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Aspects influencing the roles of PBL researchers working at the science and environmental policy interface. An illustration from PBL practice.

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Abstract

The mission of PBL Netherlands Environmental Assessment Agency is to produce policy relevant research on a sound scientific basis. Individual researchers working for PBL may take up various roles at the interface of science and-policy. There are indications from literature that a role is not fixed, but varies among individual researchers and in different contexts. This raises the question what aspects may influence the role of PBL researchers and what role seems to be more adequate in a specific context. The literature mentions some important aspects, but it is not clear to what extent these aspects are relevant for the context in which PBL researchers operate. A survey of ten projects of PBL researchers was used to see what information can be gathered from practice. Two aspects seem of particular importance as they instigate researchers to reflect on their roles and take up roles other than the 'usual' ones. These two aspects are the strategic, agenda setting character of the activity and the unstructured character of the policy problem at hand.
Finally, we discuss the consequences of these findings in terms of awareness and education, skills and competences of PBL researchers against a changing environment.

Keywords: roles of researchers; science-policy interface; policy analysis; boundary work.

1. Introduction

In this paper we discuss the roles of researchers working at the science-policy interface and specifically what aspects influence the roles of researchers working for PBL Netherlands Environmental Assessment Agency.
First, we discuss the concept of 'roles' of researchers (Section 2), then some findings from literature on the roles of researchers working at the science-policy interface . Section 3 describes the method we used in our survey of ten projects.
In section 4 we discuss the observations from ten cases we selected from PBL practice and compare the findings from the survey with the findings from literature. Finally, in section 5 we draw some conclusions and discuss the implications of these findings against a changing context of the science-policy interface.

2. The roles of researchers at the science-policy interface

Environmental researchers working at the boundary of science and policy are confronted with the question to what extent and in what way they should be involved with policy making. For example: should they give just technical advice or also put forward ideas about policy alternatives? Such a question touches upon the role of a researcher working in a specific context. What roles can a researcher choose, and what should he or she take in consideration when defining what he or she should do at the science-policy interface?

Not every researcher seems to be aware of the importance of such a reflection on his or her role. The international audit committee that visited PBL in 2012, notes that 'the awareness of and reflection on roles shows varying degrees of sophistication' (International Audit Committee 2013). The committee continues: 'Differences exist across different levels of hierarchy as well as between sectors in PBL. Some researchers subscribe to the notion of 'speaking truth to power', without seeming to realise that policy framings are always normative, and that 'independence' in the case of PBL may involve taking into account the beliefs of different societal stakeholders — even those regarded as marginal by some scientists. The committee recommends that PBL should continue to develop among its staff a clear and conscious understanding of research on science-society-policy relations and the ways in which this research can be reflected in PBL's interactions with policy and society'.

2.1 Definition of 'Role'

The observation of the International Audit Committee warrants a reflection on the notion of 'role'. A role is basically a social construct. The definition of a social role by Stark (2007) reads as follows: 'a role is a set of expectations that govern the behaviour of persons holding a particular position in society; a set of norms that defines how persons in a particular position should behave'. The position of an actor A is linked to functions and tasks and linked to positions of other actors (B,C, etc.) in the social system. Functions can be formally and explicitly described as rights and obligations, creating expectations with other people in the social system. However, besides formal notions and agreements, also informal agreements and commitments create expectations that other people have with regard to the behaviour of actor A. Actors can - within certain limits - actively shape a role. The actual roles are the result of negotiation between the actor A and the other actors (B,C, etc.) with whom he or she interacts. The actor A transforms the role expectations into concrete behaviour (see Herrmann *et al.*(2004)).

This definition of a role can be applied to scientists too. They may work in different social systems, occupy different social positions, have different functions and tasks and the

people with whom they interact may have different expectations of what these scientists should do.

In this paper we use the definition of role by Stark to describe the activities of PBL researchers and the expectations that are linked to the social position of these researchers. In the following we present a short literature survey about roles of scientists, working at the interface of science, policy and society.

2.2 Roles of Dutch researchers at the science-policy interface

When reviewing the literature about roles of scientists however one has to keep in mind that the definition of role which the authors explicitly or implicitly use, may be different from the one we use in this paper. To characterise roles, a typology can be helpful. Various typologies are available from literature on Dutch practitioners working at the science-policy interface.

Mayer *et al*. (2004) concluded from a study among various experts that the activities of experts at the science-policy interface can be classified in six different categories. These activities vary for example from performing research and analysis to clarifying values and arguments. The categories that Mayer *et al.* described, appear to be too rigid for the analysis of interactions between PBL researchers and policy makers, because in practice, research and analysis are often combined with other activities such as strategic advice, design, etc. Research and analysis is part and parcel of nearly all activities of PBL researchers, so a distinction according to the categories of Mayer *et al.* will not be of great help. Also, the social context (expectations, norms, responsibilities) in which knowledge is produced, and which we think is important for defining a role, is neglected by using these purely functionally defined categories.

Hoppe (2008) who analysed the responses of various Dutch boundary workers to a Q sort, found seven different types of boundary workers and associated these types with the structure of policy problems. Hoppe in a later publication states that researchers working for policy analysis institutes – like PBL Netherlands Environmental Assessment Agency (PBL) - make policy analysis doable as a mix of several styles (Hoppe 2010). These styles are described in terms of 'powering and puzzling (research)' activities and are related to the categories that Mayer has proposed. The arguments for not making use of the categories of Mayer also hold for the styles of Hoppe.

Turnhout *et al.* (2013)[1] , who interviewed researchers of Wageningen University and Research, emphasise the gradual differences between roles of researchers on the spectrum from knowledge production to knowledge use. They distinguish three 'repertoires ' of 'knowledge brokers', but they give no indication which repertoire prevails in which situation.

