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Assessment Agency

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PBL Netherlands Environmental Assessment Agency is the national institute for strategic policy analysis in the fields of the environment, nature and spatial planning. We contribute 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 of our studies. We conduct solicited and unsolicited research that is both independent and scientifically sound.

Contents

1	INTRODUCTION	5
2	DESCRIPTION OF THE ORGANISATION, COMPOSITION AND FINANCING	6
2.1	Description of PBL and its mission	6
2.2	History and institutional setting	6
2.3	The strategic line of development	7
2.4	Funding and work programme	8
2.5	PBL Advisory Board	8
2.6	Organisational structure	8
2.7	Works council	10
2.8	Activities and publications	11
2.9	Academic partners, academic positions and visiting scholars	11
	2.9.1 Strategy for collaboration	11
	2.9.2 Collaborations with Dutch universities and other research institutes	12
	2.9.3 International collaboration	12
2.10	Human resource management	13
2.11	Quality management	13
3	RECOMMENDATIONS AND FOLLOW-UP TO THE PREVIOUS ASSESSMENT	15
3.1	Interaction between science, policy and society	15
3.2	Scientific quality control	16
3.3	Organisation and human resources	16
4	ENVIRONMENTAL FACTORS AND DEVELOPMENTS	18
4.1	Past period	18
	4.1.1 The opening up of policy-making	18
	4.1.2 Transitions and system changes	18
	4.1.3 Disputed knowledge	19
	4.1.4 Budget cuts	19
	4.1.5 The move to B30	19
4.2	Coming years	19
5	PERFORMANCE	21
5.1	Performance indicators	21
5.2	Results	21
6	SWOT AND BENCHMARKING	26
6.1	SWOT	26
	6.1.1 Strengths	26
	6.1.2 Weaknesses	26
	6.1.3 Opportunities	27
	6.1.4 Threats	27
6.2	Benchmark comparisons	28

7	STRATEGY AND TARGETS	29
7.1	Strategy and targets of the past period	29
7.2	Strategy and targets for the coming years	29
8	RESEARCH INTEGRITY	32
8.1	Integrity, ethics and self-reflection	32
8.2	Research culture and manner of interaction	32
8.3	Data storage, models and processing	32
8.4	Policy on research results that deviate from the prevailing scientific context	33
8.5	Normativity	33
9	CONCLUSION: RELEVANCE TO POLICY AND SOCIETY, RESEARCH QUALITY AND VIABILITY	34
9.1	Research quality	34
9.2	Relevance to policy and society	34
9.3	Viability	34
9.4	Strategic priorities	35
	APPENDIX A PBL ADVISORY BOARD	36
	APPENDIX B FTES AND FINANCES (2013–2016)	37
	APPENDIX C NATIONAL AND INTERNATIONAL PARTNERS	38
	National partners	38
	International partners	38
	APPENDIX D PBL'S RESPONSES TO PREVIOUS AUDIT RECOMMENDATIONS	41
	APPENDIX E THE USE OF PBL WEBSITES	45
	APPENDIX F MOST IMPORTANT PUBLICATIONS	46
	APPENDIX G SCIENTIFIC PUBLICATIONS WITH THE HIGHEST CITATION INDEX	50

1 Introduction

PBL Netherlands Environmental Assessment Agency is *the* Dutch national institute for strategic policy analysis in the fields of the environment, nature and spatial planning. PBL's role as an interface between science, policy and society is unique, due to its independent position at the heart of the Dutch national policy-making process. Its core tasks are to investigate and articulate the state of the human environment, including its physical and spatial quality; to explore future developments and new policy challenges; and to identify and evaluate relevant policy options, based on the best available knowledge. Scientific assessments of strategic policies are among the main products of PBL.

PBL regularly invites outside experts to assess the quality and relevance of its work and to identify areas for improvement. In 2012, a scientific audit was conducted¹. This time, the focus will be on an assessment of both academic and policy-oriented output and impact. In November 2017, a review committee will evaluate PBL's performance over the 2013–2016 period. The review will follow the Standard Evaluation Protocol 2015–2021 (SEP), adjusted to PBL's unique role as a policy assessment agency².

In line with the SEP, this report is a self-evaluation. It provides the review committee with input about the PBL organisation, its development and performance. The report describes what PBL is and does, its activities and results, as well as its strategic outlook and plans for the future, while reflecting on internal and external developments. Following the SEP, it does so by applying three criteria: research quality, relevance to policy and society, and viability (the extent to which the institute is equipped for the future).

The remainder of this document is organised as follows. Chapter 2 describes the organisation, composition and financing. Chapter 3 describes the recommendations in and follow-up to the previous audit. Chapter 4 describes environmental factors and developments in relation to the PBL context. Chapter 5 evaluates PBL's performance regarding research and societal impact. Chapter 6 reports the results of a SWOT analysis and makes benchmark comparisons. Chapter 7 lists the objectives of the Provisional Strategic Plan, including results achieved over the past period, and describes the goals for the medium term, as well as the strategy to achieve those goals. Chapter 8 reflects on research integrity. Chapter 9 concludes by assessing research quality, relevance to policy and society, and viability. In addition, the document includes seven appendices (A–G) that provide more information on the PBL Advisory Board (A), operating budget and number of staff (B), national and international partners (C), recommendations from the previous review and PBL's responses (D), usage of PBL's websites (E) and certain publications (F, G).

¹ <http://www.pbl.nl/sites/default/files/cms/International-Scientific-Evaluation-of-PBL-2008-2012.pdf>

² See <https://dans.knaw.nl/nl/actueel/nieuws/knaw-nwo-en-vsnu-presenteren-nieuw-evaluatieprotocol-voor-onderzoek>, *Standard Evaluation Protocol 2015 - 2021: Protocol for Research Assessments in the Netherlands*.

2 Description of the organisation, composition and financing

2.1 Description of PBL and its mission

PBL is geared to strengthen the quality of political and administrative decision-making in the Netherlands, with regard to the environment, nature and spatial planning, by conducting outlook studies, analyses and evaluations, in which an integrated approach is considered paramount. Policy relevance is the primary concern in all of PBL's studies. PBL conducts solicited and unsolicited research that is independent and scientifically sound.

Its core tasks are:

1. to investigate and document current environmental, ecological and spatial quality, and to assess the related policies;
2. to explore future societal trends that may influence environmental, ecological and/or spatial quality, and to evaluate relevant policy options;
3. to identify societal issues of importance to environmental, ecological and/or spatial quality and raise them for discussion;
4. to identify strategic options for achieving policy objectives with regard to the environment, nature and spatial planning.

2.2 History and institutional setting

PBL Netherlands Environmental Assessment Agency was established in May 2008, following a merger between the Netherlands Institute for Spatial Research (RPB) and the Netherlands Environmental Assessment Agency (MNP) (for further details see PBL self-evaluation 2012³). Similar to the other Dutch policy assessment agencies (CPB Netherlands Bureau for Economic Policy Analysis and the Netherlands Institute for Social Research (SCP), PBL is uniquely embedded in the Dutch administrative system. Organisationally, PBL is part of the Ministry of Infrastructure and the Environment. PBL's autonomous and independent position is safeguarded under the Protocol for the Policy Assessment Agencies (*Aanwijzingen voor de Planbureaus*, Staatscourant 3200, 21 February 2012)⁴. In consultation with the Dutch Cabinet, the Minister of Infrastructure and the Environment (IenM) appoints the Director-General. In addition, PBL has an independent Advisory Board (see Section 2.4.1) whose members are also appointed by the Minister of IenM, also in consultation with Cabinet. PBL operates on the basis of a fixed budget and is subject to national government budgetary rules.

PBL conducts research for the national government. Its annual work programme is therefore discussed by the Council of Ministers, together with the work programmes of CPB and SCP. In addition, PBL may also receive research requests from political parties, Directorates-General of the European Union (DG Climate Action, DG Environment, DG Regional and Urban Planning) and international organisations, such as the UN and the OECD. Policy relevance and the available capacity determine whether PBL is able to honour such requests. A notable example is that of PBL's assessment of the election manifestoes of political parties, in the run-up to the general elections. Recently, PBL has begun to explore its possible role towards other stakeholders, such as provincial and local authorities.

³ See <http://www.pbl.nl/publicaties/2012/zelfevaluatie-pbl-2012>

⁴ See <http://wetten.overheid.nl/BWBR0031972/2012-04-01>

2.3 The strategic line of development

To understand the direction into which PBL has been heading, in recent years, it is necessary to point out some important changes in PBL's environment. In a direct, instrumental sense, PBL's activities were seriously affected by budget cuts, especially those implemented by the Rutte I Cabinet. In its Provisional Strategic Plan (*Houtskoolschets 2015, 2011*), PBL outlined its strategy to cope with these cuts by means of a 'dynamic' reorganisation. At the same time, the arena in which PBL operates was changing. A more complex environmental agenda, with 'wicked' problems, such as climate change, forced PBL to adjust its course. A more systemic approach was emphasised, combining an interest in environmental outlooks with pro-actively exploring alternative policy options (linking content and process). The traditional role of public policy or policy assessment is no longer obvious. Today's emancipated citizens are knowledgeable and well-informed. PBL invested in more pro-active forms of communication and collaboration. The recommendations by the 2013 international audit committee (see Chapter 3) were an important indication for the fact that PBL was 'on the right track' of adjusting to these changing circumstances. By the end of 2015, the reorganisation was completed. Currently, PBL is updating its strategy for the following years (*Visie2025*).

Today, PBL is increasingly strengthening its role as a trustworthy and inspiring strategic knowledge institute, operating in the context of a more participatory policy environment, facing major transitional challenges in the environmental agenda (e.g. energetic society, demand for multi-level and multi-actor governance, crisis of public legitimacy, demand for public participation) as well as along the policy-society interface. Important strategic lines for the coming years include (see also Chapter 7):

1. PBL has to make knowledge more easily available and expand its knowledge base, to create a broader landscape that includes knowledge, policy and society, on multiple levels and for multiple actors, due to the increasing complexity of environmental and spatial challenges, and to the move towards more participatory policies, in the context of a diversifying 'energetic society';
2. Innovation and learning within PBL must remain a priority. Not only by attracting new staff (through various forms of entrepreneurship), but also by actively sharing and securing knowledge and experience, with outside parties as well as within and between PBL departments, thus also ensuring continuity;
3. Throughout this process, close attention must be paid to prioritisation, with a strong focus on PBL's mission and related basic values on the one hand, and a sharp eye on societal and environmental challenges and the related policy options, on the other. This could include a regular evaluation of PBL's project portfolio, in light of the priorities distinguished in the biennial Assessment of the Human Environment;
4. In addition, in order for PBL to maintain its authoritative and trust invoking position, this also involves ongoing and even stronger attention for quality maintenance schedules, explicit and implicit forms of normativity, disputed knowledge, and maintaining the quality of integrated models, both internally with regard to our own work, and externally along the relevant knowledge or data chains.
5. Furthermore, in line with its core mission, PBL should continue efforts to ensure that its message is being heard and gets across within its administrative, departmental environment, which is based on its authoritative expertise, the integrality and urgency of the environmental and spatial challenges identified, and the inspirational strength of policy options suggested. PBL should achieve this through research and along other avenues, such as 'knowledge at the table', without losing its independence.

PBL, of course, needs to be selective about the societal issues it engages in. One basic criterion is whether or not a particular subject involves the national government's 'responsibility for the system'. A second criterion is whether the issue is related to the priority challenges included in the work programme.

2.4 Funding and work programme

PBL Netherlands Environmental Assessment Agency is structurally funded by the Ministry of Infrastructure and the Environment. Additional, project-based budget is provided, on occasion, by the other ministries. For example, the Ministry of Foreign Affairs asked PBL, in 2013, to explore the connection between Dutch foreign policy and development cooperation, in relation to the PBL work programme. The Ministry of Economic Affairs finances research that is carried out by Wageningen University and Research, which is commissioned to provide input for PBL's research on nature (see Section 2.8). Towards the end of 2016, the Minister of Economic Affairs decided to transfer the policy analysis section of the Energy research Centre of the Netherlands (ECN) to PBL, as this would facilitate a more integrated and efficient analysis of energy policy. This decision will be implemented before the end of 2017. It is expected that about 10 energy analysts will be added to PBL's Department of Climate, Air and Energy, while the budget will be increased by EURO 2.8 million.

In recent years, external funding has gradually increased, (a) to create opportunities for methodical and topical innovation and exploration, and (b) to achieve a more balanced workforce (see Appendix B). Important contributions come from collaborations in various international projects, such as those under EU research and development programmes (e.g. 7th Framework Programme and Horizon 2020). In accordance with the above-mentioned protocol, external funding should not exceed 20% of PBL's total annual budget, in order to safeguard its independence.

PBL's work programme is determined on an annual basis, by its Director-General, after internal deliberations and external consultations with stakeholders. The work programme reflects PBL's strategic choices in addressing environmental challenges. A key publication, in this respect, is the biennial Assessment of the Human Environment (*Balans van de Leefomgeving*). In line with this, PBL's work programme for 2017 (*Werkprogramma 2017*) is organised around four integrated challenges: climate change and the energy transition; the transition of food, agriculture and nature; achieving a green and circular economy; and strengthening city regions (see also Section 7.2).⁵

2.5 PBL Advisory Board

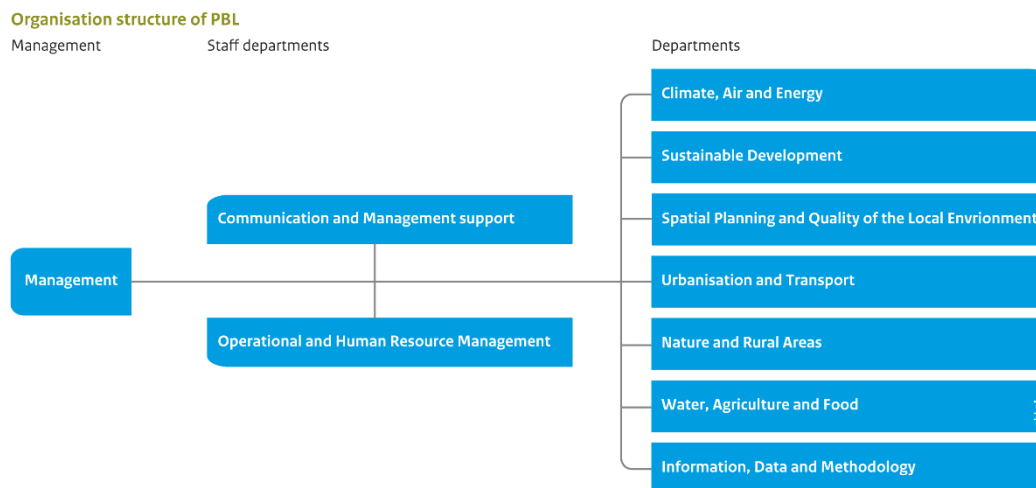
The PBL Advisory Board is responsible for supervising the scientific quality and societal relevance of PBL research. This includes organising a periodic audit. The members of the PBL Advisory Board represent many fields of expertise, ranging from academia to industry and from national to regional and local authorities, reflecting the full range of environmental topics and expertise in PBL's work programme. Members of the PBL Advisory Board are appointed by the Minister of Infrastructure and the Environment, in consultation with PBL's Director-General. They are appointed for a four-year term, with the possibility of reappointment. To guarantee independence, the members of the PBL Advisory Board should not be accountable to the responsible Minister or any other Member of the Dutch Cabinet. Appendix A presents a list of the current PBL Advisory Board members.

