researchers, policy-makers and participants in the dialogue participated; in October there were sessions where in particular the dialogue partners could react to the research. The conferences had two functions: the scientific discourse (it concerned a scientific and no political forum) and the provision of information.

The relationship between research and dialogue caused a considerable amount of frustration on the part of the dialogue partners: one could hardly contribute to the research questions – not to mention the points of departure or methods of research – one could only take cognisance of and react to the results, neither did one have any say or could one make any contributions in the follow up round⁷⁵.

Another relationship that is of importance is that between the small core of policy-makers and the research. In this relationship, too, there was a ‘misfit’. The research and the process of writing the policy memorandum ran parallel. At the same point of time at which the research had been rounded off, the policy view had to be ready. One attempted to compensate for this

75 WRR: Scientific Advisory Council of the Dutch Government

misfit by composing a special team of ‘summarisers’ that, when the research results became available, had to summarise all the research produced for the authors of the policy view and make it transparent. By this one wished to give the policy-makers the opportunity to ‘digest’ the research results in a short period of time and to include them as much as possible in the writing of the policy view. The authors of the policy memorandum officially had no say in the drawing up of the research programme.

The relationship between knowledge production and policy-making during the prolonged IBV phase

During the prolonged IBV phase the broad question with respect to the use and the necessity of aviation in The Netherlands no longer was the subject of discussion. During the prolonged IBV phase further research with respect to a number of locations where the selective growth, that meanwhile had been chosen for, could be accommodated, was the main concern. It concerned the locations of Schiphol, maasvlakte, flevoland and an island in the sea. The steering group TNLI continued to exist, the chairmanship changed from the Directorate General of the National Aviation Department (RLD) to the Secretariat-General of the Ministry of Transport, Public Works and Water Management, by which also the increasing political importance of this phase of decision-making was indicated. The project organisation TNLI continued to exist but underwent strong personnel changes. Now the project organisation was based on the dividing lines in the research: the research had been divided into research with respect to the location of Schiphol (supervised by one project supervisor) and research with respect to the other locations (an island in the sea, Maasvlakte, Flevoland, also supervised by one project supervisor).

The writing of the final product of this phase, the strategic policy view, took place this time again within a writing group of civil servants.

The expectations with respect to the process of interaction with society were strongly reduced. It now concerned ‘tailor-made interaction’ that was given shape by means of three information meetings about each of the locations examined. At the first of these meetings the project organisation TNLI discussed the draft version of the research programme with the persons attending. However, it was made clear that it was the project organisation TNLI that finally decided about the question which research was carried out and which research not. At the second ‘tailor-made interaction’ meeting the persons attending were informed about the progress and the provisional results of the research. At the third meeting the final results of the research were discussed.

In view of the slower tempo of the preparations there was more space during this phase for the processing of the research results than during the dialogue phase. The major part of the research was rounded off in September 1998. In December 1998 the strategic policy choice was presented.

In fact the link between research and dialogue hardly had been changed by this compared to the preceding phase. The link between research and policy-making had acquired its shape somewhat more quietly than beforehand. As opposed to this it seemed as if the link between research and 'dialogue', in as far as this still existed, had been given shape in an even thinner and more one-sided way than before. That had been done intentionally. One did not wish to create false expectations about the influence of citizens on research. The project organisation TNLI wished to inform citizens and was pleased to hear their comments but wanted to decide itself about what would be finally done with this, answered the project director Bussink when he was asked this. It seems somewhat paradoxical that in the beginning of this phase, as opposed to what happened in the dialogue phase, a complete research programme was submitted to the participants in the tailor made interaction meetings for their comments. This seems to indicate that this phase after all was more interactive or more based on dialogue than the actual dialogue phase.

Persons involved in policy are not really motivated by any need for knowledge

Remarkable is that the dialogue of TNLI ran from 2 March until 2 July 1997 and that the supplemental research programme ran from April until August 1997. The research programme still had to be composed in April 1997. This was very urgent. The composition of the research programme took place separately from the dialogue and was done by a relatively small group of people within the project organisation TNLI. The research programme was an accumulation of questions that had been posed by departments during the round of the perspectives memorandum. The steering group approved the research programme relatively quickly, within two months. There was relatively little discussion about what had to be researched and what need not be researched. The discussion concentrated rather on matters that according to the steering group did not belong to the research programme. Not to the extent that one was involved in determining research questions that had to be dealt with. We conclude from this that (at least a part of) the actors in the policy area do not actually operate in a knowledge-driven way. The active demand for and need for research is not strong.

