

AMAP Report 2007:5

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Minutes of the AMAP Heads of Delegation Meeting Copenhagen, Denmark, 17–20 September 2007

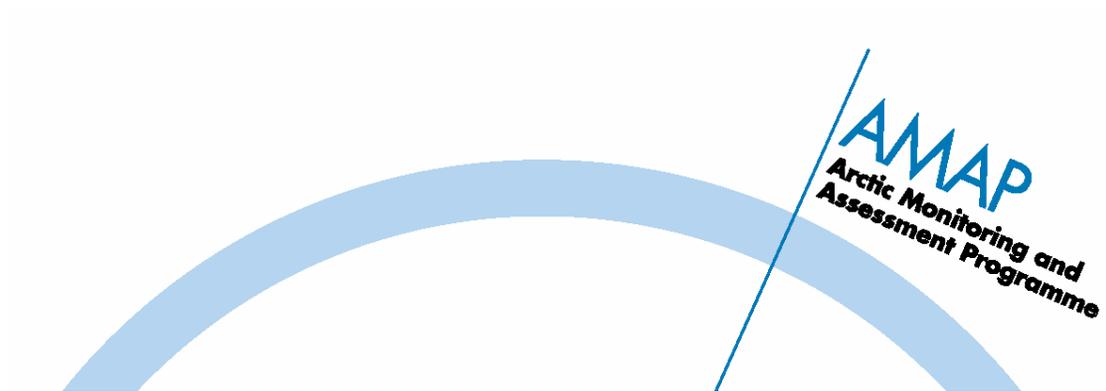


Table of Content

1. Opening of the meeting and practical information	4
2. Approval of the Agenda	4
3. Short report from the Chair and the Secretariat	4
4. The Follow up of ACIA	7
4.2 The AC requested projects	7
4.3 The AMAP projects	8
4.4 Other Issues	9
5. The Oil and Gas Assessment	10
6. The production line for the Oil and Gas reports, Overview and Science	14
7. The presentation of the Overview and Science reports: Communication strategy	14
8. The Financial side of the oil and gas publication	14
9. AMAP-CAFF joint Biodiversity programme and other related issues	14
10. Follow up work from last WG meeting in Hanover	15
11. Follow up from the SAO meeting in April and preparation for November meeting.	15
12. Administrative work	15
13. Next WG meeting.	15
14. Any other Business	16
15. End of Meeting	16

List of Annexes

Annex 1:	Annotated agenda for the AMAP HODs meeting in Copenhagen, September 17-19/20, 2007	17
Annex 2:	Final List of Documents for the AMAP HODs; AMAP CEG and Joint AMAP-CAFF meetings, Copenhagen September 17-20, 2007	21
Annex 3:	Final List of Participants: AMAP HoDs and CEG Meetings, Copenhagen, Denmark, 17 – 19 September 2007	24
Annex 4:	Minutes of the Joint Meeting between AMAP Heads of Delegation (HoDs) and the Climate Expert Group (CEG), Copenhagen, 17–19 September 2007	33
Annex 5:	Arctic Council Cryosphere Project Instructions to Authors	42
Annex 6:	Action List from AMAP HoDs meeting, Copenhagen, 17–20 September 2007	46
Annex 7:	Joint Meeting between AMAP Heads of Delegation and CAFF Board Members Copenhagen, 18 September 2007	48

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1 Opening of the meeting and practical information

The AMAP Chair, John Calder (USA), opened the meeting at 9:15 hrs on 17 September and welcomed the participants, which included the AMAP Heads of Delegation, the CAFF Board members, and members of the AMAP Climate Expert Group (CEG).

The Danish Senior Arctic Official, Mikaela Engell, welcomed participants, noting the high political priority now accorded to the Arctic owing to climate change, which has prompted many political leaders to visit Greenland this year. She considered this meeting very important for the enhanced cooperation between AMAP and CAFF and stressed the need to continue the sound scientific basis for work in the Arctic. She also briefly mentioned a Danish international conference in Greenland to be held in May 2008 with the intention of reaffirming international conventions and agreeing on peaceful cooperation in the Arctic.

