



**Report of the review
of the research efforts of
the Royal Netherlands
Meteorological Institute**

Royal Netherlands Meteorological Institute



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**Report of the review of the research efforts of the
Royal Netherlands Meteorological Institute**

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February 2004



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Report of the review of the research efforts of the Royal Netherlands Meteorological Institute.

1. Introduction

An international Review Committee (RC) has been established by the Dutch Ministry of Transport, Public Works and Water Management (V&W), acting through Drs. P. Heij, Deputy Secretary-General of the Ministry, to review the research efforts of the Royal Netherlands Meteorological Institute (KNMI) in the past four years. The RC offers in the present document its conclusions and recommendations.

The Ministry of V&W of which KNMI is an agency, is responsible for the continuity and the resources of the research at KNMI.

Carrying out research is one of the tasks of KNMI as formulated in the Act on KNMI. Under the same Act, the KNMI Council was established. Its main task is to monitor the scientific level of KNMI, which entails assessing KNMI's long-term research programme. It was felt, however, that a more in-depth, periodic international evaluation of KNMI's research efforts by an international committee of experts, would be a valuable complement. The remit for the review was established in cooperation with the KNMI Council, and the Council will transmit the review report to the Ministry. In its recommendations, the RC will comment on the Council's role.

Scientific research at KNMI is divided into three categories: climate research, seismology research, and meteorological research. Climate research and seismology research are carried out in the Climate Research and Seismology Department in six divisions, meteorological research is carried out in three divisions in the Observations and Modelling Department. The RC also considered the activities of the Climate-Policy Support Unit in the former department, whose aim is to provide information to policy makers and the public at large, and to support national and international policy making.

The climate research Department has been subject to earlier international reviews in 1994 and 1999. The seismology research and the meteorological research have never been externally evaluated before. The RC stresses that because of this integral look at KNMI's research, its conclusions cannot simply be seen as an 'analytical continuation' of those of the previous reviews. Issues relating to the focus and the connectivity of the overall research efforts, and to their link to operations could not be considered before.

The evaluation procedure that has been followed was similar to the previous reviews. Each member of the RC was sent in advance a set of documents, including the Report and Recommendations of the 1999 RC, the KNMI Research Programme 2003-2007, the Biennial Scientific Reports 2001-2002 of the Climate Research and Seismology and the Observations and Modelling Departments, and a selection of five publications for each division from the past 4 years. Moreover, overviews of what Department and Division Heads considered major achievements in the period reviewed were also sent beforehand. A site visit by the full RC on 12-14 January 2004, at KNMI, De Bilt concluded the

review. After the introductory welcome by Prof. de Jong, Director of KNMI, the Department Heads Prof. Komen and Dr. Hafkenscheid gave introductions to the Climate Research and Seismology Department and the Observations and Modelling Department. Hereafter, the Division Heads gave eight short presentations. Representatives of the research divisions and of the Climate-Policy Support Unit were interviewed separately and in more depth by two or three members of the RC, at least one of whom was a specialist on the subject of the division or the unit. In-depth interviews were also held with Drs De Jong, Komen, and Hafkenscheid, as well as Drs den Besten and van Lammeren, head and deputy-head of the Forecasting Department. Members of the RC have also spoken informally to young KNMI scientists and members of the employees' council. Finally, the RC had constructive discussions with Drs. Heij.

In line with its remit the RC has put its comments on the performance of the various divisions of KNMI's research departments in a much broader perspective on the overall research efforts at KNMI, their further integration in wider European efforts, and the need to establish more effective links with operations. The RC develops its overall assessment in 19 short paragraphs in chapter 3. Chapter 4 contains the more detailed evaluation of the various research divisions at KNMI. In chapter 2 the RC puts together all its recommendations, both the general ones taken from chapter 3, and a few specific ones from chapter 4 insofar as these are not yet implied in the general ones.

The remit for the review is attached as Annex 1.

The agenda of the meeting is attached as Annex 2.

Annex 3 gives background information on the members of the RC.

2. Recommendations

(in the recommendations reference is made to the paragraphs of chapter 3)

Developing an overall vision on research in the context of restructuring KNMI.

Main recommendations.

1. The RC recommends that all of KNMI's research efforts, whether in meteorology, climate or seismology, should fit with KNMI being a mission-oriented institute, that is research should be linked to and have potential relevance for products ranging from forecasts, warnings, observations, climate scenario and model data all the way to public awareness and policy support (paras 1, 14, 15). The RC explains in para 11 that carrying out research in this way, is not at odds with leaving room for a fundamental component.
2. The RC recommends to achieve this by elaborating its vision of KNMI (para 14) in which the RC has integrated what it has learnt from its discussions at KNMI. That is a vision of KNMI as supporting two outlets (providing products such as forecasts, warnings and increasingly observational and model data on the one hand, and public awareness and supporting policy making on the other), two underlying research functions (meteorology, climate research; there is a third, seismology, of course) and two 'translational' functions to connect the whole of the research endeavour to the two outlets. Subsequently KNMI should define which core competencies it needs, and how it should use its permanent budget to provide a sufficient and balanced financial basis for infrastructural investments (observational and computer facilities) on the one hand and human resource investments on the other.
3. The RC recommends the Ministry of Transport, Public Works and Water Management to facilitate the overall restructuring KNMI has to undertake (para 2) which will inevitably involve rising costs in the short term to realise the long term gains, by making available adequate transitional investments (para 5). The repositioning and refocusing of research that forms part of the restructuring will according to the RC (para 17) require at least transitional investments in the observational and computer and communications infrastructure at KNMI, and in Human Resource Development. In particular the RC recommends some resources to enable KNMI to invest in 'rising stars' and to eventually increase flexibility by having more temporary positions.
4. RC strongly encourages the management to actively engage all of KNMI's employees in the process of restructuring. That is all the more essential as considerable efforts are necessary to combat the existence of two cultures, if not two levels of hierarchy, symbolised by 'research' and 'operations' (para 19).
5. The RC recommends that KNMI develops a more unified view on its research efforts. The RC identifies in para 10 why this is so, and which areas could and must benefit from such an approach. Without suggesting organisational solutions, the RC

recommends to consider appointing a chief scientist who can wield considerable influence on the direction, the coherence and the quality of the research activities.

6. The RC recommends KNMI management to establish a strategic Task Force to propose and analyse a few scenarios for the future international position of KNMI (para 16).

Other recommendations.

7. The RC urges to avoid leaning too heavily on the software development experts in research for the build-up of automated services in the forecasting services while restructuring (para 17).
8. KNMI should pursue vigorously its efforts to obtain ISO accreditation (para 13).

Cross-cutting issues in research.

Main recommendations.