2.6 Organisational structure

PBL Netherlands Environmental Assessment Agency employs both permanent and temporary staff; permanent staff of 171.4 FTEs (full-time equivalents), as agreed with the Ministry of IenM, as well as 40 FTEs in temporary employees. This has allowed PBL to rejuvenate its work force, bring in new expertise and broaden its scope. Employees have various and sometimes multi-disciplinary academic backgrounds. In October 2016, PBL moved into its new offices in The Hague, from previously having operated from two separate locations (in Bilthoven and The Hague).

⁵ see: http://www.pbl.nl/sites/default/files/cms/publicaties/PBL%20WP2017_definitief.pdf

In November 2015, Professor Hans Mommaas was appointed Director-General of PBL. He succeeded Professor Maarten Hajer. Reinier van den Berg was the Deputy Director until January 2017, after which he was succeeded by André van Lammeren. The organisation consists of two staff departments and seven research departments, as shown in the diagram below. The Director-General, Deputy Director and the department heads discuss strategic and operational issues during regular management meetings.



Source: PBL

The **Office of Communication and Management Support** (CBO) is responsible for corporate communication (both internal and external) and PBL's publication process. It also provides public-affairs support to PBL's management; for example, in maintaining contacts with the Dutch Parliament and Ministries.

The **Office of Operational and Human Resource Management** (BPO) is responsible for human resource management, quality management, corporate finance and ICT.

The Department of **Information, Data and Methodology** (IDM) is engaged in the quality control of PBL information, data and methods. It focuses on advice, knowledge management, management of information, scientific quality of information, introduction and development of methods and techniques, and manages the collective data and instruments and their availability. Furthermore, the department is responsible for the presentation of information in PBL publications according to various visualisation techniques. The Head of IDM is also PBL's Chief Scientist.

The Department of **Climate, Air and Energy** (KLE) analyses the development of the energy system, mainly from an energy-transition perspective. Looking at the national, European and global scale, KLE carries out assessments of implemented and proposed policy on how to mitigate and in certain cases adapt to climate change, combat air pollution and achieve a sustainable energy supply. This work is often based on integral quantitative analyses, using various calculation models and a systems approach.

The Department of **Water, Agriculture and Food** (WLV) covers the fields of water quality and quantity, water safety, agriculture, agricultural emissions, and food production and demand. Issues include the effects of climate change, the availability of fresh water, and the living conditions and safety around the deltas. On a national scale, the department looks at possibilities to combine expansion and efficiency in food production with nature and landscape, which on an EU scale, is also linked to European Agricultural Policy reform. On a global scale, the department studies food supply and biofuel production, and how these issues relate to biodiversity, emissions and the use of space.

The Department of **Sustainable Development** (DO) aims to operationalise the concept of 'sustainable development' for policymakers and society. It looks at sustainable development from various perspectives; what would be needed to achieve and maintain a good quality of life – both here and now, and elsewhere and in the future? A specific research topic is that of

the 'circular economy'. To study these issues, comparative frameworks and accompanying policy instrumentation are applied and developed.

This also involves further development of methods and cost-benefit analyses, and system dynamics and economic model calculations used in outlook studies and policy evaluations. The DO department focuses its research not only on the Netherlands and Europe, but also considers the global context.

The Department of **Spatial Planning and Quality of the Local Environment** (ROL) focuses on spatial planning in the Netherlands, especially considering area-specific policies. It pays particular attention to the connection between spatial developments and their impact on the environment. Examples include social cohesion within and economic vitality of neighbourhoods, energy efficiency within the built environment, and the accessibility of nature and the landscape. In addition, this department studies regional and national policy on integrated spatial development.

The Department of **Urbanisation and Transport** (V&M) concentrates on analyses, outlooks and policy evaluations of urbanisation processes and sustainable mobility. This entails interrelated issues of sustainable urbanisation, national and international accessibility, qualitative and quantitative aspects of housing, robust knowledge-economy networks, and sustainable transport and mobility. Research within this department focuses particularly on the dynamics of spatial coherence within and between various scales, using and managing demographic, spatial, economic and transport models.

The Department of **Nature and Rural Areas** (NLG) focuses on issues around nature, landscape and rural areas. Loss of biodiversity — the variety in species and ecosystems — is one of the global sustainability problems. The department studies and evaluates trends and solutions, connecting the various scales — from global to local and vice versa. In addition, it studies the multi-functionality and cohesion within the cultural landscape and cultural heritage, and related questions of which landscape values need to be preserved and what could be done to develop landscape qualities. The NLG department explores spatial dynamics in 'green' and 'blue' spaces, and their consequences for the quality of rural areas.

Appendix B contains an overview of FTEs, also per department, and of changes over the years.

2.7 Works council

The PBL works council (*ondernemingsraad*) consists of nine staff members who are elected by PBL employees every three years. The council has the right to advise PBL's Director-General on organisation and personnel issues. In specific cases, it can formally approve or reject decisions made by the Director-General. In 2012, the works council agreed with the Director-General's strategy to implement the imposed budget cuts without the need for layoffs. This 'dynamic reorganisation' was backed by the government employment programme (*Van Werk naar Werk*).⁶ Other important topics of discussion and advice have been the move to the new premises in The Hague and the new, flexible way of working. More recently, the works council has been discussing the draft version of PBL's strategy for the future (*Visie2025*) and the related vision for human resource management.

Until the end of 2016, PBL had an external confidential advisor, mainly for scientific integrity. In May 2017, two PBL employees (1 male, 1 female) were appointed as confidential advisors with respect to both scientific integrity and non-scientific issues. In addition, one external advisor will be appointed with regard to matters of scientific integrity.

⁶ <https://www.p-direkt.nl/informatie-rijksperoneel/mijn-werk/organisatieverandering/van-werk-naar-werk-beleid>

2.8 Activities and publications

PBL is making information more readily available, and is becoming more receptive to a wider, more participatory interaction between policy, society and knowledge. PBL's knowledge is communicated in a wide variety of formats, not only in the form of articles and reports (the latter of which are becoming increasingly more concise and accessible), but also on websites, in social media, presentations and infographics, through interaction with policymakers and through large events and workshops that are organised for a wide variety of stakeholders and the general public. PBL has been a front runner among Dutch policy assessment agencies and public knowledge institutes in exploring these new communication channels. In addition, on occasion, PBL researchers also present their findings during technical briefings to inform Permanent Parliamentary Committees. Therefore, choosing a target audience for the presentation of findings from research project is important, as is choosing the most effective way to communicate them. How knowledge is likely to be received has to be prepared carefully. Traditional ways of informing an interested audience are press releases and the PBL newsletter. They provide information about recent publications and upcoming events.

PBL also produces widely appreciated interactive web tools. An example is the interactive 'Climate Pledge INDC tool', published on PBL's website, which serves to analyse the overall effects of the various plans of the Conference of the Parties (COP 21) held in Paris, in 2015. As said, over the past years, PBL has invested considerable effort in these new forms of publication and visualisation. PBL is known for the infographics it produces to communicate certain insights, in a clear and unambiguous way. PBL has also produced some videos as an alternative way of communication (<https://www.youtube.com/user/pblleefomgeving>); and, for example, for its recent Nature Outlook (with perspectives on nature in the EU) and the Reflexive Evaluation of the Nature Pact.

Some PBL products have a legal/structural basis, such as the Assessment of the Human Environment (*Balans van de Leefomgeving*). Some products are recurring as a part of policy programmes, such as the Nature Outlook (*Natuurverkenning*), the Spatial Outlook (*Ruimtelijke Verkenningen*), the Environmental Data Compendium (*Compendium voor de Leefomgeving (CLO)*, a joint online publication with CBS and WUR, updated on a regular basis) and the Regional Population Prognosis (*Regionale Bevolkingsprognose*, a joint publication with CBS). The annual National Energy Outlook (*Nationale Energieverkenning (NEV)*, joint publication with the Energy research Centre of the Netherlands (ECN) and CBS). A number of studies have been carried out in collaboration with CPB; a series on promising policy options in the run-up to the elections, such as with regard to mobility patterns and the housing market (*Kansrijk mobiliteitsbeleid 2016, Kansrijk woonbeleid 2016*); the scenario study Welfare, Prosperity and the Human Environment (*Welvaart en Leefomgeving WLO 2015*) can be used in cost-benefit analyses that may form a reference for future policy decisions. Other recurring products include the monitoring report on infrastructure and spatial developments (*Monitor Infrastructuur en Ruimte (MIR)*), evaluation of the Water Framework Directive and the Sustainability Monitor of the Netherlands 2014 (*Monitor Duurzaam Nederland*).

2.9 Academic partners, academic positions and visiting scholars

2.9.1 Strategy for collaboration

PBL has much to gain from collaborations with academic partners and other research institutes, and is able to also offer them the same, in return. PBL researchers review and contribute to the knowledge of others, they also use their data and models, publish work together with academic colleagues and keep academic and research contacts up to date. Academic partners, in turn, may increase the societal impact of their own research by using PBL data and models, and by collaborating on joint publications.

PBL's strategy for collaboration with academic partners is fourfold:

- to maintain a strong network within academia and involve relevant academic expertise in projects;
- to create a knowledge-multiplier effect by collaborating with academic partners (enriching, testing, experimenting);
- to invite PhD and Master students from universities who are interested in working within a policy-relevant context;
- to establish or endow specific chairs at universities for certain prominent PBL researchers.

PBL has an excellent network of academic partners, both in the Netherlands and abroad, as shown in Appendix C. PBL collaborates with a wide variety of Dutch universities.

Collaboration with universities and academic research institutes is sometimes consolidated in Memoranda of Understanding.

2.9.2 Collaborations with Dutch universities and other research institutes

Structural collaboration with Dutch universities and other research institutions is organised along the following functions (see also appendix C.1):

- contract-based collaborations, aimed at producing, gathering and updating of data and models used by PBL (e.g. CBS, WUR, ECN, RIVM);
- structured collaborations, with various institutes, in the production and exchange of shared analyses, evaluations, viewpoints, and opinions (e.g. CPB, SCP, CBS);
- structural agreements with academic institutes for special professorships, aimed at the updating, reviewing, exchanging and gathering of academic knowledge (Utrecht University, Tilburg University, Delft University of Technology, University of Amsterdam);
- regular contacts with academic specialists and departments, both nationally and internationally, with regard to the review of PBL products and models, and collaborations to explore strategic themes.

2.9.3 International collaboration

Although PBL's primary focus is on Dutch national policy-making, it also has a strong reputation within relevant international knowledge and research networks. This is related to maintaining its robust and reliable position at the forefront of science-policy developments. Such developments do not stop at the national border. See Appendix C.2 for an overview of the partner institutes with which PBL collaborates on an international level. Important criteria for collaboration are:

- relevance with regard to PBL's work programme and the related knowledge-policy base;
- retention of PBL's independent position;
- sufficient financial and staff capacity.

The EU Framework Programmes for Research and Technological Development (FP1-FP7 and Horizon 2020), are not only interesting from the perspective of 'science for policy', but also from that of the international exchange of knowledge between peers. Contract research enables PBL also to employ temporary staff. This is a welcome opportunity for hiring young scientists with state-of-the-art knowledge.

PBL also has connections with European institutions, such as the Joint Research Centre, EIONET, ESPON (for whom PBL is the Dutch focal point), ALTER-Net, the European Network of the Heads of Environment Protection Agencies (EPA Network), and the European Environment Agency (EEA). These connections involve the exchange of data, information, knowledge, and policy experience, and, if expedient, collaboration on specific themes, cross-border or EU-oriented projects (e.g. with regard to smart specialisation, competition and trade between regions, EU circular economy policy frameworks, and cross-border experience of climate adaptation strategies). PBL plays an important role in the global IAM community, and is one of the founding members of the Integrated Assessment Modelling Consortium (IAMC). These types of networks are important for knowledge creation and international recognition.

PBL sometimes works for UNEP, OECD and CBD (Convention on Biological Diversity of the United Nations), and hosts the Technical Support Unit (TSU) for IPBES (Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services). PBL also collaborates with IPCC, on occasion. Recently, the secretariat of the UN Convention to Combat Desertification (UNCCD) requested PBL to contribute to the Global Land Outlook (GLO). In such instances, PBL aims for its expertise on integrated assessments to be of benefit to others, thus contributing to the achievement of international policy goals. PBL has also provided advisory work for the China Council for International Cooperation on Environment and Development (CCICED), and this work is highly valued by the Chinese Government and the Dutch Ministry of Infrastructure and the Environment.

2.10 Human resource management

PBL staff is highly qualified, involved, and motivated. In recent years, PBL has had to reduce its permanent staff numbers (*Houtskoolschets 2015; 2011*). In the meantime, additional financing) allowed PBL to employ temporary staff. As a result, PBL has been able to rejuvenate the workforce and stimulate innovation. Most of the more experienced staff members are under permanent contract, while younger staff typically have fixed-term contracts. Mobility of permanent employees has been rather limited. Due to this, it is presently difficult to offer younger staff members longer term contracts, with the risk of innovative expertise being lost to PBL. Knowledge management will become even more critical for PBL, in the future. Over the coming 5 to 10 years, about 100 FTEs of permanent staff may leave, because of retirement.

Over the last few years, in line with its strategy, PBL has attracted expertise on participatory forms of evaluation, on fiscal regimes and behavioural economics. To achieve a more integrated, systemic and participatory approach to environmental issues, cross-sectoral project management structures and skills have become a focus of attention.

PBL Young has been set up to promote contacts across departments between young employees. It regularly organises meetings both within PBL and between organisations, thus contributing to PBL in the form of new ideas, new networks, and a proactive attitude. A survey, held among employees in 2014, showed a high degree of employee satisfaction. Three issues were found to need attention: (1) career development, (2) the workload, both in general and specifically with regard to the final phase of projects, and (3) collaboration between various departments within PBL.

In line with the notion of PBL as an ongoing learning organisation (as also included in the draft version of *Visie2025*), employees are offered ample training opportunities (see also Section 2.10), although not all employees use these opportunities to the full. During the move to the new premises in The Hague (in October 2016), the experiences of employees have been monitored. Overall, the move is evaluated as positive. Workshops have been organised to pay attention to issues of social cohesion.