Pielke (2007) produced a typology based on the scientist's views on democracy and science. Pielke distinguishes the roles of pure scientist, science arbiter, honest broker and issue advocate. Pielke's typology has been used by Huitema and Turnhout ((2009) and Pesch et *al.* (2007, 2012) to characterise the role of PBL researchers.

Huitema and Turnhout (2009) found that it is sometimes difficult to make a clear distinction between roles of PBL researchers. From the interviews and discussions they concluded 'that some researchers continuously shift between the roles of science arbiter and issue advocate. Some researchers make a plea for a closer involvement in the policy process. Others legitimise issue advocacy as demonstrating their independence from policy'. Huitema and Turnhout assert that issue advocacy is part and parcel of every boundary organisation that is trying to perform the science arbiter or honest broker role.

[1] The knowledge brokers interviewed work at the science policy-society interface, for Wageningen University, but also for the Ministry of Economic Affairs

In this paper, we use the typology described in Appendix 1, which is based on elements from the typologies of Pielke (2007) and Hoppe (2008).

From the studies on roles of PBL researchers that have been published, some indications can be found to answer the question what aspects influence the role of these researchers, but there is no overview available. Our idea is that it is interesting and highly relevant to get an overview of various aspects that influence the roles of PBL researchers who do their work in a policy context. The question we address in this paper is formulated as:

> *What aspects influence the role of PBL researchers in their interactions with policy makers?*

3. Method

Our method can be described as ethnographic, consisting of interviews, observations and text analyses. We selected ten projects and interviewed the PBL project leaders. Then, an analysis of the texts was made.

The ten projects we selected have all been carried out between 2005 and 2011. The interviews were semi-structured, using a questionnaire and we interviewed the project leaders. The following points were touched upon in the questionnaire:

- an indication of the sort of activity: policy evaluation, exploratory studies, strategic policy advice, monitoring, etc.;
- who is the client, the acting principal of the project, who determines the formulation of the research question? How have research results been reported, etc.?
- can the policy problem be classified as structured or unstructured (Hisschemöller and Hoppe 1996)?
- which actors are involved?
- what interactions between researcher and policy makers have taken place?
- what do they think about the role of the institute and of individual researchers?
- why did researchers consider the project as a success or failure?
- what kind of knowledge was considered to be relevant for the project?

As the interviewees and interviewers both work for PBL, there was a certain common ground for understanding and interviewees could speak freely about their experiences, the problems they encountered and the solutions they found.

The ten PBL projects were not selected at random. Selection criteria were:

- projects that are *characteristic* of PBL, that comprise *recurring activities*, such as the Reports on the Environmental 'Balance', Monitoring Spatial Development, Outlooks and the Assessment of the effects on nature, spatial planning and the environment of the Election Manifestoes of political parties;
- projects that are not recurring activities, and *interesting for various reasons*. One of these projects was the project on sustainable cities, involving a lot of stakeholders. Involvement of societal stakeholders is not customary in PBL projects. The unstructured character of the problem was also a point of interest. The Millennium Development Goals project was interesting as it tried to combine several goals on a strategic as well as an operational level. Yet another project, Making the Netherlands Climate-proof, was interesting because of its shifting policy goals.

The following ten projects of PBL were included in the survey (with an indication of the sort of activity):

- recurrent activities:

  1) Environmental Balance (2009) (policy evaluation); a recurring activity
  2) Nature Balance (2009) (policy evaluation); a recurring activity
  3) Assessing the Environmental Impact of Election Manifestoes (2010) (ex-ante policy evaluation), a recurring activity before elections
  4) Monitoring Spatial Development (2006) (instrument for policy evaluation)

- activities that are nor recurring, but interesting for various reasons:
  5) Millennium Development Goals Evaluation (2009) (exploratory study, model instrument development)
  6) The Sustainable City (2010) (exploratory study and ex-ante evaluation)
  7) Various projects on spatial consequences of EU Policy (2006) (methodological report and exploratory study)
  8) Urban Outskirts (2009) (exploratory, agenda setting study)
  9) Making The Netherlands Climate Proof (2009) (exploratory study)
  10) Particulate Matter and Air Quality (2005) (integrated policy evaluation and methodological report, reflection on uncertainties)

For details, see Appendix 2.

Of all interviews, reports were made and sent to the interviewed persons for possible comments. After the interviews had been completed, we discussed the findings to see whether some general conclusions might be drawn about the interactions between policy makers and researchers. We concentrated our observations on the science-policy interface, though in some cases the science-society interface was also relevant.
We looked at various variables that might explain the observations from the cases. For example, we looked at the sort of activity (policy evaluation, exploratory study, etc.), the policy client, the interactions with the policy client and the perceived structure of the problem.

When we discussed the findings from the interviews, the frictions between policy makers and researchers and successes reported caught our attention. We think that what went wrong or what was seen as a success may give a clue to what aspects are thought to be relevant in the interactions between policy-makers and researchers. These frictions and successes are discussed below under 'observations'. They are used as an illustration of findings from literature about aspects that seem to influence the role of researchers in practice.

The results have subsequently been discussed during an internal seminar for PBL researchers in January 2011.