Also during the prolonged IBV phase it can be clearly seen that the policy actors are not really driven by a fierce thirst for knowledge. Again the research programme is drawn up in a hurry by a relatively small group of people within the project organisation TNLI. Even more strongly so than during the dialogue phase some give expression to their antipathy against the research of certain variants. There are advocates of still including a zero variant in the research. However, the opposition is so large that it is decided not to include any variants for zero or a moderate growth in the research.

The fact that actors have no real strong need for knowledge is also apparent from the fact that the research that has become available (both during the dialogue phase and the prolonged IBV phase) is used only fragmentarily. A (large) part of the research that has become available is not used at all, if

only because of the fact that the enormous quantity of research that has been carried out within the framework of TNLI is so large that almost no one can oversee it and can digest it. The research production covers many thousands of pages, that have nowhere been summarised in an adequate way.

The normative idea of a separation between policy-making and knowledge productions is still very widespread

As apparent from the fact that research on the one hand and dialogue and policy on the other hand have been accommodated in different routes between which there is no or only a defective link, the idea that it is desirable to have the production of knowledge take place 'independently' outside the policy arena is still widespread. This became clear also in other ways during the process of decision-making. At various moments during the TNLI debate a value conflict between research institutions occurred. The reactions to this from society and from the media showed that the idea of normatively desirable separation between policy-making (values) and science (truth) is still relatively strongly adhered to and that one is often not aware of the enormous impact that values (also) have on independent research.

Varying research results of CPB and ADECS

The first instance concerned a conflict between the CPB (Central Planning Office) and a small aerospace technological research agency, called ADECS. Both institutions were asked which amount of traffic could be maximally handled at a re-configured Schiphol, assuming that the traffic handling would have to take place within the current environmental standards. The results of the two studies varied enormously: according to the (independent) ADECS less than 44 million passengers could be handled, according to the CPB more than 60 million. An explanation for this was asked for in the RROM (Cabinet Council for Spatial Planning and the Environment). None of the two agencies had an explanation ready; furthermore both agencies deemed the own way of reasoning and the own assumptions to be superior to those of the other agency. There were indignant reactions to the incident. Nobody had expected such an enormous difference. It should not have been possible. There was some understanding for the fact that the outcome of the two calculations might vary somewhat, but that there could be so much value colouring in mere calculations was amazing to many.

The agencies were ordered to find out what was the matter. The outcome of this was that it indeed was mainly caused by the assumptions that had been used, for instance with respect to the number of night flights and the number of large air carriers. However, the differences were never clarified completely, thus interwoven had been the value concepts used with the complex calculation methods.

CPB and RIVM about possibilities of growth at Schiphol

A second instance concerned a conflict between two institutions (RIVM [National Institute of Public Health and the Environment] on the one hand and the CPB [Central Planning Office] and NLR [National Aerospace Laboratory]

on the other hand) about the possibilities of growth at Schiphol. On 24 April 1998 the cabinet requested a joint venture of the CPB and the NLR to study and compute the possibilities of growth at Schiphol under different alternative runway systems. Upon the request of the minister of transport, public works and water management dated 19 May 1998 the RIVM was also involved in this assignment during a later phase of the evaluation research. When the results of the research were ready, the RIVM initially agreed with the conclusions as intended to be drawn by the CPB and the NLR; later the RIVM revoked this agreement; this was announced with a lot of publicity. The conflict concerned the conclusion of the CPB/NLR that 60 million passengers could be handled at Schiphol, within the environmental limiting conditions. The RIVM thought that that conclusion was not justified and placed remarks with respect to the report. The conclusions in the final report were for the account of the CPB/NLR, the RIVM added its views and comments on possible conclusions in an appendix.

This incident again was met with indignation: two reputable, independent institutions that fight over research results through the media. To what extent can we trust independent science in these times? Science appears to be politics: a great disappointment, and moreover an outrage and a shame.

This debate looked different to the actors in the knowledge arena: they were precisely concerned with demonstrating their own scientific superiority and spreading its validity. In this mainly epistemological values (scientific superiority) played an important role. However, it can not be denied that apart from scientific superiority also political views were important. The cluster CPB/NLR was more in favour of large scale extension of aviation than the RIVM, whose thinking is more based on environmental interests.

The two examples show how tensions are created between policy arenas and knowledge arenas. The conflicts between the research agencies in the perspective of the agencies concern scientific superiority but are not always recognised as such by the actors in the policy arena (they are sometimes seen as political conflicts).

Evaluation: coupling between knowledge production and policy-making in environmental policy leads to improved decision-making

Earlier on the practice of knowledge production and policy-making have been considered in theory and in the practice of TNLI.

We see that the provisional conclusions drawn in this article are confirmed for the major part. Not only in theory but also in practice the relationship

between knowledge and values is an asymmetrical one: values exercise a stronger influence on knowledge than the other way around.