9. The RC recommends the adoption of more formal processes for research prioritisation, planning and programme definition to allow the development of a more integrated research programme (para 12).
10. The RC recommends to urgently set up a well-organised strategic and structural communication pattern between forecasting, operations, development and research. The links between development and operations, in particular, need to be very formal to 'shield' operations from too frequent interference from development efforts (para 9).
11. The RC recommends that KNMI develops a more comprehensive, explicit and longer-term oriented approach in several areas that cut across the various research divisions. In particular:
 - a) The RC recommends to develop a more comprehensive approach towards modelling by more explicitly discussing and deciding where modelling efforts should be concentrated and what models serve KNMI's purposes best. The pros and cons of a larger degree of international integration in the interest of both efficiency and sustainability should be discussed as well in a more comprehensive way (para 10a).
 - b) The RC recommends more in particular to look carefully into the future of the HIRLAM model. The RC is not necessarily advocating discontinuation, but there are pros and cons (para 9).
 - c) The RC recommends to develop, against the background of KNMI's important contributions to observational facilities and satellite remote sensing, an explicit longer term policy on how much effort KNMI wishes to expend on developing

and maintaining facilities in comparison to human resources, in part to use these facilities (para 10b).

- d) The RC recommends to develop more explicit KNMI-wide guidelines for collecting, storing and making accessible of data by the scientists, on top of the formal guidelines for making available the observational and modelling data to outside customers, or for the satellite data centres (para 10c).
 - e) The RC recommends to develop a more comprehensive approach to climate scenario development across KNMI to prevent fragmentation and duplication (para 10d). A cross-cutting initiative might be appropriate.
 - f) The RC recommends to develop a more explicit human resource development policy that focuses on attracting high quality people, providing career perspectives and mobility (para 10e). It should include a more concerted effort to attract good research students throughout the organisation (para 6).
12. The RC recommends to consider seriously the sustainability of several research efforts as the RC has noted this to be at risk, implying also sometimes lack of visibility (paras on AO, AS, SO, RW/KD, CKB). Concentrating on fewer topics and combining (parts of) divisions are among the strategies the RC recommends.

Other recommendations.

13. The RC recommends a more visible and perhaps strengthened research effort in theoretical dynamical meteorology/geophysical fluid dynamics that fully embraces fundamentals but also feeds directly into operational numerical weather prediction (para 11).
14. KNMI's climate research agenda should not be determined solely by the IPCC process and its short term needs and constraints (para 15).

Recommendations on specific issues.

15. The RC recommends to continue vigorously to find resources to improve drastically the calibration of OMI, and that this calibration be carried out under the lead of the science team (para AC).
16. The RC recommends to consider initiating a pilot project on chemical weather (para AC).
17. The RC recommends to explore routes that evolve the intermediate coupled model toward a high-end system (para VO).
18. The RC recommends to think through the interaction of the VO group with the IPCC process and to forge stronger links to high-end modelling groups (para VO).

19. As regards the seismological research, the only recommendation is to put more emphasis on scientific publications (para 7, para SO).
20. The RC recommends the Ministry of Transport, Public Works and Water Management to make sure that KNMI can continue to play its essentially 'interdepartmental' role in supporting climate policy making (para CKB).
21. The RC recommends that management looks once more at the by itself clear 2008 objectives of the Climate Support Unit, as set out in the Plan of Work 2004, in the light of the remarks of the RC about the climate research activities of KNMI (para 15), the broader role the unit might play as part of the 'translational' function of KNMI as a whole towards policy and public awareness (para 15) and the resource requirements (para CKB).

Future reviews and the role of the KNMI Council.

22. With regards to future reviews of KNMI's research efforts, the RC recommends that the organisation of such reviews pays more attention to the essential interaction between products and operational units on the one hand and research on the other.
23. The RC recommends the use of one of the by now common protocols for research evaluations to provide Review Committees with a more standardised information input.
24. The RC recommends that the Ministry and KNMI agree that the Council should play a more substantive role in priority setting and quality control of research (para 17).

3. The Review Committee's overall perspective on the research efforts of KNMI.

- 1) The Review Committee's remit was to assess the research efforts taking place at KNMI. KNMI is a mission-oriented institute. The RC is convinced that this perspective should influence the the research objectives of KNMI. One aspect of the assessment must therefore be the relevance to the 'products' KNMI has to deliver to specific customers as well as to society at large, and the operational units within KNMI are responsible for doing this. The RC's view on longer term development of research is equally influenced by the need to guarantee these links. This is one reason why the RC recommends to build up a more unified longer term vision on research at KNMI that brings out this relationship between research and 'products' more strongly. In passing, the RC recommends that the organisation of future reviews of KNMI's research efforts pays more attention to this essential interaction between products and operational units on the one hand and research on the other.
- 2) There is, however, another reason. KNMI is at a crossroads. A serious budget reduction has now to be implemented. At the same time, KNMI's management has clearly stated that restructuring of the weather forecasting service is overdue, given new technologies that have become available to provide higher quality and more efficiency. A new vision of research should underline this restructuring.
- 3) The Review Committee (RC) is strongly convinced of the importance of high quality operational services and knowledge with regards to weather, climate and seismic events. Equally policy making across a wide range of public responsibilities benefits enormously from solid forecasts and scientific inputs in these three areas. Investing in high quality weather, climate and seismological operations and research pays off; there is a very tangible return on investment. The RC notes with satisfaction that efforts within KNMI are now made to provide such quantitative insights.
- 4) The RC commends The Netherlands for having built up in the past 150 years important efforts in meteorology, climate research and seismology. They have resulted in a strong institute that is internationally well known. The RC is satisfied to note from its discussion with the Deputy Secretary-General of the Ministry for Transport, Public Works and Water Management the continued support for KNMI. The RC has considered as its main objective at the present turning-point to provide a long-term perspective for KNMI's research efforts in close interaction with its operational outputs and its relevance for policy. If management and staff will fully and actively share, develop and implement this vision, the RC has no doubt that KNMI will be in a good shape for the next 10 to 15 years.
- 5) The overall restructuring of KNMI mentioned in para 2, including the sharpening of the vision on research and steering the organisation towards it, will be a complicated and strenuous process. Staff has to develop new skills; the organisation needs to learn new operating and communication rules. The RC is pleased to note that the Deputy Secretary-General recognises the major re-engineering challenge the Institute is

facing: rising costs in the short term are inevitable to realise the long term gains. Indeed, there is a need for considerable transitional investments to allow for an efficient restructuring and building up these new qualities. The RC will identify some later on. The RC has no doubt that the positive returns on investment in meteorological, climate and seismological services and knowledge warrant permanent and continuing investments in a re-structured KNMI.

- 6) The RC has identified many research efforts of high international quality. Of course, the picture is not uniformly positive. Nor are relevance and sustainability always assured in the case of high quality research. The very uneven involvement of PhD students indicates that KNMI might benefit from a more explicit quality strategy, an important part of which always is to stimulate senior staff to apply for PhD positions. The RC has therefore concluded that now is the time to undertake a repositioning and refocusing of the research efforts. The high quality the RC has found among individual persons and teams is a solid basis for such a repositioning. In its discussions with KNMI management and staff, the RC has identified many very valuable elements for a vision that would provide more coherence to KNMI's activities.
- 7) The RC finds the research efforts in the seismology division good and relevant. The research on induced events and on infrasound is innovative. The credibility with policy makers, industry and the public is high; and the work is well connected to efforts in other European countries. The RC only recommends putting more emphasis on scientific publications.