4. Observations from the ten cases

The following aspects of the interaction between policy makers and researchers will be discussed in this section, with relevant literature references first and then observations from ten cases (Appendix 2):

. the institutional setting of the research institute
. the knowledge needs of policy makers in various stages of the policy process

. the ideas of individual researchers of what they should do
. the character of the problem: structured, moderately structured or unstructured
. the sort of activity asked for by the policy maker
. the policy maker's perception of the role of the researcher
. the sort of products PBL can deliver

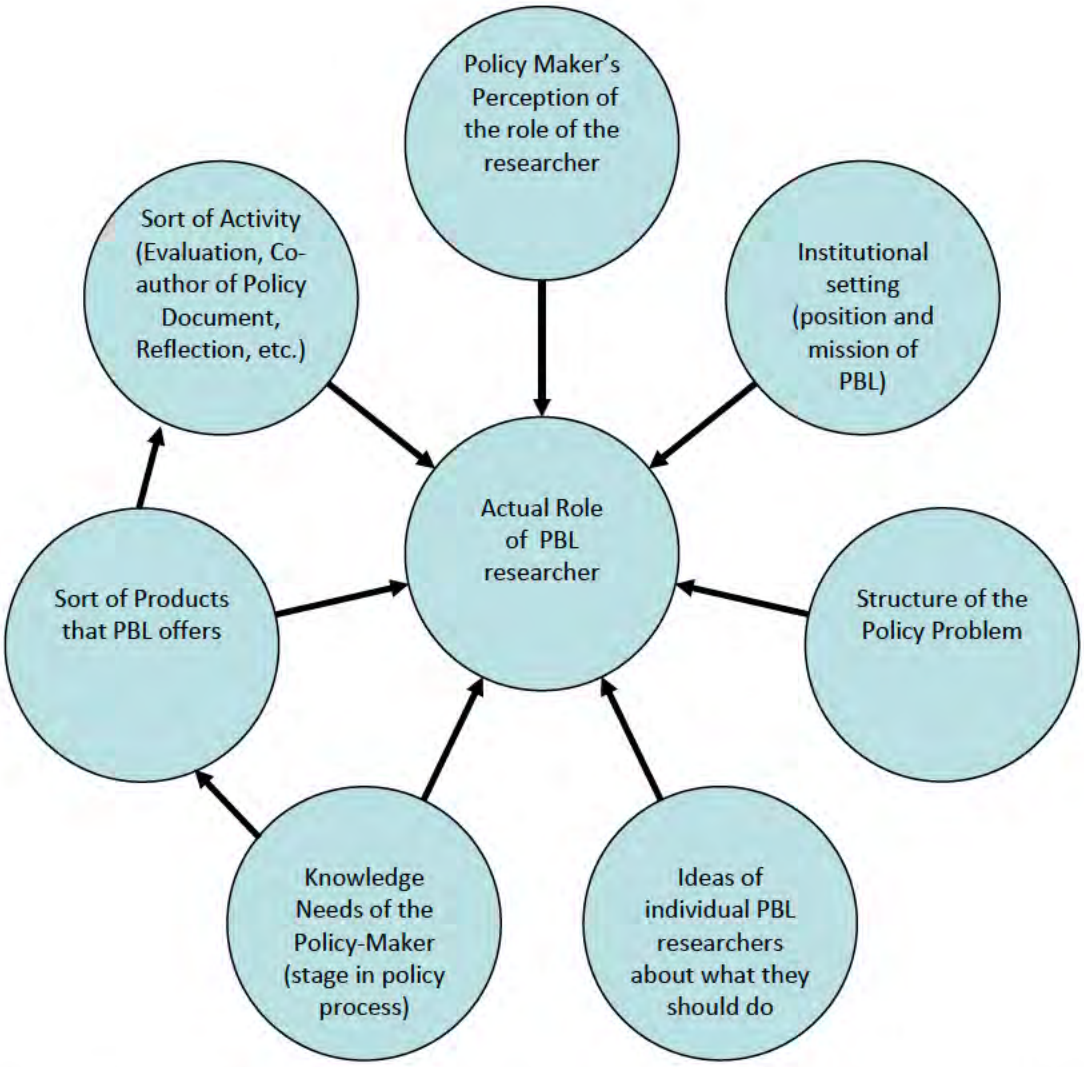

Figure 1. ***An overview of the various aspects that influence the role of PBL researchers***

4.1 The institutional setting

The institutional context in which researchers operate, is a very important aspect in defining the role of researchers. Kropp and Wagner (2010) give a detailed account of the interactions between various researchers and policy makers of the German Ministry of Agriculture. They distinguish various types of experts with different strategies to produce

'usable knowledge', which is scientifically framed, but 'orientational' knowledge, i.e. knowledge that answers the requirements of the policy makers in the respective stage of the policy cycle[2].

Although the institutional context of PBL is not the same as that of the German researchers in government funded agencies, it is obvious that the findings of Kropp and Wagner are relevant. PBL is an independent research institute, funded by government and working for government. PBL's mission is constructed on the notions of policy relevant research, sound science and independence[3]. PBL's research is 'demand driven', not 'curiosity driven'. A role as a 'pure scientist' (Appendix 1), who is curiosity driven and does not care whether the knowledge produced is 'usable', is not adequate in view of the mission of PBL. One cannot produce policy relevant knowledge in isolation. A two-way communication is needed for producing policy relevant knowledge.

Some roles of researchers are more adequate for this demand driven research, for example the roles of science arbiter or honest broker (Appendix 1). In Dutch political parlance, policy analysis agencies like CPB and PBL are known as the 'Accountants of the Cabinet'. And the 'usual' roles of PBL researchers are those of the science arbiter and honest broker, as they not only make evaluations of policy options but can also – at their request - advise policy makers to consider particular policy options. The mission of PBL precludes that researchers should be involved in the policy making process and be held responsible for the final policy document.

Interactions between policy makers and researchers are very important in defining the roles of researchers who work for policy analysis agencies. De Vries *et al.* (2008) and Halffman (2008) observed the interactions between representatives of CPB[4] with policy makers and concluded that back stage[5] interaction is very important for producing 'usable knowledge'. The interaction may comprise negotiations about the limits, alignment with policy processes, and so on. Halffman (2008) found that CPB representatives negotiate with their counterparts from the Ministry of Finance how they will deal with uncertainties in CPB outlooks. The result was that they agreed on the use of two specific scenario variants.