We have also seen it confirmed that the influence of values on the demand for knowledge is different than the influence of values on the production of knowledge; in policy arenas other values are important than in knowledge arenas. The articulation of the question and the use of knowledge that has become available both take place in the policy arena and are strongly influenced by values as to the contents of policy. In knowledge production other values than values as to contents play a role; here values with respect to the quality of knowledge and its production are dominant.

It could also be seen in the case history that debates in which these different values play a role, but in which these values are not recognised and acknowledged as such, result in tensions between the policy arena and the knowledge arena.

Separation between science and policy not desirable

The consequence that one links to this asymmetry in social-scientific meta theories is that a separation between science and policy is not desirable. Not only should the arenas of policy-making and the arenas of knowledge production each be composed in a broad way (since they have to represent different groups of values) but they should be coupled to each other emphatically. Knowledge production must not be done exclusively from one paradigm that is dominant in the policy arena, but must be done from a range of paradigms that is as varied as the range of paradigms represented in the policy arena. That is a democratic postulate. There must be an open debate about choices, points of departures, on which knowledge (production) is based. In this debate also other parties than professional knowledge producers must be involved. Science in such a context ideally is 'postnormal science'.

Coupling policy dialogue and research

From the case-study TNLI we can conclude that the concept of postnormal science has not (yet) lived up to its promise. Within the process of TNLI the complexity of organising a social dialogue in a well-arranged way proves to be very large. The making of a connection between that dialogue, in which very different values are confronted with each other, and the research programme would mean that the diversity of values in the policy arena would have to be expressed in the research programme. That is a bridge too far for the current generation of policy-makers. It would involve a complete abandoning of the idea that 'independent science' can provide a more or less objective truth with respect to the best solution.

Although science has already put forward many relativations of this idea, we see signs in the present policy practice that the normative idea of separation of policy and science still prevails. Actors in the policy arena sometimes act in a very opportunistic way with respect to the relationship between policy-making and knowledge production: sometimes one attempts to influence

scientists with respect to the contents of research, but at the same time they are reproached (where this is convenient) for their lack of independence.

The making of a connection between arenas of policy-making and knowledge production would furthermore mean in the case of TNLI that the research programme would have become even larger and more complicated – and even in the present approach a large quantity of the knowledge that had become available was not used at all or was hardly used at all.

There exist therefore (practical and conceptual) obstacles in the policy arena to have the insight that a many-sided coupling of the production of knowledge with the policy-making, in which the plurality of values in the policy arena returns in knowledge production, be of any effect. This, too, is an example of knowledge that is not used since it does not fit in with the prevailing value system of the policy-makers, and neither with the value system of knowledge producers. For knowledge producers have explicit views about their own position and role towards policy-makers.

We are of the opinion that the making of these connections could bring about considerable improvements for the relationship between knowledge production and policy-making. For in society disappointment is growing at this moment amongst a part of the social partners about TNLI and processes that have been organised in a comparable way. Many parties have invested an enormous amount of energy in the participation and as a reward for this see that the decision-making is continuing without any honouring or real representation of their own views. This leads to frustration. Therefore there is a chance that at a later stage this will lead to obstacles and resistance in the decision-making; that it cannot be continued without any obstructions, that it will be reversed partly, or that it is continued under large dissatisfaction about the contents and procedures on the part of large groups. If the parties are dissatisfied with such a decision-making route, there is a large chance that in future they will no longer participate in such a joint decision-making process. And that seems particularly harmful at a time in which the government and social parties will have to collaborate to an increasing extent in solving large social problems such as the problem of the environment. The making of connections between research and policy-making therefore contributes to the quality of decision-making as a result of the fact that by such a connection the democratic content of it is increased and since collaboration between the authorities and social parties in the administration of our present society is indispensable. Furthermore, the making of connections between policy arenas and knowledge arenas increases the chance that the decision-making process up to and including its implementation will run more smoothly. And finally the involvement of a large diversity of values may lead to more creative solutions.

However, it will be necessary to describe the desired connections between the two arenas – the policy arena and the knowledge arena – on which we

reported extensively earlier on, in more detail than has been done up till now. For those connections do not have to be the same during the different phases of the total process.

Preparatory phase

We can imagine that during the preparatory phase within the policy arena the various parties involved may be given ample opportunity to derive their knowledge demand and questions from their views on the policy questions that are the subject of discussion. This partial process should be in a phase in which scientists give their opinion about the probable results of research to be carried out and assess in a dialogue whether the benefits of the research would surpass the costs of it. It would be characteristic of a true democratic feeling if here, too, the points of view of the opposition in the form of alternative knowledge questions would be formulated. This phase could be finalised by transparent political decisions about the research programme to be carried out.