2.11 Quality management

In order to safeguard the robust and trustworthy quality of its work, PBL has numerous operational arrangements in place to enhance the scientific quality of its products. These include: review procedures (internal and external peer reviews of articles and working papers); seminars; guidelines for methodology and support structures for handling information and data; a PBL Academy programme. The Chief Scientist coordinates the quality control. Indirectly, the PBL Advisory Board has a monitoring role. All PBL products need final approval by the heads of the departments involved, who are responsible for the scientific quality, while the Chief Scientist also keeps a close watch. Depending on the importance and especially the policy relevance of products, a broader approval of management is required. External review is obligatory for high-profile products. Of course, scientific publications are subject to the peer-review procedures of the particular scientific journals. PBL scores high on various research themes in peer-reviewed journals, thus also

guaranteeing the scientific quality of the work (see Chapter 5). For high-profile products (top 20), seminars are organised at the start, midway and at the end of the project.

At these seminars colleagues are invited to critically examine the project plan, the ongoing work and the results. In addition, external participants may also be invited, such as policymakers, stakeholders and experts. Departments have a strong academic network; academia knows how to reach out to PBL and vice versa (see above).

To enhance research quality, PBL has produced a number of guidance documents on reviews, uncertainty, stakeholder participation, scenario building and cost-benefit analysis. It remains a challenge to apply these guidelines in day-to-day work. Existing formal frameworks for quality control are not always kept up to date. Hence, the decision was made to update the status of data and models. Larger models, such as IMAGE, are audited on a regular basis.⁷ Models such as GLOBIO, Pearl and TigrisXL have been improved, recently. The filing and archiving system varies between PBL departments. Generally speaking, PBL needs to devote more attention to its information management. In recent years, PBL was unable to issue a declaration of being 'in control' as required by the Ministry. This year (2017), PBL has initiated a more comprehensive approach to comply with these requirements.

For the quality of most primary data used, PBL relies on the quality control procedures of its partners, such as CBS. This is an important consideration in regular meetings with these partners. For outside models used in PBL work, such as those by the WUR, a certain quality standard is contractually negotiated.

Last but not least, PBL has its own PBL Academy, led by the Deputy Director, and with the Chief Scientist in an advisory role. The PBL Academy offers training courses for PBL researchers and other employees on various subjects and organises lectures by distinguished scientists. Attending such courses is on a voluntary basis.

⁷ See http://www.pbl.nl/sites/default/files/cms/publicaties/pbl-2015-international-review-of-image-3.0_01799.pdf

3 Recommendations and follow-up to the previous assessment

In 2013 an Audit Committee headed by Lea Kauppi, Director General of the Finish Environment Institute Syke, evaluated the quality of the work of PBL, and the way PBL organised its quality control. Overall the assessment of PBL was very positive. The follow-up efforts were reported in PBL (2013), and are included in Appendix D. This section briefly addresses the actions PBL has taken in response to the recommendations. Looking back, it is clear that PBL has made a fair amount of progress with respect to these recommendations, despite PBL's integration and reorganisation process of the last couple of years. Because it has proven difficult to finding a suitable successor to the previous Chief Scientist, the function of Chief Scientist could not yet be developed to its full potential.

3.1 Interaction between science, policy and society

To address changes in the interface between science, policy and society, over the last few years, PBL Academy organised several lectures, given by distinguished scientists, and arranged various debates and workshops. Furthermore, several relevant training courses were organised for PBL researchers, including a course on how researchers could better communicate their research results. The results of these efforts are reflected in reports (e.g. the 2016 version (only in Dutch) of the biennial series *Assessment of the Human Environment*) and strategic documents (e.g. the draft version of *Visie2025*).

PBL has intensified its involvement with local authorities. Over the last few years, PBL, in collaboration with the provinces, has taken on innovative pilot projects, such as on water management, regional economic development, and nature policy. PBL is still expanding this multi-scale, multi-actor strategy, also in collaboration with Dutch national policy organisations representing provincial and municipal authorities (e.g. IPO and VNG). The theme is included in the draft version of *Visie2025*, as well as in the PBL work programme 2017. Currently, within PBL, project leaders of projects that involve government authorities (e.g. provinces, water boards and municipalities) meet in a so-called Community of Practice to exchange experiences and work on a common knowledge agenda and common practice.

PBL has further increased its innovative use of infographics, one-pagers and interactive applications to communicate with policymakers and the general public. In addition, PBL has also produced some videos as an alternative way of communication (e.g. <https://www.youtube.com/user/pblleefomgeving>). Both in 2014 and 2016, an evening conference was organised (*Nacht van de Leefomgeving*) to present the findings of PBL's biennial Assessment of the Human Environment, in an informal setting, for a wide audience. In addition, PBL is calling for attention for wider and earlier stakeholder involvement, also including the private sector, as part of project planning procedures.

Two-way communication with society also includes transparency about models and data used. This transparency is currently still limited, but will receive more attention, also as a result of government policy on open data. Some good examples are http://themasites.pbl.nl/models/image/index.php/Main_Page), <http://www.globio.info/what-is-globio/reference-database/per-pressure>, <http://www.wlo2015.nl>, <http://www.pbl.nl/publicaties/multi-regionale-handelsdata-voor-europa-in-2010> and <http://themasites.pbl.nl/balansvandeleeftomgeving/jaargang-2016>.

3.2 Scientific quality control

A revised guidance on review procedures and seminars was developed in 2014. A rigorous, standardised review procedure for PBL, as a whole, is currently not in place. The responsibility for quality assurance lies with the individual PBL departments, which decide about review procedures and the involvement of external reviewers (sounding boards). Review procedures may also differ according to the multidisciplinary or transdisciplinary character of the research. For high-profile publications, internal review seminars and external review reports are standard. In general, project files are not yet transparent enough, with regard to review procedures. As a consequence, a pilot project has been started, this year, with a new project filing system.

PBL provides state-of-the-art guidelines for uncertainty assessment. The overall impression is that the use of these guidelines differs between projects. Discussions with researchers revealed that the Guidance for Uncertainty Assessment and Communication was too complex for easy applicability. As a result, a more practical version is being developed and a user-friendly application is in the making. This version will be incorporated in PBL's work.

Each year, over 70 articles are published by PBL in peer-reviewed journals (see Section 5). Incentives and relevance for researchers to publish vary across departments. Last year, scientific output was included, once again, in regular talks with PBL professors and in progress meetings between the Chief Scientist, Director-General, Deputy Director and the Department Heads.

The role of Chief Scientist has been strengthened. The Chief Scientist advises project leaders, department heads and general management, on issues of scientific quality assurance. Furthermore, the Chief Scientist is authorised to request amendments. Department heads are required to discuss any scientific quality issues with the Chief Scientist. Unresolved issues will be brought to the Director-General's attention by the Chief Scientist. The number of FTEs allocated to this role has been increased, from 0.4 FTEs to 0.6 FTEs, and an assistant to the Chief Scientist was appointed for 0.4 FTEs.

The intention is to keep strategic research at the level of 15% to 20% of the budget. Project plans and programmes do not specify clearly which part is devoted to strategic research and how. There is an ongoing reflection on what strategic research in the PBL work programme implies: its status and its role. The research central to the long-term societal challenges as identified in PBL's work programme can be regarded as strategic research. However, there is also an independent demand for knowledge of a more basic, generic nature, such as in relation to the development of models and new (e.g. more adaptive or participatory) research methods. As expressed in PBL's work programme (and in the draft version of *Visie2025*), this is not an 'either-or' issue, but rather 'and-and'.

3.3 Organisation and human resources

PBL has been very successful in obtaining external funding, as can be concluded from Appendix B, not only from the EU, but also from other national and international sources. The international orientation is primarily linked to the project portfolio of the departments, and the related EU or international dimensions and networks. Departments may call on the administrative support of a specially assigned employee.

External funding enabled the attraction of younger personnel with specific expertise, on a temporary basis. From 2016 onwards, based on this experience with a 'shell' of temporary employees, an HRM strategy more strongly supporting strategic choices will be elaborated

(see Section 2.9, where the present and future HRM challenges have been indicated, and Section 6.2 for strategic lines for the future).

The PBL Academy organises masterclasses and training courses to increase the ability of PBL staff to work effectively at the interface of science, policy and society. The interactive format includes lectures and experiences.

Also, the PBL Academy has organised training courses for researchers on how to communicate more effectively about their research results; on the various roles and positions of experts at the interface between science, policy and society; on how to deal with uncertainties and normativity; and on interdisciplinary and transdisciplinary collaboration.

Furthermore, a postdoc position has been created to strengthen the scientific justification for participatory approaches. This postdoc supports method application in a project setting, and facilitates organisational learning and knowledge exchange, on the basis of project experience. Capabilities can also be increased through participation in international projects.

More governance expertise (including behavioural economics) has become available to several of PBL's departments and a number of projects for which it was very relevant, such as the Reflexive evaluation of the Nature Pact (*Lerende Evaluatie Natuur Pact*, 2017) and the Assessment of the Human Environment (*Balans van de Leefomgeving*, 2016). Additional expertise has also been provided through alliances with universities and other research organisations. PBL has collaborated, for example, for governance expertise, with the Netherlands School of Public Administration (NSOB) and VU University.

4 Environmental factors and developments

4.1 Past period

This section further elaborates on developments in the nexus between knowledge, policy and society that have already influenced PBL's work in the past and continue to do so, today.

4.1.1 The opening up of policy-making

In general, in the Netherlands, just as elsewhere in the world, there is a tendency to actively expand national policy-making by including the organisational and developmental capacity of a broader platform of societal stakeholders, including local/regional levels of government, private companies and citizens' organisations. This in order to address both the increasing complexity of environmental challenges and the ongoing emancipation of the informed citizen-consumer. Under the conceptual umbrella of the 'energetic society', policy-making is more and more about facilitating and stimulating wider societal involvement in the exploration and execution of policy options. As a consequence, within spatial planning and environmental policy-making, part of the policy process has been decentralised, and is now conducted by the provinces, municipalities and regional boards. For PBL this poses two challenges. One the one hand, there is the question of how these decentralisation processes evolve; are they able to strengthen environmental policy-making, both in terms of their legitimacy and their effectiveness; what works and what does not? On the other hand, there is the question of how PBL may facilitate the decentralisation process, from a knowledge perspective; how to expand the PBL knowledge base for local/regional policy-making in such a way that this strengthens the quality of the decision-making process. On this subject, PBL has conducted some pilot projects, such as on regional coherence in the south-western delta (*Samenhang in de Zuidwestelijke Delta*, 2013)⁸. In the domain of nature policy, the Ministry of Economic Affairs and the Dutch provinces jointly commissioned PBL to regularly monitor and evaluate local/regional nature policies, the results of which are published in the *Reflexive evaluation of the Nature Pact (Lerende evaluatie Natuurpact*, 2017)⁹. One of the risks connected to ongoing decentralisation processes is that of strategic knowledge becoming fragmented and local authorities trying to reinvent the wheel. This can be seen as an opportunity for PBL (see Chapter 7), as it may provide information about effective decentralisation processes ('what works?') from the perspective of system responsibility, which rests with national government. Furthermore, increasing the variety of participants in the policy-making process is also related to the challenge to further expand PBL's communication landscape and broaden its stakeholder involvement, without, of course, weakening PBL's independent position.

4.1.2 Transitions and system changes

Parallel to this, as part of the same process, transitional thinking has become generally accepted as a developmental perspective in politics, policy-making and society. This is related to increasing recognition of the systemic, global nature of many environmental issues (e.g. climate change, loss of biodiversity, increasing socio-spatial differentiations). Major challenges involve systemic changes in the fields of energy transition, circular economy, a more sustainable relationship between food and nature, and more resilient city regions. Sectoral challenges may be so big that they affect society at large. This requires a more integrated approach, not only in policy-making, but also in the underlying research. The policy options for the human environment as well as the underlying research both need to be considered, with respect to transitional challenges.

⁸ See <http://www.pbl.nl/nieuws/nieuwsberichten/2013/PBL-focus-op-transities-noodzakelijk-voor-vitale-zuidwestelijke-delta>

⁹ See <http://themasites.pbl.nl/evaluatie-natuurpact/>

4.1.3 Disputed knowledge

In the current knowledge-communication democracy, and amidst a growing diversification of developmental perspectives and truth claims, scientific authorities have lost much of their self-evident position. An institute such as PBL, working at the interface between policy, science and society, may expect active involvement or criticism from a wide variety of interest groups and involved citizens. This underlines that PBL research is relevant for society, while also underscoring PBL's responsibility. In general, criticism is welcomed as it plays an important role in keeping researchers sharp. In addition, the debate is seen as a vital part of current deliberative policy-making and, thus, also as a crucial element in establishing PBL's position as an authority in its field. Thus, PBL takes grounded criticisms seriously. In the meantime, in order for the exchange of viewpoints to become fruitful, and for PBL to maintain its trustworthy position, it is crucial to become as transparent and clear as possible about how knowledge is gathered, modelled and presented, and in explaining underlying standards and assumptions. See Chapter 8, in which the policy with regard to disputed knowledge is explained.

4.1.4 Budget cuts

Section 2.2 describes government budget cuts (from 2010 onwards) and their consequences for PBL. Important data providers for PBL, such as CBS and WUR, were also confronted with such budget cuts. So far, efforts to keep the impact of CBS budget cuts on PBL work to a minimum have been successful.

4.1.5 The move to B30

In 2016, PBL moved from two locations (one in The Hague, the other in Bilthoven) to one new office location (Bezuidenhoutseweg 30, also known as 'B30') in the centre of The Hague, the seat of the Dutch Government. The building is shared with CPB and SCP. This provides opportunities for sharing services and, if expedient, integrating knowledge from various disciplines and on various geographic scales. The move to B30 also provides opportunities for PBL staff members, as they are all now housed at the same location (see also Section 2.9). The consequences for employees, in terms of workload, commuting time, working from home, and social cohesion within the agency, are being monitored.

4.2 Coming years

The same challenges as those described in Section 4.1 around the nexus between knowledge, policy and society, will continue to dominate the environment in which PBL operates. PBL, therefore, will continue to evaluate, study and explore future policy options, with regard to the energy transition, the transition towards a circular economy, the nexus between food, agriculture and nature, and the resilience of city regions. In doing so, multi-level and multi-actor issues will be included. Societal stakeholders will become more and more important for bringing about the desired changes in society, with respect to long-term policy goals in the fields of spatial planning, nature and the environment. In addition to continuing its distinctive integrated modelling work, on both global and national scales, PBL will also and more often involve stakeholders, not just to explore uncertain futures, but also to respond to increasing regional differences. In line with this, PBL may also further widen its circle of clients horizontally, involving other ministries and directorates.

A certain loss of focus may result from such a widening of the circle of stakeholders, both vertically and horizontally. Preventing such a loss requires concentrating on urgent social and environmental challenges, such as those described in PBL's biennial publication *Assessment of the Human Environment (Balans van de Leefomgeving)* and annual work programme, and considering them in relation to the central government's policy agenda.

With the presence of substantive knowledge decreasing within the ministries, PBL will probably be asked more often to provide input for the policy-making process. In relation to this point, if ministries call on PBL to provide input more often, it will become more difficult and complex for PBL to balance short-term operational and long-term strategic priorities. This calls for a well-balanced and autonomous position for PBL as a knowledge institute. Disputed knowledge is also entering policy and politics. In some political circles, 'fact-free' politics seem to be gaining momentum. If this tendency increases, it may have important consequences for PBL.