From the ten PBL cases we studied some examples can be mentioned of conflicting ideas about responsibilities of researchers and policy makers that are linked to the institutional setting. The PBL researchers who were asked by policy makers to compare national spatial policy goals with policy developments at the EU level, got the impression that policy makers wanted them to prepare a strategic policy document. They thought they should not get involved in strategic policy making, as the mission of PBL is to provide policy relevant knowledge, but at the same time to keep its independence by maintaining a clear distance from actual policy making. The policy makers then hired a consultant for the job. The Urban Outskirts case on the other hand illustrates that researchers may contribute to the making of a strategic policy document at the request of policy makers. The policy makers wanted the researchers to present a fresh view on the issue and design new action perspectives, instead of sticking to the old policy frame. Policy makers even asked

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[2] Cf. Jasanoff (1990) who used the term 'serviceable truth' to characterise the knowledge produced as the result of the interaction between scientists and policy makers.

[3] PBL's Mission (PBL 2012): 'The PBL Netherlands Environmental Assessment Agency is the national institute for strategic policy analysis in the field of the environment, nature and spatial planning. PBL contributes to improving the quality of political and administrative decision- making by conducting outlook studies, analyses and evaluations in which an integrated approach is considered paramount. Policy relevance is the prime concern in all its studies. PBL conducts solicited and unsolicited research that is always independent and scientifically sound.'

[4] CPB = CPB Netherlands Bureau for Economic Policy Analysis, one of the three policy analysis agencies in The Netherlands

[5] Front stage refers to the official independent position of an advisory body, back stage is what happens in actual practice where interactions with policy makers are essential (see also Bal *et al. 2003).*

researchers to promote their ideas as a member of a jury that had to judge various innovative proposals for the policy project "Beautiful Netherlands".
In the case of the monitoring of spatial developments policy makers did not want PBL researchers to make an evaluation of spatial developments at the national level - which would be in line with the mission of PBL - but merely to provide a framework for evaluation. These examples from the ten cases illustrate the point that within the institutional setting of policy relevant research, the actual role of researchers is not fixed, but the result of interactions (and negotiations) with policy makers. Nevertheless, one can say that some roles are more obvious from the point of view of the mission of the institute. A role as a science arbiter or honest broker is in line with the mission of PBL and the reputation of the policy analysis agencies in general as "The Accountants of the Cabinet".

4.2 The knowledge needs of the policy maker

The knowledge needed by policy makers is context dependent, and the stage in the policy process for which 'usable' knowledge is needed, determines what sort of knowledge is adequate. Kropp and Wagner (2010) found that when a policy problem is in the stage of policy formulation, experts are expected to provide scientific information about the political problem that can contribute to the further 'framing' of the problem. But in the stage of decision making, scientists are expected to deliver 'hard facts' that policy makers can use to push through policy strategies. For the policy evaluation stage, scientists are expected to take the role of distant, critical commentator. The way researchers present and communicate uncertainty information, may also be more or less effective depending on the needs of policy makers (cf. Halffman 2008).

The articulation of knowledge needs by policy makers is sometimes problematic. When face to face contacts are limited for some reason, perceived preferences of policy makers are used instead. Van 't Klooster (2008) for example noted that researchers of RPB[6] produced those scenarios of which they thought they might be more acceptable to policy makers because of their plausibility.

From our PBL cases we can mention some examples illustrating the change in knowledge need of policy makers as observed by the project leaders. In the project 'Making the Netherlands climate-proof', the goal of the project changed. The knowledge need of the policy maker changed from broad strategic advice to an evaluation of strategic infrastructure plans. This made it necessary for researchers to reconsider their role in the project.

Sometimes, policy makers asked researchers to produce agenda setting documents. In the case of the Millennium Development Goals Evaluation, the policy makers for example wanted to influence agenda setting of the OECD. In such cases, researchers have to provide arguments for strategic discussions and take up an advocate role (Appendix 1). But in other cases, for example in the case of policy evaluations, an advocate role is not appreciated. Even an honest broker role may then be criticised by policy makers who do not appreciate 'an evaluation from a broader perspective'. A science arbiter role is considered more appropriate for policy evaluations.

Sometimes, researchers had to speculate about the knowledge need of policy makers when the interaction with policy makers was limited and the articulation of knowledge needs weak. Researchers in the projects on urban outskirts and the spatial consequences of EU policy for example had to deal with that problem.

[6] RPB: Ruimtelijk Planbureau, Netherlands Institute for Spatial Research, a predecessor of PBL Netherlands Environmental Assessment Agency

4.3 Ideas of individual researchers of what they should do

Turnhout (2003) noted from interviews with researchers of MNP[7] that although they shared the vision of an independent research institute, which should not engage in policy making, their interpretation of this independence was different. The demarcation of what the researchers considered to be the task of the planning agency, proved to be contingent, depending upon the individual researcher´s perceptions.

This finding corresponds to the finding of Kropp and Wagner (2010) that researchers working for government research institutes in Germany see themselves as 'service providers', but that even within core institutions of policy research, some individual researchers see themselves as counter-experts. So, individual perceptions of researchers of what they should do as a researcher seem to be important for defining their role.

From the ten cases we studied, there are several examples illustrating the importance of the researcher's perception of his or her role. The project leader who produced the 'Environmental Balance' (policy evaluation) thought his task was not only to give an indication of the effectiveness of the current environmental policy, but also put the evaluation in a broader perspective. Policy makers however expected him to 'stick to the figures' and not make suggestions for policy changes.

In the case of the particulate matter project, there was a deadlock situation, politically speaking. Policy makers referred to it as 'a nightmare dossier'. As uncertainties (in monitoring and assessments) played a key role, PBL researchers analysed what these uncertainties were and how the various responsible authorities dealt with these uncertainties. The PBL researchers conceived their role as being broader than making a policy evaluation. On the contrary, they analysed all relevant aspects of the problem and reflected on uncertainties that were linked to monitoring and assessment of the problem. The role perception of PBL researchers in this case was that they had to make a broad policy analysis of the problem and pay particular attention to the uncertainties that play a key role in policy making. One can argue that the independent position of PBL researchers warrants such a more reflexive approach of the problem, even if policy makers do not explicitly request to make such a broad analysis.