The remainder of the RC's observations, conclusions and recommendations concern the climate and the meteorological research.

- 8) Without being exhaustive, the RC cites among the examples of excellent climate and meteorological research the use of aircraft, radar and satellite data. The Cabauw observation station is another example of very good quality research, as are the observations and the modelling of clouds and aerosols. The regional climate modelling research deserves praise. The observations and modelling of the chemical composition of the atmosphere are of high quality. The oceanographic research, for example, on data assimilation, ENSO, large scale currents and the ocean monitoring using ARGO floats, is very good, well managed and focused after discontinuing some work. The Climate Explorer is a tool widely appreciated in the climate community. The coupled ocean atmosphere climate research is another example of fine research; a leading role is played in the area of intermediate coupled models. The work on Holocene climate is laudable, though one should perhaps discuss the relevance for IPCC. The research on observations is good to excellent, and is well connected to efforts elsewhere, but lacks a clear strategy. The Dutch HIRLAM model is no doubt good compared to other versions, but the RC finds the quality of the research in modelling somewhat difficult to judge. As a last example the RC cites the historical re-analysis efforts and the contributions to the European Climate Assessment as work of high quality.

- 9) The RC has identified one major problem: unclear relations and often insufficient links between forecasting, routine operations (the routine collection of data, running of models and distribution of results), and meteorological research and climate research. The areas have drifted apart.

The provision of routine weather forecasting services by KNMI (that is by the WA department) to customers – and the same holds of course for the commercial and other operators who use only the underlying observation and model data – depends on a very professional interaction with the Operational Data Management Division. They in turn must have a very strictly defined interface with the divisions carrying out R&D on observations and modelling.

The RC was surprised to find that no quality assessment procedures exist to link forecasting services in a strict way to research and development on the models used. New developments should only be introduced in operational services in a very structured and controlled way, and the ‘customer’, i.e. operations, should be leading. Operational models used now not always seem to be stable. The RC noted also that the R&D numerical modelling division is too much involved in operational processes. More generally, the feed-back between forecasting, operations and research and development is too weak. But one should be precise here: feed-back through a well-organised strategic and structural communication pattern should come from Forecasting to Operations and vice versa, from Operations to R&D and vice versa, but also between Forecasting and R&D and vice versa, for example because of the strategic aim to base more and more forecast products on automatic NWP guidance. The very formal part of that communication, to be strictly tied to formal procedures, is between Operations and R&D on introducing new developments into the operational running of models. Forecasting as the ‘internal’ buyer of observational and model data should be involved in such changes as well.

This communication pattern needs to be set up urgently. A discussion on the future of the HIRLAM model should be included. As some major decisions have to be made on the HIRLAM model, a continuation should not be taken for granted. The RC is not necessarily advocating discontinuation, but there are pros and cons.

- 10) The RC has some general observations with respect to the research and its organisation at KNMI. No doubt, partly as a consequence of the major shifts that have taken place in the last 5 to 10 years, the overall research efforts at KNMI have become imbalanced. There is some overlap, and the coherence can be improved. There is also a lack of visible attention for the areas of expertise that underly much of meteorological and climate research, to wit fluid mechanics or dynamical meteorology, to which the RC comes back in the next paragraph. In short, the RC feels that there is a lack of a unified overseeing of research at KNMI. This would be beneficial for a number of cross-cutting issues, too. The RC cannot escape the opinion that the current approach towards them is somewhat fragmented. Also, the current five-year (2003-2007) research strategy document makes no effort at a unified approach. It consists of separate plans for the climate research, the meteorological

research and the seismological research. Quote: "Taken together, these programmes represent the research programme of KNMI". More specifically, the RC notes the following items.

- a) One area is modelling. This is at the heart of modern meteorology and climate research, so it does not come as a surprise to find modelling efforts throughout KNMI's research divisions. But the RC would expect a more comprehensive approach towards modelling by more explicitly discussing and deciding where modelling efforts should take place predominantly, what models serve KNMI's purposes best and whether a larger degree of international integration would not be in the interest of both efficiency and sustainability.
 - b) Another concern is observational and computer facilities. KNMI has built up over the years a good infrastructure with important recent additions: the Cabauw tower, the Suriname station, the (co-)PI roles in SCIAMACHY and OMI are all widely acclaimed internationally. The RC commends KNMI for this, but is at the same time convinced of the need for an explicit longer term policy of KNMI on how much effort it wishes to expend on developing and maintaining facilities in comparison to human resources, in part to use these facilities. OMI is a case in point where KNMI should make sure that its own research will benefit too from the data that will be generated.
 - c) Data handling is a third area. The RC has no indications that with respect to collecting, sharing, storing etc. of data current practices are mistaken. But noting the absence of institute-wide guidelines, it has the impression that some explicit guidelines would be beneficial to the institute.
 - d) The increasing use that is being made of climate scenarios makes up a fourth area where there is a need for a more comprehensive approach across KNMI's research departments and divisions.
 - e) And finally, and very importantly, KNMI's ambition to carry out excellent research depends crucially on a human resource development policy throughout the institute that focuses on attracting high quality people, providing career perspectives and on mobility.
- 11) The review committee has been made aware that there is some concern at the perceived reduction in fundamental research in favour of research of a too technical and applied nature. Apparently some pressure is being felt from the ministry to cut fundamental research. Though the concerns were certainly not felt uniformly, the RC wants to make clear its position on this issue.

In general, the RC is of the opinion that presentation of research objectives is important and that scientists should present their work as strategic i.e. oriented towards KNMI's mission. The committee points out that one of the three main objectives of the KNMI climate research plan is 'Understanding Climate' and that the opportunity and the need for fundamental/strategic research were already there. Likewise the committee felt that basic fluid dynamic research is an important aspect of weather forecasting. Cross-department work is needed in this case. Moreover, the

committee feels that some fundamental research is important for motivating some scientists (perhaps 10% of their research time?) as well as being potentially important for climate research or weather forecasting. But it also feels that staff should help management by stressing the strategic nature of their work rather than insisting on calling the work fundamental. High-quality strategic research necessarily contains a fundamental component. The perceived threat to fundamentals is perhaps exacerbated by the present lack of visible attention for areas of expertise that underlie much of meteorological and climate research, to wit theoretical dynamical meteorology/geophysical fluid dynamics at KNMI. The RC does not want this to be read as a plea for a distinct unit focusing exclusively on these areas. A strengthened research effort should fully embrace fundamentals but also feed directly into operational numerical weather prediction. Neglecting research in the underlying disciplines of geophysical fluid mechanics and dynamical meteorology will eventually harm the quality of the products of KNMI.