Execution phase

During the execution of the research no irreversible completion of any partial route in the preparation of the policy should take place, since this would in so many words deny the necessity in providing an answer to the demand for knowledge. This “waiting” problem may perhaps cause great political tension. This must be solved by observing strict care beforehand. If it is clear that the time for research will be too short in view of the urgency of the problem to have the results thereof be of service to the design of policy, it should be recommended not to order the research now.

Intermediary

In our opinion it is recommendable to investigate very carefully if the introduction of an intermediary between policy and science is desirable. In the relevant literature many arguments have been put forward to support such a proposal: the increasing awareness and involvement of citizens, that also leads to demand for knowledge, the increasing pressure on administrators to account for actions, also with respect to their research policy, that activates the wish for use of external expertise, the progressive de-ideologisation that makes room for other than regular procedures, the increased turn-around time of knowledge, the increasing conflicting nature of knowledge.

An independent intermediary who has competence both with respect to the policy problems and the science involved may arrange and steer the process of consultation about and the execution of research in such a way that there will be added value. He will be able to limit the extent to which the harmful two level game is played. In as far as the research ends in a process of negotiation with respect the validity of insights gained, he may supervise this process, too.

He will be an interpreter, in as far a common language between policy-makers and scientists will be missing, he will be a process architect, he will be a collector of ideas that may result in a creative contribution to the policy problem,

he will be a court jester in as far as this is necessary to relativise the position of the authorities with irony.

He will see to it that:

- *all relevant knowledge and information will be discussed;*
- *fixations amongst actors will be dealt with in a constructive way;*
- *a balanced discussion of all recognised knowledge questions will take place;*
- *no results will be left out from the discussion untimely;*
- *there will be continuous monitoring of the process of knowledge development on the one hand and of the policy-making process on the other hand.*

Of course there already exist institutions that fulfil the aforementioned functions upon certain occasions. In accepting the suggestions formulated above it is necessary to carefully investigate per domain whether there is an existing institution that can be rebuilt into such an intermediary or whether a new institution must be established.

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5. Clarifications

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A perspective for action

Near the end of this book the reader is likely to pose the question of how the insights formulated in this book can be forged into a perspective for action. Which insights and knowledge in this book are useful building blocks? It would be disastrous to let the preceding reflections and analyses stand for what they are worth and do nothing with them at all. The reader would get the impression that the relationship between policy and knowledge is as it is and that nothing much can be changed. This is why you will find some general recommendations in this chapter to optimise the role of knowledge in processes of decision-making that may potentially have a great influence on the environment and on nature. The purpose of the recommendations is to improve decision-making, more specifically the democratic content of it. Also wasting money can be prevented. The credibility of 'science' will increase if the recommendations are complied with (or at least will not be affected negatively any further).

Some general conclusions

Upon reviewing the casuistry discussed in this book for a second time, and in the light of the preceding analysis, several more general conclusions can be drawn concerning the relationship between knowledge and policy:

- *It is important to make a distinction between knowledge production and the use that is made of knowledge, since the relationship with policy-making varies strongly. The articulation of the demand for knowledge and the use of knowledge in the policy arena are strongly influenced by the values that play a role in policy. These have a normative-political nature. In the production of new knowledge in the knowledge arena different values – of an epistemological nature – play a role: with respect to the quality of the knowledge and how that knowledge is established. Independence, institutional prestige and peer review are decisive in this.*
- *In polarised situations in which large social interests are opposed, the conflict of interests from the policy arena is continued as it were in the knowledge arena. In order to get certain objectives realised at a political level or to make sure that certain values are honoured, actors make use of knowledge in a strategic way. These interrelated actions can be characterised as a kind of two-level game, in which the outcome of the struggle in the policy arena (level 1) is influenced by the knowledge arena (level 2).*
- *In the discussion about knowledge concerning complex projects in which many interests play a role, 'independence' and 'objectivity' of the knowledge are of essential importance. The discussion about 'objectivity' and 'independence' of research(ers) is often endless.*

In the philosophy of science the conclusion that this discussion makes no sense and that ‘value-free’ knowledge does not exist was already reached a long time ago.