In the Sustainable City project, some researchers saw their roles as facilitators of a process of co-production of knowledge, whereas others stuck to the more traditional role of assessing the effects of policy options by model calculations. The individual role perceptions of the researchers involved were different.

4.4 The structure of the policy problem

The findings of Hoppe (2008) indicate that the perceived character of a policy problem and specifically its unstructured character[8] influences the role of policy analysts. For such unstructured problems - if a learning discourse is possible - co-production of knowledge is needed (Hoppe and Huijs 2003). Hegger *et al.* (2012) also think that a reflection on the perceived structure of a problem is necessary for researchers when they assume a role in climate adaptation projects. A science arbiter role seems unlikely for a researcher who explores regional climate adaptation projects.

But even when researchers are aware of the unstructured character of a policy problem, that does not mean that they all assume similar roles in projects that address these problems, as Pohl *et al.* (2010) found when they analysed various sustainability

[7] MNP Milieu- en Natuurplanbureau, another predecessor of PBL Netherlands Environmental Assessment Agency

[8] An unstructured problem is a problem characterised by lack of consensus on relevant values and lack of consensus on relevant knowledge (Hisschemöller and Hoppe 1996). As Funtowicz and Ravetz (1993) point out, these problems belong to the realm of post-normal science. Often high risks are linked to high stakes.

research projects. The roles of researchers varied from one case to the other, depending on the specific context. Similarly, Jakil (2011) who investigated sustainability governance in various projects, found various roles of policy analysts, which indicates that the unstructured character of a problem is not the only aspect that influences the role of researchers. However, Van Zeijl (2011) who also studied several sustainable development projects, thinks the role of honest broker seems to be the most appropriate one for pursuing sustainable development. The responsibility of the researcher is to show society the many possible roads and the consequences of possible actions[9].

PBL is often asked by policy makers to report on problems which are generally perceived as moderately structured[10] problems, where cognitive uncertainty can be diminished by further research and there is more or less consensus about the values at stake. Pesch *et al*. (2007, 2012) found that roles of PBL researchers may change due to fluctuations in the political domain and that to cope with these fluctuating conditions, exploratory activities are needed.

Most recurrent activities can be classified into the category of moderately structured problems. The public image of policy analysis agencies as 'the Accountants of the Cabinet' also reflects this idea that they preferably do research on moderately structured problems (see also Huitema and Turnhout 2009).

At least five out of the ten cases studied, deal with unstructured problems. They are among the 'interesting projects'. If the concept of 'sustainable cities' is used as a leading concept in policy making, it can be considered as an unstructured problem. The project leader of the Sustainable City Project favoured a post-normal approach from the beginning, and a role as a facilitator (or so-called postnormal scientist, see Petersen *et al.* 2011) because he was aware of the unstructured character of the policy problem. It proved to be very difficult to ensure a good mix of quantitative and qualitative elements in this study (see Dassen *et al*. 2012). A stakeholder dialogue was a necessary part of the project. To be able to accommodate a stakeholder dialogue, PBL has produced a guide for stakeholder participation (Leroy and Hage 2007).

The problem of particulate matter also had the characteristics of an unstructured problem: lack of consensus on knowledge and lack of consensus on values. Huge stakes and huge uncertainties linked to this policy problem warranted a 'post-normal approach'. MNP succeeded in making a report that was broadly accepted as a basis for further policy development. Amongst other things, the report prompted a revision of the monitoring system. The work of MNP on the particulate matter project fits the learning model, as normative issues and uncertainties are explicitly taken into account (see Hoppe and Huijs (2003).[11]

In at least three cases (Making the Netherlands Climate-proof, the Sustainable City and Urban Outskirts), the project leaders were aware of the fact that they were confronted with an unstructured problem, which made them reflect upon their role in the project. In most PBL projects, the 'post-normal' approach is however limited to the management of uncertainty for which a Guidance Document has been produced (Visser *et al*. 2005, 2006).

4.5 The sort of activity asked for by policy makers

The activities of researchers are very relevant for defining their role, but as noted before, the social context in which these activities take place, is important too.

[9] These functional and normative characteristics are seen as characteristics of the honest broker role (Appendix 1)

[10] moderately structured problem: see Hisschemöller and Hoppe, 1996

[11] a learning model is difficult to fit in Pielke's typology of roles, that is why we distinguished the facilitator's or postnormalist's role in Appendix 1.

Mayer *et al.* (2004) link roles to activities at the science-policy interface and Hoppe (2010) links styles of policy analysis to 'powering/puzzling activities', but they give no clue as to what makes researchers choose a specific role or style.

In the ten cases we examined, the sort of activity of PBL researchers varies to a considerable extent:

. producing assessments of the state of spatial planning, nature and the environment for policy evaluation
. policy evaluations on specific subjects, for example election manifestoes
. producing exploratory studies and agenda setting studies
. producing ideas and drafts for strategic policy making in collaboration with policy makers
. developing alternative policy options
. developing new modules for models (to suit the knowledge need of specific departments)
. organising stakeholder dialogues
. monitoring policy implementation
. producing methodological reports

This is a broad range of activities. These different activities call for different roles of researchers. For example, for strategic studies and agenda setting studies, it is necessary to make a broad survey of possible relevant developments in society and in the fields of spatial planning, nature and the environment. Then conflicting views and conflicting knowledge claims and uncertainties are often prominent in the political discussions. For strategic advice not only integration of data and knowledge from several domains is necessary, but also an analysis of argumentations and uncertainties. And the researcher should know what values people cherish as values are important for the selection of policy options.
In the Urban Outskirts case, policy makers expected the researchers to present a fresh view on the issue and suggest new policy options, instead of sticking to the old policy frame.
For the Evaluation of the Millenium Development Goals, researchers were invited to take up an advocate role in order to get the environment higher on the agenda of international organisations (i.e. OECD).
But when policy makers want a policy evaluation (in the cases of the 'Environmental Balance' and 'Nature Balance'), at least some of them do not appreciate 'an evaluation in perspective' with traffic light signals - they 'just want the figures'.