- 12) The RC acknowledges the improvements of the past several years in elaborating research programmes and work plans and the concomitant efforts to identify priorities. Yet the RC still questions whether the process and the management of priority setting, programme definition and resource allocation are sufficiently explicit and focused. In a mission-oriented institute like KNMI a definite top-down steering has to guide and balance, indeed provide incentives for the bottom-up flow of ideas coming from the divisions and their scientists and students. The RC recommends to define the research programme more on the basis of a leading vision, and the core competences which are essential to realise such a vision. Further research efforts may be added on the basis of excellent quality, opportunities and affordability. To illustrate its views the RC refers to the current research strategy document, which it finds rather too general to be of much help in outlining the medium and long term scope of what KNMI research does and does not do. On the other hand, the work plan for climate and seismological research was useful. The RC understands that such a plan is being developed for the meteorological research too, and underlines its importance. In line with the view that a top-down framework should provide incentives for bottom-up initiatives the RC does stress that it is essential to maintain the many existing links between individual scientists across division borders.
- 13) The RC has learnt that for part of the operations at KNMI ISO accreditation is now being pursued. The RC recommends extending and intensifying this effort. For a mission-oriented institute, ISO accreditation can considerably help to routinely and explicitly focus on quality and efficiency of output and processes.
- 14) Based on its discussions with KNMI management and staff the RC feels that it should be possible to base KNMI's strategy for the next 10 to 15 years on the following integral vision. (The RC notes again that it is not considering here the seismology part of KNMI, though the close links between products and research in that division fit in very well with the RC's view for the rest of KNMI).

The unique feature, indeed imperative for KNMI, for example in comparison to a university department, is to link research and products (ranging from forecasts, warnings, observational and model data all the way to public awareness and policy support). This is not only the case for meteorological research; for climate research too, the link increasingly will not only be to policy, but to forecasts, scenarios and warnings as well. Collecting data for providing (weather) forecasting services is broadening worldwide: the earth system, and not just what is directly relevant for the weather, is defining the scope. Climate data will more and more become useful for and even integrated in operational forecasting. The RC recommends therefore that KNMI's efforts both in meteorological and climate research should be guided by their potential relevance for products defined in the broader sense just mentioned.

As an illustration the RC would refer to the KNMI's largest research division. Its accomplishments over the past years have shown that research in atmospheric composition is maturing to a degree where a closer link between operational relevance and research should become the distinctive characteristic of KNMI's efforts. The RC is convinced that this is not incompatible with KNMI's desire – to which the RC subscribes – to carry out excellent research that can be published in high quality peer-reviewed international journals.

Starting from such a vision, KNMI should define which core competencies it needs and how it should use its permanent budget to provide a sufficient and balanced financial basis for infrastructural investments (observational and computer facilities) on the one hand and human resource investments on the other.

- 15) This reflects a vision of KNMI as supporting two outlets (providing products such as forecasts, warnings and increasingly observational and model data on the one hand, and public awareness and supporting policy making on the other), two underlying research functions (meteorology and climate research; there is a third, seismology, of course) and two 'translational' functions to connect the whole of the research endeavour to the two outlets. The RC uses the somewhat vague term 'function' deliberately to underline that the organisation of these functions is the responsibility of the management.

There are several advantages to such a view of KNMI.

The first one is that it not only allows for, but requires a unified leadership of the research activities of KNMI. How exactly this translates into management and organisational responsibilities, is, once more, not for the RC to decide upon, but the RC does stress the vital role of a very strong scientific leadership over all of KNMI's research activities (the RC sees no fundamental reason to exclude the seismological activities here) and in co-charting the future strategy and role of KNMI. A chief scientist with a highly visible position, a high standing in the scientific community, and a sufficiently authoritative position in KNMI's management could exercise such a role.

Another advantage is more subtle, and has to do with the overall development of KNMI's climate research over the past 10-15 years. Given that 15 years ago there was no climate research at KNMI, and that now there are over 100 people involved in

climate research, the committee felt that KNMI had done a good job. But the RC noted views that perhaps there was too much emphasis put on IPCC. The importance of IPCC stands without doubt, and KNMI should contribute substantially to it, but not to the exclusion of other relevant climate research. The RC was inclined to agree, and takes the following future look.

Policy relevance is now largely linked to climate research, and the present conduit for it is the IPCC process. The RC strongly supports KNMI to continue to contribute to IPCC to support the scientific integrity of the IPCC process. Yet, the RC is convinced, too, that KNMI's climate research agenda should not be determined solely by the IPCC process and its short term needs and constraints. In this same context, being referred to by IPCC is a good measure of KNMI's performance, but that should not become an end in itself. If climate research will profit from being driven less exclusively by the IPCC process and policy, policy and public awareness will benefit by a broader effort of KNMI to feed all its work in the climate, meteorological and seismological areas into it.

Thirdly, as climate, meteorological and seismological research contribute increasingly both to products and policy making, there is an additional incentive for developing synergies and collaborations across the research efforts of KNMI.

- 16) It is essential for KNMI to position its future role amidst the rapidly changing situation in Europe. The RC has no doubts that KNMI researchers and divisions are very active in a large variety of European collaborations. The examples given in chapter 4 in the assessments of the divisions testify to this. KNMI does play a vital role in sustaining some networks such as projects within the European Climate Assessment or the ORFEUS seismological network. The RC has already mentioned the investment of KNMI in the HIRLAM modelling activities as another example of the desire to be involved in regional cooperative efforts. Yet, this was an instance where the RC felt a need for more intense considerations of KNMI's position in Europe, in which strategic and longer term orientation should prevail.

Taking into account the enormous ongoing developments in observation, modelling, numerical and computational and communication techniques with their implications for wider and faster coverage of geographical areas without a loss of resolution, for direct links to end-customers, and so on, international positioning has to be addressed at several levels.

In terms of research which is the remit of the RC, KNMI should seriously consider concluding strategic partnerships with other met offices or research institutes to make the most of the expertise, position and infrastructure (the RC refers to para 10b) it has built up over the years. As the RC makes clear in its division assessments, KNMI is a very credible partner in several areas.

A European positioning cannot, however, be limited to the research efforts. In line with the closer links the RC advocates between research and the 'products' of KNMI, a European re-positioning should be an integral effort to optimize the outcome. The relation to ECMWF and to neighbouring meteorological services are crucial issues to be addressed.

The RC recommends that KNMI management establish a strategic Task Force to propose and analyse a few scenarios for the future international position of KNMI.

- 17) The RC notes with satisfaction and appreciation the willingness of the Ministry of Transportation and Public Works and Water Management to make available funds to assist KNMI in restructuring.

It recommends the Ministry to not only help in mitigating the consequences for the employees affected, but enable KNMI to use the opportunity to organise itself in accordance with a new vision the outline of which the RC believes to have identified in its discussions with KNMI management and staff. The RC signals a definite need in two areas.

One concerns securing an adequate observational and computer and communications infrastructure at KNMI. The RC has recommended that KNMI develops a more explicit overall policy, but when this is available the RC has no doubts that temporary investments will be needed. It notes, without an investigation of its own, the conclusion of the OMI Review Board that more funds are needed to realise the potential of the OMI instrument.

The other area concerns human resources. Restructuring an institute requires that staff develops new skills and the organisation learns new operating and communication rules. Despite the need to decrease staff numbers, management should be able to invest in 'rising stars'. Moreover, more flexibility should be built in, for example to have more temporary positions as soon as the current reduction has been realised. Finally, the RC notes a particular concern with respect to KNMI as regards personnel problems. The reduction in staff numbers in the weather forecasting service will require the build-up of automated services and hence involve highly qualified software development experts. These are to a certain degree available in the research departments of KNMI, but the RC urges to try to get experts from outside KNMI in order to avoid a deleterious effect on the research and development efforts at KNMI.