Technological developments, and especially in ICT, have a great impact on people's behaviour and the organisation of society. Developments in the area of big data, citizen science, internet platforms, social media and the Internet of Things will have consequences for research and policy-making, as they will change the use of our human environment and will induce shifts in public values linked to infrastructures. They may also make a number of other sources of information (e.g. social media and machine-generated information) available and other research methods necessary. In line with government policy on the provision of data to be used in assessments, PBL has already made some of its data freely available (open data) and is striving to make this part of regular project management.

The consequences of all these developments for PBL staff and the internal organisation have to be considered. The workforce is ageing, and there is the challenge of having to attract young employees within a situation of restrictions on workforce expansion. Existing expertise, of both older and younger employees, has to be secured. PBL will need to attract new scientists, with an excellent track record in science-policy interaction. In its strategic HRM policy, PBL is preparing for this future. In addition, more adaptive and participatory interaction between knowledge and policy calls for flexible and adaptive combinations of disciplinary expertise, without losing the solid foundation for the individual disciplines. In line with this, PBL continues to work towards increasing its internal and external networking capacity. Special points of attention include the balance between the internal departmental organisation and the need to work on more integrated societal and environmental challenges, and the balance between the primary responsibility of PBL in relation to the national policy environment and the need to address a wider circle of stakeholders in government, society and knowledge networks.

5 Performance

5.1 Performance indicators

This chapter presents the selected performance indicators (according to the Standard Evaluation Protocol). These indicators are tailored to the mission of PBL (see Chapter 2). PBL's target audience consists of policymakers at various government levels, parliament, and society at large.

The six categories of indicators according to SEP are:

1. Number of research products for policymakers, parliament and societal groups; This involves mostly policy-oriented output, reports, articles in professional journals for non-academic readers, data sets (e.g. open data), software tools, and outreach activities, such as lectures for general audiences;
2. Use of research products by policymakers, parliament and societal groups; This concerns a contextual response analysis of PBL publications, evaluation of the impact of a selected number of projects, possibly supplemented with interviews with policymakers to assess their view on PBL's impact;
3. Marks of recognition by policy-makers and societal groups; Involved is the membership of civil society advisory bodies, policy committees, professional committees, public prizes;
4. Research products for peers; Research articles and scientific publications, all scientific output, data, models;
5. Use of research products by peers; Use of data, software and models by peers, citation analysis;
6. Marks of recognition from peers; Science awards, scholarly prizes, research grants, invited lectures, membership of committees, editorial boards.

The output of PBL for some of these indicators is rather easy to identify, but, for other indicators, such as the use of research products by various target groups, this is more difficult. In order to obtain an overall picture of the use of research products by policymakers, parliament and societal groups (2), a contextual response analysis has been carried out. CWTS Leiden conducted a citation analysis for an overview of the use of research products by peers (5) (see Appendices F and G). The results from these analyses can be found in separate reports.

5.2 Results

This section only provides main findings. Further details can be found in the individual reports.

The numbers of PBL publications per type are based on Scopus and PVS (PBL's internal, electronic product planning tool):

Number of publications per type, 2013–2016	
Peer-reviewed articles	311
Other articles	196
Top-20 products	37
Policy studies	86
Policy briefs	16
External reports	96

Books	2
Book contributions	39
Background studies	99
Working papers	24
Notes	114
Total	1020

Ad 1) Research products for policymakers, parliament and societal groups

The total number of research products is about 250 each year. Over the 2013–2016 period, the numbers of publications and peer-reviewed articles increased, slightly. Furthermore, PBL has adjusted its communication strategy (see Section 2.7) to include more infographics, interactive websites and Wikis, and fewer lengthy reports and more concise reports. An example is the interactive website on energy transition and energy consumption, per fuel type (*Energietransitie: Joulebak 2050*), which addresses questions about the transition of the energy system in the Netherlands. PBL also published an interactive website on the climate mitigation plans of various countries (INDCs).

One-pagers, such as *Opportunities for a circular economy* have been set up as 'scrollable storytelling', which is a narrative web application, in which written content alternates with clear infographics and data visualisations. Products of PBL research are not only published on the PBL website, but for example also on the websites of institutes with whom PBL collaborates, such as CBS Statline and the Regional Population and Household Prognoses and 'Ruimtevolk' (website about innovative environments).

Articles for societal groups written by PBL researchers have appeared in various magazines.¹⁰

In 2015, PBL and the Ministry of Infrastructure and the Environment agreed on the principle of providing open data when publishing research results. PBL publishes more and more research results in the form of open data, including those related to the scenario study Welfare and the Human Environment (2015) (a joint publication with CPB Netherlands Bureau for Economic Policy Analysis).

Examples of outreach activities directed at a larger audience include:

- On the occasion of the publication of the biennial report Assessment of the Human Environment, in 2014 and 2016, PBL organised a 'Night of the Human Environment' for a wide audience of about 300 people. In both cases, the Assessment of the Human Environment was presented to the Minister of Infrastructure and the Environment;
- A similar event was organised in 2015, at the launch of the report on the spatial metamorphosis of the Netherlands, over the 1988–2015 period (*De ruimtelijke metamorfose van Nederland 1988-2015*);
- PBL contributed to the International Architecture Biennale Rotterdam (IABR) in 2014 and 2016, by presenting infographics and holding symposia;
- Important, from an international perspective, were the presentations held during the 2015 United Nations Climate Change Conference (COP 21 in Paris);
- In 2016, PBL organised an Autumn School on regional economic growth, for senior strategic policymakers from municipalities and the provinces (see also <http://www.pbl.nl/en/publications/pbl-autumn-school-what-works-for-regional-economic-growth>).
- Longreads and videos, such as https://m.youtube.com/watch?v=SdECWnx_6NY and <https://ruimtevolk.nl/publicaties/kernelementen-van-succesvolle-innovatiemilieus/>

¹⁰ These magazines include: ROM-Magazine, Blogs in Energie Actueel, articles in Cobouw, De levende natuur, De internationale Spectator, Agora, S+RO, and Tijdschrift voor de Volkshuisvesting.

Ad 2) Use of research products by policymakers, parliament and societal groups, technical briefings of Standing Committees of Parliament

Information for policymakers may also be provided in the form of direct advice, when PBL comments on government plans while participating in the Council for Economic Affairs, Infrastructure and the Environment (REZIM) and in the interdepartmental Committee for Economic Affairs, Infrastructure and the Environment (CEZIM). For example, on energy and climate, PBL offered tailor-made information to possible coalition partners, outlining policy options and costs and benefits for energy policy packages. PBL also provided tailor-made assessments to the Social and Economic Council of the Netherlands (SER) during its discussions on the energy transition and a circular economy.

PBL researchers provide policymakers and politicians with information that matters. PBL, for example, pointed out the need for adaptation of policy instruments in view of the growing regional differentiation of the housing market. Other examples of the use of PBL output are provided below.

- Over the past years, PBL played an important role in the process of concluding the Energy Agreement and in monitoring the achievements of the societal parties involved in the Agreement (National Energy Outlook (NEV) 2014, 2015, 2016);
- PBL has continually supported the climate negotiations and the Dutch Government during the international UN Framework convention on Climate Change (UNFCCC) by holding presentations during various Conferences of the Parties (COP);
- PBL researchers are lead authors of several publications that have delivered a key input into international environment policy, such as the IPCC assessments, and UNEP's Emissions Gap Reports and Global Environmental Outlooks. These contributions have been widely acknowledged in the international media.
- In various publications, PBL has elaborated on the concept of a circular economy, and PBL information has also been included in the government-wide Vision on Circular economy and the report of the Social and Economic Council of the Netherlands (SER);
'Cities in Europe' is a booklet with 13 infographics illustrating the recent urban developments in a great number of European cities. This booklet was distributed by the Ministry of the Interior and Kingdom Relations during the Informal Meeting of EU Ministers responsible for Urban Matters on 30 May 2016 in Amsterdam
- An article on the Brexit was retweeted over 15,000 times
<http://www.cer.eu/insights/brexiting-yourself-foot-why-britains-euroscptic-regions-have-most-lose-eu-withdrawal>

For an impression of the use of PBL products by the general public, an overview of the visits and page views of PBL websites is included in Appendix E.

The contextual response analysis by Prins (2017)¹¹ gives some more information on the use of PBL products. External research funding, over the past period, is also an important indicator of the usefulness of PBL products for policymakers at various government levels (see Appendix B).

For 67 publications, Prins (2017) assessed how they were used by policymakers and society, by analysing public sources and user diversity within various audiences. PBL publications on societal themes showed a strong increase in the number of users from all user groups, in comparison with a similar analysis in 2012 (Prins 2012)¹². Users were found to mainly come from user groups directly relevant to the publication's particular topic, but there were also other user groups, such as professionals in various fields, bloggers, public and government organisations and firms. Publications on politically sensitive issues, such as climate change,

¹¹ A.A.M. Prins, 2017: Contextual Response Analysis of Publications of PBL reports 2012-2017

¹² A.A.M. Prins, 2012: Contextual Response Analysis of reports of the Netherlands Environmental Assessment Agency PBL

agriculture and sustainability, were used by various sides of the public debate. The most frequently used publications included the three PBL Trends reports as well as their English translations: *The Energetic Society; In search of a governance philosophy for a clean economy (De Energieke Samenleving)*, *Changing track, changing tack; Dutch ideas for a robust environmental policy for the 21st century (Wissels Omzetten)*, and *Green gains: in search of opportunities for the Dutch economy (Vergroenen en Verdienen)*. Various policy evaluation and monitoring reports were also frequently used by a diverse audience, and included the National Energy Outlook (*Nationale Energieverkenning*) 2016 and 2015 editions, and the Assessment of the Human Environment (*Balans van de Leefomgeving*) 2016 and 2014 editions. A topical report on the sustainable supply of healthy food (*De macht van het menu 2013* (Dutch version only)), received considerable attention in the printed media and was especially popular among non-frequent users, i.e. those who had used fewer than three publications, in total, over the period included in the contextual response analysis. In comparison with a similar analysis conducted in 2012, there were many more users of reports on urban planning, housing and mobility, including a report about the ageing population and its consequences for spatial development (*Vergrijzing en Ruimte* (Dutch version only)); a report about the resilience of inner cities (*De Veerkrachtige Binnenstad* (Dutch version only)); the IABR book *Smart about Cities (Slimme Steden)*; a report about developments of people moving between cities and their surrounding municipalities (*De Stad: magneet, roltrap, spons* (Dutch version only)), and the working paper *Greening the Dutch car fleet: the role of differentiated sale taxes*, which formed the basis for the policy report published in Dutch (*Vergroening aanschafbelasting personenauto's effectief*).

Members of Parliament as well as Cabinet Ministers often quote PBL as an authoritative and independent source of policy relevant facts and policy insights regarding sometimes highly sensitive issues of climate change, mobility, agriculture and sustainability. In parliamentary documents, 278 references to PBL were made in 2014, 217 in 2015 and 199 in 2016.

Ad 3) Marks of recognition by policy-makers and societal groups

Over the years, the ministries' Directors-General, who are consulted about PBL's work programme, have been very positive about the work of PBL, as have the Dutch Cabinet and the PBL Advisory Board. The positive response mostly concerns the strategic significance of the work, in the light of societal and environmental challenges and amid future uncertainties. PBL studies contribute in formulating relevant policy options.

Former Director-General Maarten Hajer was elected Government Manager of the Year 2014. He was praised for his leadership during the time following a merger which established the new PBL organisation in 2008, bridging the differences in process and visions between the merged organisations and connecting the various dossiers.

A mark of recognition of a totally different kind is the Infographics Annual Award (awarded by the Association of Dutch Designers (BNO) and Dutch Association of Journalists (NVJ, Nederlandse Vereniging van Journalisten) which PBL received in 2013 for its publication *The Netherlands in 21 infographics*.

In the international realm, institutions connected to the EU and the UN increasingly find their way to PBL, in search of integrated assessments and/or to expand their knowledge portfolios and networks. One recent example is that of UN Environment asking PBL to participate in the creation of a Global Centre of Excellence on Climate Adaptation.

Ad 4) Research products for peers

Over the 2013–2016 period, a total of 311 PBL articles were published in peer reviewed journals (figures based on Scopus). The scientific output is strongly concentrated around issues of climate change, agriculture, water quality and energy. About 20 to 30 articles have appeared in high profile journals, such as *Nature*, *Science*, *Nature Climate Change* and *Nature Energy*.

Ad 5). Use of research products by peers

The Centre for Science and Technology Studies (CWTS, 2017)¹³ carried out a scientific research performance analysis, based on bibliometric analysis of articles published by PBL in scientific journals, by analysing citations of publications indexed in Web of Science during the 2011–2016 period (430 in total). In terms of citation impact, 34% of PBL publications belong to the top 10% in their particular field, more than three times the worldwide average. The vast majority of PBL publications were included in this result, with, by 2016, less than 6% remaining uncited. Forty per cent of PBL publications are in the field of environmental sciences, and 11% in meteorology and atmospheric sciences. The other publications cover a wide variety of fields.

The analysis of PBL's collaboration profile indicates that such research is predominantly (over 90%) carried out in collaboration, with one or more other organisations. Publications produced in collaborations with foreign organisations are particularly important, in terms of the number of publications and the high citation impact achieved.

Ad 6). Marks of recognition from peers

The 2016 Highly Cited Researchers list includes Professor Detlef van Vuuren (PBL and Utrecht University) as one of the 3000 most cited scientists, worldwide (weighed according to scientific discipline). At the core of his work is the use of the IMAGE integrated modelling system. Between 2013 and 2016, PhD degrees were obtained by seven PBL researchers, followed by one more, so far, this year.

PBL is financing the following special professorships, at certain universities: Professors Van Vuuren, Bouwman and (since March 2017) Buitelaar at Utrecht University, Professor Manting at the University of Amsterdam, and Professor Vollebergh at Tilburg University. PBL's Director-General, Hans Mommaas, is also a part-time professor at Tilburg University.

¹³ CWTS, 2017, PBL Netherlands Environmental Assessment Agency Research Performance Analysis (2011-2016), Leiden University

6 SWOT and benchmarking

6.1 SWOT

Based on external consultations with stakeholders and discussions within the PBL management team and works council, a SWOT analysis was performed. The findings pertain to the internal organisation (strengths and weaknesses), and the external context (opportunities and threats). The outcome of the analyses is summarised below, and limited to three entries per category.