- *Mostly implicit policy-makers, social groups and researchers still depart from the classical view that knowledge is objective and free of values and that policy must be based on objective knowledge. Policy and politics on the one hand must be strictly separated from science on the other hand, according to this view. But political rationality can prevail over scientific rationality. This so-called rational model of the relationship between knowledge and policy is not adequate to explain the phenomena observed in complex policy problems in which many interests and actors play a role, as is true in the cases described.*
- *The theoretical model that is used for studying the role of knowledge in the making of environmental policy must be a multi-actor model and not a rational uni-centered actor model. This means that the point of departure in analysis must be that the existence of not only one actor, but of different actors, is relevant to the explanation of how one is dealing with knowledge in policy. Furthermore our point of departure is that these actors look at the problem in different ways (differences in problem perception). Both the problem itself and the knowledge that exists with respect to it, are considered to be a social construction in the multi-actor model. Then the necessity to investigate how (different) actors think about the problems and its possible solutions is evident. Thus one may arrive at a ‘shared truth’. The knowledge that was discovered and generated during the policy process can be seen as a product of mutual influencing and exchange. This knowledge is also called ‘negotiated knowledge’. This concept seems to have hardly been applied or welcomed in policy practice. For the present generation of policy-makers it would mean that the idea that ‘independent science’ can provide a more or less objective truth with respect to the best solution in complex projects would have to be abandoned.*
- *The classical separation between science and policy is in fact eliminated if one strives to arrive at a ‘shared truth’. This also means that it is necessary to make provisions for critical testing, interpreting, structuring and communicating knowledge (claims) on the interface between science and policy. This activity is also indicated by the term ‘boundary work’ in the scientific literature.*
- *An independent facilitator, or as the case may be, an intermediary function may be useful, both for the facilitating of the process of knowledge exchange and for the work on the interface of policy and science.*

These general conclusions have also been based on some ten observations from the preceding chapters. Recommendations have been coupled to these observations for an optimal relationship between knowledge and policy.

Observation 1

The structuring of the policy problem determines the role of science and knowledge in policy preparation.

The role of knowledge depends on the extent to which a policy problem is structured, that means whether or not there is a consensus about the knowledge that is deemed relevant by the various actors and whether or not there is a consensus about the values linked to it.

The cases that have been studied (Betuwe track, Schiphol fifth runway, manure policy, choices of locations VINEX policy) are examples of policy problems that one may call moderately structured or not structured at all. The policy-makers in question assumed that it concerned a structured problem for which research would help to find the best solution. However, gradually it became apparent that strongly varying values were being adhered to by the actors involved and that there was no consensus about the knowledge that was deemed to be relevant. In the case of Schiphol this fundamental disagreement became manifest only at a later point in time, when it appeared in the TOPS (Temporary Consultation Platform Schiphol) that the relevant actors could not reach agreement about (a part of) the relevant knowledge.

The cases therefore were actually unstructured problems. In such cases, scientists can contribute mainly by clarifying the policy problem. If their contribution is more solution-oriented, the chances that it will be mainly used in a strategic way to provide arguments for the stance of one actor are great.

Recommendation 1

It is recommended that the demand for knowledge be explicitly related to the nature of a policy problem: does it concern a structured or unstructured problem in the perception of the policy-makers and other parties involved. This presupposes stock-taking, confrontation and integration of different views about the problem. Methods are available for this. If there are doubts, an integral problem analysis as a separate activity is desirable.

Observation 2

Problem definitions differ according to policy level and actor and may shift in the course of time.

A study about the drying out problem shows that local administrators use another problem definition than state civil servants. In the case of the Betuwe track the Ministry of Transport, Public Works and Water Management initially assumed that the problem concerned the choice of a track, whereas others made the usefulness and necessity of the railway connection a point of discussion. We can conclude from this that actors at different administrative levels may see “the problem” differently, from the point of view of their own

frame of reference and also that the actors involved use their own problem definitions that have been determined by their own interests. Furthermore, the problem definition may change in the course of time under the influence of new knowledge, or other relevant dynamics. This for instance was the case with respect to the manure problem. First it was considered purely to be a problem that had to be solved technologically (especially by the state and the professional organisations in the middle of the eighties), later one also started to look at the optimal manure production from an agricultural and environmental point of view and a shrinking of the number of hogs could be discussed.

Recommendation 2

It is recommended, in the case of problems with respect to which one may suspect that different interests in society are involved and that different ideas about them exist, to take these differences into account in the preparation phase of the policy. This concerns differences between actors at the same scale level and differences caused by differing scale levels. One should also taken into account the dynamics of the interaction between actors that may (sometimes) lead to adjustment of the problem definition. Practically this means that one approaches the different actors in an active way and that one investigates which problem definitions and ideas for solutions exist amongst them.

Observation 3

A strategic use of knowledge occurs frequently: knowledge struggle = power struggle

A strategic use of knowledge in the policy arena occurs frequently. Policy makers have either an implicit or explicit idea of how knowledge can be used in the policy arena, usually to provide arguments for their views and to confirm their own problem definition. This may lead to a polarisation in the decision-making process, in which the policy question is actually fought over and decided through the debate about knowledge. See, for instance, the course of affairs in the Betuwe track project in which meters of pro and contra reports have been produced.