- 18) The RC has discussed the role of the Advisory Council of KNMI. Its role, as prescribed in the KNMI Law, can be too easily perceived as implying only to guard that KNMI has procedures in place to ensure quality. The RC is of the opinion that this is not an attractive role for a group of highly qualified persons. Involving the Council and its members in a more substantive role in priority setting and quality control is one of the most important ways to ensure quality. The RC recommends that the Ministry, KNMI and the Council agree on such a role, which the RC feels is possible under present regulations. Whether it is eventually opportune to make the articles of the Law more precise, the RC leaves to the Ministry, KNMI and the Council.
- 19) As a final observation the RC strongly encourages the management to actively engage all of KNMI's employees in the process of restructuring. That is all the more essential as considerable efforts are necessary to combat the existence of two cultures, if not two levels of hierarchy, symbolised by 'research' and 'operations'.

There are many ways to do this, such as staff meetings, retreats, and so on. The RC has not only encountered criticism among staff, but also a great willingness to contribute to finding solutions. KNMI is felt to be a place to be at. That is what one should try to preserve.

4. Assessments of the various research divisions.

Atmospheric Research (AO)

Research in the AO division has three primary foci: 1) Land-atmosphere interactions; 2) Clouds, radiation and aerosols; 3) Climate modelling of the atmosphere.

The land-atmosphere interactions research is mainly centered on the Cabauw observing site. This is widely considered to be a premier international site and data obtained from it are extensively used by the international research community. Modelling activities in this focus area are mostly centered on boundary layer modelling, including clouds, and large eddy simulation. In both these areas KNMI has a long standing tradition of excellence which is being continued. The Cabauw site is of international relevance and KNMI appears to be strongly committed to its maintenance and improvement, which is highly recommended by this committee.

Research on clouds, radiation and aerosols centers on monitoring and retrieval from satellite data, process studies of cloud-aerosol-radiation interactions and use of cloud observations for model validation and development of cloud parameterizations. These are all very relevant areas within atmospheric and climate research. The AO division effort in these areas is of very good quality, both on the observational and modelling sides. This area encompasses the largest number of FTEs within the division so that excellence in this effort should be well sustainable.

The primary effort of the climate modelling activities is centered on the development and application of the RACMO regional climate model. This effort has really progressed in the last 2-3 years, during which RACMO has been developed into a state-of-the-art model essentially by modifying its physics parameterization schemes. This modelling effort does not have yet a high international visibility, probably because a state-of-the-art version of RACMO has become available only relatively recently, and some effort needs to be devoted to improve its visibility within this growing field. This could be achieved by increasing the participation to international projects and producing more climate change-oriented publications. The issue of sustainability of this effort is an important one. Although several people gravitate around this model, it appears that only about 2 FTEs are actively working on it. This is probably not sufficient to maintain a competitive model in the long run, despite the interactions with the HIRLAM community and the ECMWF. If this model is to become a centerpiece for the production of climate change scenarios for The Netherlands, it needs a greater sustained effort. Regarding the production of climate change scenarios, the mechanisms of synergistic collaboration between the AO and KA divisions are not entirely clear. In fact, the overall strategy for producing climate change scenarios does not seem well established within the Climate Research department, being seemingly left to rather individual efforts. A more clearly designed strategy of climate change scenario generation within the department should be developed.

Overall, the AO division looks like a strong and healthy one, people are motivated and enthusiastic about their work, and the quality and relevance of research is very high within the national and international context. Attention needs to be given to support the growth of the regional modelling effort.

Atmospheric composition research (AS)

This has become a very large group where high quality observation and modelling work is being carried out. The group is very successful in attracting project money, the result of which is a large proportion of project-supported staff. The group enjoys a good international recognition. The publication rate is high. The RC is, to just give one example, very positive about the successful OMI project, a collaboration of KNMI with NASA and Finland, to be launched before the summer 2004. The RC was, however, very concerned to learn about the problems with the calibration of the instrument. It is essential that resources be found to improve drastically the calibration, and that this is done under the lead of the science team.

The RC would like to see the division develop a keener eye on the potential of atmospheric chemical composition data for operational use. It recommends to consider initiating a pilot project on chemical weather.

The RC sees three major areas for concern. One is the unstable funding for large portions of the group. The RC is not necessarily saying that the situation is unsustainable, but it strongly recommends to define on the basis of the division's strategy (as part of KNMI's overall research strategy) which are the core competences of the division, and to make available sufficient permanent positions to sustain those core competences.

The RC has noted that no money is available to exploit the OMI observations. Of course, these observations are for use by the worldwide scientific community, but an institute like KNMI with a strong scientific basis should make it a point to benefit itself from the early scientific use of data of a new quality.

The RC has the impression that the importance of non-meteorological data is insufficiently recognised by KNMI's management and its operational divisions. As a consequence there is no clear institute strategy for KNMI's role with respect to new space sensor initiatives.

Climate Analysis (KA)

This division is concerned with the analysis of climate data, digitizing and recovering early instrumental data and the development of scenarios (principally for extreme impacts important for The Netherlands, such as extreme Rhine discharges and North Sea storms). Overall, the committee felt the division was strong with research outputs being published in the international peer-review literature. The RC felt that the division was motivated about its work, but were potentially losing good, young staff when they complete their PhDs.

Data digitizing is progressing apace, principally here for early Dutch data from the 17-19th centuries, together with series from some former Dutch colonies and trading posts

(e.g. the early Japanese records at Nagasaki) and early marine data (the CLIWOC project). Efforts do not stop with digitising, but extend, as they should, to homogenizing the series and making them available for all to use. Of particular importance with respect to recent climate change is the thorough assessment of the homogeneity of the long Dutch records for temperature, precipitation and, most recently, pressure. The quality of such records is vital in an IPCC context. Although data digitising will eventually run its course, there will always be scope for further analyses. Making the data available for all to use is excellent, but can be a double-edged sword. More analyses can be undertaken with the data, but there will be those who misuse/misunderstand it. Web pages need to be well documented and a small part of someone's job needs to be titled 'answering enquiries about these data on KNMI web pages'.

The one note of concern of the RC was the apparent lack of co-ordination of research work into future climate scenarios for The Netherlands. Whilst this division has the clear responsibility for extreme scenarios within KNMI (and this is known by potential users in relevant institutes, such as RIZA), other divisions are also developing scenarios (not necessarily for extremes), so there could be a cross-cutting initiative on the issue within KNMI.

Oceanographic Research (OO)

This division studies the variability and predictability of the ocean and climate system, the interaction of the ocean with the atmosphere, including processes such as El Nino, and the large-scale ocean circulation. The objectives are to improve understanding and modelling of ocean processes of relevance to climate, to improve climate prediction on seasonal time-scales, to understand patterns of climate change, and to reduce uncertainties in estimates of future sea level rise.