<p>Strengths</p> <ul style="list-style-type: none"> - Leading in integrated policy analysis - External awareness - Committed professionals 	<p>Weaknesses</p> <ul style="list-style-type: none"> - Prioritisation - Quality control in the knowledge chain - Continuity of expertise
<p>Opportunities</p> <ul style="list-style-type: none"> - More complex policy challenges - Energetic society - Broadening the knowledge-policy landscape 	<p>Threats</p> <ul style="list-style-type: none"> - Governmental volatility - Loss of authority of science - More competitors

6.1.1 Strengths

Leading in integrated policy analysis

PBL is *the* Dutch national institute operating at the interface between science, policy and society, in the fields of spatial planning, nature and the environment, where expertise from various disciplines is combined to produce integrated assessments. In policy circles and society, PBL is considered an authority on these subjects; it is highly valued by ministries for its reliability, and its long-term orientation. Internationally, PBL is acknowledged for its expertise in the field of quantitative, global assessments and studies.

External awareness

PBL invests strongly in a broad dialogue with policymakers and society at large. Stakeholder participation by government authorities, as well as society in general, is key. Research and the communication about this research are adjusted in line with changes in environmental challenges and in the nexus between science, policy and society.

Committed professionals

With regard to their research themes, PBL researchers are leading in their field. In general, the staff is committed to working on issues of the human environment and the related interface between science, policy and society, considering them from an integrated trans-disciplinary perspective.

6.1.2 Weaknesses

Prioritisation

In a volatile political environment, it is difficult for a policy analysis institute to continually respond to new political priorities. Research programmes are drawn up for more than one year, reprioritisation is difficult and flexibility of employees is limited. Ongoing reprioritisation in interaction with science, policy and society calls for an open, 'horizontal' organisation, not hampered by an abundance of disciplinary, departmental rules and routines.

Quality control within the knowledge chain

Two aspects play a role, with respect to quality control. First, PBL is dependent on quality assurance provided by partners and data suppliers. PBL has only limited expertise to be able to verify this. In addition, the generally rather heavy workload means that internal quality control, such as reviewing products and securing knowledge, sometimes comes under pressure.

Continuity of expertise

It is a challenge to retain unique knowledge held by individuals, especially given the outflow of older employees, in the coming years — expertise which cannot be replaced easily by other individuals. At the same time, the necessary new expertise is often held by young temporary staff. This knowledge is difficult to retain, too.

6.1.3 Opportunities

More complex policy challenges

Society is on the brink of systematic changes related to the energy transition, the circularisation of the economy, more sustainable land use and more resilient city regions. Challenges related to these transitions tend to be more complicated. This fits in well with PBL's integrated and multidisciplinary approach. Availability of big data and open data may pave the way for innovative approaches in which the demand for data interpretation becomes a priority.

Energetic society

The need for knowledge from various actors at various policy levels and for authoritative, independent outlooks, evaluations and reports is growing. This is PBL's ultimate *raison d'être*. PBL is the institute that links national, regional and supranational levels and has the expertise and capability to bridge these levels. PBL provides sound scientific bases for policy-making. In addition, it also acquires relevant knowledge from within the energetic society.

Broadening the knowledge-policy landscape

The shift towards more participatory and adaptive styles of policy, in order to more effectively face the demand for systemic change and opportunities of the energetic society, will lead to a broader knowledge-policy interface. This will happen both in relation to local and regional government authorities and other policy actors. PBL may approach a wider group of stakeholders in order to meet the related knowledge demand.

6.1.4 Threats

Governmental volatility

In a more dynamic policy-society context, the increasing demand for participatory, adaptive styles of policy-making often goes hand in hand with a decreasing role for substantive knowledge. In situations where policy responsibilities have been decentralised, knowledge responsibility may become diffuse. This means that when multiple parties call on PBL to provide certain knowledge, it becomes increasingly difficult to determine the demand for knowledge from all those parties, and how the PBL products are perceived or used within the policy-making process.

Loss of authority

Within society, science is losing some of its, formerly self-evident, authority. Moreover, contradictory analyses are not always welcomed. Less emphasis on evidence-based underpinning of policy-making, or even its complete rejection, is no longer a rare phenomenon and may increase in the future. It may reduce the attention and support for maintaining a solid public-knowledge base.

More competitors

With the increasing emphasis on open data, the 'monopoly' position of institutes such as PBL will become less self-evident. Market parties, other research institutes and highly educated citizens and interested scientists may learn from PBL, and/or become active within the scientific fields of PBL.

Furthermore, increasingly engaging in an ever-broader scope of advisory activities, for a broader range of clients, at various policy levels, may lead to a loss of focus.

6.2 Benchmark comparisons

Benchmark comparisons are complicated. Policy assessment agencies, such as PBL, constitute a separate group within the Dutch knowledge infrastructure. Their role and mission are rather unique. What typifies these organisations is their overriding focus on policy-making. Their main objective, therefore, is for their research not to contribute to knowledge for the sake of increasing it – as can be said of universities – but rather to provide knowledge-intensive strategic services (see also Public knowledge Organisations in The Netherlands, Facts and figures 17, Rathenau, 2016). Therefore, comparing them with other types of research institutes has its limitations.

In comparison with the other two policy assessment agencies, CPB and SCP, the response to PBL publications is less pronounced; by parliament, in the press and among societal users. In comparison to those of the SCP, this may be related to the specific PBL topics – to their technical or systemic nature. In comparison to CPB's publications, this may be related to the fact that environmental issues have a less institutionalised position in the policy-making process (see Prins, 2017). Compared to CPB, PBL has a far better track record regarding scientific output (see Section 5.5) (SCP does not produce comparable research impact analyses). A very large percentage of articles by PBL researchers (34 %) belongs to the top 10% in their field, in comparable journals, in terms of citation impact (for CPB, this is 7% of publications (CPB, 2015)). Also, more in general, PBL scores high on the subject of citations compared to similar institutions.

Internationally, PBL is acknowledged for its expertise in the field of quantitative, global assessments and studies. Expertise and experience with integrated assessment models and scenario methodologies allow PBL to play a prominent role for organisations such as UNEP, IPCC, IPBES, UNCCD, UN-CBD, UN-CSD, Integrated Assessment Modelling Consortium (IAMC) and the Energy Modelling Forum (EMF) (see IMAGE <http://www.pbl.nl/en/publications/integrated-assessment-of-global-environmental-change-with-IMAGE-3.0> and http://themasites.pbl.nl/models/image/index.php/Main_Page).

PBL is highly regarded by both the European Network of the Heads of Environment Protection Agencies (EPA Network) and the European Environment Agency (EEA) for its systemic and forward-looking approach to environmental issues, and its proactive communicative strategies. PBL is visited regularly by other national and international assessment or advisory organisations working on the knowledge-policy interface, with an interest in its model and experiences, ranging from Flanders to China.

7 Strategy and targets

7.1 Strategy and targets of the past period

PBL's Provisional Strategic Plan (*Houtskoolschets 2015, 2011*) covers the 2012–2015 period. The goal of the Provisional Strategic Plan was to reinforce the unique added value of PBL as an independent producer of quantitative and qualitative analyses based on reliable data, emphasising integrated assessments, evaluations and outlooks. In certain areas, activities were ceased, such as in physical monitoring, sectoral policy evaluations and a number of sectoral models and studies at a sub-regional level. The strategic choices have been reconsidered in subsequent annual work programmes. Housing, climate adaptation, and evaluation of manure policy were reintroduced on the political agenda and, thus, also in PBL's work programme.

An important change was the shift from mainly answering *what* questions to also including *how* questions, in PBL's assessments and evaluation of policy options. Elaborating on 'the energetic society', this implied paying more attention to *governance* issues, to the behaviour of citizens and companies, and to the role of other layers of government. More attention was also paid to value patterns; for example, in Nature Outlook studies (2012, 2017), where researchers tried to find a way to start their research from different perspectives. This shift called for other expertise among researchers and for more attention for the education of individual employees.

Over the past years, more active and open forms of communication were developed, using new interactive tools (see Section 2.7). PBL pays due attention to identifying its target audience and to the effective promotion of its products and how these are received, as well as to text quality and other aspects of communication quality. PBL research should be accessible, easy to understand and attractive to the eye.

7.2 Strategy and targets for the coming years

The draft version of PBL's vision for 2025 contains objectives and strategies for the coming years. The overall strategy is to increase PBL's strengths, address its weaknesses and respond to opportunities and threats. In the context of a further increase in the participatory quality of policy-making, and in light of the transitional character of the challenges faced, PBL will continue to focus on integrated assessments, linking various actors and governance levels, with an eye for developments in society and based on the best available knowledge. PBL's previous Director-General directed the work towards the 'energetic society', with its current Director-General placing the emphasis on multi-level and multi-actor approaches. The basic challenge for PBL will be to broaden its knowledge network, while remaining focused on the primary task of conducting strategic policy analyses, and staying alert to societal changes and needs. These requirements should not be seen as opposites, but as complementary. In line with this perspective, five strategic lines can be identified:

1. PBL will further **expand its knowledge base to improve the interaction between knowledge, policy and society, on multiple levels and for multiple actors**. This is needed because of the increasing complexity of environmental and spatial challenges, and the move towards more participatory policies, within the context of a diversifying 'energetic society'. Embedding research in a societal context may require the use of new methods. The various actors may have a differing demand for knowledge, their preferences for specific policy options may also differ. These differences need to be known, in order to make a realistic assessment and understanding of the various policy options. Transitions call for more exploratory research and more adaptive forms of knowledge production and utilisation ('learning by doing') — a combination of content- and process-oriented knowledge. This combination will be vital for climate and energy policies over the coming years, as well as for policies on the circular economy, new combinations of mobility and

urbanisation, and a more sustainable relationship between the demand for food, agriculture and nature.

Last but not least, increased receptiveness to society also means paying attention to developments related to big data, internet platforms, social media and the Internet of Things (see Section 4.2). In its work, PBL must pay attention to interactions between international, national and local scales. This is an opportunity, but also poses a risk, as the scope of the institute could become too wide. Each of the four themes distinguished in the work programme requires a large amount of effort on a national scale, if the underlying policy goals are to be achieved. An integrated approach may enhance interdepartmental and intergovernmental collaboration. A draft version of a multi-level, multi-actor strategy has been worked out for the four integrated themes of the work programme. PBL also takes part in the so-called knowledge chamber for local authorities (*Kenniskamer Kennis voor decentrale overheden*) and has its own community of practice on this subject (*Kennis voor decentrale overheden*), to gain insight into the implications of the differentiation on the knowledge demand side.

2. **Innovation and learning will remain at the top of the agenda.** Carried along by maintaining and expanding 'soft' forms of entrepreneurship, as part of strengthening PBL as a learning organisation, involving a maximum of up to 20% of its annual budget. In addition, PBL will maintain and further increase its attention for continually renewing its research methods, by participating in academic networks. On an internal level, PBL will devote ample attention to sharing and securing knowledge. Collaboration and the exchange of expertise between departments is also key. The PBL Academy can also play an active role, in this respect.
3. This will be combined with **ongoing attention for prioritisation**, with a strong focus on PBL's mission and the related basic values on the one hand, and a sharp outlook on societal and environmental challenges, on the other. This calls for a regular evaluation of PBL's project portfolio. In line with the *Assessment of the Human Environment 2016*, PBL selected four themes for its work programme for 2017 (*PBL Werkprogramma 2017*)¹⁴ and 2018. These four themes are: (1) Climate change and energy transition; (2) Food, agriculture and nature in transformation; (3) Greening the economy and making a circular economy; and (4) Strong regions and policies for the human environment. These themes have been selected because of their strategic importance for national government and because of their societal and environmental urgency.
4. In order for PBL to stay in its authoritative and trustworthy position, this will be accompanied by **ongoing and increased attention for quality maintenance schedules, explicit and implicit forms of normativity, disputed knowledge, and maintaining the quality of integrated models**, both internally with regard to PBL work, and externally, along the relevant knowledge and data chains. The quality of research and the robustness of the formulated policy options will be awarded ongoing attention, within a societal context in which the authority of vested knowledge is increasingly under public scrutiny. As such, being more receptive to society and advocating an integrated approach to problems and policy options, calls for specific sensibility of researchers for an increase in normative and positional diversity. Disputed knowledge needs to be addressed (see Section 8.4), through a consistent policy of transparency, validation and reflexivity.
5. Furthermore, in line with its core mission, PBL should continue efforts to ensure that its message is being heard and gets across within its administrative, departmental environment, which is based on its authoritative expertise, the integrality and urgency of the environmental and spatial challenges identified, and the inspirational strength of policy options suggested. PBL should achieve this through research and along other avenues, such as 'knowledge at the table', without losing its independence.

¹⁴ http://www.pbl.nl/sites/default/files/cms/publicaties/PBL%20WP2017_definitief.pdf

The HRM strategy, for the coming years, will be based on the idea that a system-wide and exploratory involvement of PBL, in combination with its position as a robust, trustworthy knowledge authority, is only possible with a large enough base of temporary employees, organised around a stable core group. A group of temporary workers will be assembled to enhance the flexibility of the institute. An annual review of work, personnel and bottlenecks within the PBL departments will be linked to an overall view on the status and future of the organisation. HRM will also focus attention on the health and vitality of PBL staff, and on training opportunities and job rotation ('durable employability'). Because of upcoming retirements and the temporary character of certain work relationships, due attention must be paid to securing the expertise that will be needed, over the coming years.

8 Research integrity

8.1 Integrity, ethics and self-reflection

In the light of the institute's positioning towards political and societal trends (see Chapters 4 and 6), PBL recognises the need for a more proactive strategy with respect to quality assurance. Self-reflection is an important element in such a strategy. This can be stimulated not only by peer review, but also by training courses organised by the PBL Academy. Moreover, criticism from outside can stimulate self-reflection. External review committees concluded that, in general, PBL studies are scientifically sound. In a limited number of cases, PBL's research has been disputed. Some of those cases have stimulated greater transparency and more explicit external review^{15,16}.

8.2 Research culture and manner of interaction

PBL promotes an integrated approach, which requires multidisciplinary or transdisciplinary research. In practice, this is not without its difficulties. Different perspectives come with their own jargon. Research culture varies between and within departments (see Chapter 3). Researchers tend to devote themselves to a specific field of expertise for long periods of time. Internal mobility is low. For high-profile products, such as the Assessment of the Human Environment, PBL strives for a wider internal involvement through broad discussion within PBL, along the entire production process.

8.3 Data storage, models and processing

PBL relies heavily on data provided by public institutions, such as CBS. Data from private organisations are also used, on an incidental basis. Collaborating parties, such as ECN and WUR, are also important in supplying data. PBL has a data committee, in which all departments are represented, which is involved in data procurement. Data are centrally managed, except for those that are project-specific, and made available through an internal data portal. Project-specific data on sources and models as well as the data they generate, are managed and stored by the researchers. On its website or via the national open-data portal (<https://data.overheid.nl>) PBL increasingly publishes results in the form of data that can be reused.

Modelling is and will be at the core of PBL's work. This calls for transparency and validation. As mentioned earlier, in Section 2.10 and Chapter 3, some larger models have been subject to external review by an international committee of scholars, while others have been revised or improved. For models developed jointly with WUR, a system of quality management and review is in place. An explicitly designed and generally applied system of quality management of models is under construction. Model development remains the responsibility of the particular departments, and an overarching PBL model strategy is currently being considered.

