



**VERTRAULICHES DOKUMENT**

**Vorschlag des SAE:**

**Stellungnahme zum  
Potsdam-Institut für Klimafolgenforschung e. V. (PIK)**

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## Vorbemerkung

Der Senat der Wissenschaftsgemeinschaft Gottfried Wilhelm Leibniz – Leibniz-Gemeinschaft – evaluiert in Abständen von höchstens sieben Jahren die Forschungseinrichtungen und Einrichtungen mit Servicefunktion für die Forschung, die auf der Grundlage der Ausführungsvereinbarung „Forschungseinrichtungen“<sup>1</sup> von Bund und Ländern gemeinsam gefördert werden. Diese Einrichtungen haben sich in der Leibniz-Gemeinschaft zusammengeschlossen. Die wissenschaftspolitischen Stellungnahmen des Senats werden vom Senatsausschuss Evaluierung vorbereitet, der für die Begutachtung der Einrichtungen Bewertungsgruppen mit unabhängigen Sachverständigen<sup>2</sup> einsetzt. Die Stellungnahme des Senats sowie eine Stellungnahme der zuständigen Fachressorts des Sitzlandes und des Bundes bilden in der Regel die Grundlage, auf der der Ausschuss Forschungsförderung der Bund-Länder-Kommission für Bildungsplanung und Forschungsförderung (BLK) überprüft, ob die Einrichtung die Fördervoraussetzungen weiterhin erfüllt.

Auf der Grundlage der vom Potsdam-Institut für Klimafolgenforschung e. V. (PIK) eingereichten Unterlagen wurde eine Darstellung der Einrichtung erstellt, die mit dem Institut sowie den zuständigen Ressorts des Sitzlandes und des Bundes abgestimmt wurde (Anlage A). Die vom Senatsausschuss Evaluierung eingesetzte Bewertungsgruppe hat das PIK am 03./04. April 2007 besucht und daraufhin einen Bewertungsbericht erstellt (Anlage B). Auf der Grundlage dieses Bewertungsberichts und der vom PIK eingereichten Stellungnahme zum Bewertungsbericht (Anlage C) erarbeitete der Senatsausschuss den Entwurf einer Senatsstellungnahme. Der Senat der Leibniz-Gemeinschaft hat die Stellungnahme am **22. November 2007** erörtert und verabschiedet. Er dankt den Mitgliedern der Bewertungsgruppe für ihre Arbeit.

## 1. Beurteilung und Empfehlungen

Der Senat schließt sich der Beurteilung und den Empfehlungen der Bewertungsgruppe an. Das PIK untersucht die akuten und potentiellen Auswirkungen des Globalen Wandels auf Umwelt und Gesellschaft und setzt dabei Systemanalysen, Modellierungen und Computersimulationen ein. Es ist eines der weltweit führenden Institute auf seinem Fachgebiet und erbringt in den meisten Fällen exzellente wissenschaftliche Leistungen. Herausragend sind die Arbeiten in den Bereichen der Klimamodellierung und der Modellierung biologischer Systeme, die durch den Klimawandel beeinflusst werden. Der stark interdisziplinäre Ansatz des Instituts bei der Bearbeitung der Themen ist vorbildlich und hat die Forschung auf dem Gebiet des Globalen Wandels stark beeinflusst. Das PIK ist in Deutschland einzigartig und auch weltweit eine der wenigen Einrichtungen, die naturwissenschaftliche mit sozialwissenschaftlichen Aspekten verknüpfen. Neben der hervorragenden Qualität der Forschungsarbeiten, die ihren Ausdruck in einer quantitativ und qualitativ beeindruckenden Publikationsleistung finden, weist das PIK zusätzlich außerordentliche Leistungen bei der wissenschaftsbasierten Politikberatung und dem Wissenstransfer in die Öffentlichkeit auf.

Die Forschungsthemen des PIK sind wissenschaftlich und gesellschaftlich von höchster Relevanz und von großem öffentlichem Interesse. Es ist allerdings eine klarere Definition der Aufga-

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<sup>1</sup> Ausführungsvereinbarung zur Rahmenvereinbarung Forschungsförderung über die gemeinsame Förderung von Einrichtungen der wissenschaftlichen Forschung (AV-FE)

<sup>2</sup> Status- und Funktionsbezeichnungen, die in diesem Dokument in der männlichen oder weiblichen Sprachform verwendet werden, schließen die jeweils andere Sprachform ein.

ben des Instituts nötig, um weiterhin mit der wachsenden Komplexität der Thematik „Globaler Wandel“ Schritt zu halten. Um seine Führungsposition auch in Zukunft beizubehalten, muss das Institut neue Ideen und Methoden entwickeln und klare Strategien verfolgen. Die geplante Fokussierung auf Anpassungsstrategien wird in diesem Zusammenhang sehr begrüßt, da das Institut über exzellente Voraussetzungen verfügt, um diese Thematik zu bearbeiten, und bisher wenige Untersuchungen auf diesem Gebiet durchgeführt wurden. Die Kernkompetenzen in der Klimafolgenforschung, in der sich das PIK in der Vergangenheit ausgezeichnet hat, sollten dabei nicht vernachlässigt werden. Des Weiteren muss das PIK eine klar definierte Modellierungsstrategie entwickeln, die sich auf Modelle mit mittlerer Komplexität konzentrieren sollte. Eine Fokussierung auf eine geringere Anzahl von Modellen wäre wünschenswert.

Zurzeit befindet sich das PIK in einer Umstrukturierungsphase, in der die bearbeiteten Themen in vier neuen interdisziplinären Forschungsfeldern organisiert und dabei die bisherigen fünf Abteilungen aufgelöst werden. Die neue Organisationsstruktur wird voraussichtlich dazu beitragen, die interne Kommunikation und Zusammenarbeit weiter zu verbessern. Das PIK muss aber in Zukunft dafür Sorge tragen, dass die Sozialwissenschaften in dieser neuen Struktur weder fragmentiert werden noch eine bloße Hilfsfunktion für das restliche Institut einnehmen.

Der Senat erwartet vom PIK aktive Maßnahmen zur Rekrutierung von Frauen in Leitungspositionen.

Die deutliche Erhöhung der institutionellen Förderung des PIK wird vom Senat begrüßt. Die erfolgte Aufstockung sollte insbesondere für folgende Maßnahmen verwendet werden: eine Aufstockung des Personals, insbesondere in den Bereichen Klimasysteme, Soziale Systeme und *Data & Computation* sowie in der Hydrologie im Bereich Natürliche Systeme, die Schaffung weiterer fester Stellen in den Bereichen Wissenstransfer und Öffentlichkeitsarbeit sowie die Erhöhung der Annexmittel auf die ursprünglich vom Wissenschaftsrat empfohlene Summe. Die eingeworbenen Drittmittel sind in den letzten Jahren deutlich gestiegen und machen einen Anteil von 30 % am Gesamtbudget aus, was als sehr gut bewertet wird. Die Höhe der von der DFG eingeworbenen Mittel sollte gesteigert werden.

Die Zahl der am Institut beschäftigten Doktoranden hat seit der letzten Evaluierung zugenommen, könnte aber noch gesteigert werden. Die Etablierung eines strukturierten Ausbildungsprogramms für Nachwuchswissenschaftler in Zusammenarbeit mit mehreren Universitäten der Region wird nachdrücklich empfohlen. Davon abgesehen, ist die Kooperation mit den Universitäten in Berlin und Brandenburg exzellent, und das Institut ist gut in nationale sowie internationale Netzwerke eingebunden. Die Zusammenarbeit mit anderen führenden Instituten, die komplementäre Forschungsgebiete bearbeiten, sollte allerdings verstärkt werden. Eine klarere Strategie, welche Aufgaben das PIK selbst übernimmt und welche es durch Kooperationen abdeckt, könnte die Effizienz der Arbeit erhöhen.

Die Empfehlungen des Wissenschaftsrates aus dem Jahr 1999 sind zum größten Teil umgesetzt worden. Insbesondere die Förderung der Sozialwissenschaften ist dem Institut in den letzten Jahren sehr gut gelungen. Das Institut war außerdem erfolgreich darin, die Publikationstätigkeiten seiner Mitarbeiter zu verbessern und die Anzahl der Veröffentlichungen insgesamt zu steigern.

Das PIK ist eine international führende Forschungseinrichtung auf dem Gebiet der Klimafolgenforschung, die durch ihren interdisziplinären Ansatz und ihr erfolgreiches Engagement in der

wissenschaftsbasierten Politikberatung eine einzigartige Stellung in Deutschland einnimmt. Das Institut erfüllt nach Auffassung des Senats ohne Einschränkung die Anforderungen, die an Einrichtungen von überregionaler Bedeutung und gesamtstaatlichem wissenschaftspolitischen Interesse zu stellen sind. Aufgrund der Interdisziplinarität und der Langfristigkeit der Projekte können die Aufgaben des PIK nicht von einer Hochschule erfüllt werden. Eine Eingliederung in eine Hochschule wird daher nicht empfohlen.

## **2. Zur Stellungnahme des PIK**

Das PIK hat zum Bewertungsbericht Stellung genommen (Anlage C). Es bedankt sich für die fairen und ausgewogenen Bewertungen und Empfehlungen, die wertvolle Hinweise für die zukünftige Entwicklung des Instituts enthalten.

Der Senat begrüßt die positive Aufnahme des Bewertungsberichts durch das PIK und den konstruktiven Umgang mit den Empfehlungen. Die in der Stellungnahme des PIK thematisierten Detailfragen zur Modellierung sollte das Institut intensiv mit dem Wissenschaftlichen Beirat diskutieren.

## **3. Förderempfehlung**

Der Senat der Leibniz-Gemeinschaft empfiehlt Bund und Ländern, das PIK als Forschungseinrichtung auf der Grundlage der Ausführungsvereinbarung „Forschungseinrichtungen“ weiter zu fördern.

## Annex A: Presentation

### Potsdam Institute for Climate Impact Research (PIK)<sup>1</sup>

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<sup>1</sup> This presentation, which was compiled by the Evaluation Office, has been approved by the Institute and the relevant Federal and State departments.

## List of Abbreviations

ADAM	Adaptation and Mitigation Strategies: Supporting European Climate Policy
BEST	Brandenburg Simulator of Environmental and Socio-economic Transformations
BLK	Bund-Länder Commission for Educational Planning and Research Promotion ( <i>Bund-Länder-Kommission für Bildungsplanung und Forschungsförderung</i> )
BMBF	Federal Ministry of Education and Research ( <i>Bundesministerium für Bildung und Forschung</i> )
BMFT	Federal Ministry of Research and Technology ( <i>Bunderministerium für Forschung und Technologie</i> )
BRAIN	Berlin Regional Area Information Network
CLIMBER	Climate and Biosphere Model
COEM	Co-evolutionary Biosphere and Geosphere Model
DEKLIM	German Climate Research Programme ( <i>Deutsches Klimaforschungsprogramm</i> )
DFG	German Research Foundation ( <i>Deutsche Forschungsgemeinschaft</i> )
DKRZ	German Climate Computing Centre, Hamburg ( <i>Deutsches Klimarechenzentrum</i> )
ECF	European Climate Forum
EGU	European Geosciences Union
ESF	European Science Foundation
EU	European Union
EUROPA	European Network Activities on Global Change (Core Project at PIK until 2005)
EUROPA	EUROPA – Modelling, Reflecting and Communicating Possible Futures in the Context of Global Change (BMBF-Project)
FU Berlin	<i>Freie Universität Berlin</i>
HBFG	Law for the Promotion of Building Universities ( <i>Hochschulbauförderungsgesetz</i> )
HU Berlin	<i>Humboldt-Universität zu Berlin</i>
IMPRS-ESM	International Max Planck Research School on Earth System Modelling
LPJmL	“Lund-Potsdam-Jena managed Land” Model
MATISSE	Methods and Tools for Integrated Sustainability Assessment
MIND	Integrated climate and economic growth model
PIK	Potsdam Institute for Climate Impact Research ( <i>Potsdam-Institut für Klimafolgenforschung e.V.</i> )
POEM	Potsdam Earth System Modelling
RAGTIME	Regional Assessment of Global Change Impacts Through Integrated Modelling in the European River Basin
REMINd	Regionalised version of MIND
ToPIK	Interdisciplinary research field at PIK
WGL	Leibniz Association ( <i>Wissenschaftsgemeinschaft Gottfried Wilhelm Leibniz</i> )

## 1. Development and Funding

The Potsdam Institute for Climate Impact Research (PIK) was founded in 1992 by what was then called the Federal Ministry of Research and Technology (BMFT, now BMBF) and the Ministry of Science, Research and Culture of the Federal State of Brandenburg as a “Blue List” institution. Unlike other Blue List facilities in eastern Germany, PIK had no predecessor. It was set up following a recommendation of the German Science Council (*Wissenschaftsrat*) which recognised a global deficit in research on the impacts of global climate change on regional levels and on living conditions for people in general.

Since 1992, PIK has been receiving institutional funding from the German Federal Government and the community of German Federal States (*Länder*) at a ratio of 50:50. Further, the Ministry of Science, Research and Culture of the State of Brandenburg (MWFK) is responsible for related matters on a state level, while the Federal Ministry of Education and Research (BMBF) is the nationwide (federal) responsible body.

The previous evaluation of PIK by the German Science Council took place in 1998. In 2000, based on the evaluation report, a statement by the German Science Council (dated November 12<sup>th</sup>, 1999) and a joint statement by both Ministries, the committee of the Bund-Länder Commission for Educational Planning and Research Promotion (BLK) subsequently decided to continue funding PIK.

## 2. Mission, Tasks, Main Work Areas and Scientific Environment

The Institute’s **mission** includes addressing scientific questions in the fields of global change, climate impacts, and sustainable development, close collaboration between researchers from the areas of natural and social sciences in order to produce interdisciplinary insights and provide society with well-founded information for decision-making purposes, and the application of methodologies such as systems and scenarios analysis, modelling, computer simulation, and data integration.

According to PIK, it has, for these purposes, successfully introduced a number of essential concepts unavailable back in 1992. Since 1999, the Institute has fostered, in particular, the Department of Global Change and Social Systems and established its research agenda at PIK as well as on national and international stages. Facing the transition from “laying the foundations” to “building on them”, PIK now aims to advance as a productive knowledge enterprise for in-depth analyses and strategic solutions in the context of climate change and its impacts.

Research and development account for most of PIK’s workload. Yet, “providing society with sound information for decision-making” implies a hierarchy of concrete subtasks:

*Transdisciplinary Networking* and *Co-Production of Knowledge* are required to identify relevant research challenges and to develop solution strategies in collaboration with stakeholders from governments, industries and non-governmental organisations. Testimony to PIK’s efforts in this context is the Director’s appointment as Chief Advisor to Chancellor Angela Merkel on Climate and Related Issues, as well as the successful establishment of the European Climate Forum (ECF), an interface organisation between climate science and climate politics in a wider sense.