In the case of complex policy problems where many interests are at stake, it is remarkable that the contribution of knowledge during the first phase of the process of preparing the policy is mostly fragmented and one-sided: for instance mainly economic research, with relatively little attention to environmental and nature aspects. The actors representing these latter aspects are often in an opposing position. The integration of knowledge from different fields is often established too late (see TNLI discussion). Also, in most cases, clear supervision of the research is missing (see also VERM discussion). A lack of supervision in the steering of the research leads to studies the result of which can hardly be compared, while researchers choose points of departure that are as favourable as possible in relation to the expectations of their principals. The credibility of research is very strongly affected in a negative

way as a result of this. Only rarely do research results achieve the opposite: namely that the problem definition is broken open, and broadened.

Recommendation 3

The recommendation that can be coupled to this observation is that not only a good typology of the policy problem is required, but that, apart from this, in the case of an insufficiently structured policy problem, also an adjustment of the architecture of the decision-making process is necessary. The decision-making process will have to be more interactive. This should be done in order to prevent knowledge being used exclusively or predominantly in a strategic way, which leads to the research power struggle. Good supervision of the research that is ordered for being used in the provision of points of departure for the decision-making process (during the first phase) is necessary.

Observation 4

Knowledge exchange and knowledge generation during the decision-making route often depend on the dominant (policy) actor.

The way in which knowledge gaps are identified in decision-making processes around moderately structured or unstructured problems appears mostly to depend on the dominant actor in those processes. This leads to an imbalance in the knowledge generation, as has already been concluded above (examples: VERM, TNL). The one-sided use of certain knowledge available to certain actors can be deemed to be a democratic shortcoming and may lead to frustrations among the parties involved.

In most cases the planning and supervision of the research are weak and the relationship between the research and the decision-making process has not been indicated clearly. This leads to a mass of research data, much of which is not used directly for the decision-making process.

Recommendation 4

The recommendation that we couple to this is that in the case of complex policy questions it is desirable to have an independent facilitator in order to get a clear overview of the knowledge (both formal and informal) existing amongst the different actors and to identify possible needs for additional knowledge. Knowledge production must not be done exclusively from one paradigm that is dominant in the policy arena, but from a range of paradigms that is as varied as the range of paradigms represented in the policy arena. The opposition shall have a right to its own research. This is a democratic postulate.

An open debate must be conducted about choices / points of departures that form the basis of knowledge (production). Also, in this debate other parties than professional knowledge producers must be involved, since they possess for instance so-called tacit knowledge, implicit knowledge of the parties involved.

In the case of large and complex state government projects, testing of the knowledge is desirable. For instance by an independent intermediary or by a

commission of experts (which was recommended by the WRR⁷⁷). This intermediary or commission of experts supervises, amongst other things, the way in which knowledge is contributed to the process. It also provides a certain balance with respect to the knowledge about different aspects and interests. The aim is to improve the democratic content and the quality of decision-making. The execution of the research must be arranged in such a manner that dependency on the principals is neutralised as much as possible (expertise and counter-expertise must be easily available).

Observation 5

The contribution of environmental and nature information often comes too late.

In large projects, the timely availability of the correct information about the environment and nature is often a problem. Usually, environmental and nature information are not involved at a strategic level, in the production of plans and in the preparation of policy. The Environmental Impact Assessment is often aimed at the execution level. In the location policy for VINEX an Environmental Impact Assessment at a strategic level was rejected, although since then it has become obligatory. In the case of Schiphol Fifth Runway the Integral Environmental Impact Assessment was carried out on a strategic level, but this had no visible influence on political decision-making. Apparently environmental and nature aspects are often seen as a limiting factor in the execution of large projects and not as factors that may yield added value in the design phase.

Recommendation 5

It is recommended that information about the environment and nature be brought in during the first phase of the policy formulation, thus at a strategic level. In this way the information concerning the environment and nature may play a role in the selecting of alternatives and may achieve a function in the design project.

Observation 6

Knowledge is often not used for the formulation of policy.

Large quantities of knowledge produced for the benefit of policy are never used in that policy-making. This selective (under)use of knowledge can be attributed to different factors.

Some are person-bound (for instance: the paradigm of a policy-maker, interests of policy-makers and users, knowledge monopolies), other relate to the way in which knowledge is presented (too much, too little structure, too little interaction, bad timing). Apart from this, the knowledge may be ill adjusted to the administrative level. Of course the process architecture (openness) of

77 WRR = Scientific Advisory Council of the Government

the process itself also determines the extent to which certain (formal or non-formal, implicit) knowledge is used.