4.6 The perception of the policy maker about the role of the researcher

This aspect is not extensively discussed in literature, but can be considered as a logical complement of the 'role perception of the researcher', as roles are linked to mutual expectations.

The history of the relations between research institutes and departments may influence the actual interactions between them. For some policy areas, in the past there was a closer connection between (in house) research and policy making in the ministry. This may explain why some policy makers ask researchers to write a part of a (strategic) policy document. But this need of policy makers can also be explained by the 'outplacement of knowledge' that has occurred in Dutch ministries[12]. A history of a close connection between research institutes and ministries can be seen on the one hand as an advantage, if policy

[12] An example: the former knowledge centers of the ministry of Agriculture were closely linked to policy preparation and part of the ministry. Nowadays, the researchers are no longer part of the ministry, but work for research institutes that are for a part funded by government.

maker and researcher share the same policy theory. Such parallel thinking is advantageous, as policy maker and researcher understand each other very well (cf. 'epistemic communities' (Haas 1992) and 'schools of thought' (Pohl 2010)), but is disastrous when 'group think' determines the framing of problems and the identification of policy options (see for example: Frouws 1994; De Wit 2006, 2011; In 't Veld 2009).

From the PBL cases we studied, some examples can be seen of policy makers having a specific perception of the role of researchers. In the case 'Monitoring Spatial Planning Document' the step from data collection to interpretation of data should - according to the policy maker - be done not by researchers, but by the policy maker.
Another example is the use of traffic light colours in the case of the Environmental Balance and Nature Balance (evaluation reports). The use of the red colour to indicate the expectation that 'probably the policy goal will not be attained, even using all possible policy instruments', caused annoyance with some policy makers. They interpreted this as a consequence of a 'basic pessimistic attitude' of the researchers. Clearly, the critics had the idea that the evaluation should be done by them and not by PBL researchers. A similar reaction was noted from some political parties in their reaction to the ex-ante evaluation of policy proposals in election manifestoes by PBL.

4.7 The products PBL can offer

PBL researchers are in a way bound to the portfolio of products that PBL can offer. Policy makers and researchers both have their ideas about the type of product they want. Although PBL researchers are accustomed to the idea of producing a report, policy makers are sometimes more interested in presentations or infographics or co-productions. In one of the cases (on spatial policy in a European context), this outspoken preference of policy makers was clearly stated: presentations will do, an extensive report is not needed. Input for strategic discussions in the form of presentations is not a customary product of PBL, but may become more usual in future. Infographics as a way to present research results to policy makers have been more and more used in the past years.

Making a reflexive, methodological report (for example on particulate matter policy), does not belong to the usual products of PBL, but it makes sense if there is a possibility of a learning dialogue between policy makers, societal actors and researchers to get out of a policy deadlock.

On the other hand, some of the products of PBL have a special, legally defined status. For the Environmental Balance and Nature Balance (now combined with the evaluation of spatial policy in the Assessment of the Living Environment) there is a fixed protocol for researchers and policy makers and a format that must be followed. There is a close correspondence between the issues in the evaluation documents and the policy documents. Proposals for additional themes are first discussed with policy makers before they are included in the report.

In recent years the portfolio of PBL has been enlarged with new products, such as a trends report (PBL 2011) and infographics. A trends report points out trends in society and their relevance for environmental and spatial policy. 'The energetic society' essay is such a trends report. It is clearly different from an evaluation report. If the policy maker wants strategic advice, it need not be delivered in the form of an exploratory study or outlook, but it can also take the form of a trends report or a discussion with policy makers.
It is clear that different products put different demands on the role of the researcher, and all products need to be scientifically underpinned. So, a researcher has to take into account the sort of products the institute has in its portfolio when discussing a project with a policy maker.

As stated earlier (4.2), the knowledge needs of the policy maker are linked to the stage of the policy cycle and give an indication of what sort of product will be appropriate.

From the interviews it seems that the kind of knowledge a policy maker needs, the sort of activity a researcher is asked to do and the kind of products a researcher can produce are interdependent. In figure 1 the connections between these three variables are indicated by arrows. We cannot decide on the basis of the interviews, whether there are similar connections between other variables.

5. Conclusion and discussion

The main question of our study was what aspects influence the role of PBL researchers in projects in which they are involved at the science-policy interface. The actual role of PBL researchers is seen as the result of interaction between researcher and policy maker. The interaction is about mutual expectations, institutional possibilities and limitations. The interaction may comprise negotiations about the limits, alignment with policy processes, and so on.

From a literature review we identified several aspects that seem to influence the role of researchers . Ten case studies of PBL projects have been analysed to see whether these aspects could be retrieved in practice and used for illustrating these aspects. The results of the analysis of ten cases provide support for the hypothesis that the seven aspects that have been identified do influence the role of PBL researchers in practice. But in order to get more evidence, more research is needed and the research will have to be set up in a different way.

The questionnaire we used for our survey for example did not include a question about skills and competences and experiences at the science-policy interface, but it seems obvious that skills and competences are important too when it comes to defining the role of researchers in a particular project. If researchers have done their job in various contexts, they will more readily reflect on the question what role in a particular context is most appropriate (see for example, Pohl 2010). Especially when they have to deal with unstructured problems with their multiple problem framings and concomitant problem of integration of knowledge. Not only a solid methodological basis is needed, but also skills that can partly be learned in training courses. For example, facilitation skills, competences to understand various disciplinary languages or to conduct stakeholder dialogues. For this purpose, PBL has produced several Guidance documents (for research in general and for Uncertainty and Stakeholder Participation in particular) to help researchers. So, a follow up case study should also pay attention to skills and competences of researchers.