¹⁵ See <http://www.pbl.nl/nieuws/nieuwsberichten/2013/meer-transparantie-gewenst-bij-discussie-over-kwaliteit-wetenschappelijke-rapporten>).

¹⁶ See <https://www.nationaleombudsman.nl/rapporten/2016052>

8.4 Policy on research results that deviate from the prevailing scientific context

In the first instance, the mechanisms that are in place for quality control and peer review should be sufficient to deal with research results that deviate from the prevailing scientific context. Sometimes, additional review procedures and focus groups of external peers are set up when normative issues are involved. If measurements deviate from projections, this may prompt new research and modelling.

8.5 Normativity

Normativity is an important issue for research integrity, and a central theme for internal reflection. Under an 'Open Assessment Programme', PBL developed the Guidance for Uncertainty Assessment and Communication and the Guidance for Stakeholder Participation. The latter offers help for mapping the related issues and values among stakeholders outside PBL. More recently, the topic of frame reflection has been receiving increasing attention, as part of this programme.

Normative plurality in society has been the starting point for various outlook studies, such as the most recent Nature Outlook study, European nature in the plural - Finding common ground for a next policy agenda (*Europese Natuurverkenning, 2017*), Spatial outlook about urban-economic disparities and policy options, 2016 (*De verdeelde triomf - Verkenning van stedelijk-economische ongelijkheid en opties voor beleid - Ruimtelijke verkenningen 2016*), and a value chart on mobility in 2016 (*Waardenkaart mobiliteit, 2016*).

In addition to training and knowledge exchange activities (also as part of the PBL Academy programme), these examples indicate that normativity is becoming a common topic of reflection among PBL staff. The focus should not be on reducing normativity as such, but on acknowledging normativity and the plurality of frames and perspectives, and on increasing the transparency about how researchers intend to address those in their research process.

9 Conclusion: relevance to policy and society, research quality and viability

To conclude this self-assessment, this section first relates our findings to the central criteria of the SEP, followed by a summary of the five strategic challenges resulting from the analysis of internal and external developments.

9.1 Research quality

For PBL, scientific output is not an objective in itself. Our research is always mainly in service of the national policy-making process; yet, it is a challenge to regulate work processes in such a way that all of our analyses are indeed based on the best available knowledge and research. Peer reviews secure the quality of our work. Collaborating in academic networks allows us to tap into the latest academic findings. This self-evaluation report demonstrates that PBL's research output, to a large extent, is mirrored in publications in international academic journals. The number of citations of PBL authors – some have an impressive citation index – also indicate that the scientific quality is comparatively high. In addition, many interactions and strong relationships with academic researchers and institutes (e.g. academic partners, special professors, PhDs and postdocs, both national and international) are also a sign of how academic standards are embedded in PBL's research.

9.2 Relevance to policy and society

As our self-assessment indicates, PBL's public image is strong and getting stronger. PBL is widely regarded and acknowledged as the Dutch institute for strategic policy analysis on the human environment, covering the full spectrum from nature and agriculture to energy and housing, and from environmental aspects to urbanisation processes and spatial planning. It provides independent scientific assessments that can be used by policymakers, parliament and societal stakeholders to enhance the policy process. PBL is in the unique, central position to link knowledge and policy demand, also between various governmental and societal levels.

PBL operates at the interface between policy and science. It is in close contact with academia, policymakers and society. The environment of PBL is shifting, and its traditional role of providing national policymakers with the necessary input, is no longer sufficient. PBL is increasingly aware of the different roles knowledge plays in the political arena. Environmental issues are becoming more complex and knowledge is no longer unambiguous or neutral. This underlines the need to interact with a broader range of stakeholders.

9.3 Viability

Over the past couple of years, government-imposed budget cuts have forced PBL to make important choices. But this did not fundamentally alter its viability. PBL has been successful in increasing its budget, through work done for national and international public parties. This has allowed us to attract a significant number of young, new employees, thus ensuring and safeguarding the exploration of innovative, new methods and topics. PBL still has a good mix of expertise and a balanced temporary–permanent staff ratio. However, the ageing staff, in combination with the current relative lack of perspective for hiring temporary employees (due to existing government regulation on budget and formation), poses a challenge, in terms of managing knowledge and preserving expertise. This will become more pressing, the more PBL needs to hold on to its present expertise, while also working on its new ambitions along the nexus between knowledge, policy and society.

9.4 Strategic priorities

In line with this, the self-evaluation has highlighted five strategic priorities, which are also at the heart of PBL's strategy report *Visie2025*. As discussed in the above chapters in the years to come:

1. PBL will **further expand its knowledge base to improve the interaction between knowledge, policy and society, on multiple levels and for multiple actors**, due to the increasing complexity of environmental and spatial challenges, and in the context of a diversifying energetic society;
2. **Innovation and learning within PBL will remain a high priority**, through active sharing and securing of knowledge and experience;
3. This will be accompanied with **ongoing attention for prioritisation**, with a strong focus on PBL's mission and the related basic values on the one hand, and a sharp eye for societal and environmental challenges, on the other;
4. In addition, in order for PBL to retain its authoritative and trustworthy position, this will be combined with **ongoing and increased attention for quality maintenance, explicit and implicit normativity, disputed knowledge, and to maintaining the quality of integrated models**;
5. In line with its core mission, PBL will continue efforts to ensure that its message is being heard and gets across within its administrative, departmental environment, on the basis of its authoritative expertise, the inspirational strength of policy options suggested, both through its research and forms of 'knowledge at the table', and without losing its independence.

Appendix A PBL Advisory Board

Members of the PBL Advisory Board (January 2017):

- Wim van de Donk, King's Commissioner for the Province of North Brabant (Chair)
- Ina Adema, Mayor of the municipality of Lelystad
- Colette Alma-Zeestraten, General-Director of the Association for the Chemical Industry
- Luca Bertolini, Professor of Urban and Regional Planning, University of Amsterdam
- Marko Hekkert, Professor of Dynamics of Innovations Systems and Head of the Department of Innovation Studies at the Copernicus Institute of Sustainable Development, Utrecht University
- Hilde Blank, Director of BVR Consultants on Spatial Development and Director AM Concept
- Arthur Mol, Rector of Wageningen University & Research
- Mark van Twist, Dean of the Dutch School of Public Administration and Professor of Public Administration at the Erasmus University of Rotterdam
- Kees Vendrik, Member of the Board of the Netherlands Court of Audit, up to January 2017, now chief economist at Triodos Bank
- Hans van der Vlist, various administrative functions, recently including Secretary-General at the former Dutch Ministry of Housing, Spatial Planning and the Environment, and TMG Top Consultant (Senior Civil Service (ABD))

During the 2013–2017 period, the following members retired from the PBL Advisory Board:

Professor Rudy Rabbinge from Wageningen University & Research
Professor Piet Rietveld from the VU University Amsterdam
Mrs. Tanja Klip-Martin, Chair of the Waterschap Vallei and Veluwe Water Authority
Mrs. Annemarie van der Rest, manager Health, Safety and Environmental Affairs, Shell Nederland
Dirk Sijmons, Professor of Landscape Architecture at TU Delft, partner at H+N+S Landscape Architects in Amersfoort
Geert Teisman, Professor of Public Administration at the Erasmus University Rotterdam

Newly appointed members in this period are Luca Bertolini, Marko Hekkert, Ina Adema, Colette Alma-Zeestraten, Hilde Blank, Arthur Mol and Mark van Twist.

Appendix B FTEs and finances (2013–2016)

Number of **permanent** FTEs, per year, per department

	2011	2012	2013	2014	2015	2016
DIR	3.1	3.1	4	5	4	3.1
DO	20.7	20.5	19.4	18.2	18.2	17.2
IDM	22.5	19.7	17.8	17.8	19.8	20.9
KLE	30.1	27	24.2	20.4	20	19.9
NLG	22	22.9	22.5	22.5	21.9	22.6
ROL	26.4	26.6	25.6	24.4	22.3	21.1
BPO	14.1	15	12.9	12.4	14.4	13.8
CBO	13.2	13.2	13.3	13.5	13.5	14.2
VenM	23.5	23.7	23.7	21.9	22	22
WLV	25.2	25.3	24.4	22.6	21.9	20.9
Total	200.6	196.8	187.7	178.6	178	175.7

Number of **temporary** FTEs, per year, per department

	2011	2012	2013	2014	2015	2016
DO			0.8	4.6	6.5	4.7
IDM			1		0.8	
KLE			6	12.7	14.5	13.8
NLG			2.9	9.5	13.8	10.3
ROL		1	1	2	1	1
BPO		1	1	1		
CBO						1
VenM	2.8	1	3	4.9	4.9	3.7
WLV	2			4.8	4.8	6.6
Total	4.8	3	15.7	39.5	46.2	40.9

Total number of FTEs, per year

year	2011	2012	2013	2014	2015	2016
number	205.4	199.8	203.4	218.1	224.1	216.7

Finances

Budget in k€	2013	2014	2015	2016
Regular funding by IenM	23,41	23,092	24,679	24,742
Funding by other ministries	448	2,988	2,786	3,141
International funding	3,489	3,549	3,056	3,807
Total	27,278	29,629	30,521	31,690

Appendix C National and international partners

National partners

PBL has ongoing collaborations with national institutes such as universities, and with national institutes that do comparable work. A number of PBL employees also have part-time positions and academic fellowships, at various universities. Academic positions (as of 1 January 2017) include those of Hans Mommaas (Tilburg University), Dorien Manting (PBL Chair at the University of Amsterdam), Detlef van Vuuren (PBL Chair at Utrecht University), Lex Bouwman (Utrecht University) and Herman Vollebergh (Tilburg University).

National partners of PBL include colleges of further education, such as the Design Academy in Eindhoven, and universities, such as Utrecht University, VU University Amsterdam, the University of Amsterdam, the Erasmus University Rotterdam, Delft University of Technology, Tilburg University, the University of Groningen, the Radboud University Nijmegen, the University of Twente and Wageningen University & Research (including Wageningen Environmental Research and Wageningen Economic Research).

Structural collaboration

The collaboration with Wageningen University & Research (WUR) is a structural one. Every year, a joint research programme is drawn up, for the WUR's contribution to PBL's Assessment of the Human Environment and the Nature Outlook. This includes concrete contributions to these regular products as well as strategic knowledge development for future products. Important themes in this programme are nature policy evaluations, governance research, economic value of nature, and guaranteeing the quality of models and data.

There is also structural collaboration between Statistics Netherlands (CBS) and PBL on the Environmental Data Compendium and the Regional Population Prognosis, and between PBL and the Energy research Centre of the Netherlands (ECN) and CBS on the Energy Outlook. Another recurring product for which PBL collaborates with other research institutes is the monitoring report on infrastructure and space (*Monitor Infrastructuur en Ruimte* (MIR)). For this product, PBL collaborates with KiM (Netherlands Institute for Transport Policy Analysis), CBS and the Cultural Heritage Agency (RCE). CPB and PBL produce outlook studies on promising policy options in connection with the election manifestoes of political parties. The scenario study Welfare and the Human Environment (2015) is produced by CPB Netherlands Bureau for Economic Policy Analysis and PBL Netherlands Environmental Assessment Agency. It provides two scenarios that policymakers can use as a reference for future policy decisions.

For the MIR, PBL on occasion also collaborates with CPB Netherlands Bureau for Economic Policy Analysis and the Netherlands Institute for Social Research (SCP). In addition, PBL coordinates the contributions by all Dutch scientists involved in IPBES assessments. For climate projections, PBL collaborates with Utrecht University and the Royal Netherlands Meteorological Institute (KNMI), the Netherlands Organisation for Applied Scientific Research (TNO); the National Institute for Public Health and the Environment (RIVM), Deltares, RVO, MVO-Nederland, CML, SWOV and Platform 31.

Relationships with other Dutch organisations include the Delta Programme Commissioner, Informatiehuis Water, Rijkswaterstaat, the Council for the Environment and Infrastructure (Rli), the Board of Government Advisors (CRA), and the Netherlands School of Public Administration (NSOB).

International partners

PBL has been leading a consortium of European research institutes for DG Climate Action, to address knowledge questions and support the EU in international climate negotiations. In

addition, PBL is involved in the exploration of financial instruments for implementing climate policy and investigating land-use changes caused by climate change (LUC4C) Within the EU's Seventh Framework Programme (FP7) and the Horizon 2020 programme, PBL collaborates with several European research institutes (FEEM, PIK, IIASA, SYKE, SRC/SEI, ETH, JRC, UCL).

PBL is involved in various research projects, such as ADVANCE (energy and climate modelling), COMBINE (climate scenarios), PATHWAYS (sustainability transitions), OpenNESS (Operationalisation of Natural Capital and Ecosystem Services), SIM4NEXUS, CRESCENDO, REINVENT and NATURVATION (nature-based solutions in cities).

A number of researchers involved in international projects meet on a regular basis to exchange experiences and ideas.

1. Collaborations with European research institutes

PBL collaborates with the Joint Research Centre of the European Commission in the fields of smart specialisation and regional competitiveness, and on the EDGAR database and the annual publication on greenhouse gas emissions. Furthermore, PBL coordinates the Dutch network that is linked to the European Environment Information and Observation Network (EIONET) and is the National Focal Point coordinating the Dutch network of experts and data suppliers to the European Environment Agency (EEA).

PBL is also the contact for the Netherlands for the European Observation Network for Territorial Development and Cohesion (ESPON). PBL is a partner in the European ALTER-net, the Long-Term Biodiversity, Ecosystem and Awareness Research Network.

For projects for the EU Framework Programme and Horizon 2020, PBL collaborates with various European research institutes, such as Fondazione Eni Enrico Mattei (FEEM), Potsdam Institute for Climate Impact Research (PIK), International Institute for Applied Systems Analysis (IIASA) and the Finnish Environment Institute (SYKE). Other collaborating European institutes and universities are mentioned in the overview in Appendix C2.

2. Collaborations with other international organisations and institutions

PBL contributes to the development of scenarios used by the IPCC. PBL plays an important role in the global IAM community, and is one of the founding members of the Integrated Assessment Modelling Consortium (IAMC). PBL has been involved in the production of a number of international publications on biodiversity, such as the Convention on Biological Diversity's Technical Series No. 78 and 79 and the Methodological Assessment on Scenarios and Models of Biodiversity and Ecosystem Services of IPBES (Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services).

PBL hosts a Technical Support Unit (TSU) for IPBES, providing policy support tools, scenarios and modelling. Several staff members are involved in the IPBES Global Assessment, European and Central Asia Regional Assessment and the Land Degradation and Restoration Assessment, as coordinating lead authors or lead authors.