This department does excellent work and is well recognised internationally, both within Europe and world-wide. They have made substantial contributions to El Nino understanding and prediction. The work has not only scientific importance but has had practical applications through collaboration with ECMWF. The work on the thermohaline circulation, upper ocean tropical/subtropical interaction and ocean variability is also of high quality and relevance. The Climate Explorer is a tool of considerable importance. Although developed for personal use, the RC was very pleased that it had been made widely available and its functionality continued to expand as new data sets were included.

The group is well managed and has changed direction in line with changing circumstances (for example the ending of wave tower observations and wave modelling). The RC commends the change in emphasis from wave modelling and observation to understanding sea-level rise through modelling studies, and the potential impact of wind extremes and storm surges. The proposal to continue some observational work through the purchase and deployment of ARGO floats seems reasonable and a cost-effective way of being involved in Clivar and GCOS observational programmes. The involvement of the group through EU projects such as ENACT and ENSEMBLES will keep up their

interaction with European partners at the forefront of climate research and data assimilation. Future collaboration with ECMWF also seemed sensible.

The RC was heartened by the collaborative work with the VO group, focussed round the SPEEDO/PATCH project. It was unclear to the RC whether the OO and VO divisions needed to be separate. Computing resources were felt by the OO division to be adequate for their needs. The RC could not judge this. A general feeling was that the division would like to have more good research students. The RC supported this view.

Climate variability Research (VO)

This division investigates (i) dynamics of weather and climate (ii) variability of the coupled atmosphere-ocean system (iii) paleo-climate and climate change.

The quality of the research group and the research team is very high. The spirit and collaboration within the group is commendable. They are world leaders in the development and application of coupled models of intermediate complexity. Research in VO complements that of high-end modelling centers - such as Hamburg's Max Planck and the UK Met Office Hadley Centre - in permitting longer-timescale (>1000 yr) coupled problems to be addressed. The increasing focus of the VO group on paleoclimate helps to place the IPCC activities of the wider community in context.

The RC noted, and was strongly supportive of:

- (i) the evolution of the coupled model ECBILT toward a more comprehensive treatment of the atmosphere (including the tropics and the hydrological cycle) in collaboration with Molteni (ICTP) on the SPEEDY model.
- (ii) the increasing interest in applications of the model to problems in paleo-climate, to which the intermediate coupled model is ideally suited; and
- (iii) collaboration with the oceanography group (OO) in the SPEEDO/PATCH project on patterns of climate variability. Although in its infancy, this project could lead to a major new research thrust in KNMI.

The RC raised the following points that deserve careful thought:

- (i) Routes that evolve the intermediate coupled model toward a high-end system should be explored. KNMI has large resources and the intermediate model could be used as a spring-board to a more ambitious program. If planned carefully this can be done without sacrificing what has been achieved and the laudable philosophy of the group. Biogeochemical interactions will ultimately need to be addressed both because the paleo record is laid down biogeochemically but also because physical-biogeochemical interactions are the key to much of climate variability.

(ii) the interaction of the group with the IPCC process needs to be thought through and stronger links to high-end modelling groups forged. Many 'high-end' modelers are aware of the need for better integrated physics packages and the ability to carry out 'what if?' experiments, that only intermediate models allow. The suggestion here is not to 'ape' what is going on at other centers but to maintain a dialogue.

(iii) there seems to be a disconnect between VO research and the operational activities of KNMI. This is particularly true now that the 'predictability' name (and activity) has been dropped. At the very least the group ought to be able to clearly articulate what that link to operations is.

(iv) the residual expertise at KNMI in Geophysical Fluid Dynamics (GFD) and dynamical meteorology resides in VO. Either dynamics needs to find a more natural home within KNMI or the expertise needs to be channeled into the main thrust of the group. The present state does not seem optimal.

Seismology Division (SO)

The division is the center of seismological observations and research in the Netherlands. Earthquake surveillance, maintaining the European seismological waveform data center (ORFEUS) and research each constitute about a third of the working capacity. In addition to teleseismic and local earthquake monitoring, engineering seismological and infrasound measurements are performed with network and array stations in the Netherlands.

The quality of the observatory work is good; instrumentation and data acquisition methods are at the state of the art. Considering the relatively small size of the group the research activities are satisfactory both in terms of quality and quantity. The overall productivity of the division is very good. An intensified collaboration with universities (more PhD studies and post doc work) is desirable to help increase the research component and the number of reviewed publications in the coming years. The working plans for the future are adequate and well structured. The integration of a seismology group, active in the CTBT and carrying out infrasound measurements, in a meteorological institution is unique. The reason is that meteo data are crucial for infrasound measurement interpretation, hence a meteorological institution offers, potentially, a very favourable environment for carrying top-level research on that topic. The potential synergies from a close collaboration between seismologists and meteorologists should be developed.

The relevance of the work is very high. Seismic hazard assessment for both natural and gas production-induced earthquakes, is an important and relevant safety issue. The division is respected by the public and the gas producing industry as a neutral organization. The seismic hazard and risk assessment should benefit from a closer collaboration with other national agencies involved such as NITG and TNO. The work of the ORFEUS data center is important for the entire European seismological community. The seismology division fulfills the national role within the CTBT. The infrasound

measurements and research are relevant both for the Dutch military and the general public.

The RC sees the sustainability of the division as risky. About 3-4 people are actively doing research in the division. Due to the matrix structure of the duties, downsizing of staff could easily undercut the critical mass which would have significant negative effects on maintenance of the ORFEUS data center.

The visibility of the seismology division is high in the European seismological community as well as in the Dutch media and for the general public. The general feeling of the RC is that the seismology division is in a good situation with good infrastructure and facilities.

R&D Numerical Modelling (RM)

The relevance of this group, being the link between research and the weather-room, is high. Also, they form a knowledge base of which 'Climate Research' and other groups within KNMI make frequent use. Nevertheless, their relevance could be much higher if they could focus on their proper task: doing research and putting the results into operations. Instead, the group is too busy with operational processes. The situation is further complicated by the lack of rules and procedures on why and how and when to make changes to the operational systems. Miscommunication and lack of trust between the groups is the result.

HIRLAM forecasts are the most important product of R&M. Within the international HIRLAM-community their position and reputation seems to be good. However, it is not clear to the RC-members what scientific contribution KNMI has in HIRLAM overall. The RC-members are well aware of the arguments pleading for having one's own version of a regional model; a shorter response time and better knowledge of regional/local influences are usually advanced in its favor, and there is certainly some ground in these arguments. But anticipating further advances in more commonly available models, the RC recommends that the added value of running HIRLAM at KNMI over other available common numerical forecasts should be better established if one wants to continue the HIRLAM efforts.

The visibility of the group is not high enough; partly due to above mentioned squeezed-in position, partly due to the lack of interest in and eye for this problem by the Management Team of KNMI.

The potential of the group seems to be high. The group leader is well able to articulate the objectives, role and results of the group; she looks for collaboration with research groups within and outside KNMI, on the one hand HIRLAM-related and on the other hand related to extreme events. Specifically the cooperation on extreme events is highly appreciated in the Netherlands.

The size of the group seems to be OK, especially if the group could focus on its specific task.