*Scientific Collaboration* with external partners is needed as the range of topics involved often exceeds the Institute’s stand-alone capacities. Thus, PIK has (co-)initiated and coordinates

national and international projects and networks such as the Innovation Modelling Intercomparison Project. The key findings of the project, published in a special issue of the *Energy Journal*, are among the most cited references in the recent influential "Stern-Report".

*Interdisciplinary Research and Development* projects, often in collaboration with partner institutions, address the specific scientific questions that arise from analyses of the complex, often unspecific, cognitive demands found in stakeholder dialogues. Such projects are typically led by one specific department that gathers expertise across the Institute.

*Disciplinary Research and Development* is pursued at PIK in order to close strategic gaps in disciplinary knowledge. New developments are initiated where needed and additional momentum is provided in areas that are promising but poorly developed.

*Model Development and Operation* as well as *Data Acquisition, Analysis, and Synthesis* constitute the foundations of both disciplinary and interdisciplinary research at PIK.

### **Key (Inter-) Departmental Activities since the Last Evaluation**

The **Climate System** Department investigated the mechanisms and consequences of abrupt climate changes in the Earth's past climate and in a future greenhouse world as well as improved and extended its intermediate complexity climate model family. In addition, it established and refined its regional statistical downscaling technology, and, in collaboration with the Data and Computation Department, provided the first release of its dynamic regional climate model, which is now maintained by a Europe-wide developers' and users' group.

Extending their analyses of climate impacts on ecosystems and water bodies to areas of more direct societal relevance, the **Global Change and Natural Systems** Department incorporated human interference through global land use into their process-based analyses of land biosphere dynamics. Further, this department developed an integrative regional ecological assessment methodology for water quality and availability in river catchments, and established the quality and security of "ecosystem goods and services" as a paradigm in applied ecological research.

Since 1999 the **Global Change and Social Systems** Department has assumed a central role at PIK, and has, according to the Institute, successfully introduced its research themes into the socio-economic scientific community. The department has shown that climate protection cost estimates are far lower when endogenous technological change is accounted for. In addition, a coastal vulnerability assessment system was developed, and a mathematical formalisation of "vulnerability" proposed (in collaboration with the Data and Computation Department). Regional adaptation and global change mitigation are related through regional emissions and global agreements. The department also developed sustainable solution strategies which balance resulting global-to-regional conflicts of interest through market-economic mechanisms.

The **Integrated Systems Analysis** Department has consolidated the foundations of their earlier developments of qualitative modelling, and of the Syndromes and Tolerable Windows Approaches. The department applied these techniques to problems of regional sustainability management. In addition, it studied scientific uncertainties associated with mathematical and computational modelling practices in sustainability science and investigated the long-term evolution and habitability of Earth and other planets.

Mathematical formalisation, which is central to scientific communication, theory, and computational modelling, was supported by the **Data and Computation** Department in



several research areas. Furthermore, Data and Computation provided software to ease the workload caused by recurring, laborious tasks (e.g., an environment for parallel multi-run simulation and data analysis) and developed tools for the management, access, and visualisation of data and metadata. Moreover, the IT group handles the planning, acquisition, and maintenance of PIK's information technology.

Sustainable climate change solution policies will fail unless understood and supported by the public and by practitioners in industry, governments, and non-governmental organisations. Thus, PIK's further activities include Public Outreach, Environmental Education and Training, and two Spin-Offs, a consulting firm and an association which allocates emission allowances from EU Emission Trading Scheme.

PIK's research programme has since the Institute's foundation been framed in terms of Core Projects (1992-1999) and later in terms of ToPIKs (2000-2007). PIK was organised in a matrix-like manner. Both Core Projects and ToPIKs posed research questions and involved research tasks defined in line with PIK's mission, thereby necessitating the aggregation of expertise across the departments. Until the end of 2005, seven ToPIKs provided the guiding framework for PIK's research activities. Following a suggestion made by the Institute's Scientific Advisory Board, the ToPIK structure was streamlined in 2006 to just four. These are broadly identical in terms of title and layout to the Research Domains that PIK now is in the process of establishing: Earth System Analysis (ToPIK I), Impacts and Vulnerability (II), Sustainable Solutions (III) and Transdisciplinary Concepts and Methods (IV). Although interdisciplinary cooperation increased with the introduction of the ToPIKs, the Department-ToPIK matrix still exhibited considerable diagonal dominance, i.e., most activities within a ToPIK could still mainly be identified with a single department. Hence for the sake of simplicity in the context of the present evaluation, PIK associates the current projects with the five departments.

### **Future Perspectives**

Since the foundation of PIK in 1992, rapid developments have occurred inside and outside the Institute, leading to a re-calibration and restructuring of its research strategy. Anthropogenic climate change is now broadly acknowledged as a reality requiring wise and resolute responses by all decision makers in society. According to PIK, the crucial features of the climate change problem have been identified and call for highly focussed research on a few inherently interdisciplinary themes of overriding importance. As a consequence, PIK now intends to adopt a new structure inspired by transdisciplinary and outcome-oriented thinking. In this plan, the Institute will pursue its research in 3+1 broad *Research Domains*, three of them addressing topical challenges and one the methodological aspects of knowledge co-production.

In Research Domain I – Earth System Analysis research will aim to understand the basic physical, chemical, and biological properties of the Earth System and the causes and mechanisms of past and present natural climate changes. In addition, the global environmental effects of human activities such as agriculture, industry and social activities will be analysed and improved methods of observing, analysing and modelling the joint dynamics of climate, biosphere and human sphere will be developed.

Research Domain II – Climate Impacts and Vulnerabilities will focus on the integration of the biogeophysical aspects of climate change with other changes in society, such as demography, economy and politics. To advance the knowledge base of climate impacts and

vulnerability, this group will study a broad range of potential damage (sensitivity and exposure) as well as the capacity of society to cope with damage (adaptive capacity).

The main objective of Research Domain III – Sustainable Solutions is to derive mutually consistent mitigation and adaptation strategies for a Kyoto-Plus architecture. It will aim to design political and economic instruments that accomplish the necessary decarbonisation of the world's energy systems compatible with the expanding competing global land use for food, fibre, and energy. Adaptation strategies will successively be incorporated.

Research Domain IV – Transdisciplinary Concepts and Methods will develop climate impact research in areas where concepts and methods are found wanting. It will be guided by stakeholder dialogues and using mathematics as a tool to meet conceptual challenges.

Each Research Domain shall be co-chaired by one natural and one social scientist so as to provide top-down support for interdisciplinary research. The main managerial responsibility will rotate among the co-chairs on a yearly basis. According to PIK's vision, the Research Domains will acquire the resource and personnel responsibilities of today's departments. The latter are to be dismantled so as to avoid the conceptual and managerial complexities of organisational matrix structures. To guarantee the continued provision of in-depth disciplinary exercise after this transition, the Institute foresees intensified cooperation with national and international partner universities and research institutes.

PIK acknowledges, in its own estimate, urgent signs of dangerous human-induced climate change, and calls for a dual strategy that helps to “avoid the unmanageable” (mitigation) and to “manage the unavoidable” (adaptation). It expects scientific insights of the climate change research community to be instrumental for adequate decision making during the next three decades. Among the biggest challenges for institutions like PIK is, in the opinion of the Institute, the scarcity of appropriate human resources in the face of fierce international competition for talented young researchers. PIK demonstrates its determination to stay on top of these developments by maintaining its commitment to innovative as well as problem-oriented research. To be able to sustain the pace, the Institute plans to initiate, participate in, and support medium-term networks of excellence at national and international scales.

### **Importance of the Work carried out in the Institute**

According to scientists at PIK, regional climatic change is inextricably linked with global climate change. Accelerating processes associated with “globalisation” induce analogous linkages of regional and global economic developments. As a consequence, most of PIK's research projects have, in the opinion of the Institute, elements of national, continental, or even global importance. PIK is – in its own estimate – very much in demand in **international and national** research partnerships. The Institute sees a strong **national science policy** interest in its research that is connected to global climate developments on the one hand and Germany's global economic position on the other. PIK's work programme includes studies on climate, economic, and employment politics, and its scientists are regular members of various national and international advisory boards.

The reasons for establishing PIK's tasks in a **non-university institute** include – according to the Institute – the necessity to react flexibly to the needs and questions of economic and political decision makers and to pursue long-term, continuous, and interdisciplinary research to achieve a holistic treatment of the highly complex and long-term problems connected with PIK's mission.

PIK is – in its own estimate – unique as a research centre for interdisciplinary climate impact research in Germany, and even worldwide there are very few **comparable institutions**. The institution closest to PIK in terms of its tasks, concept, and research direction is the Tyndall Centre for Climate Change Research in the United Kingdom, which was patterned after PIK when it was founded in 2000. The majority of institutions working on climate change focus on specific sub-aspects of climate, ocean and atmosphere dynamics. They generally emphasise natural science-oriented links between the climate system and material cycles, such as the water or carbon cycle, atmospheric chemistry, or vegetation (e.g., MIT Center for Global Change Science, CGCS). In addition, there are institutions specialising in political or social science aspects, such as the Institute for Global Environmental Strategies (IGES) in Japan, the International Institute for Applied Systems Analysis (IIASA) in Laxenburg near Vienna, or the Wuppertal Institute for Climate, Environment and Energy in Germany. The national and international importance of PIK in the science community is, in the Institute's opinion, also expressed in the way it affects international research programmes and research strategies and in the leading role it plays in the national and international science arenas by addressing a range of non-standard tasks and challenges that are based on its central tasks and mission.

Important aspects that constitute, in PIK's opinion, the **uniqueness of the Institute**, are the interlocking of the natural, economic and social sciences in joint domains of research, and the close ties it has developed between its research and the needs and interests of stakeholders from governments, industries and non-governmental organisations.

### 3. Structural Features and Organisation

PIK is a non-profit association, supervised by the Board of Directors. An overview of the organisational structure is given in App. 1. The Institute is divided into five research departments, plus one administrative one. The **General Assembly** selects a President and the members of the Board of Trustees. It decides upon changes in the statutes, accepts the annual closing of accounts and approves the activities of the Board of Directors. The **Board of Trustees** makes all fundamental decisions of the Institute, determines the guidelines for the Institute's activities and oversees the Board of Directors. It consists of representatives of State and Federal Governments, the Chair of the Scientific Advisory Board, the President of the General Assembly, representatives of the University of Potsdam and the *Freie Universität* (FU) Berlin and a scientist sent by the German Research Foundation (DFG). The **Director**, who is appointed for a period of up to five years, and his deputy, appointed for up to two years, constitute the Board of Directors. In both cases, re-appointments are possible. The **Board of Directors** represents the Institute internally and externally and is responsible for all scientific and administrative matters. The Department Heads carry responsibilities, delegated by the Director, for personnel as well as for finances and are members of the **PIK Council**. This Council also consists of the Board of Directors, the Assistant Director, the Science Coordinator, the Public Relations Officer and the ToPIK-Mentors and is responsible for management issues across the board of PIK's affairs. The **Scientific Advisory Board** consists of six to twelve internationally recognised scientists who are not employed at the Institute. They are appointed for a period of four years by the Chairperson of the Board of Trustees according to proposals by the Board of Directors. A second term is possible. The responsibilities of the Scientific Advisory Board include advising the Board of Trustees and the Board of Directors on all important scientific and organisational matters. The Board itself is completely independent.

Details about PIK's research work are included in the **research programme**. As mentioned above, it was framed in terms of Core Projects (1992-1999) and ToPIKs (2000-2007), both involving research tasks in line with PIK's mission. The matrix structure of Departments and Core Projects (disciplinary skills vs. interdisciplinary research projects), which provided an appropriate framework for the initial phase of the Institute, was replaced by the ToPIK structure after the Science Advisory Board and the German Science Council made suggestions accordingly. The ToPIKs hosted the long-term research themes within which short-term (three years) projects would flexibly focus on specific questions. Until the end of 2005, seven ToPIKs provided the guiding framework for the research activities. Again, suggestions by the Scientific Advisory Board resulted in a reduction to four ToPIKs which are broadly identical with the future Research Domains in terms of title and layout. ToPIKs form a relatively loose organisational support structure for cross-departmental research activities. The future Research Domains on the other hand will have the advantage of acquiring a role comparable to that of today's Departments as main units of governance.

Over the past few years, PIK has offered **services** on providing scientific background information, policy advice and environmental education. The external request for such services has increased continuously and has inspired PIK to establish a small policy advice and public relations team as well as to systematise its efforts in environmental education.

To assure research quality, PIK uses different instruments of **quality management**. Internal arrangements include instruction of scientists in the rules of good scientific practice, documentation of methods, data and results and project internal peer review. In addition, PIK-internal reports are written and the publication of findings is encouraged, as is further education of staff. Moreover, PIK regards scientific discussions and transfer of research results on workshops, conferences, etc. as further external audit instruments. The role that the Scientific Advisory Board has played in respect of quality management is in PIK's opinion invaluable and gratefully acknowledged.

Like all Leibniz Institutes, PIK introduced a **cost performance accounting system** in 2004 in compliance with the BLK decision. The funding agencies have, in PIK's view, not implemented the flexibilities of accounting procedures as announced and, therefore, the cost performance accounting scheme is an administrative burden for PIK. For the first time, **programme budgets** were drawn up for 2006 and 2007. They formulate PIK's tasks and programme, its goals and expected results. They are both the basis for budget negotiations with the funding agencies and an internal resource management instrument.

PIK is an **equal opportunity employer** and since April 2006 complies with the Equal Opportunity Agreement concluded with the state of Brandenburg. Applications from female scientists are given preference if the applicants have the same qualifications. Of the 127 employees working at PIK in 2005, 48 were women (37.8 %). Of these, 60.4 % had temporary contracts. Almost half of the women were academic and higher management staff and about 20 % were doctoral candidates. Women held 60 % of the part-time positions. Applications received in 2006 were mainly submitted by females. The actual number of applications by men and women varied greatly depending on the discipline, reflecting numbers of men and women studying in the various disciplines. PIK encourages young parents to combine bringing up a family with their profession, for example, by providing a nursery school facility on the Telegrafenberg campus.

#### 4. Resources and Personnel

In 2005, the Institute's **annual budget** amounted to a total of € 10.7 million (see Appendix 2). The proportion of third-party funding in relation to total financial resources reached 29.6 % in 2005. In that year, PIK received funds from different **third-party sources**: the largest share of research support came from the Federal Government (€ 986,000), followed by Foundations (€ 900,000) and the EU (€ 785,000) – all funds amounting overall to approx. € 3.1 million (see Appendix 3). Between 2003 and 2005, PIK received on average € 3.3 million in research support annually. In 2005, € 6.1 million were spent on personnel and € 1.8 million on materials, supplies and equipment. Investments, not including building investments, accounted for € 510,000.

Since the last evaluation by the German Science Council in 1998, more **office space** has become available through extensive renovation of buildings. Thus, 1,685 m<sup>2</sup> of office space for 90 employees was created and two large seminar rooms for up to 85 participants. PIK plans to renovate the two remaining buildings where the rest of the staff is currently working. One temporary building container will be dismantled in 2007.