A shift of roles

The 'customary' roles of researchers in a policy analysis agency like PBL are those of the science arbiter ('the Accountants of the Cabinet') and honest broker (Appendix 1).
From the ten projects we studied we got the impression that two aspects seem of particular importance as they seem to instigate project leaders to take up different roles than 'usual'. These two factors are the strategic, agenda setting character of the activity and the unstructured character of the policy problem at hand.

- The Millennium Development Goals project and the Urban Outskirts project challenge PBL researchers to produce elements of strategic advice, concepts and argumentations that can be used for agenda setting. That goes far beyond the role of 'Accountant of the Cabinet'. Strategic advice for policy makers should provide an overview of argumentations and opinions that are relevant for a policy problem. Policy makers may need these argumentations for advocacy.
- Unstructured problems challenge the researcher to take up a role that is not 'usual' for PBL researchers. We see this in the case of the Sustainable City project, but also in the Urban Outskirts project. The Particulate matter project also differs from

ordinary PBL projects in its emphasis on reflection and methodological issues, including the question how to deal with uncertainties.
Some researchers are aware of the fact that research on an unstructured problem requires a role that is different from the 'usual' role. They see themselves as 'facilitators' or 'post-normal scientists'.
There are some findings from research on unstructured problems that support our finding that 'usual' roles are not adequate in those cases. As mentioned earlier, Hegger *et al.* (2012) concluded from climate adaptation projects that a role as a science arbiter is not adequate to cope with complexity and values that are at stake in climate adaptation projects and that researchers should reflect on what role is adequate in such projects. Furthermore they underline that it is important for a researcher to make clear to the other people involved in the research project, what type of role he/she enacts. They believe this role confirmation will contribute to the success of the projects.

Of course, our provisional conclusion that a shift of roles occurs when dealing with strategic questions and unstructured problems, needs further substantiation as does our contention that the policy maker's perception of the role of the researcher and the portfolio of products of the institute influence the role of researchers.

What can we learn from this study?

We think that the results of the present survey can be of use to encourage PBL project leaders and researchers to reflect on their role. The aspects we have identified as being important for their role, can be of help for them. It is for example very important to have an idea of the sort of activity policy makers want, how it fits in the policy process and what sort of product is most adequate. Strategic advice in whatever form (outlook, scenario study, conceptualising report) is for example needed in the stage of policy preparation, whereas policy evaluation is needed in a later stage of the policy process. The requirements for PBL products are correspondingly different as are the roles of researchers. Also, it is important to have the mission of PBL in mind to produce 'usable' and 'orientational' knowledge for policy. And from the interaction with policy makers, researchers can get an idea of how policy makers see the role of these researchers and can discuss and decide whether or not this role fits in the mission of the institute.

Although the survey covers only ten projects of PBL – and generalisation consequently is not possible - we think the findings of this study can be used for education, as they open up new perspectives for making researchers aware of their roles in interaction with policy makers. It is important for researchers in policy research institutes to reflect on their role at the science policy interface as the demarcation between science and policy making is rather more fluid than static and fixed. It is important to know what aspects should be taken into account when researchers define their role.

As PBL sees itself as a learning organisation (PBL 2012), this issue needs to be taken up in the professional training agenda of the institute. PBL has an internal Academy for learning and training. The international audit committee that visited PBL in 2012 considers master classes a very good instrument to stimulate reflection of researchers on their roles in interaction with policy makers.

Compatibility of different roles at the institute level

In this paper, we have concentrated on aspects that influence the roles of individual researchers of PBL. But inevitably, at the level of the institute as a whole, questions come up about the combination of several roles in different stages of the policy cycle and to what extent the role of the institute is connected to the role and role perception of individual researchers. During an internal seminar in 2011, the point came up to what extent PBL as an institute can combine several roles in the science-policy interface, even if this is on

request of policy makers. Some people fear the outside world will not make a distinction between PBL as an advisor of strategic policy and PBL as an evaluation institute. For the outside world, it would seem that 'the butcher probes his own meat'. That might raise doubts about the credibility of the institute. But the PBL researchers who discussed this possible role conflict think this problem can be avoided by a clear demarcation between the advisory function and the political decision afterwards. At the same time, different people in the organisation could be made responsible for contributions in different stages of the policy cycle. Or, if the same people are involved, they should be conscious of the different roles that are required from them and stick to the activities that belong to these roles. Despite these precautions to internally disentangle potential role conflicts, there is no guarantee that there will not be cast doubts from the outside world on the institute's credibility in the situations sketched. Transparency about the process and its outcomes will play an important role in restoring trust and in preventing reputation damage.

Roles of researchers and institutes in a changing societal context

The mission of research institutes and the roles of researchers may change in future due to changes in the societal context. Information is nowadays available to a much greater public than before. Citizens can get involved in data collection (participatory sensing) and are themselves subject to data collection. Big data analysis can open up new perspectives on problems and options. Web 2.0 social media change the way scientists are collaborating in research. Research involves more and more actors and digital data are produced in many ways and in many places. Not only research practices will change, also communication about research and the publishing of research results will change (open access) (cf. RIF project 2013)

Transparency is demanded by citizens, also in science-policy interactions. Not only because people want to know what knowledge has been used for policy making, what methods have been employed, but also to allow them to check whether the knowledge that they think is vital, has not been neglected.

The authority of scientific research is under scrutiny of a large public nowadays. On the other hand, science is expected by the public to make a key contribution to the solution of societal challenges. The Media have a clear influence on the definition of problems ('framing') and possible solutions (Hajer, 2009). In a society in which the roles of media, politicians and policy makers change, the roles of science and scientists also change (In 't Veld 2010).