R&D Observations and Climatology (RW/KD)

The RC assessed the work of two small R&D divisions together.

The division that works on research observations produces high quality work which in some areas is judged excellent. Some tasks are carried out on behalf of the network of European Meteorological services on a fully funded basis. There is wide recognition and appreciation for the work of KNMI in these areas e.g. in the quality evaluation of AMDAR data. There is a high level of expertise and the future work programme seems to broadly address the right areas i.e. utilisation of space data, automation, remote sensing etc.

The work is well connected internationally and this is a very strong point. KNMI is well known within Eumetnet, ESA and EUMETSAT. However, there was not much evidence that the work is proceeding within the context of a well considered strategic plan which sets out the observational requirements of KNMI and shows how these will be met in the most cost effective way using an optimal mix of remotely sensed, in-situ, space and terrestrial data. Likewise it was difficult to detect the real user drive from the forecasting and operations areas. Although we were made aware of some forecasting problems (for which additional data would be very helpful) the response from R&D seemed limited. As for the organisation as a whole there was only weak evidence for effective processes for prioritisation, resource allocation etc.

It was very clear that the division was under-resourced for the tasks assigned and in some areas was barely coping. Given the enormous challenge ahead from automation in pursuit of cost reductions and the huge increase in valuable satellite data it is considered particularly important to set a clear strategy at the top level and define the most important programme elements to deliver it. The head of the forecasting department should have a major say in setting the programme and assigning priorities.

As to the Climatology group, there are four researchers in this group, but their output has a high profile across Europe as they have led an inter-met-agency project under the European Climate Assessment umbrella. This has sought to get NMSs to supply to KNMI daily series of maximum and minimum temperature and precipitation totals. The efforts have been so successful that data are available from all countries belonging to RA VI of WMO, with the exception of three to four. A number of research papers have appeared and these will be extensively cited by the next IPCC review. With much of the data being made available on the web, it is likely that many more papers will be written, which would not have appeared without these efforts. The committee hopes these efforts will be encouraged in the future as there will be a need to update and extend the series at regular intervals.

The only small note of concern of the RC is that the group is small and it might be preferable to combine it with the Climate Analysis division, but this would be at the expense of the link to the division working on real-time updating of Dutch data.

Climate Policy Support (CKB).

The unit for Climate Policy Support (CKB) has changed its mission in line with the recommendations of the previous review of the climate research activities at KNMI. It no longer is involved in policy making, but instead focuses on supporting climate policy making and awareness in Dutch society at large by providing information based on KNMI's own work and the IPCC reports, especially on IPCC 1. The RC welcomes this restriction.

The RC was impressed by the high output and the high visibility of the unit: through many articles, meetings, presentations and media events the unit has provided information to government departments, provinces, municipalities and the general public. The RC cites in particular the 'Klimaatrapport' as a highly visible and well thought-through document to impart knowledge on the climate system of relevance to The Netherlands to the general public as well as policy makers. On a more particular note the RC cites the publications on the statistical significance of the actual climate change and the reaction on theories of dominant solar forcing.

The RC acknowledges the good access the unit has to the various ministries involved in policy making, though in a formal sense the unit's role is only to provide information for the climate policy of the Ministry of Transport, Public Works and Water Management. But as KNMI has the chair of the interdepartmental IPCC coordination group, the role of KNMI which is essentially 'interdepartmental' seems to be assured. The Ministry is recommended to ensure this.

The link to the outside world, that is to 'users', created by the unit is an important one for KNMI. Its products are essential KNMI products, and should therefore be based on a close interaction between the research divisions of KNMI and the coordination unit. From a policy point of view, the political sensitivity of the average KNMI research scientist is perceived as moderate. While the RC has requested attention for a research agenda not only to be driven by IPCC, it suggests that researchers need to appreciate the importance of the policy dimension perhaps more.

At the same time management should be aware of the delicate nature of the unit's activities. It is unavoidable that the information provided is put in a context and comes with a certain assessment. That will be seen as the KNMI view, which is just a fact of life. Yet, this should not prevent continuous discussion on the uncertainties and unknown factors involved. The scientific debate goes on and KNMI scientists should be able to participate freely in that debate. CKB account-managers within the research department could perhaps help to maintain this delicate equilibrium.

The RC notes and welcomes the role the unit plays in increasing coordination among Dutch climate researchers by contributing to establishing common platforms and defining common projects such as the recent ICES/KIS (or Bsik) project on Climate and Spatial Aspects.

Overall, these various roles raise, however, concern about the small size of the unit. Moreover, the unit so far acts very much responsively and is instrumental in grasping opportunities for collaboration in the Netherlands. The unit's output is, however, essential and highly visible. It will also be increasingly linked to a wider range of KNMI activities:

local and regional scenarios will get more attention, for example; climate data and meteorological data get more interlinked. Therefore the RC recommends that management looks once more at the by itself clear 2008 objectives, as set out in the Plan of Work 2004, in the light of the remarks of the RC about the climate research activities of KNMI (para 15), the broader role the unit might play as part of the 'translational' function of KNMI as a whole towards policy and public awareness (para 15) and the resource requirements.

Annex 1. Remit

Introduction

The questions mentioned below follow from the overall questions to be addressed by the Review Committee (RC), which are as follows:

What is the RC's assessment of the international position of KNMI Research in terms of quality and relevance, what are its core competences, what questions are central in the research strategy of KNMI? In the light of developments to be expected in the next five to ten years in science, technical and observational facilities, as well as in the competitive landscape: is this position sustainable from the point of view of available resources (people, infrastructure, financing), and has KNMI a clear view where it wants to be in five years? Is KNMI as a mission-oriented institute embedded in the right network of national and international, university and non-university partners?

Is the research programme coherent, its implementation – including the use of external resources – efficient, and the potential for synergy exploited? Has the right balance been found between the two functions of KNMI Research: to carry out leading edge research and to support operational services and policy making?

Can the RC identify practical indicators to benchmark KNMI Research's position, and to monitor its evolution?

Questions

Research Strategy

Climate Research

- 1a Is the Research Programme adequate, given the mission of the institute, the present state of the science of climate change and the related (inter)national developments?

Applied Meteorological Research

- 1b Is the Research Programme adequate, given the mission of the institute, the present state of applied meteorological research and the related (inter)national developments?

Seismology

- 1c Are the Research Programme and the Programme on Observations adequate, given the mission of the institute, the present state of the science of seismology, and the related (inter)national developments?

Productivity and quality of research

Climate research

- 2a How do you judge the overall quality of the climate research and development activities, applying international standards?
- 3a How do you judge the overall productivity, applying international standards?
- 4a How do you judge the quality and productivity of the communication about climate change, in particular the policy support and advice to government and society, and the visibility and impact of the research within the IPCC framework?

Applied Meteorological Research

- 2b How do you judge the overall quality of the applied meteorological research and development activities, applying international standards?
- 3b How do you judge the overall productivity, in terms of improvements and extensions to operational meteorology, applying international standards?
- 4b How do you judge the visibility and impact of the applied meteorological research, and the quality of the support offered to users from government, aviation, meteorologists and service providers, and research institutes?