Recently, the secretariat of the UN Convention to Combat Desertification (UNCCD) requested PBL to contribute to the Global Land Outlook (GLO), a flagship publication by the UNCCD. Sustainable land use is the central theme of the three Rio Conventions (UNFCCC, CBD and UNCCD). PBL is contributing to the development of scenario analyses on land use and land-use change. These analyses provide the central underpinning of the GLO. The request from UNCCD can be seen as a recognition of PBL's leading role in global assessments. For the Organisation for Economic Cooperation and Development (OECD), PBL works on the CIRCLE Project, together with OECD's Environment Directorate. On occasion, PBL collaborates with the OECD in fields, such as biodiversity, air quality, and the greening of taxation. For UNEP's most recent outlook (GEO-5), several PBL staff members were involved in scenarios as well as in a coordinating role. Michel den Elzen was lead author of UNEP's Emissions Gap Report 2013.

Furthermore, PBL is involved in the UNEP Resource Panel (by participating in the panel and providing support in the form of advice and research results). PBL is also involved in the Global Centre of Excellence on Climate Adaptation, founded by UN Environment, Japan and the Netherlands (February 2017). PBL further collaborates with UNESCO-IHE (on water issues) and UN Habitat. PBL has also offered advice to the China Council for International Cooperation on Environment and Development (CCICED), which produced a framework for

environmental management and social development. A postdoc researcher at the Stockholm Resilience Centre (SRC) and Stockholm Environment Institute (SEI) is also working for PBL on governance, policy and institutions, with respect to planetary boundaries.

PBL is a member of the European Network of the Heads of Environment Protection Agencies (EPA). This is an informal grouping of directors and heads of European environment protection institutes and similar bodies. PBL is also a member of ENCA, a similar network of the Heads of European Nature Conservation Agencies.

Appendix D PBL's responses to previous audit recommendations

This appendix represents the text of the original document 'Response of PBL to audit report' (2013).

An international audit committee chaired by Professor Lea Kauppi (Finnish Environment Institute & University of Helsinki) has made a thorough evaluation of the quality of PBL's work over the past few years. PBL's core business is not science per se, but rather presenting scientific assessments for public policy.

Therefore, the Audit Committee was asked to concentrate its evaluation on the quality of analyses and the underpinning of policy recommendations that PBL gives to government and the way PBL organises the quality control for its products. Next to these central questions the committee was also invited to give its views on a broader range of themes which are important for PBL's strategic choices for the future with regard to its interface function. These topics cover questions concerning the role of PBL as an independent advisor to the government in view of subsequent budget cuts. The Audit Committee was asked what it thought of the choices PBL has made with regard to the kinds of products it wants to concentrate on, its national and international embedding and its ambitions.

On 14 February 2013, the Audit Committee published its report with overall a rather positive assessment outcome. This positive judgment relates to the quality of the research published, as well as to the way in which PBL connects science and policy. The Committee was pleased to see that PBL is committed to its independence: PBL plays a proactive role in the agenda setting discussions with the Ministries. At the same time, the Committee was of the opinion that PBL should improve its process of quality assurance. The Committee's recommendations can be found below.

We are strongly committed to implementing our intended actions in response to the Committee's recommendations, taking into account resource constraints within which PBL has to operate. Our response (following hereafter) concludes with a list of 26 action items, which are referred to in the individual responses.

1. Science-policy-society interactions

I. The understanding of PBL's role in interactions with policy and society shows varying degrees of sophistication across PBL. 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.

Response: PBL management will organise agency-wide debates, led by PBL's external counsellor for scientific integrity, on interconnected issues of scientific integrity, normativity and communication with society, in particular through the press (1). Project plans should explicitly reflect on the approach taken towards science-society-policy relations and will be screened for this (2, 3). Furthermore, PBL will initiate a sustained programme of lectures and a course (involving external speakers) about the state-of-the-art in scholarship on science-policy-society interactions (4). Participation in the PBL Academy course (which will be repeated over a number of years) will be obligatory for all researchers.

II. PBL studies issues that transcend different geographical scales and multiple policy levels. It needs to address these issues as multi-scale problems to make sure that comprehensive analyses result and effective solutions, strategies or policies are proposed. It is not so clear if and how PBL is doing this. The Committee recommends that PBL should provide more clarity about how it intends to work across scales, especially given the counteracting forces of policy decentralisation and budgetary constraints that limit the level of PBL's activities at regional and local levels.

Response: *In 2013, PBL's pilot programme for regional governments will be concluded and evaluated (5). In 2014, PBL will develop a strategy for dealing with multi-scale problems and for handling inevitable risks faced when it chooses to 'serve two masters' (national government vs.*

European or regional governments), taking into account that the national government will remain PBL's primary client (6). Furthermore, project plans will have to contain an explanation of the choice of focal scale(s) (2, 3).

III. PBL has adopted a leadership role in conceptualising science–policy–society interactions, but does not necessarily have the means and resources to bring its vision into full-scale practice. The Committee strongly endorses PBL's intention as stated in the Communication Strategy 2012–2015 to increase the use of (new) communicative techniques. Furthermore, PBL is recommended to continue to improve its two-way communication with all parts of society, including more engagement with the private sector.

Response: *The guidances that have been developed for science–policy–society interactions (on uncertainty assessment and communication; on stakeholder participation, including participation of the private sector; on review and seminars; and on scenario building) will be brought more systematically to the attention of project managers: it will become obligatory to specify their use in project plans (2, 3). Furthermore, in support of its Communication Strategy, PBL will continue research and development on infographics and on techniques for interactive communication with society (7) and a strategy will be developed in 2013 for increasing transparency and opening up of models and data (8).*

2. Scientific quality control

IV. Procedures for scientific quality control vary among PBL departments and there is no uniform policy on external reviews. In addition, internal review procedures (e.g., seminars) do not always meet the expectations of a critical review. The Committee recommends considering a more rigorous, standardised review procedure and that the procedures used and the content of the review be carefully documented in the projects.

Response: *A revised guidance on review and seminars that assists in identifying suitable internal and external review techniques will be developed and made available (9). Conscious choices for the review procedure should be made in developing project plans and reported in the section on quality control (2, 3). Where necessary, budget will be allocated for paying external reviewers. Department Heads will see to it that, following to the guidance on review and seminars, the aim of inviting constructively critical review in external reviews and project seminars is reached; the Chief Scientist has a monitoring and signalling role (10). For the category of high-profile publications (less than 20 per year) it will become obligatory to ask the Chief Scientist's approval on scientific quality assurance, while for other projects the Chief Scientist will be authorised to request amendments to the scientific quality assurance (11). In case of disagreement, the Directors will decide.*

V. The number of peer-reviewed journal publications varies widely among departments, researchers and projects. The Committee recommends that significant results and methodological advances be disseminated in peer-reviewed journals. Adequate time and incentives should be offered for such work.

Response: *For each project, the way it is ensured that the results are scientifically well-underpinned and – where relevant – spread in the wider academic community will be specified in the project plan (2, 3). For some policy-analysis projects this may not necessarily lead to academic publications, but for other policy-analysis projects the results may be very significant, or the methods new, so that an effort to produce peer-reviewed publications as integral part of a project is warranted. For strategic research projects, a PBL-wide goal will be set that aims for one peer-reviewed journal or book publication per FTE per year committed to a project (2, 3). This will be monitored by the Chief Scientist (see VII). Of course, peer-reviewed publications that underpin PBL reports can in some cases also be produced through universities and research organisations in PBL's network, who will be recognised in the PBL reports they contributed to.*

Aside from working on academic publications there are also other routes to expose PBL staff to the latest academic thinking, such as scanning the peer-reviewed literature, participating

in external seminars, presenting at conferences and participating in (inter)national scientific networks (which should be sufficiently diverse).

Furthermore, also related to ensuring the scientific underpinning of PBL results, a strategy will be made in 2013 on PBL's networking with Dutch universities and research institutes, and with research organisations abroad – this strategy will also address the mechanism of secondments (in both directions, including external researchers and professors at PBL and PBL researchers and professors at universities) (12).

VI. The role of the Chief Scientist is still unclear to many staff members. The Committee recommends that PBL management explains better to researchers the role of the Chief Scientist and how to interact with him/her.

Response: PBL management will clarify the role of the Chief Scientist to PBL's staff members, by organising presentations by the Chief Scientist of PBL's updated scientific quality control policy (based on the present response) in plenary meetings of all departments and offices (13). The Chief Scientist acts as an advisor to Project Managers, Department Heads and the Directors on issues of scientific quality assurance, in all stages of projects. Furthermore, the Chief Scientist has the authority to request amendments (see IV and VII).

VII. The allocation of responsibilities for scientific quality control may not be optimally effective. The Committee recommends reconsidering the responsibilities and tasks of the Chief Scientist as well as the possible need for a Scientific Director.

Response: The role of Chief Scientist will be strengthened, but not in the form of a Scientific Director, since the two Directors together can adequately fulfil their role of holding ultimate responsibility, provided that effective communication between Chief Scientist and Directors is maintained within the Directors Team. First, the Chief Scientist will become a full member of the Directors Team and the Management Team (14). Second, the Chief Scientist will have to formally approve all high-profile publications (11), as discussed before under IV. Third, all Department Heads will be required to discuss any outstanding scientific quality issues with the Chief Scientist in preparation for their regular progress meetings with the Directors (15). Unresolved issues will be brought to the Directors' attention by the Chief Scientist. Finally, in order to be able to realise all tasks and responsibilities of the Chief Scientist role, the time allocated to this role will be increased from 0.4 FTEs to 0.6 FTEs and an assistant to the Chief Scientist will be appointed for 0.4 FTEs (16). In this way, the time available for scientific-quality control will increase by 150%.

These changes will be reflected in the updated PBL policy on scientific quality assurance and quality control (17). The Chief Scientist will produce an annual report, which will include monitoring of the implementation of the PBL policy on scientific quality assurance and quality control and of all action items identified in this response (18). Based on this annual report, the effectiveness of our response will be annually evaluated by PBL's Management Team and Advisory Board (19).

VIII. In times of a shrinking budget and changing strategic priorities there is a risk that long term strategic research will be given lower priority. The Committee recommends maintaining PBL's current level of investment in strategic research.

Response: PBL will maintain strategic research (research projects that develop knowledge for use in the multiannual strategic programmes of PBL) at the level of 15– 20% of its budget (similar to the past) (20). Project plans will have to specify to what extent the project strategically develops knowledge (percentage of the project devoted to strategic research) (2, 3).

3. Organisation and human resources

IX. The Committee is concerned about the mix of expertise and skills within PBL. It does not seem to be adequate for achieving the strategic choices. Because of budget cuts there will be little opportunity to hire new people. Training and education will not be enough to solve this problem. The Committee recommends preparing a human resource strategy to support the implementation of the strategic choices. This strategy should be accompanied by a concrete plan to realise the actions needed, along with a monitoring plan.

Response: *In 2013, PBL will develop a human resource strategy to more clearly support the implementation of its strategic choices (21).*

X. PBL should consider seeking more external funding while the Ministry should abolish funding rules that form a disincentive for obtaining external funding (i.e. they should allow PBL to carry over external funds from one budget year to the next).

Response: *In 2013, PBL will evaluate its pilot programme for regional governments (5), hire a senior advisor for increasing EU funding (22), decide on rules for the internal allocation of external funds (23), seek, together with the Ministry, to realise a solution for being able to carry over external funds from one budget year to the next (24), and develop a strategy to increase skills in tendering and financial management, as part of the human resource strategy (21).*

XI. Within PBL there is no explicit attention to facilitation skills. The Committee recommends that PBL build staff capacity in such skills to support interdisciplinary collaboration and stakeholder participation.

Response: *In 2014, the PBL Academy will develop a course in facilitation skills that can support capacity building (25). This course will build on the small amount but high quality of expertise on interdisciplinary collaboration and stakeholder participation that is already available within PBL.*

4. Evaluation of scientific quality and societal and policy relevance based on the selected projects

XII. The Committee has reviewed eight PBL projects. Based on this review and the self-evaluation material provided by PBL the Committee arrives at the following recommendations:

In three of the projects assessed there was little or no reference to uncertainty. At the same time the Committee noted that PBL provides state-of-the-art guidelines for uncertainty characterisation and communication. The awareness and implementation of these guidelines within PBL needs to be improved.

Response: *It will be required that project plans indicate how use will be made of the guidance on assessing and communicating uncertainties; on stakeholder participation; on review and seminars; and on scenario building (2). The release of the second edition of PBL's Guidance on Uncertainty Assessment and Communication in 2013 will be used to raise awareness of the uncertainty guidelines (26). The Department Heads will see to it that the guidelines are actually used (3).*

XIII. The Committee concludes that while some good examples of governance expertise are available within PBL, this kind of expertise is not yet broadly applied throughout all of PBL's work.

Response: *How governance (including behavioural economics) expertise can become available in all of PBL's departments and in all projects for which this is relevant, will be decided in the human resource strategy (21). It is expected that alliances with universities and research organisations can offer help here (12).*

Appendix E The use of PBL websites

Use of website PBL.nl in 2016:

- 314,000 visits
- 893,000 page views
- 75,762 downloads

About 25% of the visits is by persons from outside the Netherlands. Most of these come from the United States, the United Kingdom, Belgium and Germany.