Furthermore, the political environment and advisory system at the national level have changed already considerably in the past decade. The policy in the field of the environment has been decentralised on the one hand and on the other hand for a part Europeanised. The number of advisory bodies in the advisory system has been reduced. Expertise in policy circles has been reduced too. As expertise gets more and more dispersed, new configurations may evolve in the next years in response to these changes. For example, direct interactions between knowledge supply and knowledge demand side in the field of sustainable development become more common and replace institutionalised ways of knowledge transfer. Societal groups may become more prominent in defining the demand for knowledge as well as in supplying practitioner's knowledge. Open innovation is thought to be able to provide an adequate response to grand challenges. The role of government in research on grand challenges may become more facilitating and enabling (spaces for innovation) than steering.

The question is how the role of PBL as a policy analysis agency may change in response to these developments. Of course, that depends foremost from the question how the need for advice (in various governance layers and in society in general) will develop in the coming decade and what is considered to be the most adequate way to provide 'usable knowledge'. If for example, PBL would be requested to give advice to other public

authorities more often, this could mean that the nature of the policy problems could become more entangled with regional conditions and that participatory research may become more adequate to produce 'usable knowledge'. And this point raises the question to what extent PBL researchers are well-equipped to deal with participatory projects, which will more often call upon skills and capacities of researchers to act as a facilitator and/or to do transdisciplinary research. And to what extent are the knowledge base and models adequate for such activities at another governance level?

On the other hand, the European science-policy interface may become more important for PBL. What does that mean for roles of PBL and PBL researchers?
We just raise these questions to underline the fact that roles will change when the societal context, the political and knowledge landscapes change. It might be appropriate to think through what consequences different scenarios might have.

Finally, we hope future research, in different institutional settings and in other countries, will further elucidate the aspects influencing roles of researchers working at the science-policy interface.

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Appendix 1

Typology of roles of researchers

Role of Researcher [13]	**Characteristics**
Pure Scientist	*'I provide the figures; it is up to policy makers to interpret them'*
Science Arbiter	*'I provide the knowledge that is available and relevant to answer your questions and I make it usable'*
Honest Broker	*'I give not only an overview of the knowledge that is available and relevant to answer your questions, I also give an indication of what policy options could be considered in the present situation'*
Advocate	*'I know how you can solve your problem and I can provide the relevant knowledge'*
Facilitator *(postnormalist[14])*	*'Together with you and other stakeholders we will try to find solutions for complex societal problems'*

[13] The role characteristics are based on typologies of Pielke (2007), but they are in our wordings.

[14] 'Postnormalist' based on Hoppe (2008).

Appendix 2

Characterisation of the 10 projects

Project	Sort of activity	Target groups Client	Type of Problem	Frictions/ Feedback
1. Environmen-tal Balance	Evaluation of environmental policy and report on the state of the environment and relevant trends;	Client: department; Interaction with departmental group Main Target Group: Parliament	Mainly moderately structured problem, but also some dissent about values	Valuations by traffic light colours, partly based on expert judgement; Some policy makers and politicians think 'PBL has a pessimistic view of the world', a bias
2. Millennium Development Goals Evaluation	Exploratory study. Report on the connections between Environment and Development; Defining Long Term strategic goals but also adaptation of modeling instruments to the needs of a specific department	Client is a department; the OECD is one of the target groups	Unstructured; cognitive uncertainties and uncertainties linked to values	The client department uses the PBL report for agenda setting in the OECD; Articulation of the knowledge demand is problematic
3. Environmen-tal assessment of election manifestoes	Ex-ante evaluation of policy options in Election Manifestoes of political parties	Client: political parties Target group: the electorate	Unstructured as there are quite some cognitive uncertainties and uncertainties with regard to values	Some political parties say the evaluation is 'too political'

4. Sustainable City	Strategic explorative study. Ex-ante evaluation of alternative policy scenarios. Production of an assessment framework	Client: inter-departmental project management; Target group: Various stakeholders in the cities	Unstructured problem	Little interaction with national policy makers; loose connection to national policy items
5. Monitor of Spatial Policy	Instrument for evaluation of spatial planning (national)	Client: department, Target group: The other layers of government and Parliament	The policy problem has been structured by the policy maker, leaving aside a lot of indicators that were uncertain	The Policy Document on Spatial Policy was found to be not consistent with regard to the political goals; Department wants to do the evaluation itself
6. Projects on spatial effects of European policies	One methodological report (Guidance document on the spatial effects of European policies); an exploratory study of possible spatial effects of EU policy; a discussion with policy makers	Client: department, Directorate of Spatial Policy Target group: national and European policy makers and authorities	Moderately structured or unstructured (depends on the project)	Expectations of policy makers and researchers were not similar; Articulation of knowledge demand sometimes problematic; A more flexible range of products suggested

7. Urban Outskirts	Exploratory, agenda setting study on urban outskirts	Client: department Target group: other departments and other layers of government	Unstructured problem	Articulation of knowledge demand of department problematic; Combination with other political agendas not clear; Researcher as a member of a jury
8. Making the Netherlands Climate Proof	Exploratory study about how to make parts of the Netherlands climate-proof; Goal of the study changes to making an agenda for adaptation of infrastructure program to climate change	Client: department Target group: other departments, interdepart-mental programme	Unstructured problem	The research question is constantly changing, as the goal of the study changes
9. Nature Balance	Policy evaluation, report on the state of nature with prospective elements	Client: department Target group: Parliament, other layers of government and societal organisations	Mainly moderately structured problem	Mixed reactions to evaluation 'in perspective'; ideas for new nature typology well received
10. Particulate matter	Policy evaluation, including analysis of monitoring problems and uncertainties with regard to particulate matter	No client, at PBL's own initiative	Moderately structured problem Cognitive uncertainties dominant	Trend setting booklet; emphasis on the responsibilities of policy makers to decide how they will deal with uncertainties