Seismology

- 2c How do you judge the overall quality of the seismology research and observational work, applying international standards?
- 3c How do you judge the overall productivity, applying international standards?
- 4c How do you judge the quality and productivity of the communication about seismology, in particular the policy support and advice to government and society?

Quality of Management and Organisation

- 5 How do you judge the way in which KNMI's research and development activities are organized?
- 6 How do you judge the viability of KNMI's research and development activities, given the existing human, financial, computational and experimental resources?
- 7 How do you judge the extent to which the different research groups take advantage of each other's specific expertises?

External relations

- 8 How do you judge KNMI's national scientific position, its co-operation with related organisations, and its efforts to maintain and improve this position?
- 9 How do you judge KNMI's international scientific position, its co-operation with related organisations, and its impact on the international scientific community?

Climate Research

- 10a How do you judge the Climate Research Department's position within the national and international climate policy community, its relevance for national policy making and its role in the international negotiations?

Applied Meteorological Research

- 10b How do you judge the relations with the external user community of operational meteorological data and knowledge?

Seismology

- 10c How do you judge the relations with the external user community of seismological data and knowledge?

Annex 2. Agenda of the Meeting

In addition to the agenda below, meetings with representatives of young KNMI scientists and the employees' council, as well as the head and deputy-head of the forecasting department have been scheduled.

Monday 12 January 2004

Informal welcome
Dinner

Tuesday 13 January 2004

Welcome by the director of KNMI, introduction to the Climate Research and Seismology Department and the Observations and Modelling Department by the Department Heads

Short presentations by Division Heads:

Climate Analysis
R&D Observations / R&D Climatology
Atmospheric Composition Research
Climate Variability
Atmospheric Research
R&D Numerical Modelling
Oceanographic Research
Seismology

Lunch

1st interview session

Climate Variability (*Anderson, Marshall, Brasseur*)
Atmospheric Research (*Giorgi, Grassl, Feignier*)
R&D Numerical Modelling (*Wergen, Tomson, Battjes*)
R&D Observations/ R&D Climatology (*Jones, Caughy, Hinzen*)

Interview with Head Climate Research and Seismology Department

Interview with Head Observations and Modelling Department

Interview with Director KNMI

Talk with the Deputy Secretary-General, Peter Heij

Evaluation, tomorrow-planning

Dinner

Wednesday 14 January 2004

2nd interview session

Atmospheric Composition Research (*Brasseur, Grassl, Wergen*)

Oceanographic Research (*Marshall, Anderson, Battjes*)

Climate Analysis (*Jones, Tomson, Giorgi*)

Seismology (*Feignier, Hinzen, Caughy*)

Climate Policy Support (*van Egmond, Tindemans*)

Break

Research, operational services and policy making

Discussions between (members of the) Committee and KNMI-employees

Lunch

Internal discussions

Preliminary conclusions

Informal meeting and drink

Annex 3. Members of the Review Committee

Dr Peter Tindemans (Chair) is assisting worldwide governments, international organisations, laboratories and universities with strategic developments, reviews, developing new programmes and facilities, and science, technology and innovation policies. Trained as a theoretical physicist, he was responsible for research and science policy in the Netherlands Ministry of Education, Culture and Science until 1999. He has been chairing the OECD Megascience Forum from 1992 till 1999.

Prof Dr David Anderson is Head of the seasonal forecasting section at the European Centre for Medium-Range Weather Forecasts (ECMWF). He is a former Vice Chairman of the CLIVAR scientific steering group, and Professor of Physics at Oxford University.

Prof Dr Ir Jurjen Anno Battjes is Professor in Fluid Mechanics in the Department of Civil Engineering and Geosciences of the Delft University of Technology. His main research area is free-surface flows and waves. He has acted at several review panels and is currently chairman of an international Review Team for a multi-year study within Rijkswaterstaat (the Dutch government agency responsible for the primary high-water defence works).

Prof Dr Guy Brasseur is Director at the Max Planck Institute for Meteorology in Hamburg, and Scientific Director of the German Climate Computer Center. He is also Chair of the Scientific Committee of the International Geosphere-Biosphere Programme, and President of the Atmospheric Sciences Section of the American Geophysical Union.

Dr Jim Caughey is International Director at the Met Office and is also the manager of the Eumetnet Composite Observing System for Europe. Prior to this he held the posts of Technical Director at the Met Office. He has participated in many international research programmes and committees.

Prof ir Nicolaas D. van Egmond is Director of the Netherlands Environmental Assessment Agency (MNP-RIVM) and part-time Professor on Environmental Sciences at Utrecht University. Prior to his current appointments he has been (among others) Head of the Air Research Laboratory of the National Institute on Health and Environment (RIVM) and in that capacity involved in meteorological research on the dispersion of air pollutants.

Dr Bruno Feignier is Head of the 'Laboratoire de Détection et de Géophysique' at the Commissariat à l'Energie Atomique, France. He is presently also vice-president of the European Seismological Commission and the European-Mediterranean Seismological Centre.

Dr Filippo Giorgi is Head of the Physics of Weather and Climate Group of the Abdus Salam International Centre for Theoretical Physics, Trieste, Italy. He co-authored over 100 peer-reviewed publications in international journals and is an expert in regional climate modelling and climate change research. Giorgi is currently a Vice Chair of the IPCC WGI Bureau.

Prof Dr Hartmut Grassl is a Professor for Meteorology at the University of Hamburg and Director at the Max-Planck-Institute for Meteorology in Hamburg. From 1994 to 1999 he has been Director of the World Climate Research Programme (WCRP) at WMO, Geneva, Switzerland.

PD Dr Klaus-G. Hinzen is Head of the Earthquake Geology Department of the Geological Institute of Cologne University. His main area of research is local earthquake and archaeo-seismology. He is member of the seismology working group of the German Reactor Safety Commission and board member of the German Society of Earthquake Engineering and Structural Dynamics.

Prof Phil D. Jones is Director of the Climatic Research Unit at the University of East Anglia in Norwich, UK. He is on the Review Committee of the Hadley Centre, UK Met Office and a member of the Atmospheric Observation Panel for Climate, which is part of the Global Climate Observing System.

Prof Dr John Marshall, a Professor in the Department of Earth, Atmospheric and Planetary Sciences at the Massachusetts Institute of Technology, is an oceanographer interested in climate and the general circulation of the atmosphere and oceans, which he studies through the development of mathematical and numerical models of key physical and biogeochemical processes. He is Director of MIT's Climate Modeling Initiative.

Mrs Arike Tomson is member of the Board of Directors of the Dutch Institute for Inland Water Management and Waste Water Treatment/RIZA and Head of the Department Water Systems.

Dr Werner Wergen is Head of the data assimilation section and Deputy Head of the Numerical Weather Prediction Department of Deutscher Wetterdienst. Prior to this he was Principal Scientist at the European Centre for Medium-Range Weather Forecasts.

Mr Albert Klein Tank (scientific secretary to the RC) is a senior scientist at KNMI.

Dr Ir Peter Siegmund (scientific secretary to the RC) is a senior scientist at KNMI.