Thematic websites, 2016

Thematic website	Visits	Page views
CLO	284,907	599,442
Image	17,848	39,888
Globio	16,636	29,521
WLO	9,013	26,924
Natuurlijk Kapitaal Nederland [Natural Capital Netherlands]	7,471	17,324
Balans van de Leefomgeving [Assessment of the Human Environment]	7,435	14,933
Regionale bevolkingsprognose [Regional Population Prognoses]	n/a	13,312
Circulaire economie [Circular economy] (one-pager)	6,562	7,921
Global CO ₂ (one-pager)	5,761	7,276
Balans van de Leefomgeving 2014 [Assessment of the Human Environment]	4,303	9,010

The two most-visited PBL websites, 2013–2016 (CLO in cooperation with CBS and WUR)

	2013	2014	2015	2016
PBL.nl				
Visits	175,000	304,504	266,864	314,000
Page views	430,000	824,760	774,238	893,000
CLO.nl				
Visits	260,000	296,353	290,722	284,907
Page views	580,000	691,588	637,380	599,442

Appendix F Most important publications

These publications have been processed by Prins (2017) for the contextual response analysis:

Year	Title	Subtitle
2016	National Energy Outlook 2016 [English summary]	
2016	Opties voor energie- en klimaatbeleid [options for energy and climate policy]	
2016	Global and regional abatement costs of INDCs and of enhanced action to levels well below 2 °C and 1.5 °C	
2016	Kansrijk woonbeleid [promising housing policy]	
2016	Transformatiepotentie: woningbouwmogelijkheden in de bestaande stad [transformation potential: new-housing possibilities within cities]	
2016	Samenvatting voor Beleidsmakers van de IPBES assessment van scenario's en modellen voor biodiversiteit en ecosystemendiensten [summary for policymakers on the IPBES assessment of scenarios and models for biodiversity and ecosystem services];	
2016	Belastingverschuiving: meer vergroening en minder complexiteit? [shift in taxation: more greening and less complexity?]	
2016	Grondstof voor een circulaire economie [resources for a circular economy]	
2016	Het belang van een thuismarkt voor de export van eco-innovaties [the importance of a domestic market for exporting eco-innovations]	
2016	Monitor Infrastructuur en Ruimte 2016 [monitoring infrastructure and spatial development 2016]	
2016	Balans van de Leefomgeving 2016. Zie ook website www.pbl.nl/balans [2016 report (in Dutch) in the biennial series Assessment of the Human Environment]	Richting geven - Ruimte maken
2016	Natural Capital in the Netherlands: Recognising its true value: http://www.pbl.nl/sites/default/files/cms/publicaties/pbl-2016-natural-capital-in-the-netherlands-2406.pdf	
2016	De verdeelde triomf [spatial outlook about urban-economic disparities and policy options]	Verkenning van stedelijk-economische ongelijkheid en opties voor beleid. Ruimtelijke Verkenningen 2016
2016	Kansrijk Mobiliteitsbeleid [promising policy on mobility]	
2016	Betaalbaarheid van het wonen in de huursector. Verkenning van beleidsopties [affordability of rental housing; an exploration of policy options]	

Year	Title	Subtitle
2016	Keeping track of adaptation in the Dutch Delta. Design of a reflexive monitoring and evaluation framework for the Delta Programme	Design of a reflexive monitoring and evaluation framework for the Delta Programme
2016	Report by UNEP IRP: Food systems and Natural Resources	
2016	Waterkwaliteit nu en in de toekomst [Water quality now and in the future. Final report, ex-ante evaluation of Dutch implementation of the Water Framework Directive]	Eindrapportage ex ante evaluatie van de Nederlandse plannen voor de Kaderrichtlijn Water
2016	Subsiding soils, rising costs	
2016	Nitrogen on the table	The influence of food choices on nitrogen emissions and the European environment
2015	De stad: magneet, roltrap, spons [developments of people moving between cities and their surrounding municipalities]	
2015	De economie van de stad [the economy of the city]	
2015	Dutch National Energy Outlook (NEV) 2015	
2015	Implications of long-term scenarios for medium-term targets	
2015	Arbeidsmarkt zonder grenzen [labour market without borders]	
2014	Beoordeling Programmatische Aanpak Stikstof: De verwachte effecten voor natuur en vergunningverlening [assessment of the Integrated Approach to Nitrogen (PAS); the projected effects on nature and the issuing of permits]	
2015	Trends in Nederlandse voetafdrukken [trends in the Dutch footprints]	
2015	De veerkrachtige binnenstad [the resilience of inner cities]	
2015	Wetenschap en beleid verbinden [connecting science and policy]	Een terugblik op de eerste zeven jaar van het PBL [looking back on the first seven years of PBL]
2015	Klimaatverandering [climate change]	Samenvatting van het vijfde IPCC-assessment en een vertaling naar Nederland [a Dutch summary of the fifth IPCC Assessment Report]
2015	Nederland in 2030 en 2050: twee referentiescenario's [the Netherlands in 2030 and 2050; two reference scenarios]	Toekomstverkenning Welvaart en Leefomgeving (WLO) [Forecasting Welfare, Prosperity and Quality of the Living Environment (WLO)]
2015	Cahier Regionale ontwikkelingen en verstedelijking [report on regional developments and urbanisation]	WLO
2015	Cahier Mobiliteit [report on mobility]	WLO
2015	Cahier Klimaat en energie [report on climate and energy]	WLO
2015	Assessment of the Dutch Human Environment 2014	The future is now

Year	Title	Subtitle
2015	De ruimtelijke metamorfose van Nederland 1988-2015 [the spatial metamorphosis of the Netherlands, over the 1988-2015 period)]	
2015	Adaptation to climate change in the Netherlands	Studying related risks and opportunities
2014	Belastingkortingen voor zuinige auto's: afwegingen voor fiscaal beleid [tax credits for fuel-efficient motor vehicles; considerations for fiscal policy]	
2014	How Sectors can contribute to sustainable use and conservation of biodiversity	
2014	Sustainability Monitor of the Netherlands 2014	Indicator report
2014	Green Gains	In search of opportunities for the Dutch economy
2014	Kiezen en delen [strategies for better coordination between urbanisation and infrastructure]	Strategieën voor een betere afstemming tussen verstedelijking en infrastructuur
2014	IABR book: Smart about Cities - Visualising the Challenge for 21st Century Urbanism	
2014	Kleine kansen, grote gevolgen [slim chances, serious consequences]	Slachtoffers en maatschappelijke ontwrichting als focus voor het waterveiligheidsbeleid [human casualties and social disruption, as the focus for water safety policy]
2013	Doorrekeningen SER energieakkoord [assessment of the SER energy agreement]	
2013	The Netherlands in 21 infographics	
2013	General Guidance for Cost-Benefit Analysis	
2013	Evaluation of policy options to reform the EU Emissions Trading System	
2013	Plannen voor de stad [plans for the city]	Een multidisciplinaire verkenning van de effecten van verstedelijkingsprojecten op het functioneren van een stad [a multidisciplinary assessment of the impact of urbanisation projects on how the city functions]
2013	Changing track, changing tack	Dutch ideas for a robust environmental policy for the 21st century
2013	Leren van het Energieke Platteland [learning from the energetic countryside]	
2013	Sustainability of International Dutch Supply Chains	Progress, effects and perspective
2013	Gebiedsontwikkeling en commerciële vastgoedmarkten [area development and commercial real estate markets]	Een institutionele analyse van het (over)aanbod van

Year	Title	Subtitle
		winkels en kantoren [an institutional analysis of the supply of retail and office space]
2013	Vergrijzing en ruimte [population ageing and spatial development]	
2013	Samenhang in de Zuidwestelijke Delta (Hoofdrapport) [coherence within the south-western delta (main report)]	Naar een vitale, veerkrachtige en veilige Zuidwestelijke delta [towards a vital, resilient and safe delta]
2013	De macht van het menu [the power of the menu]	Opgaven en kansen voor duurzaam en gezond voedsel [policy tasks and opportunities for food that is both sustainable and healthy]
2013	Ex ante evaluatie mestbeleid [Ex-ante manure policy assessment]	Gevolgen van de invoering van verplichte mestverwerking en het afschaffen van productierechten in de veehouderij [consequences of the implementation of mandatory manure processing and the abolition of production rights in livestock farming]
2013	Our Nutrient World: challenge to produce more food and energy with less pollution	
2012	Nature Outlook 2010–2040	
2011	The Energetic Society	In search of a governance philosophy for a clean economy

Various types of websites also have been included in the analysis:

Year	Title
2016	Can the decline be stopped? [Is de achteruitgang te stoppen?]. A short, animated film (in Dutch).
2013-2016	PBL-CBS regional population and household prognoses 2016, see: http://www.pbl.nl/themasites/regionale-bevolkingsprognose
2013-2016	Theme website on nature, landscape and biodiversity, see http://www.pbl.nl/onderwerpen/natuur-landschap-en-biodiversiteit
2013-2016	Environmental data compendium http://www.clo.nl
2013-2016	PBL website, as a whole: http://www.pbl.nl
2015	CO ₂ onepager: www.pbl.nl/globalco2

Appendix G Scientific publications with the highest citation index

The list of 50 scientific publications with the highest citation index (source: CWTS). At least one of the authors is a PBL researcher. These publications are:

NCS ¹⁷	Year	Title and magazine
61.93	2011	The RCP greenhouse gas concentrations and their extensions from 1765 to 2300. <i>Climatic change</i> , 109(1-2): 213-241
51.69	2011	The representative concentration pathways: an overview. <i>Climatic change</i> , 109(1-2): 5-31
31.98	2014	A new scenario framework for climate change research: the concept of shared socioeconomic pathways. <i>Climatic change</i> , 122(3): 387-400
30.78	2014	Assessing agricultural risks of climate change in the 21st century in a global gridded crop model intercomparison. <i>Proceedings of the national academy of sciences of the United States of America</i> , 111(9): 3268-3273
24.77	2015	Global carbon budget 2014. <i>Earth system science data</i> , 7(1): 47-85
23.44	2014	Persistent growth of CO ₂ emissions and implications for reaching climate targets. <i>Nature geoscience</i> , 7(10): 709-715
19.47	2015	Beyond cockpit-ism: Four Insights to Enhance the Transformative Potential of the Sustainable Development Goals. <i>Sustainability</i> , 7(2): 1651-1660
17.14	2013	The global carbon budget 1959-2011. <i>Earth system science data</i> , 5(1): 165-185
16.91	2013	Used planet: A global history. <i>Proceedings of the national academy of sciences of the United States of America</i> , 110(20): 7978-7985
16.76	2014	Global carbon budget 2013. <i>Earth system science data</i> , 6(1): 235-263
16.12	2011	RCP2.6: exploring the possibility to keep global mean temperature increase below 2 degrees C. <i>Climatic change</i> , 109(1-2): 95-116
15.83	2011	The HYDE 3.1 spatially explicit database of human-induced global land-use change over the past 12,000 years. <i>Global ecology and biogeography</i> , 20(1): 73-86
14.64	2012	The need for and use of socio-economic scenarios for climate change analysis: A new approach based on shared socio-economic pathways. <i>Global environmental change-human and policy dimensions</i> , 22(4): 807-822
14.62	2013	Ecological traits affect the response of tropical forest bird species to land-use intensity. <i>Proceedings of the Royal Society B: biological sciences</i> , 280(1750): 2012-2131
14.36	2015	Global Carbon Budget 2015. <i>Earth system science data</i> , 7(2): 349-396
14.00	2014	A mid-term analysis of progress toward international biodiversity targets. <i>Science</i> , 346(6206): 241-244
13.93	2012	Residual soil phosphorus as the missing piece in the global phosphorus crisis puzzle. <i>Proceedings of the national academy of sciences of the United States of America</i> , 109(16): 6348-6353

¹⁷ Normalized Citation Score

NCS ¹⁷	Year	Title and magazine
13.28	2011	Evolution of anthropogenic and biomass burning emissions of air pollutants at global and regional scales during the 1980–2010 period. <i>Climatic change</i> , 109(1–2): 163–190
13.17	2011	Black Carbon as an Additional Indicator of the Adverse Health Effects of Airborne Particles Compared with PM10 and PM2.5. <i>Environmental health perspectives</i> , 119(12): 1691–1699
12.90	2013	Exploring global changes in nitrogen and phosphorus cycles in agriculture induced by livestock production over the 1900–2050 period. <i>Proceedings of the national academy of sciences of the United States of America</i> , 110(52): 20882–20887
12.29	2011	Harmonization of land-use scenarios for the period 1500–2100: 600 years of global gridded annual land-use transitions, wood harvest, and resulting secondary lands. <i>Climatic change</i> , 109(1–2): 117–161
12.01	2013	The global nitrogen cycle in the twenty-first century. <i>PHILOSOPHICAL TRANSACTIONS OF THE ROYAL SOCIETY B: BIOLOGICAL SCIENCES</i> , 368(1621)
11.44	2014	Sharing a quota on cumulative carbon emissions. <i>Nature climate change</i> , 4(10): 873–879
10.60	2014	The role of technology for achieving climate policy objectives: overview of the EMF 27 study on global technology and climate policy strategies. <i>Climatic change</i> , 123(3–4): 353–367
10.38	2013	A blueprint for mapping and modelling ecosystem services. <i>Ecosystem services</i> , 4: 4–14
10.28	2014	Food choices, health and environment: Effects of cutting Europe's meat and dairy intake. <i>Global environmental change-human and policy dimensions</i> , 26: 196–205
9.94	2015	Locked into Copenhagen pledges – Implications of short-term emission targets for the cost and feasibility of long-term climate goals. <i>Technological forecasting and social change</i> , 90: 8–23
9.89	2014	A new scenario framework for Climate Change Research: scenario matrix architecture. <i>Climatic change</i> , 122(3): 373–386
8.77	2011	Emission pathways consistent with a 2 degrees C global temperature limit. <i>Nature climate change</i> , 1(8): 413–418
8.75	2011	Land use/land cover changes and climate: modeling analysis and observational evidence. <i>Wiley interdisciplinary reviews-climate change</i> , 2(6): 828–850
7.76	2013	Land use impacts on biodiversity in LCA: a global approach. <i>International journal of life cycle assessment</i> , 18(6): 1216–1230
7,74	2011	Global and regional evolution of short-lived radiatively-active gases and aerosols in the Representative Concentration Pathways. <i>Climatic change</i> , 109(1–2): 191–212
7.49	2013	Opening up knowledge systems for better responses to global environmental change. <i>Environmental science & policy</i> , 28: 60–70
7.46	2015	Post-2020 climate agreements in the major economies assessed in the light of global models. <i>Nature climate change</i> , 5(2): 119–126

NCS ¹⁷	Year	Title and magazine
7.20	2012	Framework for systematic indicator selection to assess effects of land management on ecosystem services. <i>Ecological indicators</i> , 21: 110–122
6.59	2014	A new scenario framework for climate change research: background, process, and future directions. <i>Climatic change</i> , 122(3): 363–372
6.42	2014	Regional GHG reduction targets based on effort sharing: a comparison of studies. <i>Climate policy</i> , 14(1): 122–147
6.33	2014	Roles of scientists as policy advisers on complex issues: A literature review. <i>Environmental science & policy</i> , 40: 16–25
6.26	2011	Quo Vadis MRIO? Methodological, data and institutional requirements for multi-region input-output analysis. <i>Ecological economics</i> , 70(11): 1937–1945
6.24	2012	A synthesis of carbon dioxide emissions from fossil-fuel combustion. <i>Biogeosciences</i> , 9(5): 1845–1871
6.14	2012	Synergies and trade-offs between ecosystem service supply, biodiversity, and habitat conservation status in Europe. <i>Biological conservation</i> , 155: 1–12
6.02	2015	A review of trend models applied to sea level data with reference to the 'acceleration-deceleration debate'. <i>Journal of geophysical research-oceans</i> , 120(6): 3873–3895
5.55	2012	Determining Robust Impacts of Land-Use-Induced Land Cover Changes on Surface Climate over North America and Eurasia: Results from the First Set of LUCID Experiments. <i>Journal of climate</i> , 25(9): 3261–3281
5.51	2013	A framework for global river flood risk assessments. <i>Hydrology and earth system sciences</i> , 17(5): 1871–1892
5.47	2015	The impact of near-term climate policy choices on technology and emission transition pathways. <i>Technological forecasting and social change</i> , 90: 73–88
5.42	2011	Impact of reservoirs on river discharge and irrigation water supply during the 20th century. <i>Water resources research</i> , 47, No. 3.
5.36	2012	A model for inventory of ammonia emissions from agriculture in the Netherlands. <i>Atmospheric environment</i> , 46: 248–255
5.30	2011	Livestock and greenhouse gas emissions: The importance of getting the numbers right. <i>Animal feed science and technology</i> , 166–67: 779–782
5.23	2012	Climate-driven simulation of global crop sowing dates. <i>Global ecology and biogeography</i> , 21(2): 247–259
5.10	2015	The reflective futures practitioner: Balancing salience, credibility and legitimacy in generating foresight knowledge with stakeholders. <i>Futures</i> , 66: 1–12