Recommendation 6

Although one should not take for one's point of departure the assumption that all knowledge that originates from policy research must be used and one therefore has to accept a certain redundancy of knowledge, one should certainly optimise the use of knowledge in the policy.

In particular, this can be done by improving the process architecture and communication. By ensuring that the need for knowledge and the research questions are not formulated only by the dominant party, but that this is done co-operatively as far as possible. Then one-sided knowledge production is avoided. By ensuring that values that form the basis for research are already made explicit beforehand, instead of afterwards, 'negotiations' about values will already have taken place before the knowledge is produced. In this way, 'negotiations' on the basis of values that have always been allowed to remain implicit beforehand taking place after the research has been completed will be prevented. The involvement of a greater diversity of values may lead to more creative solutions.

Observation 7

Uncertainties in environmental and nature knowledge do not differ from those in other knowledge.

Uncertainties in environmental and nature knowledge are for the major part comparable to uncertainties in knowledge from other disciplines. Uncertainties are dependent on the nature of the environmental problem, the way in which it has been defined (more 'integral subjects' increase the complexity and usually also the uncertainties) and the perceptions of the parties involved. Uncertainties can be divided into two important categories: the inherent ones and the epistemological ones. The latter uncertainties can in certain cases be reduced by further research, whereas inherent uncertainties, of course, can not.

In most cases, whether knowledge is expressed quantitatively or more in qualitative terms plays no decisive role in the decision-making process, but it is used in polarised situations as an argument to disqualify certain knowledge. In most cases uncertainties in knowledge are not made explicit for the user (e.g. the policy-maker) who, incidentally, often has no need of this. If the user is aware of the uncertainties, he may often ask that these uncertainties be reduced through further research. Inherent uncertainties, that originate from the complex nature of the policy problems or from the chaotic nature of phenomena, cause problems because they can not be eliminated. There exist different methods to cope with uncertainties of a different nature.

Recommendation 7

It is recommended that the parties involved in a decision-making process investigate how they plan to cope with uncertainties that are expected to be present in knowledge (not only environmental and nature knowledge) and with more gradually rather than quantitatively offered information.

The making explicit of uncertainties and the indication of the dilemmas that result from them may be an option in important social questions to stimulate social discussion. Also there are other methods, such as a certification system of quantitative information.

Reduction of uncertainties is usually only possible in a limited way (because of the time needed for research or because the uncertainty has an inherent nature).

In the case of global environmental problems with a large inherent uncertainty one should rely on the consensus of opinion within the international scientific community.

In particular, dealing with uncertainties means: building flexibility in to the response, as well as creating the possibility to learn during the development of the process. Decentralisation of the decision-making process may also be an option (this results in less or other uncertainties).

Observation 8

In the case of large projects, the inter-communication between researchers and the policy-makers is far from perfect.

Communication and collaboration between researchers (and policy-makers) from different disciplines in problem defining and problem solution is often a difficult process. Both differences in culture and methodological problems play a role here. The knowledge infrastructure that is used in large projects is often one-sidedly oriented. This is perhaps a consequence of implicit presuppositions on the part of policy-makers.

Recommendation 8

An interdisciplinary approach to complex policy problems is desirable. Such a thing must be organised in the preparation phase of the policy. The communication between researchers from different disciplines and between researchers and policy-makers can be promoted by working together on the structuring of the formulation of the problem after which a common knowledge basis ('shared truth' or 'serviceable truth') can be realised.

Observation 9

Auxiliaries in decision-making sometimes do and sometimes do not take into account the socially constructed nature of knowledge.

Appreciation of knowledge is an affair that can not be considered in isolation from the norms and values amongst the parties involved, the basic cultural attitude and the interests that they have. Auxiliaries in decision-making (such as decision support systems, integrated models) have sometimes been

adjusted and sometimes not adjusted to the fact that knowledge is a social construction. Auxiliaries that have been based on a one-sided technological/non-social scientific approach to the problem can only be used for decision-making in a limited way.

Recommendation 9

In using auxiliaries to aid decision-making about complex policy questions one should take into account that knowledge is a social construction. These auxiliaries should be adjusted to allow for this.

Observation 10

A balanced input of knowledge is often not possible since the project supervisors are too strongly bound by the departmental policy line.

Some recent examples of usefulness and necessity discussions (TNLI, VERM) illustrate the problems that exist with respect to the way in which knowledge is fitted into the decision-making process. Probably these can partially be traced back to the fact that the policy actors in question had no clear idea about how existing knowledge and knowledge from the especially carried out research should be coupled to the decision-making process.