In 2000, the Institute obtained a high-performance computer that was co-financed by the EU and can also be used by external scientists over the Internet. This computer needs to be replaced in the near future (2008-2010). Automated data backup and manual archiving is achieved through a special software system that protects the results of PIK's scientific and administrative work from both human errors and attacks. According to PIK, the IT facilities are good if not excellent. Six full-time employees in the IT group deliver a broad set of services for all of PIK's members.

On the reporting date, 31.12.2005, the Institute had 127 **employees**, which amounts to roughly 116 in full-time equivalents (see Appendices 4 to 6). Among the 127 employees were 73 positions for academic and higher management staff and 22 for doctoral candidates (22 full-time equivalents). Doctoral candidates are generally paid according to the rules prevailing in Germany's public sector (BAT IIa) and employed on a temporary basis. 77 % of the doctoral candidates were funded by third-party resources.

44 % of the academic and higher management personnel were paid by third-party funds and 48 % held temporary contracts. The share of temporary contracts among institutionally funded positions of scientific and management staff was 29 %. About 34 % of the academic staff were aged 39 or younger, 41 % were in the age group of 40-49 years and almost 25 % were 50 or older. Approximately 34 % had worked at the establishment for less than five years and 22 % for over ten years.

Vacant positions are advertised, depending on the type of position being filled, in regional, national or international newspapers, in science journals, online newsletters and on PIK's web page. In addition, the advertisements are regularly sent to cooperating partners with the request for distribution. The formal procedure for appointing management staff involves external reviewers as well as the relevant cooperating university for the position. One central criterion in the selection of the qualified scientist is his or her ability to work in an interdisciplinary group.

Since the last evaluation the total number of employees at PIK has decreased due to institutional funds remaining constant while costs of staff rising during the same period. This problem affected permanent staff positions as well as externally funded positions. The number of doctoral candidates, on the other hand, has increased since 1998.

The restructuring into Research Domains will result in an expansion of know-how in certain areas of expertise in the near future. A new joint appointment for a professorship with the *Humboldt Universität (HU)* zu Berlin is in progress as well as the expansion of staff to match the new thematic areas to be addressed in the Research Domains.

Since 2002, ten academic members of PIK's staff were offered professorships. All ten accepted the appointment, two of them after the second offer. The growing list of now well-positioned alumni documents in PIK's opinion the high scientific quality of PIK's work.

## 5. Promotion of Junior Academics and Cooperation

PIK's scientists teach mainly at the FU Berlin and the University of Potsdam. Since the winter semester of 2002/2003, on average 23 courses per semester have been taught by PIK's staff, including lectures, seminars, practices, exercises, and a field trip of 8 days. In addition, compact courses of up to 14 days were conducted, mainly through summer schools.

For PIK, the support of young scientists at the Institute is an important issue. Therefore, interns, diploma students, and doctoral candidates regularly work at PIK. They are assigned to a department and contribute to a particular project within one of the research areas. On the reporting date (31.12.2005), about 17 % of PIK's staff were doctoral candidates. Between 2003 and 2005, 31 **diploma theses**, 22 **PhD theses**, and one **Habilitation** were carried out at PIK. Guidelines have recently been formulated to regulate the rights and duties of doctoral students and supervisors. The responsibility for the doctoral students normally lies with the Head of the Department. All scientists are encouraged by PIK to attend conferences or seminars and visit other institutions. However, the severe cuts in the Institute's annex budget in 2007 will constrain these efforts.

Schools in Berlin/Brandenburg are very interested in PIK's research leading to, on average, one visit by a school class every week. In addition, PIK participates in the "JUWEL Summer University", the "Day of Science and Research of the State of Brandenburg" and "The Day of the Future in Brandenburg", to attract females in particular to study natural science subjects.

Regarding **cooperation**, the Institute has connections to universities in Berlin (FU and HU) and Brandenburg (University of Potsdam and University for Applied Sciences Eberswalde). The cooperation agreements mainly refer to joint appointments of professors and teaching activities of other scientists of PIK, which have increased from three to eleven since the last review. These include five positions on the professor level jointly appointed with the University of Potsdam (four) and FU Berlin (one). One of these positions is currently not filled. Also included are three extraordinary ("*außerplanmäßige*") professors at the HU Berlin (two) and the University of Potsdam (one), one junior professor who teaches at the University of Potsdam and two additional joint appointments also with the University of Potsdam. Active national and international cooperation with a range of universities exists through joint research projects.

PIK operated the young scientist research group **CVECA** (Climate, Vegetation and Carbon) between 2001 and 2005 which was led by Prof. Wolfgang Lucht and funded by the BMBF through the German Climate Research Programme (DEKLIM). Goals were the support of the participants' careers, including the group leader who was, as a result, appointed as professor at the University of Potsdam. In addition, numerous publications, one of them in *Science*, were generated. The DFG priority research programme "**Scale-transgressing models in Fluid Dynamics and Meteorology**" was granted in April 2006 and will be launched in April 2007.

Furthermore, PIK plays a central role in the network **VIMO** (Virtual Institute for Macroecology), funded by the Helmholtz Association and coordinated by the Helmholtz-Centre for Environmental Research Leipzig-Halle (UFZ). Among other activities, PIK organised an internationally recognised conference on “Macroecological Tools for Global Change Research” in 2006.

Cooperation within projects funded by the “**Pakt für Forschung und Innovation**” (Pact for Research and Innovation) include the German Institute for Economic Research Berlin (DIW), the Leibniz Institute of Marine Sciences at the University of Kiel (IFM-GEOMAR), the Baltic Sea Research Institute Warnemünde (IOW), the Leibniz Institute for Tropospheric Research, Leipzig (IfT), the University of Kassel and the Max Planck Institute for Meteorology in Hamburg.

Moreover, PIK cooperates within the framework of contracts with research and service organisations at the national as well as international level. Cooperation between PIK and the Tyndall Centre, UK, are of particular importance since PIK’s Director was also Research Director of the Tyndall Centre between 2001 and 2005. Currently, cooperation is through, for example, the jointly operated European Projects MATISSE and ADAM. Other international cooperating partners include eleven institutes and universities in Vienna, the USA, Poland, Israel, the Netherlands, Italy, and Russia.

PIK is part of 17 international science networks, some of them initiated by PIK, and the Institute is or was overall coordinator of eight of them. Examples are the ECF and the International Max Planck Research School on Earth System Modelling (IMPRS-ESM), which is in cooperation with the Max Planck Institute for Meteorology and the University of Hamburg.

In the period 2003-2006, PIK was in charge of, or a working member of, 24 EU-financed projects of the 5<sup>th</sup> and 6<sup>th</sup> EU Framework Programmes. The project “Urban Sprawl: European Patterns, Environmental Degradation and Sustainable Development” (URBS PANDENS) was coordinated by PIK between 2002 and 2005. PIK was or is involved in the coordination of eight more, two of them already concluded. Furthermore, PIK is a member of six science and technology societies and cooperates with ten industry and commercial societies.

Solving global problems requires, in the Institute’s opinion, global problem-solving capacities. One option in this context that is actively pursued by PIK is the formation of an international “Sustainability Alliance” (SUSA) of research institutions which includes, among others, the JFK School of Government at Harvard University, the Environmental Change Institute at Oxford University, and the Centre for Resources and Environmental Studies at the Australian National University. The main objectives of this community are (i) to recruit and train together an entire new generation of sustainability scientists, (ii) to raise and allocate significant funds for research from public and private sources, and (iii) to conduct and apply strategic research for the 21<sup>st</sup> century and beyond.

Between 2003 and 2005, 46 guest scientists spent time at PIK. 30 came from German research institutions and 16 from abroad. Of the latter 16, eight came from the EU and other western European countries, four from Asia and four from North America. The guests were supported by German Academic Exchange Service (DAAD), the EU Marie Curie Actions and ERASMUS funds, the IMPRS-ESM (one), the Alexander von Humboldt foundation (one), PIK (six) or their own university (21). 33 guest scientists stayed longer than three months, nine visited PIK for one to three months and four for less than one month. In the same period, twelve scientists from PIK visited other institutes (Central and North America, Western Europe, Middle East and Asia), some of them more than once. Three of them stayed for more than two years, nine for less than

one month. They were mainly funded by PIK, in some cases in combination with EU Marie Curie Actions, the European Science Foundation (ESF) or the Hanse Institute for Advanced Study. The Director of PIK who stayed abroad for three years was supported mainly by the Tyndall Centre.

## 6. Results – Research, Development and Services

According to PIK, the Institute strives to excel in terms of standard criteria of scientific output. Besides conventional bibliometric measures for publications and financial measures for research funding, less standardised criteria need, in PIK's opinion, to be considered in view of the Institute's mission. The Institute believes that there are at least three crucial points to be observed in this context: (i) selecting the right criteria; (ii) choosing the right benchmarks; and (iii) weighing available information in a fair manner.

With regard to (i), PIK has selected seven criteria that encompass the overall goals of scientific excellence, salience and credibility. With regard to (ii), PIK has compared itself with three prototypes of research institutions: (a) Highly specialised advanced research institutes, focussing on concisely defined special problems, (b) Policy-oriented think tanks, addressing salient societal issues in a fast and often interdisciplinary manner, (c) Policy-relevant interdisciplinary "research tanks" which, like PIK, combine some elements of the first two types. To address (iii), PIK has assessed PIK's average performance in seven dimensions.

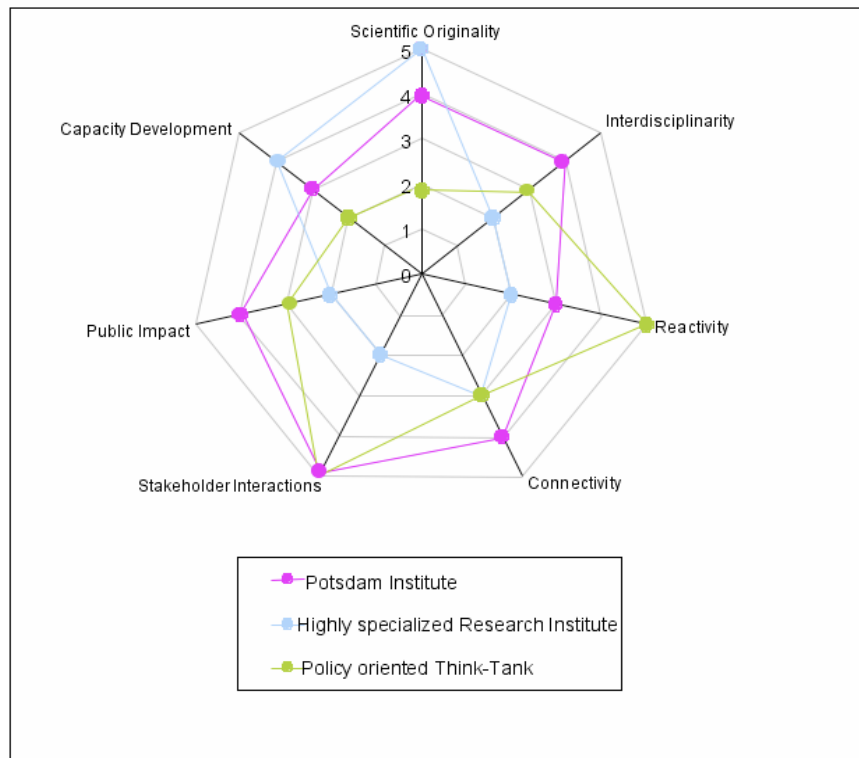


Fig. 1: PIK's self-assessment along seven dimensions and in comparison with two idealised research institutes.

PIK predominantly presents its results in scientific journals. According to PIK, the Institute's **publication activity** has continuously improved since the last evaluation in 1998. Between 2003 and 2005, each scientist is at least co-author of one or more publications. Doctoral





each year at conferences and workshops or presented their results at universities or institutions (more than 50 % of the presentations were keynote lectures or invited talks). In 2005, 70 (not invited) oral presentations were held by PIK staff.

Ten scientists (including four doctoral candidates) received prizes, awards or honours between 2003 and 2005. The Director was awarded the Honorary Medal “Commander of the British Empire” and became a member of the US National Academy of Sciences. The Deputy Director received the Gottfried Wilhelm Leibniz Prize 2003 and was granted membership in the Berlin-Brandenburg Academy of Sciences and Humanities. Three members of staff and their teams were awarded for their excellent teamwork in individual projects. One scientist received the Milutin Milankovich Medal of the EGU and was appointed Science Ambassador of the State of Brandenburg. Two dissertations won two awards.

## 7. Implementation of German Science Council’s Recommendations

According to PIK, the recommendations of the German Science Council have been addressed as follows:

### Recommendations related to the Departments

(1) Priority must be given in the near future to the development of a productive socio-economic department. The position of the Head of the Global Change and Social Systems Department must be filled as soon as possible; here, it is vital that the position be filled by a qualified, well-established social scientist possessing modelling skills. The department itself must be expanded to include ten to twelve scientists, preferably through additional positions, but also by the way of internal re-organisation and external funding.

As Head of the Department a scientist who is highly qualified in economics and sociology as well as in formal modelling was appointed in 2000. With the BMBF-funded project EUROPA it was possible to upgrade the department in terms of staff and critical intellectual mass. The ten recommended positions were financed at first until 2004 with project funds from the federal ministry (BMBF) and in the following years were formally taken over into the Institute’s regular budget. Notice, however, that the Institute’s budget did not increase proportionally. The positions have been designated as temporary, as a result of contract negotiations with the Institutes’ Director, and will be eliminated should he decide to leave his position. In 2005, a peer review of the department took place, involving four external reviewers and the Scientific Advisory Board. The group praised the interdisciplinary research performed by the department, but also the fact that it had gained inner-social science reputation.

(2) It is recommended that PIK gather the expertise it lacks in forest and agricultural sciences through cooperation with other institutions.

The agronomist at PIK who appropriately coordinated the GLOWA-Elbe (Impacts of Global Change on the Water Cycle in the Elbe Region – Risks and Options) project has recently been given a permanent position. In addition, one agricultural economist works at PIK. Cooperation with agricultural research institutes in Germany such as the Federal Agricultural Research Centre (FAL Braunschweig), the Leibniz-Centre for Agricultural Landscape Research (ZALF) e. V. (Müncheberg), and abroad (e.g. Institut National de la Recherche Agronomique-Centre d’ Avignon, France) has been intensified.

(3) PIK should consider changing [from FORTRAN] to a more modern, more object-oriented programming language.

The majority of computer models used in the fields of meteorology, oceanography, and climate research continue to be written and maintained in FORTRAN. Other languages are also used at PIK depending on the individual scientific community, and the scientists remain free to select their programming languages and operating systems according to their individual needs. One of the main tools at PIK ("Lund-Potsdam-Jena managed Land" LPJmL) has recently been rewritten in C. To support a flexible exchange of data across boundaries of programming languages and computer operating systems, the Data and Computation Department has developed a software library. This library is able to connect FORTRAN, C, C++, Python, Java, GAMS, and MATLAB models and codes with each other while the programmes are running on, possibly, a variety of operating system platforms. Thus, the path towards modern programming languages has been initiated at PIK.