Recommendation 10

It is recommended in cases of complex policy problems to carefully investigate whether the introduction of an intermediary between policy and science is desirable. Several arguments in favour of this can be put forward:

- *The increasing awareness and involvement of citizens, which also leads to knowledge questions;*
- *The increasing pressure on administrators to account for their actions and also for their research policy, as a result of which they tend more and more to make use of external expertise;*
- *The progressive de-ideologisation that provides room for other procedures than those normally used;*
- *The increasing turn-around speed of knowledge;*
- *The increasingly conflicting nature of knowledge.*

An independent intermediary who possesses competence both with respect to the policy problems and with respect to the sciences involved will be able to design and steer the consultation process and the execution of research in such a way as to make it more valuable. He will be able to limit the extent to which the harmful two level game is played (see general conclusions). Of course this concerns more a function than a person. In as far as the research ends in a process of negotiation about the validity of the insights obtained, he will also be able to lead such a process.

The intermediary is an interpreter, in so far as a common language between policy-makers and scientists is lacking, he is a process architect, he collects ideas that may yield creative contributions about the policy problems, he is a

court jester in so far as it is necessary to compare the relative positions of the parties with irony.

The intermediary makes sure that:

- *All relevant knowledge and information is discussed;*
- *Fixations amongst actors are dealt with in a constructive sense;*
- *A balanced handling of all recognised knowledge questions takes place;*
- *Results are not in an untimely manner withheld from the discussion;*
- *There is a continuous monitoring of the process of knowledge development on the one hand and the decision-making process on the other hand.*

Of course, sometimes institutions exist that already fulfil the aforementioned roles. Upon accepting the suggestions formulated above it is necessary to carefully investigate per policy domain whether an existing institution can be rebuilt into such an intermediary or whether a new institution must be established.

The very existence of an arrangement concerning intermediaries will probable also in itself have a preventive effect on the development of harmful forms of two-level games and other destructive strategic dealing.

Colophon first edition

The *Raad voor het Ruimtelijk, Milieu- en Natuuronderzoek (RMNO)* - the advisory council for research on spatial planning, nature and the environment - is a sectorial council. The advisory council's main objective is to develop a vision of research policy, of knowledge and of knowledge infrastructure about spatial planning, nature and environmental issues in the medium and long term. The Council also makes proposals for the improvement of co-ordination and the encouragement of the research.

The advisory council is given the task to advise the government, in this case the ministers of economic affairs (ez), of agriculture, nature management and fisheries (LNV), of education, culture and science (OCW), of housing, spatial planning and the environment (VROM) and of Ministry of Transport, Public Works and Water Management (v&w), on matters involving research on Spatial planning, nature and the Environment in the medium and long term. Its sphere of activities not only includes scientific research, but also economic, socio-scientific and public-administrative research. The advisory council can draw from a network of experts in the field to develop advice, study reports and statements of affairs.

The composition of the advisory council is tripartite: its representatives come from circles of policy-makers, research and research users (non-allied organisations). The current (May 2000) composition of the advisory council is as follows:

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RMNO, linking policy and research

The Advisory Council for Research on Spatial Planning, Nature and the Environment (RMNO) advises the government, either on its own initiative or in response to requests from ministries, on the content and organisation of research concerning spatial planning, the environment, nature and landscape. Focusing on mid- to long term planning, RMNO tries to be a knowledge broker between science, politics and society. Preparing advice is often a complicated and time-consuming process. The publication of preliminary studies is a way to stimulate reflection, and is often a landmark in such processes. Therefore RMNO not only issues Advice, but also Preliminary studies and Background studies.

Willingly and Knowingly

Rows about the cost-effectiveness and environmental benefits of the Betuwe railway track, conflicts about how to measure aircraft noise and the number of people bothered, arguments about the Environmental Balance, reproaches for statistical incompetence and accusations of corruption, addressed to consultancies. These are just some examples of recent headlines in the Dutch media concerning environmental research. They give evidence of the tensions between politics on one hand and scientific institutes on the other. In Willingly and Knowingly these tensions are analysed for a number of policy cases. The cases studied are: the Betuwe railway track from Rotterdam to Germany, the planning of the Fifth Runway on Amsterdam Airport, the planning of new housing areas near the city of Utrecht and the policy on the manure surplus. It appears that knowledge is often not used or used strategically to underpin the position of one of the parties involved. These findings can be explained in the context of post-normal science. Values have a stronger influence on knowledge than knowledge on values. In the final chapter, a number of conclusions are drawn and recommendations made to optimize the use of knowledge about nature and the environment in complex decision making processes.