(4) The percentage of modern methods in computer science could be increased. A particular challenge is presented by the internal numerical validation of the models.

Scientists at PIK are increasingly working on integrating modern methods of numerical mathematics into their models and assessing the resulting increase in accuracy. However, in the view of the German Research Foundation (DFG), to answer the conceptual questions in this context will require an interdisciplinary research programme for six years hosting ten to twenty individual projects. All questions of numerical validation of the models used at PIK can therefore not be answered in the immediate future.

(5) The degree to which the models of simple and intermediate complexity in the various Core Projects can be complemented with highly complex models must be investigated.

The operation of highly complex global climate models requires major personnel resources which PIK cannot muster in addition to its current investments in the area of global climate modelling. The Institute therefore focusses its own resources on intermediate complexity global models, while building on long-standing cooperation with the Max Planck Institute for Meteorology in Hamburg and other institutions worldwide to access modelling results from General Circulation Model (GCM) simulations regarding atmosphere, oceans, sea and land ice, and biogeochemistry.

(6) In the context of PIK's interdisciplinary approach, the models, which are still currently oriented along natural sciences/technical lines, should be combined with a workable socio-economic model family.

A strong link has been created in the past three years between one of PIK's most prominent simulation models from the natural sciences (the global biosphere model LPJmL) and socio-economic modelling. On the one hand, the expansion of the biosphere model to account for human land use has allowed, for the first time within such a model, to comprehensively and consistently simulate the dual pressures of climate change and land-use change on the biogeochemical balances of the global land surface. The impacts of population and income growth and of dietary life-style choices on carbon and water fluxes in the biosphere have been studied conceptually as well as based on scenarios. On the other hand, the socio-economic modelling family REMIND has been developed to explore strategies and costs of low stabilisation scenarios. The REMIND model comprises a detailed energy system and allows the analysis of macroeconomic trade patterns. REMIND is complemented by a simulation model of land-use patterns as a function of agro-economic parameters which was

newly created (MAGPIE: Management module of Agricultural Production and its Impact on the Environment Syndicate). MAGPIE is operated interactively with LPJmL: land-use patterns are computed as a function of both agro-economic (demand, production costs, regulatory limitations) and environmental constraints (land and water availability, potential yields from process-based biogeochemical modelling of climatic factors). Due to these developments, PIK now considers itself a pioneer in the model-based integrated assessment of joint effects and interactions between climate change and land-use change on both the human agro-economy and the flux balances of remaining natural and semi-natural systems.

(7) More emphasis should be placed on the study of unavoidable uncertainties before expanded applications of the models are attempted. Existing problems must be documented in publications in international journals.

PIK established an Uncertainty Research Team within the Integrated Systems Analysis Department. This group has initiated projects which demonstrated the applicability and usefulness of a range of uncertainty analysis techniques in the context of PIK's research. The group presented their results in ISI-acknowledged journals and currently supports several application-oriented projects at PIK in their own model uncertainty analyses. The team also supports other research projects at PIK, e.g., in the application of modern sensitivity analysis techniques. In addition, the Data and Computation Department's Simulation Environment (SimEnv) has been specifically designed to grant its users easy access to a wide range of uncertainty analysis tools.

### Recommendations related to Research

#### Research Field: Regional Integrated Modelling

(8) The hydrologically oriented Core Project RAGTIME produces interdisciplinary regional research of high relevance to policy advice. It would be desirable, however, to carry out model or sensitivity comparisons that have not yet been performed and to integrate social phenomena into the Core Project.

Shortly after the last evaluation, RAGTIME was terminated. In its place, PIK established two new connected projects: BEST-IF to develop an innovative integrative framework (IF) for regional watershed studies and BEST Assessment in order to carry on the much-needed regional integrated assessment of the Elbe catchment. The latter project, carried out in close collaboration with German and Czech partners, has gained international attention and continues to be supported by BMBF and the EU.

(9) The model selected for the EU project "Influence of Environmental Changes in River Floods" should be examined for its suitability.

With the termination of the Core Projects in 2000, research activities from this and other externally funded projects have been reorganised. To validate the related models in general, the hydrology research team has pursued a number of studies on hydrological model comparison and model sensitivities. To remain up-to-date, the group continues to participate in further ongoing model comparisons.

(10) The validity of the results in the project ULYSSES (Urban Lifestyles, Sustainability and Integrated Environmental Assessment; Core Project EUROPA) must continue to be

investigated, since causal connections between life-style data and environmental indicators were not part of the project.

PIK has responded in two ways: (1) The issue of lifestyles has been taken up by the Consumption and Lifestyle Research Group in the Global Change and Social System Department. The group investigates lifestyle and consumption dynamics that can help bring about a low-carbon society. The group has developed a computer model of lifestyle dynamics, based upon the integration of sociological research into economic modelling, and is now in the process of publishing. As one activity of the group, the Hollywood climate-change blockbuster "The Day After Tomorrow" was investigated in its impact on the German cinema public (cf. PIK Report No. 92, "Double Impact"). This project, supported by the German Federal Ministry for the Environment, Nature Conservation and Nuclear Safety, and ECF, has been part of an international research activity focussing on this movie. In the near future, the issue of urban lifestyles will be taken up again, and comparative studies on European and Asian cities on urban climate change policy are planned. (2) In order to institutionalise its stakeholder dialogue capabilities in the social sciences, the PIK project EYES (Science-society dialogues) was initiated. This project is a combination of outreach activities and research, aiming at disseminating PIK's knowledge, learning about the research needs of stakeholders and policy makers, and further developing PIK's capabilities in this area.

(11) The results of the project CLIMPACT (Regional Climate Modelling and Integrated Global Change Impact Studies in the European Arctic) have shown promise so far, but careful sensitivity studies must follow to ascertain the reliability and validity of the model.

CLIMPACT never had the status of a project but was an ESF Network in which PIK played a (minor) advisory role in discussions on the impact of climate change in Arctic regions. However, PIK's impact models were later successfully used for the Arctic Climate Impact Assessment (ACIA) (published in *Ambio*).

#### Research Field: Earth System Analysis

(12) Using the Long-Term COEM (Co-evolutionary Biosphere and Geosphere Model) within Core Project POEM, scenario calculations covering a period of several million years are performed. This timescale does not, however, coincide with the other parts of the POEM project and it should therefore be established separately or concluded.

The PIK-internal project PLACES (Planetary Ecospheres), which today develops and uses the COEM model, provides very long-term future scenarios. These will be extended to include increasingly shorter timescales so as to ultimately match those represented in other global climate models available at PIK.

(13) In the climate system model CLIMBER-2, the physical processes of the atmosphere should be looked at in a more complex setting and complete documentation should be carried out.

In joint work with the Climate System Department, the CLIMBER-2 model was scrutinised using a wide range of available proxy data on long-term climate history. By constraining the model to reproduce the pre-industrial as well as glacial climates, the range of possible choices for the model's free parameters was drastically reduced. In this way, a systematic link between paleo-climate modelling efforts and confinement of future climate

scenario uncertainties could be established. The new CLIMBER-3 Dmodel was presented to the scientific community in 2005.

(14) The project “A Possible Mechanism for Asymmetric Glaciation” is less convincing owing to its unclear objectives.

The project was not continued.

(15) The Core Project QUESTIONS (Global Change: Qualitative Dynamics of Syndromes and Transition to Sustainability) utilises the new syndrome approach which has great scientific value and has gained much attention internationally. The development of coordinated strategies for the treatment of single syndromes would be desirable. In the future, the results of the project should be quantified.

With the termination of the Core Projects in 2000, these research activities have been transferred to several other studies. Within the PIK Projects SYNAPSE (SYNdrome Assessment and Policy Strategy Evaluation) and SYNDICATE (Syndromes and Paradigms) the global distribution of seven syndromes on a 0.5°x0.5° spatial grid was calculated from a set of approximately 100 quantitative indicators, yielding several hot spots of syndrome activity.

(16) In the Core Project ICLIPS (Integrated Assessment of Climate Protection Strategies) it became especially clear that a consolidation of PIK’s socio-economic department, which is also required for many other areas of PIK’s work, is urgently needed for a more complex scientific investigation.

This recommendation was done justice by appointing the Head of the Global Change and Social Systems Department, the subsequent increase of the department’s staff base, and by the establishment of a new coherent mission for the department. These developments were positively reviewed by the Institute’s Scientific Advisory Board and by external reviewers in 2005.

#### Recommendations related to Political Consulting

(17) PIK has an advisory function in politics and takes this role seriously. Nevertheless, PIK’s expertise has thus far been used too little by the Federal Government for large international conferences focussing on international agreements in environmentally relevant areas.

To facilitate the exchange of information with decision makers in politics, administration, industry and commerce, there are long-term contacts and discussion platforms such as the German Advisory Council on Global Change (WBGU) and the ECF, which was co-founded by PIK. In addition, PIK’s Director was appointed “Chief Government Advisor on Climate and Related Issues” by the German Chancellor in December 2006, which illustrates the Institute’s involvement in stakeholder dialogue at the highest possible level.

#### Structural Features of the Establishment

(18) There are many individual projects within the framework of the Core Projects. It is recommended that the Institute focus on key aspects. ... Somewhat borderline, externally funded umbrella projects should be examined to ascertain whether they are in line with the general conception and continued only if they are found to be so.

The Institute established the new ToPIK research structure in 2000 which provides an evolution of the research programme on three timescales. The Institute and its Departments provide the long-term institutional framework. The ToPIKs with a characteristic lifetime of seven to ten years define the focal points of PIK's research. Each ToPIK groups a number of PIK projects, each with a duration of two to four years. An important aspect of the ToPIK structure is its association with PIK's external project funding strategy. Project funding applications have to pass the internal requirement of matching the research agenda in that they must have a direct connection to one or more of the PIK projects. In well-founded exceptional cases, new PIK projects can be founded to host external grants.

(19) PIK should provide its staff with further training in project management.

PIK has started to institutionalise the management capabilities of the medium hierarchy level. Research group leaders have since then been part of regular decision meetings with the Department Heads. The delegation of responsibilities and decision authority has evolved within the limits of the constraints provided by, e.g., budgetary regulations and rules. The fact that some younger scientists have been appointed co-chairs of the new Research Domains reflects the lessons learned.

(20) With the support of the Scientific Advisory Board, PIK is aiming to change its name to "Potsdam Institute for Earth System Analysis and Climate Effects Research" (PEAK). The German Science Council is of the opinion that the name "Potsdam Institute for Climate Impact Research" does not adequately reflect the actual work carried out at PIK.

The acronym "PIK" has become a well-known "brand" or "trademark". Therefore, it appears that a change of the Institute's name should be undertaken only if absolutely necessary. In its 14<sup>th</sup> meeting the Board of Trustees voted to retain the current name.

## Resources and Infrastructure

(21) The Core Projects are long-term projects, but are partially financed through external funding, mainly federal funds. The Institute must develop a procedure – in agreement with the Scientific Advisory Board – for the termination of a Core Project once the research goal has been attained in order to avoid long-term quasi-institutional additional Institute funding.

At the time of the last evaluation by the German Science Council, PIK still operated with open-ended Core Projects as the principal unit of its research programme. As time evolved, these Core Projects acquired a certain thematic rigidity which hampered PIK's flexible reaction to new challenges from science and stakeholders. The present structure, which involves key Research Domains (ToPIKs) with a seven to ten year characteristic life time and, within these, time-limited research projects, addresses this issue.

(22) In 1993 the German Science Council recommended using Annex funds for visiting professorships, young scientists and doctoral students and for workshops and seminars in the amount of ca. 50 % of the staff budget. Currently however, only about 20 % of the personnel costs are covered by Annex funds, while the rest is covered through intensive external funding. It is strongly recommended that the funding agencies increase the Annex funds to the amount recommended by the German Science Council, i.e., to approximately one-half of the staff costs.

The recommendation to increase the Institute's Annex to around 50 % of the regular staff plan was realised in 2000. However, since then the Annex also had to be used to cover the

expenses for Scientific Computing associated with the establishment of the scientific branch of Data and Computation. Furthermore, funds from the Annex were needed, beginning in 2002, to cover lacking financial resources in the Institute's regular budget. Therefore, the percentage of Annex funds will by 2007 be back down to about 20 % of the staff budget, their level at the time of the last evaluation in 1998. As the Annex now includes the Scientific Computing resources, the amount available for the purposes originally intended is even considerably lower than 20 %.

(23) PIK should aim at increasing external funding from other sources in the future, especially from the German Research Foundation and from industry.

External funding has remained at around € 3.3 million on average, or 30-35 % of PIK's total budget. Funds from BMBF and the EU have decreased, while the number of DFG projects has increased to 8.5 % of the external funding in 2006. Acquiring DFG funds continues to be difficult because interdisciplinary and application-oriented research proposals often do not pass peer reviews for reasons that have little to do with proposal quality.

(24) Where applicable, PIK has to find means of becoming better known among private-sector institutions in order to attract the interest of potential external sponsors.

The ECF, of which PIK is one of the founding members, is extremely important in this area in that it offers a platform for scientific studies and stakeholder dialogues in the fields of climate change. Cooperation with industry exists with, e.g., the Munich Climate Insurance Initiative.

(25) PIK does not have enough work space. It is very positive that additional suitable space will become available by 2002 partly through the use of the Meteorological Observatory of the German Weather Service on the Telegrafenberg.

After the renovation of two buildings, 1,685 m<sup>2</sup> of office space for 90 employees have been created in addition to two large seminar rooms for up to 85 participants. Working conditions in these buildings (which include the Meteorological Observatory) are, according to PIK, excellent. Two more buildings still need to be renovated.

(26) In the near future PIK's parallel computer, or even the intended replacement to upgrade to more advanced technology, will not be able to provide the capacity needed for extensive modelling. PIK should therefore arrange its computer needs with the German Climate Computing Centre (DKRZ) in Hamburg.

In 2000, the high-performance computer was replaced by a noticeably higher performance computer system. The system was further upgraded in 2003 to a theoretical maximum performance of one teraFLOPS. Through intensive deliberations with DKRZ, it was determined that a parallel computer in Potsdam should be used in partnership with the vector computer at DKRZ in order to give the scientists the possibility of using two different computer architectures. Two recent external reviews, as of spring 2006, corroborated that PIK continues to need in-house access to high-performance computing capacities.

(27) It is recommended that the state of Brandenburg join the Northern German Computer Association (Norddeutscher Rechnerverbund) and introduce PIK's computer requirements there.

The state of Brandenburg worked intensively to join the Northern German Computer Association but until now it has not been possible to pay the necessary fees for Brandenburg to join. Even if the state were to join, PIK would still be left with huge additional



costs to pay for computing time, since only organisations sponsored by the HBFG-funding scheme can use this facility free of charge.

(28) The intended participation of PIK in the union of the city networks of Berlin and Potsdam, BRAIN (Berlin Regional Area Information Network), is very positive.

PIK is a consortial and founding member of the Potsdam Metropolitan Area Network (PMAN) and through this is directly connected with BRAIN.

## Publications

(29) An increase in publications is desirable and indeed possible given the fact that around one third of the scientists employed at PIK have published rarely or not at all in recent years. PIK should find ways of motivating these scientists to publish.

Today each PIK scientist is at least co-author of one or more scientific publications. For 2003-2005, around 2.5 publications per scientist and year were counted, which exceeds PIK's self-defined goal of two submitted publications per year and scientist. Doctoral students are regularly involved in PIK's publication activities.

(30) After the appointment of the Head of the Socio-Economic Department and the department's expansion, the respective publications should also be submitted to peer review.

The staff of the Global Change and Social Systems Department published 49 papers in 2005 (23 % of PIK's publications in 2005), 13 of them in peer-reviewed journals and ten in other journals.

(31) It is recommended that PIK investigate the possibilities of publishing data in the Internet to make it available to the general public.

Relevant data sources that support the research interests of PIK are constantly being acquired, assessed, homogenised, and compiled, as well as being made accessible to external users wherever possible. The conditions of contracts with the data providers, however, do not permit making the original data available to the general public in many cases. Nevertheless, the data can be used by other institutes for joint research projects. Furthermore, PIK uses the acquired data to derive secondary meteorological or climatological products that are made available to external users without restrictions. In addition, Data and Computation's Scientific Data Management Group has developed a host of internet-based software tools that ease the way for PIK scientists toward web-based publication of their results.

## Promotion of Junior Researchers and Cooperation

(32) It is recommended that PIK continues to develop its close relations with the Freie Universität Berlin and the University of Potsdam. In particular, the somewhat less intensive relationship to the latter should be strengthened.

PIK has developed its relations with the universities in Berlin and Potsdam through shared appointments. New cooperation started with the HU Berlin and the University of Applied Sciences, Eberswalde. An additional cooperation with the Technische Universität Berlin is in preparation.

(33) The Institute should continue to work intensively in training young scientists. In particular, more diploma students should be supervised at PIK. PIK should consider offering internships for college students.

The number of students working towards their degree at PIK has increased, as well as the successfully completed doctoral degrees. PIK receives about 40 applications for internships yearly from high school and college students; about 50 % of them can be granted. The contacts developed in this way often lead to the students taking up research tasks that will earn them an academic degree under the supervision of PIK scientists. In addition, PIK initiated the first networking workshop for doctoral candidates in the field of environmental sciences.

Appendix 1

Organisation Chart

## Appendix 2

Financial Resources and Allocation of Resources  
(in € 1,000)

	2005	2004	2003
<b>I. Financial resources (income) <sup>1</sup></b>	<b>10,763</b>	<b>11,023</b>	<b>10,835</b>
1.1 Institutional funding	5,862	6,116	5,744
- Federal States <sup>2</sup>	2,929	3,058	2,872
- Federal Government <sup>2</sup>	2,929	3,058	2,872
- Other institutional support <sup>3</sup>	4	0	0
Institutional funding as a proportion of total financial resources (in %)	54.5	55.5	53.0
1.2 Research support	3,120	3,291	3,588
As a proportion of total financial resources (in %)	29.0	29.9	33.1
1.3 Services, contracts, licences, publications	23	14	28
As a proportion of total financial resources (in %)	0.2	0.1	0.3
1.4 Other third-party resources	41	5	25
As a proportion of total financial resources (in %)	0.4	0	0.2
1.5 Withdrawal from reserves and the like	1,717	1,597	1,450
<b>II. Expenditures</b>	<b>10,763</b>	<b>11,023</b>	<b>10,835</b>
2.1 Personnel	6,127	6,116	6,174
2.2 Materials, supplies, equipment	1,844	2,352	2,674
2.3 Investments (not incl. building investments)	510	686	224
2.4 Building investments <sup>4</sup>	800	152	166
2.5 Special positions (where applicable)	0	0	0
2.6 Allocations to reserves and the like	1,482	1,717	1,597
2.7 For information only: DFG charges	140	149	137

<sup>1</sup> Actual revenues in each year classified by financial resource; not incl. money in transit

<sup>2</sup> Support according to BLK decision

<sup>3</sup> Special financing, European Regional Development Funds (ERDF) etc.

<sup>4</sup> Building investments, multiannual measures for building maintenance, land acquisition incl. demolition

## Appendix 3

Third-party Resources classified by Organisational Unit <sup>1</sup>  
(Figures in € 1,000)

	2005	2004	2003
<b>I. Total</b>	<b>3,184</b>	<b>3,310</b>	<b>3,641</b>
- DFG (German Research Foundation)	277	214	206
- Federal Government	986	1,480	1,822
- Federal States	172	221	169
- EU project funding (without forwarding allowances to partners)	785	521	572
- Foundations, other research support	900	855	819
- Services, contracts, licences, publications	23	14	28
- Other third-party resources <sup>2</sup>	41	5	25
<b>II. By organisational unit</b>			
<b>Integrated Systems Analysis</b>	<b>559</b>	<b>736</b>	<b>635</b>
- DFG (German Research Foundation)	54	73	94
- Federal Government	180	223	276
- Federal States	95	155	100
- EU project funding (without forwarding allowances to partners)	187	218	40
- Foundations, other research support	41	67	125
- Services, contracts, licences, publications	2	0	0
- Other third-party resources <sup>2</sup>	0	0	0
<b>Climate System</b>	<b>691</b>	<b>733</b>	<b>678</b>
- DFG (German Research Foundation)	77	57	32
- Federal Government	213	342	378
- Federal States	3	0	0
- EU project funding (without forwarding allowances to partners)	0	0	12
- Foundations, other research support	398	334	248
- Services, contracts, licences, publications	0	0	8
- Other third-party resources <sup>2</sup>	0	0	0
<b>Global Change and Natural Systems</b>	<b>1,142</b>	<b>916</b>	<b>1,436</b>
- DFG (German Research Foundation)	10	0	20
- Federal Government	520	443	782
- Federal States	74	66	69
- EU project funding (without forwarding allowances to partners)	497	266	374
- Foundations, other research support	38	141	191
- Services, contracts, licences, publications	2	0	0
- Other third-party resources <sup>2</sup>	1	0	0

	2005	2004	2003
<b>Global Change and Social Systems</b>	<b>593</b>	<b>809</b>	<b>762</b>
- DFG (German Research Foundation)	0	0	0
- Federal Government	62	472	386
- Federal States	0	0	0
- EU project funding (without forwarding allowances to partners)	98	21	121
- Foundations, other research support	421	313	255
- Services, contracts, licences, publications	0	3	0
- Other third-party resources <sup>2</sup>	12	0	0
<b>Data and Computation</b>	<b>150</b>	<b>100</b>	<b>85</b>
- DFG (German Research Foundation)	136	84	60
- Federal Government	11	0	0
- Federal States	0	0	0
- EU project funding (without forwarding allowances to partners)	3	16	25
- Foundations, other research support	0	0	0
- Services, contracts, licences, publications	0	0	0
- Other third-party resources <sup>2</sup>	0	0	0
<b>PIK General</b>	<b>49</b>	<b>16</b>	<b>45</b>
- DFG (German Research Foundation)	0	0	0
- Federal Government	0	0	0
- Federal States	0	0	0
- EU project funding (without forwarding allowances to partners)	0	0	0
- Foundations, other research support	2	0	0
- Services, contracts, licences, publications	19	11	20
- Other third-party resources <sup>2</sup>	28	5	25

<sup>1</sup> Actual expenditure in each year classified by financial resource; not incl. money in transit

<sup>2</sup> For example: donations, member fees etc.

## Appendix 4

Staffing  
acc. to Sources of Funding and Pay Scale <sup>1</sup>  
- Personnel (financed by institutional and third-party resources) in terms of full-time equivalents  
[Reporting date 31.12.2005] -

	Total number <sup>2</sup>	Number financed by	
		Institutional resources <sup>2</sup>	Third-party resources <sup>2</sup>
<b>Total</b>	<b>115.6</b>	<b>67.8</b>	<b>47.8</b>
1. Academic and higher management staff	66.5	40.6	26
- S (B4 and above)	4	4	0
- S (B2, B3)	0	0	0
- I / A 16	1	1	0
- Ia / A 15	10.3	9	1.3
- Ib / A 14	16.8	14.3	2.5
- lia / A 13	34.4	12.3	22.2
2. Doctoral candidates	22	5	17
3. Other staff	27.1	22.3	4.8
- III, IV / A 12, A 11, A 10	8.3	7.8	0.5
- V / A 9, A 8	6.4	6	0.4
- VI / A7	4	3	1
- VII, VIII / A 6, A 5	3	3	0
- Wage brackets, other staff	3.5	0.5	3
- Trainees	2	2	0

<sup>1</sup> Employment positions acc. to BAT or other collective pay agreements for staff which is financed by institutional or third-party resources (incl. trainees and guest scientists, but excluding diploma students, student assistants and contracts for work and services)

<sup>2</sup> In full time equivalent; correct to only one decimal place

## Appendix 5

## Staffing acc. to Organisational Unit

- Personnel (financed by institutional and third-party resources) in terms of full-time equivalents  
 [Reporting date 31.12.2005] -

	Total	Academic and higher management staff <sup>1</sup>	Doctoral candidates <sup>2</sup>	Other staff, trainees
Entire establishment	115.6	66.5	22	27.1
PIK general	13.4	3	0	10.4
Integrated Systems Analysis	17.6	10.6	6	1
Climate System	20.3	14.8	2	3.6
Global Change & Natural Systems	25.8	15.9	8	1.9
Global Change & Social Systems	16.6	10.3	4	2.3
Data & Computation	22	12	2	8

<sup>1</sup> Employment positions acc. to BAT IIa and above (not incl. doctoral candidates)

<sup>2</sup> Doctoral candidates if financed by institutional or third-party resources



Appendix 6

Personnel

- Individuals (financed by institutional and third-party resources) acc. to pay scale [reporting date 31.12.2005] -

	Total number	Financed by third-party resources		Temporary contracts		Women		Women with temporary contracts	
		Number	%	Number	%	Number	%	Number	%
I. Total	127	56	44.1	66	52	48	37.8	29	60.4
1. Academic and higher management staff	73	32	43.8	35	47.9	21	28.8	14	66.7
- S (B4 and above)	4	0	0	0	0	0	0	0	0
- S (B2, B3)	0	0	0	0	0	0	0	0	0
- I / A 16	1	0	0	0	0	0	0	0	0
- Ia /, A 15	12	3	25	3	25	3	25	0	0
- Ib / A 14	17	3	17.6	6	35.3	3	17.6	0	0
- IIa /, A 13	39	26	66.7	26	66.7	15	38.5	14	93.3
2. Doctoral candidates	22	17	77.3	22	100	10	45.5	10	100
3. Other staff	32	7	21.9	9	28.1	17	53.1	5	29.4
- III, IV / A 12, A 11, A 10	9	-	-	-	-	-	-	-	-
- V / A 9, A 8	7	-	-	-	-	-	-	-	-
- VI /, A7	4	-	-	-	-	-	-	-	-
- VII, VIII / A 6, A 5	3	-	-	-	-	-	-	-	-
- Wage groups, other staff	7	-	-	-	-	-	-	-	-
- Trainees	2	-	-	-	-	-	-	-	-

## Appendix 7

Publications  
- Total number and classification by organisational unit<sup>1</sup> -

	2005	2004	2003
<b>I. Total number of publications</b>	<b>217</b>	<b>279</b>	<b>234</b>
- Monographs (authorship)	3	4	4
- Monographs (editorship) <sup>2</sup>	5	12	4
- Contributions to collective works	68	90	59
- Papers in peer-reviewed journals	79	73	70
- Papers in other journals	32	45	50
- Working Papers / Discussion Papers <sup>3</sup>	26	47	41
- Electronic publications <sup>4</sup>	4	8	6
<b>II. By organisational unit</b>			
<b>Integrated Systems Analysis</b>	<b>23</b>	<b>58</b>	<b>48</b>
- Monographs (authorship)	1	3	1
- Monographs (editorship) <sup>2</sup>	0	2	0
- Contributions to collective works	6	17	14
- Papers in peer-reviewed journals	7	14	11
- Papers in other journals	5	9	10
- Working Papers / Discussion Papers <sup>3</sup>	4	12	10
- Electronic publications <sup>4</sup>	0	1	2
<b>Climate System</b>	<b>39</b>	<b>42</b>	<b>39</b>
- Monographs (authorship)	0	0	0
- Monographs (editorship) <sup>2</sup>	1	1	0
- Contributions to collective works	8	14	10
- Papers in peer-reviewed journals	22	17	15
- Papers in other journals	6	7	12
- Working Papers / Discussion Papers <sup>3</sup>	2	2	2
- Electronic publications <sup>4</sup>	0	1	0
<b>Global Change and Natural Systems</b>	<b>92</b>	<b>117</b>	<b>64</b>
- Monographs (authorship)	2	1	3
- Monographs (editorship) <sup>2</sup>	3	4	0
- Contributions to collective works	32	39	8
- Papers in peer-reviewed journals	33	30	23
- Papers in other journals	9	16	11
- Working Papers / Discussion Papers <sup>3</sup>	10	23	18
- Electronic publications <sup>4</sup>	3	4	1

	2005	2004	2003
Global Change and Social Systems	49	54	70
- Monographs (authorship)	0	0	0
- Monographs (editorship) <sup>2</sup>	1	5	4
- Contributions to collective works	18	19	27
- Papers in peer-reviewed journals	13	6	11
- Papers in other journals	10	13	16
- Working Papers / Discussion Papers <sup>3</sup>	6	10	9
- Electronic publications <sup>4</sup>	1	1	3
Data and Computation	14	8	13
- Monographs (authorship)	0	0	0
- Monographs (editorship) <sup>2</sup>	0	0	0
- Contributions to collective works	4	1	0
- Papers in peer-reviewed journals	4	6	10
- Papers in other journals	2	0	1
- Working Papers / Discussion Papers <sup>3</sup>	4	0	2
- Electronic publications <sup>4</sup>	0	1	0

<sup>1</sup> Each publication is counted only once and should be assigned to one organisational unit.

<sup>2</sup> Contributions to a monograph which is edited by employees of the establishment are to be listed in "Contributions to collective work".

<sup>3</sup> Only if published by the establishment or another institution

<sup>4</sup> Only electronic publications which have not been published in printed form, e.g. CDs, electronic manuals

## Appendix 8

## Documents submitted by PIK

- x Report by PIK (based on questionnaire of the Senate Evaluation Committee)
- x News on Homepage of Germany's Chancellor; Letter: German Chancellor
- x Work Programme: Research beyond 2006
- x Curriculum Vitae of the Department Heads
- x List of Members of the Scientific Advisory Board and Audits by the Scientific Advisory Board
- x Letters: NEWATER Model Developer's Workshop; British Embassy
- x List of Cooperations and Cooperation Agreements
- x Programme Budget 2008
- x Biennial Report 2004/2005
- x Organisation Chart
- x Statutes of PIK (in German and English)
- x Memberships: Board of Trustees and General Assembly
- x Rules of Ensuring Good Scientific Practice at PIK and Procedures for Dealing with Scientific Misconduct; Publication Policy
- x Agreement for the Promotion of Equal Opportunities (in German and English); Employment Status for Women/Men at PIK 2003-2005
- x Revenues and Expenditures; Third-party Resources classified by Organisational Unit; Overview of Third-party Projects according to Organisational Unit
- x Business Plan 2007 (in German and English)
- x Employment Positions acc. to Sources of Support and Pay/Renumeration Grade and acc. to Organisational Units
- x Personnel: Third-party Funding, Temporary Contracts, Women
- x Academic and Higher Management Staff: Age and Duration of Employment
- x Members of Staff appointed to Professorships
- x List of Diploma Theses, PhD Theses 2003-2005, University Teaching 2003-2005
- x Scientific Activities
- x Guest Visits to the Institute; Visits by the Institute's Staff to other Scientific Institutions
- x Publications (classified by Department and by Organisational Unit); Selected Publications in ISI Journals with an Impact Factor and 10 most important Publications
- x Data and Computation - Products and Services
- x Scientific Lectures for the last three years; Organisation of Scientific Events
- x English Press Releases and Public Relations
- x Prizes, Awards and Honours

## Annex B: Evaluation Report

### Potsdam Institute for Climate Impact Research (PIK)

#### Contents

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Appendix: Participants in the Evaluation Committee; Representatives of Cooperating Institutions

**List of Abbreviations**

ATEAM	Advanced Terrestrial Ecosystem Analysis and Modelling
AWI	Alfred Wegener Institute for Polar and Marine Research ( <i>Alfred-Wegener-Institut für Polar- und Meeresforschung</i> )
BLK	Bund-Länder Commission for Educational Planning and Research Promotion ( <i>Bund-Länder-Kommission für Bildungsplanung und Forschungsförderung</i> )
CLIMBER	Climate and Biosphere Model
DFG	German Research Foundation ( <i>Deutsche Forschungsgemeinschaft</i> )
DKRZ	German Climate Computing Centre, Hamburg ( <i>Deutsches Klimarechenzentrum</i> )
EU	European Union
IPCC	Intergovernmental Panel on Climate Change
LPJmL	“Lund-Potsdam-Jena managed Land” Model
PIK	Potsdam Institute for Climate Impact Research ( <i>Potsdam-Institut für Klimafolgenforschung e. V.</i> )
SAB	Scientific Advisory Board
ToPIK	Interdisciplinary research field at PIK

## 1. Summarised Evaluation and Relevance of the Institute

The Potsdam Institute for Climate Impact Research (PIK) is a world leading institute in its field, and its scientific output is in most cases excellent. The Institute's highly interdisciplinary approach is exemplary, and its work is not only highly relevant for society but has also greatly influenced global change research. The Institute is unique in Germany and one of but a few institutions worldwide that combine in-depth analysis of the natural science of the climate system with societal and social studies in order to provide an integrated systems view of the earth's climate. PIK's high international standing contributes substantially to giving Germany and Europe a strong voice in climate science. The Institute is particularly outstanding in the area of climate modelling as well as in the modelling of biological systems affected by climate change. The overall publication record is impressive in terms of quantity and quality. PIK also plays an exemplary role in policy advice and public outreach.

PIK's field of research is of the highest relevance. Nevertheless, a clear definition of the future scope and mission is necessary in order to address the increasing complexity of global change issues. To retain its leading position PIK has to develop new ideas and methods as well as set priorities based on clear strategic grounds. In particular, the Institute should generate a more specific modelling strategy for the future with a focus on intermediate complexity models. The planned focus on adaptation is highly rated.

PIK is currently reorganising its research into four new Research Domains and disposing of its five departments in the process. The Institute has to monitor the process of reorganisation carefully and, if necessary, take suitable measures to especially prevent group fragmentation of the social sciences. It is vital that this group does not diminish into an auxiliary function for the rest of the Institute.

The institutional funding should be significantly increased. Additional funding is required to restore Annex funds and to allow for investments into IT infrastructure, software management, but also into parallelisation. Furthermore, additional personnel are needed in the Climate System Department, the Global Change and Social Systems Department and the Global Change and Natural Systems Department, where the hydrology group has to be increased significantly. The amount of third-party funding is high. Nevertheless, the majority of the referees believe that PIK should enhance its efforts to raise funds from the German Research Foundation (*Deutsche Forschungsgemeinschaft*, DFG).

The number of PhD students at the Institute has increased since the last evaluation. However, PIK offers no direct career development opportunities for young scientists. It is therefore strongly recommended that PIK set up a programme for the career development of young scientists, including courses for PhD students and Postdocs carried out in collaboration with more than one university from the region. PIK's cooperation with the universities in the Berlin-Brandenburg-region is excellent, and the Institute is well integrated into several national and international research frameworks. The Institute should, however, strengthen its collaboration with other leading institutions in complementary fields.

## 2. Mission, Tasks, Main Work Areas

PIK addresses scientific questions in the fields of global change, climate impacts, and sustainable development. It uses methodologies such as systems and scenarios analysis, modelling, computer simulation and data integration. PIK's field of research is of the highest scientific and

social relevance as well as of public interest. The Institute is world leading in its field, and its work is outstanding, especially in the areas of climate modelling and the modelling of biological systems affected by climate change. PIK's highly interdisciplinary approach is exemplary, and its work has had a huge influence on global change research. The Institute is unique in Germany and one of but a few institutions worldwide that combine in-depth analysis of the natural science of the climate system with societal and social studies in order to provide an integrated systems view of the earth's climate. The research topics in all five departments are sufficiently interlinked to obtain the necessary interdisciplinarity for dealing with the Institute's **mission statement** – i. e. to develop insights and provide relevant information for a deeper understanding of the climate system and to provide a basis for well-founded decisions that will help mitigate the negative consequences of global climate change.

During its initial phase, in particular, the Institute has been extremely strong and a global leader thanks to its new and unusual approach. The past record of achievements at PIK in terms of setting the agenda for impact modelling research is excellent. Nevertheless, new ideas and methods are needed if PIK is to retain its leading position. On the other hand, an institute with limited resources will not be able to cover every field of research related to climate change. The global research landscape will change, many more institutions will be engaged in climate impact research, and competition in the field will grow. PIK thus has to clearly define its future scope and mission in order to address the increasing complexity of global change issues. At the moment, the vision for the future development seems to be somewhat vague. The Institute's idea of integrating the complex systems perspective into climate change research is highly rated by the Evaluation Committee and would seem to constitute a good opportunity for the Institute to hold on to its leading position. The Institute's plans to develop a focus on adaptation in the future are strongly supported as there has been little research in this area, and PIK has excellent resources to pursue adaptation research. PIK should also strengthen its capacity for application-oriented activities without compromising the link to basic research. The core competencies in climate impact research where PIK has excelled in the past should, however, not be neglected.

One area where PIK has been a particular leader is intermediate complexity modelling, where it continues to do world-leading work. Nevertheless, the Institute has to develop a more specific **modelling strategy** for the future. PIK should neither start with energy modelling nor attempt to create full complexity earth system models, but should rather focus on intermediate complexity models and vulnerability/adaptation models. Developing a new generation of integrated assessment models may also be appropriate. In addition, PIK should think about focussing on a smaller number of models.

The long-term, continuous, and interdisciplinary projects undertaken at PIK could not be accomplished by a university institute. In its present form as an independent, yet well integrated, research institution, PIK is in fact more effective than it would be as a university institute. Focussed and rapid-response research can only be delivered by an independent research centre.

The Institute presented itself in five departments that work in a matrix-like structure on four interdisciplinary "ToPIKs". PIK is, however, currently in the process of changing its structure. The five departments will be dissolved, and research will be organised in the future in four Research Domains.



### **Climate System Department**

The achievements of this department are of excellent quality. Although this department is the smallest group at PIK, it has contributed largely to the reputation that PIK now enjoys in the scientific community. The collaboration between this department and the social scientists, in particular, is very good.

The group is well established both in Germany and overseas. The continuous improvements to models such as the CLIMBER-3 model are particularly impressive. Many publications have already been produced on this topic. The department continues to work on understanding Quaternary climate, and their model can currently simulate several glacial cycles when forced by orbital changes and atmospheric CO<sub>2</sub> concentrations only. Investigations on how the carbon cycle has changed over this period continue, with a view to eventually explaining climate evolution solely in terms of orbital forcing. The value of this work for predicting future climate is obvious. Previous climate changes provide the sets of data that are used to test climate models. If past climate variations cannot be explained by the models, scientists worldwide will not be able to trust in their scenarios for future climate change. Other examples of good achievements from this group are their work on the carbon cycle and on ice sheet dynamics. Their work on models of intermediate complexity, such as the first assessment of regional climate change as a consequence of a slowing ocean conveyor, has been successful.

The future results of the group will, however, be hampered by the lack of people and expertise in certain areas. The development of CLIMBER-3 is moving relatively slowly because no off-the-shelf three-dimensional model of the atmosphere that runs at the correct resolution and speed is available. It is therefore necessary to develop a suitable model in-house; the resources needed to do this, however, are currently not available. If the Institute is to continue to advance the understanding of the natural climate system in parallel with social sciences, the models being used must continue to be state-of-the-art; for this reason this work is very important for the future of the Institute. A further example of the shortcomings in this group is data management. This area provides a tremendous collection of data and very good support for the universities, but currently depends on one single person. Since the department focusses on modelling and fully depends on data from the outside, data management – including the critical area of data validation – is essential for the success of this group. The regional modelling group also requires more support in the future. Furthermore, the whole group currently receives a wealth of questions from the public, policy makers, stakeholders and industries, which does not allow the group sufficient time to continue their scientific research. Thus, the department should receive support in the form of additional personnel to address this issue. Further personnel reinforcements would be useful for carbon cycle modelling and strategic modelling.

The work of the group remains very much focussed on basic research questions with less attention given to application. Since there are other institutions in Germany and abroad which are also active in this field, it is advisable to maintain much closer cooperation with these groups and develop a long-term concept for collaboration with national as well as international partners. This is especially important in relation to the development of new projects. It is recommended that focus be placed on strategically well selected, comparatively large projects that are accomplished together with cooperating partners who offer the expertise that PIK might be lacking.

### **Global Change and Natural Systems Department**

This department consists of a large group of scientists that perform high-quality research and have a research agenda that sets out to address important scientific and policy questions. This department is excellently integrated both within the Institute and in international research programmes. The staff impress with their solid background in mathematics and physics, coupled with additional expertise in various other areas such as hydrology, ecology, forestry, and agriculture. The combination of several models and the inclusion of socio-economic aspects in a number of models are particularly remarkable. The contributions made by this department, especially with regard to the Intergovernmental Panel on Climate Change (IPCC), are very important.

The department has two major foci. The ecological research is characterised by excellent results and an excellent publication record. The work in the development of global land vegetation models is state-of-the-art, and the LPJmL model is the number one model in the world in this area. This group is the first to quantify human-driven land-use change and climate, both of which are drivers for change in biodiversity, and consolidate them in a modelling framework on equal levels of complexity. This constitutes an important step forward in climate impact research. Furthermore, their work on impacts and vulnerability is organised chiefly according to the needs of the people in the region of Brandenburg, and the group performs standard work for the most part. On the other hand, it has a world-leading position in impacts and vulnerability research, which is mainly thanks to the European network ATEAM (Advanced Terrestrial Ecosystem Analysis and Modelling), of which PIK is in overall charge.

Hydrology and water cycle research, however, which is very important in the whole climate system, has diminished over the past few years. During the first decade of PIK's existence, hydrological research was carried out on an international scale. A reduction in positions, however, resulted in a breakdown of the quality of regional and global hydrological research. Thus, the number of peer-reviewed publications has fallen significantly, and not all hydrological models that are developed and applied today at the Institute are state-of-the-art. Since hydrological modelling is of great importance in the framework of regional as well as global climate impact research, the number of researchers working in this field has to be increased significantly to strengthen this area.

The department has developed some excellent models over the past few years. Nevertheless, more coordination between the individual model systems and better communication between the people who developed them are necessary. In addition, it is also recommended that this department should focus on strategically well selected, comparatively large projects. A number of the projects currently underway (e. g. on the carbon budget of forest ecosystems) are rather small which may be due to a need for third-party funding. PIK's excellent modelling capacities could very much benefit from expertise from external partners in disciplinary fields such as agriculture or forestry.

### **Global Change and Social Systems Department**

This department produces high-quality research and addresses important scientific and policy questions. The Evaluation Committee is particularly impressed with the accomplishments of this group since the last evaluation. The group is well structured and has been successful in setting up an interdisciplinary group with social scientists, economists and modellers. Collaboration with other departments of the Institute, however, should be improved. The group is very focussed on

modelling and quantitative approaches, which is a good niche for the Institute to be involved in, provided that other approaches are used when appropriate, e. g. to explain consumption patterns and political economy. The joint appointment of a professor for sustainability in conjunction with the *Humboldt-Universität zu Berlin* will be an important strategic investment and could unite the group, which does not seem to be very homogeneous at present. Moreover, the group needs more researchers that are trained in social science theory and methods since several scientists of the group have a background in natural sciences. In addition, it was noted that the number of PhD students in this department could be increased.

The main working areas of this group are mitigation and adaptation, and the link between these two areas. Questions relating to mitigation seem to have had a greater impact in the past than the adaptation aspect, which might be due to a change in the personnel that was working on this second area. Climate adaptation research (especially on adaptive capacity) requires a different type of social science than the social science that has existed at PIK hitherto (quantitative, macro scale). Specifically, adaptation research requires expertise in institutions/political science, sociology, behavioural psychology, etc. The adaptation issue will become increasingly important in the future and, in its present form, this department will be unable to meet the requirements needed to attain a leading position in this field. A minimum of six to eight positions are required to build up a good climate adaptation group.

The present structure of the Institute is undergoing change towards a more integrative transdisciplinary combination of the natural and social sciences. This change is highly welcomed in theory but may cause some problems in terms of retaining a social science identity and profile within the new PIK organisational structure resulting in a weakening of the social sciences. The dispersion of the social scientists into the new Research Domains could lead to a fragmentation of the social science perspectives and leave the social sciences with a purely auxiliary function in modelling and impact assessment. In particular, the part of the Social Science Group that deals with the intangible and less quantifiable impacts on the social and cultural dimensions of global change may become sub-critical and thus marginalised as a result of the re-organisation. This should be carefully monitored and, if necessary, corrected. The publication and research achievements of the social sciences should also be carefully monitored to make sure that the new integration provides more rather than fewer opportunities for the social scientists to secure research funds and to publish in highly esteemed journals.

### **Integrated Systems Analysis Department**

The Integrated Systems Analysis Department consists of a large, incoherent group. The spectrum of work carried out here is innovative but also very heterogeneous. Activities encompass very long time-scale studies of the past and future evolution of the earth, projects on how climate change will alter the grape varieties that will grow best in Germany's wine-producing regions in around 50 years, new approaches in climate impact forecasting using qualitative differential equations, and an integrated assessment of the costs of possible slowdown of the Atlantic overturning circulation.

The research is very fundamental, sometimes even experimental and somewhat risky. Much of the work is good individually, some of it even excellent, for example the long-term carbon cycle study. The group has provided good scientific output in terms of publications. A further substantial merit of this group is the development of PC-based aids for direct use by decision-makers in matters relating to the effects of regional climate change on rural and urban environments. A

similar, rather popular consumer product developed by this group is a card game designed to deepen the understanding of climate change amongst the general public.

Although there are many personal and relevant links to the other departments, it is not entirely clear how this group interacts with the others in terms of PIK's mission and research. Nevertheless, the group is cooperating with the Climate System Department by using the CLIMBER-2 model to constrain climate sensitivity and, in a different approach, run it into the near future to look at the influence of different aerosols. Both approaches are important, especially since the group makes use of models that have been developed at PIK. Interaction with the Global Change and Social Systems Department, by way of contrast, is not particularly strong.

The Evaluation Committee rates the very good work of this group in the past highly, but fears that the group is running the risk of falling behind on the complex systems model issue. If the group cannot improve in this area, the output for decision-makers, which has been very good so far, would be affected. Furthermore, the department's lack of a strategy and a vision as to what it wants to accomplish in the future means that it is in danger of stagnation. Hence, PIK's decision to dissolve this department and assign its members to two of the new Research Domains would appear to be a good one. Nevertheless, it is vital that the integrated and complex systems aspects are continued within PIK's new structure.

### **Data and Computation Department**

This department is doing a very valuable job in research and development and is strongly focussed on supporting the climate impact research field. It is a major backbone of the Institute as a whole. Owing to changes that will take place in the IT world over the next few years, this group's duties and responsibilities will increase significantly. The department is essentially split into three different task areas. Besides modelling, the department also performs data management and IT services.

Modelling/scientific computing is state-of-the-art, mainly inspired by the Head of the Department, and considerable progress has been made in the field of mathematical modelling and formalisation. The work is of general relevance and has a clear focus on climate impact research. The group could, however, improve in respect of communication within the department. In addition, the group should definitely invest in suitable software that will also run on future systems. The next generation of computers will be multi-core based systems, which is why there is a strong need to parallelise the simulation codes to model the appropriate scenarios. A strategy for addressing the needs of the different models and codes has to be developed and must have the support of experienced staff in the Data and Computation Department. Therefore, a reasonable number of new staff with new expertise in the field of parallelisation is needed to implement the necessary adaptations in response to fast-approaching changes in IT infrastructure. Realistically, at least two to four new scientists are needed in this group solely to prepare for the next multi-core generation. PIK should also invest significant resources into software development. The Institute's highly diverse and heterogeneous software landscape, which presently focusses more on programming than on software development, does not ensure sustainability of the codes. The area of software development must undergo a process of 'professionalisation' that includes addressing and establishing software engineering, maintenance, verification, etc.

The Scientific Data Management Group is both providing an all-important data management service which is of central interest for the whole Institute and is involved in data exploration research, especially visualisation. As data will be the basis of all of the future research carried out

at PIK, data management will inevitably become increasingly complex. The group does not have sufficient staff, however, to provide data services, on the one hand, and pursue their own research activities, on the other hand. PIK should therefore look to bringing in more people or decide whether both directions are feasible in the future. Visualisation, for example, could become one of the group's own activities in the future. The group should establish contact with other teams who work on similar projects.

The IT Service Group is excellent, very professional and provides an IT service for the entire Institute. This group is responsible for planning, acquiring and operating PIK's high-performance computers, data networks and high-capacity data storage infrastructure, which includes the creation of automated backup files at regular intervals. The group also provides high-level support for personal computers and a helpdesk service. This is why the group does not produce many publications. PIK should make sure that this IT group does not diminish within the new structure, as this would have a severe impact on the entire Institute.

The Data and Computation Department could benefit from the reorganised Institute structure, since it is rather inhomogeneous in that it provides services, on the one hand, and conducts research, on the other. Further, the Department Head currently seems to be somewhat isolated within this department with his studies on vulnerability.

### 3. Structural Features and Organisation

PIK is currently changing the institutional **structure**. The existing Departments will be dissolved and four new interdisciplinary Research Domains established. The new Research Domains will be broadly identical in terms of title and layout to the four ToPIKs that the Departments have been working on within a matrix-like structure. Three of the new Research Domains will focus on major research issues, while the fourth will address methodological aspects in order to eliminate duplication of work and tasks. Each scientist working at PIK will consequently be assigned to one of the new Research Domains. This reorganisation is intended to particularly strengthen the social sciences at the Institute.

This new structure is rather innovative and will stand the Institute in good stead for taking on the new challenges in association with integration and, in particular, systems thinking. The new structure is hoped to bring about a more integrative transdisciplinary combination of the natural and social sciences. In particular, the internal communication between scientists will hopefully even improve. The process of the reorganisation has to be carefully monitored, however, in order to ensure that the social sciences, which have been developed mainly since the last evaluation, do not lose their impact as a result of integration into the new structure.

The **Director** of PIK is a very charismatic individual who has done an excellent job in establishing the Institute in the scientific community and who also has influence in politics. Regarding the future running of PIK, a dual solution may be envisioned in which the present Director would continue to deal with the highly successful process of knowledge transfer between science and the public domain, while a second person would be responsible for the further development of free and explorative scientific research.

The **Scientific Advisory Board** (SAB) is presently composed of twelve internationally renowned scientists that are actively and constructively involved in the development and structure of PIK. Their support over the last few years, especially in relation to the restructuring of the Institute, is highly rated by PIK and the Evaluation Committee. Nevertheless, during the next

nomination period for the SAB members, the Board of Trustees should attend to the matter that particular members seem to be not quite as active as others.

The **administration** consists of nine persons who support the scientific staff very well. The programme budget meets the requirements of the BLK.

At present no **female scientist** holds a position as Head of Department or Head of one of the new Research Domains. This is especially noticeable since the introduction of the social sciences at PIK could have attracted leading female scientists. The Institute should therefore enhance its efforts to recruit and promote women to senior positions. The current status quo on this front is unsatisfactory.

The general **working atmosphere** at the Institute is very good. PIK is a family-friendly institute. All of the staff are highly motivated and show great enthusiasm for their work and for the Institute.

The **communication** within the individual departments is good but very weak across departmental boundaries. Although most of the models that have been developed or improved at PIK over the last few years have been used successfully in national or international research projects, very little exchange of models can be found across departmental boundaries within the Institute. A meeting of all the staff takes place once a year, while more regular meetings occur in smaller groups within the individual departments. The Evaluation Committee recommends improving the internal communication between the individual groups. Some cross-departmental projects have already been established, and the staff are confident that the situation will improve within the new structure.

#### 4. Resources, Expenditures and Personnel

Following extensive renovation work on the buildings, office space conditions have improved and computer capacity is very good. The IT service at PIK is excellent despite being managed by a small group of seven people. As the Institute is running a high-performance computer cluster which is more powerful than the current computer system at the German Climate Computing Centre in Hamburg (*Deutsches Klimarechenzentrum*, DKRZ), the strategy for dividing the computational workload between PIK and the DKRZ has not been very clear in the past. Once the DKRZ system has been successfully upgraded, this strategy should be reviewed with respect to dimensioning and the use of existing and future resources at PIK and DKRZ.

In 2006, the Institute's **institutional funding** amounted to € 7.8 million, a figure which was rated as good by the Evaluation Committee. Nevertheless, the referees strongly voted for a significant increase in institutional funding. One reason for this is that Annex funds, which were supposed to give PIK flexibility, have been decreased over the last few years. To ensure flexibility in the positions for young scientists and guests or to allow for additional support for the social sciences group, Annex funds must be restored to the original figure recommended by the German Science Council. Additional funding is also needed to allow for investments into the computer infrastructure, but PIK should coordinate its computational investments with the computer infrastructure available at other institutions Germany-wide. A third area in which further funding is needed is personnel. In the Climate System Department, in particular, support is needed, for regional climate modelling, strategic modelling, addressing demands from outside the Institute, as well as for the CLIMBER-3 model, which cannot be completed as long as the atmospheric expertise is missing. The Global Change and Natural Systems Department shows a clear lack of people

working on water cycle research. Currently, only one half-position is allocated to this subject area, despite the fact that several models that are developed and used at PIK are based on hydrology. The number of scientists working in this area therefore has to be increased significantly. In the Data and Computation Department, data management is one of the core areas for PIK, and its relevance will further increase in the future. However, the present group of around seven people cannot provide a high-quality scientific data management service and pursue data exploration research on a scientifically competitive level at the same time. Additional personnel are also needed for the parallelisation of the simulation codes and the 'professionalisation' of software development. The Institute should receive a significant amount of money each year for this purpose. Furthermore, several new positions are needed in the Global Change and Social Systems Department to build up a climate adaptation group. To improve and stabilise knowledge transfer and public work at least three more permanent positions are needed. If PIK wishes to try to increase funds from the private sector, they will also need a full-time fund-raising officer. This person could concentrate on raising money not only from Germany but from different international organisations as well.

**Third-party funding** has increased over the last few years and makes up an average of 30 % of the overall annual financial resources at the Institute, which is a very good proportion. The amount of funds from the DFG, however, is not sufficient. This was already an issue during the last evaluation and DFG-funds have increased since then. PIK states that raising funds from the DFG is very difficult for an interdisciplinary institute due to the fact that proposals are assessed by referees at the DFG mainly with respect to their disciplinary excellence. This statement is backed by some members of the Evaluation Committee, while others are of the opinion that PIK can and should increase its efforts to raise funds from the DFG. There may be some possibilities for the Institute to raise funds from industry and use these funds to do more applied research. However, this should not be more than ca. 10 % of the overall budget, and should never be used to replace a shortfall in institutional funding. Furthermore, PIK should look for additional funds from non-governmental organisations, companies and energy producers that use the scientific results produced by the Institute.

The **human resources** at PIK are excellent. Many staff members have gained professorships since the last evaluation. In terms of age group distribution, the personnel structure is very good. The Institute has made a great effort to involve more young people in their work. The proportion of limited contracts of about 60 % is excellent.

## 5. Promotion of Junior Academics and Cooperation

Currently, about 20 % of the staff are **PhD students**. Fellowships for PhD students do not exist at present. Although the number of PhD students has increased since the last evaluation, the Evaluation Committee recommends increasing it even further. PhD students, as well as Post-docs, are essential for the Institute's success in introducing new research ideas and methods, which will help PIK further develop on the whole. PhD students usually need more than three years to conclude their work and are encouraged to leave the Institute afterwards. The Institute should set down a time management plan with each PhD student to ensure that no student needs more than three years to complete his or her thesis. In addition, steps are necessary to ensure that the know-how gained by the PhD students is retained after they leave the Institute.

So far, PIK has set up a doctoral seminar and a colloquium where renowned scientists are invited to talk to the young scientists. Owing to the demanding scientific level, however, participa-

tion in these meetings is rather poor. Furthermore, the lack of meeting sessions for all PhD students means that they normally do not have the opportunity to present their work to each other. In addition, till now PIK has provided no direct career development opportunities for young scientists. The Evaluation Committee thus strongly recommends setting up such a career development programme. At least one joint master (MA) course and one joint PhD programme should be established with more than one university from the region. The universities' different profiles could be combined in a school for climate impact studies. In addition, a coordinated teaching network would be of great importance.

More attention could be paid to the educational role of PIK in regard to offering more opportunities for visiting students from both local and international universities.

PIK offers very good opportunities for **guest scientists** and has been visited by several international scientists over the last few years.

The **collaboration between PIK and the universities** in the region is excellent, which is reflected, in particular, in the 11 joint appointments. The many activities between PIK and the individual universities, however, do not appear to be sufficiently coordinated.

The Institute's vision with regard to improving both **nation-wide and international networking** is highly rated. Although the Institute is already well integrated in several national and international research frameworks, PIK would benefit in particular from cooperation with other leading institutions from complementary fields, for example Max Planck Institutes or the Alfred Wegener Institute for Polar and Marine Research (AWI). The Institute should focus its networks more on the input of data from other scientists than on exporting the results achieved. Indeed, the Institute could benefit greatly from the coordination of its needs in respect to specific data-sets used for the study of climate systems. The Institute could save a great deal of resources by drawing upon cooperation and thereby importing competence rather than investing its own resources by developing its own tools. The Institute could then use these 'saved' resources for its original mission instead, i. e. to study climate impact. A clearer strategy could help increase efficiency in several places.

## 6. Results and Scientific Resonance

Given the size of the Institute, PIK's scientific and policy impact in the field of climate change is outstanding.

The overall **publication record** in terms of quantity and quality is impressive. In 2006, a total of 191 papers were published, including 74 in peer-reviewed journals, compared to 122 papers published in 1997. The distribution of publication output among the staff, however, could be improved since over the past few years some individuals have not produced measurable scientific results. All scientists, including those permanently employed, should maintain an acceptable level of publication. This would ensure that the overall publication rate further improves.

The work performed at the Institute is well recognised by the **scientific community**. PIK enjoys a high degree of visibility both nationally and internationally and is now one of the most productive and internationally recognised research centres that combine in-depth analysis of the natural science of the climate system with societal and social studies in order to provide an integrated systems view of the earth's climate.

PIK also plays an exemplary role in the areas of **policy advice** and **public outreach**. The communication of its scientific results to policy makers and the public helps to ensure that politicians



have a source of scientifically-based information on climate issues and keep the public debate well-informed. Besides publications, PIK also uses a wide range of other instruments for the presentation of their results, such as stakeholder dialogues and briefings by policy makers or the media. Such activities, which are rather unique for a research institution, are highly rated. In particular, PIK's Director is intensively involved in advising high-ranking German politicians in matters pertaining to climate change. This commitment on the part of PIK's Director is particularly highly regarded. Other leading scientists at PIK, however, have also contributed substantially to the outreach activities of PIK, e.g. by publishing important articles in German and international newspapers. To improve and stabilise knowledge transfer and public work a minimum of three additional permanent positions are required.

## **7. Implementation of the German Science Council's Recommendations**

The recommendations made by the German Science Council in 1999 have been implemented for the most part. The promotion of the social sciences over the last few years is particularly highly rated. Furthermore, it was requested that PIK increase its publication efforts, especially since some of the staff seemed to publish rarely or not at all. The Institute has managed to improve the involvement of its staff in its publication activities and the overall number of publications. As a whole, the Institute has developed towards more integrative research.

The name of the Institute has not been changed to "Potsdam Institute for Earth System Analysis and Climate Effects Research" (PEAK) as was suggested by the previous Evaluation Committee. The current Evaluation Group supports this decision since the name of the Institute is well established in the scientific community and has become a well-known trademark.

Nevertheless, some of the recommendations need further attention in the years to come. These include the acquisition of third-party funds from the DFG, better support for the development of young scientists and the establishment of interdisciplinary research projects where social and natural science collaborate on the same level.

## **8. Summary of the Evaluation Committee's Recommendations**

### Mission, Tasks, Main Work Areas

- The future scope and mission must be clearly defined in order to address the increasing complexity of global change issues. New ideas and methods are needed for PIK to retain its leading position.
- The Institute's plans to develop a focus on adaptation in the future are strongly supported as there has been little research in this area hitherto.
- PIK should also strengthen its capacity for application-oriented activities without losing a strong connection to basic research.
- The core competencies in climate impact research where PIK has excelled in the past should not be neglected in the process.
- PIK has to develop a more specific modelling strategy for the future with a focus on intermediate complexity models. The Institute should think about focussing on a smaller number of models.

- Climate System Department: This department should receive support in the form of additional personnel to address data management and regional modelling. A further recommendation is that this group focus on strategically well selected, comparatively large projects that are implemented in cooperation with partners who offer the expertise that PIK might be lacking.
- Global Change and Natural Systems Department: The coordination between the individual model systems and the communication between those who developed these systems both need to be improved. In addition, it is also recommended that this department should focus on strategically well selected, comparatively large projects. The number of researchers working in the hydrology group has to be increased significantly to strengthen this area.
- Global Change and Social Science Department: The collaboration with other departments of the Institute should be improved. A minimum of six to eight positions are required to build up a good climate adaptation group.
- Integrated Systems Analysis Department: It must be ensured that the integrated and complex systems aspects are continued in PIK's new structure.
- Data and Computation Department: This group could improve in respect of communication within the department. In addition, PIK should definitely invest in its software ecosystem, producing sustainable software that will also run on future parallel systems. At least two to four additional scientists are required in this group. PIK should also invest in more staff to cover the area of data management. The Institute should ensure that the IT group does not diminish within the new structure.

#### Structural Features and Organisation

- The process of the reorganisation has to be carefully monitored in order to make sure that the social sciences, which were developed mainly since the last evaluation, do not lose their impact as a result of integration into the new structure.
- The Institute should increase its efforts to recruit and promote women to senior positions.
- It is strongly recommended that the internal communication across departmental boundaries be improved.

#### Resources, Expenditures and Personnel

- The institutional funding should be significantly increased to restore Annex funds, invest in computer infrastructure and create several new positions.
- PIK should increase its efforts with regard to raising funds from the DFG and should look for additional funds from non-governmental organisations, companies, and energy producers that use the scientific results produced by the Institute.
- Following the successful upgrade of the DKRZ system, the strategy should be reconsidered with respect to the dimensioning and use of existing and future computer resources at PIK and DKRZ.

#### Promotion of Junior Academics and Cooperation

- Although the number of PhD students has increased since the last evaluation, it is recommended that this number be even further increased.

- The Evaluation Committee strongly recommends setting up a career development programme for young scientists. At least one joint master (MA) course and one joint PhD programme should be established in cooperation with more than one university from the region.
- PIK should strengthen its collaboration with other leading institutions in complementary fields. A clearer strategy on where to invest its own resources and where to import competence by cooperation could increase efficiency in several places.
- The Institute should focus its networks more on data input from other scientists than on exporting results; indeed, the Institute could greatly benefit from the coordination of its needs in respect to specific data-sets for the study of climate systems.

#### Results and Scientific Resonance

- The distribution of publication output among the staff could be improved since some individuals have not produced measurable scientific results over the past few years.
- To improve and stabilise knowledge transfer and public work a minimum of three additional permanent positions are required.

## Appendix

### Participants

#### 1. Evaluation Team

##### *Chairman (Member of the Senate Evaluation Committee)*

Prof. Dr. Dr. Prof. h.c. mult. Thomas <b>Geßner</b>	Center for Microtechnologies, Chemnitz University of Technology; Fraunhofer Institute for Reliability and Microintegration, Chemnitz
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##### *Vice Chairman (Member of the Senate Evaluation Committee)*

Prof. Dr. Paul <b>Gans</b>	Department of Economics, University of Mannheim
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##### *External Experts*

Prof. Dr. András <b>Bárdossy</b>	Institute of Hydraulic Engineering, Universität Stuttgart
Prof. Dr. Hans-Rudolf <b>Bork</b>	Department of Ecotechnology and Ecosystem Development, Ecology Centre of the Christian-Albrechts-Universität zu Kiel
Prof. Dr. Paul-Hans <b>Brunner</b>	Institute for Water Quality, Resources and Waste, Vienna University of Technology, Austria
Prof. Dr. Hans-Joachim <b>Bungartz</b>	Department of Informatics, Technische Universität München
Prof. Dr. Klaus <b>Fraedrich</b>	Meteorological Institute, University of Hamburg
Prof. Dr. Rüdiger <b>Glaser</b>	Department of Physical Geography, University of Freiburg
Prof. Dr. Dieter <b>Imboden</b>	Environmental Physics, Swiss Federal Institute of Technology Zurich ETH, Switzerland
Prof. Dr. Diana <b>Liverman</b>	Environmental Change Institute, Oxford University Centre for the Environment, U.K.
Prof. Dr. Jens <b>Meincke</b>	Centre for Marine and Climate Research, Institute of Oceanography, University of Hamburg
Prof. Dr. Wolfgang E. <b>Nagel</b>	Institute for Technical Computer Sciences, Technische Universität Dresden
Prof. Dr. Ortwin <b>Renn</b>	Department for Technical and Environmental Sociology, Universität Stuttgart
Prof. Dr. Jan <b>Rotmans</b>	Faculty of Social Sciences, Erasmus University Rotterdam, The Netherlands
Prof. Dr. Ralf <b>Seppelt</b>	Department of Applied Landscape Ecology, Helmholtz Centre for Environmental Research, Leipzig
Prof. Dr. Will <b>Steffen</b>	The Fenner School of Environment and Society, The Australian National University, Canberra, Australia
Prof. Dr. Andrew <b>Watson</b>	School of Environmental Sciences, University of East Anglia, Norwich, U.K.

*Federal Representative*

- excused -

Federal Ministry of Education and Research, Bonn

*Representative of the Federal States*

- excused -

**2. Guests***Representative of the relevant Federal Department*MinR Achim **Zickler**

Federal Ministry of Education and Research, Bonn

*Representative of the relevant State Department*Konstanze **Pistor**

Ministry of Sciences, Research and Culture of the State of Brandenburg, Potsdam

*Representative of the Bund-Länder Commission for Educational Planning and Research Promotion, Bonn*MinR'in Rebekka **Kötting***Representative of the Leibniz Association*Prof. Dr. Eckhard **George**Institute of Vegetable and Ornamental Crops  
Großbeeren/Erfurt*Chariwoman of the Advisory Committee*Prof. Dr. Marina **Fischer-Kowalski**Institute of Social Ecology Vienna, Klagenfurt  
University**Representatives of Cooperating Institutions**

The following representatives of cooperating institutions took part in a one hour interview:

Prof. Dr. Wolfgang **Coy**

Dean of Faculty of Mathematics and Natural Sciences II, Humboldt Universität zu Berlin

Prof. Dr. Dr. h. c. Peter **Deuflhard**

Konrad-Zuse-Zentrum für Informationstechnik Berlin (ZIB), Freie Universität Berlin

Prof. Dr. Gerald **Haug**

GeoForschungsZentrum Potsdam (GFZ), Germany's National Research Centre for Geosciences

Prof. Dr. Jürgen **Kurths**

Institute for Physics, University of Potsdam

Dr. Harry **Lehmann**

General Director Umweltbundesamt (Federal Environment Agency), Dessau



25.09.2007

**Anlage C: Stellungnahme der Einrichtung zum Bewertungsbericht**

**Potsdam-Institut für Klimafolgenforschung (PIK)**

PIK thanks the Evaluation Committee and the Leibniz Association's Evaluation Office for their fair and thoughtful evaluation report which provides highly valuable advice regarding the Institute's future development. This first-rate assessment will motivate all staff to further optimise their contributions beyond the high level already achieved.

There are a few items in the report which deserve comment:

### **1. The Institute's Mission (B-3)**

#### The Evaluation Committee states:

*PIK's field of research is of the highest relevance. Nevertheless, a clear definition of the future scope and mission is necessary in order to address the increasing complexity of global change issues. To retain its leading position PIK has to develop new ideas and methods as well as set priorities based on clear strategic grounds.*

#### Response of PIK:

We support the statement of the Evaluation Committee that to retain PIK's leading position a clear definition of its future scope and mission is necessary. We would like to point out that our recent change from the existing matrix structure to solution-oriented interdisciplinary Research Domains is our response to the increasing complexity of global change problems and their management. The co-production of knowledge within each Research Domain is based on defined goals and key deliverables supporting PIK's mission of providing the cognitive basis for avoiding dangerous climate change.

### **2. Redefinition of Research Foci (B-4, B-6, B-7, B-13, B-14)**

#### The Evaluation Committee states:

*The Institute's plans to develop a focus on adaptation in the future are strongly supported as there has been little research in this area, and PIK has excellent resources to pursue adaptation research. A minimum of six to eight positions are required to build up a good climate adaptation group.*

*Hydrology group: The number of researchers working in this field has to be increased significantly to strengthen this area.*

#### Response of PIK:

We are very pleased that the Evaluation Committee supported in their report our plans to build up a climate adaptation group. The restructuring of PIK and the transition from a matrix structure to the interdisciplinary Research Domains includes the redefinition of research foci. There is now certainly a stronger emphasis on the area of climate adaptation, and we see its importance in par with that of mitigation research. Scientific results on both mitigation and adaptation are essential in shaping the architecture of post-Kyoto climate policy regimes, and they should thus be assigned an equally prominent role at PIK. Both research areas need to be strengthened through additional institutional funding. The very successful research on the climate economy mentioned below has thus far been supported almost exclusively through third-party funding, a situation that does not allow for the needed long-term strategic planning.

We are grateful for the suggestion to strengthen the hydrology research area which is indeed essential for the understanding of global matter fluxes under the pressure of changes in climate and land use. Additional financial resources will be necessary to realise this valuable recom-



mentation. Nevertheless we would like to point out that in spite of staff reductions forced upon us in recent years the output of the hydrology group has been remarkable: The impressive number of publications in journals with a high impact factor, the contributions to the IPCC Reports and the participation in different networks (e. g. GLOWA – Elbe within Germany or NeWater within Europe) are only some examples we would like to flag.

### **3. Interactions within the Institute (B-6, B-9)**

The Evaluation Committee states:

*Global Change and Social Systems: Collaboration with other departments of the Institute, however, should be improved.*

*Data & Computation: Further, the Department Head currently seems to be somewhat isolated within this department with his studies on vulnerability.*

Response of PIK:

It seems that in view of the abundance of information presented in a very short time, the Evaluation Committee did not have a chance to recognise that there are plenty of cooperations between the Department of Global Change and Social Systems and the other departments. In this context, three recent results of just such cooperations should be appreciated: A team of researchers from the Integrated Systems Analysis and Global Change and Social Systems departments integrated the economic effects of technological change in their assessment model. They demonstrated that these effects may lower mitigation costs by up to an order of magnitude in comparison with predictions from standard economic models. This result echoed strongly both in scientific journals as well as in the arena of policy advice (e. g. Stern Report, IPCC Report). At present, it is a critical catalyst fostering the acceptance of binding mitigation measures among decision-makers. In cooperation with the Climate System and Integrated Systems Analysis departments, a computationally highly efficient reduced complexity climate model was developed and integrated in the economic assessments regarding the EU commission's 2°C target. Together with Data & Computation the department developed a novel mathematical formalisation of the vulnerability concept.

The comment that the Head of the Data & Computation department was somewhat isolated within his department with his research on vulnerability comes as a surprise. Four doctoral students in this group contribute their expertise in mathematics, computing science, and software engineering to this multi-disciplinary research area. As mentioned earlier, this research goes back to a joint initiative by the Department of Global Change and Social Systems and Data & Computation. Projects like this are representative of the Institute's interdisciplinary approach, which is one of the cornerstones of its success according to the evaluation report.

### **4. Use of Models and their Development (B-3, B-4, B-6, B-10)**

The Evaluation Committee states:

*... the Institute has to develop a more specific modelling strategy.*

*PIK should neither start with energy modelling nor attempt to create full complexity earth system models, but should rather focus on intermediate complexity models and vulnerability / adaptation models. Developing a new generation of integrated assessment models may also be appropriate. In addition, PIK should think about focussing on a smaller number of models.*

*The Evaluation Committee states that the CLIMBER-3 model has to be expanded through atmospheric expertise, which is not available at PIK.*

Response of PIK:

The Evaluation Committee's important suggestion to develop a more specific modelling strategy is already being carried through. PIK will review its research strategy on modelling and reconsider, e.g., the issue of in-house development and use of hydrological models as well as its priorities in the development of the CLIMBER-3 intermediate complexity climate model.

Cessation of energy modelling at PIK is not considered an option in view of the intense demands from politics and economy in the context of post-Kyoto, and given the considerable in-house expertise that was strategically developed at PIK over the past years. We should emphasise, in this context, that the development of intermediate complexity models requires significant expertise that is primarily needed in the design of full complexity models. In addition, PIK must maintain top-level capabilities in the theory and practice of model reduction. The energy-system knowledge developed at PIK will be particularly important for constructing integrated Earth System models that include the relevant anthroposphere elements.

In developing the atmosphere component of the future CLIMBER-3 intermediate complexity climate model it is certainly not the expertise in atmosphere science that would be missing. Rather, it has been very difficult to muster the manpower required to implement the already existing theoretical concepts.

## **5. Achievements (B-15)**

The Evaluation Committee states:

*The distribution of publication output among the staff could be improved since some individuals have not produced measurable scientific results over the past few years.*

Response of PIK:

PIK established a documentation system some years ago and reviews the achievements of its scientists annually in cooperation with its Scientific Advisory Board. The comment that some of PIK's scientists have produced no measurable results does not accord with our documentation and appears to contradict other remarks in the evaluation report which praise the Institute's outstanding scientific output. Nevertheless, PIK will endeavour to increase its output still further.

## **6. Support of Junior Academics (B-7, B14-B15)**

The Evaluation Committee states:

*Although the number of PhD students has increased since the last evaluation, it is recommended that this number be even further increased.*

*Global Change and Social Systems: In addition, it was noted that the number of PhD students in this department could be increased.*

*The Evaluation Committee strongly recommends setting up a career development programme for young scientists. At least one joint MA course and one joint PhD programme should be established in cooperation with more than one university from the region.*

Response of PIK:

Since its last evaluation PIK has trained more than 40 doctoral students. Doctoral theses have been completed in all five departments. A large number of research student reports, diploma theses, and dissertations have been produced especially in the Department of Global Change and Social Systems. As quality is at least as important as quantity in this area, supervision of an even larger number of junior scientists in the Department of Global Change and Social Systems would not be prudent considering the available staff. Nevertheless we will bear the request of the Evaluation Committee in mind and endeavour to increase the number of junior scientists.

PIK encourages its doctoral students to take responsibility in the Institute, e. g., as PIK Project speakers. There are seminar series and national and international networks in which students are encouraged to participate, such as a Max Planck Research School, the Leibniz PhD Network, and a Summer School organised annually by PIK. We do accept the Evaluation Committee's related criticism in that these many activities require improved management and structuring in the future to be able to play out their full potential.