All participants introduced themselves, practical information was provided, and the schedule of the meeting was reviewed. After this, CAFF Board members adjourned to another room and the first session of the Joint Meeting between AMAP HoDs and the Climate Expert Group was held.

2 Approval of the Agenda

The agenda was approved without amendment (see Annex 1). The list of documents for the meeting and the list of participants are attached as Annexes 2 and 3, respectively.

3. Short report from the Chair and the Secretariat

John Calder reported that the Arctic Council Secretariat in Tromsø has hired three people to serve as liaisons with the AC WGs: Maria-Victoria Gunnarsdottir for AMAP and ACAP; Tana Lowen Stratton for CAFF and EPPR; and Jesper Hansen for SDWG and PAME.

During its Chairmanship of the Arctic Council, Norway has expressed its wish to emphasize climate issues, oceans management, and adaptation, in the work of the Arctic Council; Arctic Council meetings will therefore focus on these issues. Working Groups will still have an opportunity to give short reports on their overall activities, but most of the SAO meeting will comprise thematic sessions. For the November meeting, these will cover: 1) climate, ACIA follow-up including the Cryosphere Project and other AMAP CEG initiatives; 2) energy, including the key findings from the Oil and Gas Assessment (as presented by the OGA assessment leads), and a report from the Arctic Energy

Summit; 3) the IPY, with a presentation by the Swedish SAO on the recent IPY Joint Committee meeting, and a report from AMAP on how AMAP is engaging other AC WGs in SAON, etc.; 4) human health, including AMAP-SDWG cooperation; 5) oceans; and 6) adaptation, with SDWG issues. Thereafter, the Permanent Participants will make presentations, followed by NGOs, and then there will be a discussion on efficiencies based on a paper by Norway.

John Calder reiterated that the deadline for receipt by the AC of documents for the SAO meeting that need decisions is 12 October, and for other WG input and deliverables 28 October. In order that SAOs can approve the plan to release the results of the OGA at the Arctic Frontiers meeting in January 2008, a document that informs the SAOs that the OGA has been completed and of this planned release needs to be prepared and submitted by the 12 October deadline.

Future SAO meetings have been scheduled as follows:

22–24 April 2008 on Lofoten;

7–9 October 2008 in Longyearbyen;

March 2009, tentative time for the Ministerial meeting.

John Calder reported that the joint meeting of WG Chairs held in Tromsø the previous week had been particularly useful. The fact that it had been a small meeting, with an informal atmosphere and open discussions, meant that cooperation among WGs is now functioning better, as has been the intention for years. The Indigenous Peoples Secretariat had expressed a desire to join the meeting of Chairs, but this has not been supported as it was considered that this might reduce the openness of the meetings.

The main work of the other WGs discussed at the joint meeting of Chairs included:

PAME	Production and delivery of the Arctic Marine Shipping Assessment; plans to revise the oil and gas guidelines (after the OGA is released); a possible state of the environment report for each of the 20 LMEs
SDWG	Adaptation; information communication and technology assessment (led by U.S.); Best Practices on Marine Resource Management; Human Health initiatives (it was agreed that the draft workshop report would not be circulated)
EPPR	Sharing experiences and developing common procedures; mapping initiatives
CAFF	Plans to deliver a CAFF Biodiversity Assessment (currently lacking a lead or funding); change of name of the Circumpolar Biodiversity Monitoring Programme to Arctic Nature Watch
AMAP	Finalisation and delivery of the OGA; AMAP's ACIA follow-up initiatives; coordination work with CAFF

The efficiency of the organization of the Arctic Council was also discussed by WG Chairs, without real outcome. Norway will prepare a discussion paper on this issue for the SAO meeting in November.

In the discussion of the work of other WGs, it was noted that experience with ACAP projects has shown that there has been success in following up on AMAP findings when they concern contaminant problems in Russia, but it appears difficult for some countries to accept any coordinated ACAP activities when AMAP assessments identify pollution sources or problems outside of Russia. The brominated flame retardant project is likely to end because the AMAP and ACAP Phase I inventory activities have shown that the main sources are in the United States and it is difficult to agree any follow-up activities that will reduce or eliminate these sources of BFRs to the Arctic. Similar difficulties exist in relation to the mercury project. If this continues to be the case, it is difficult to see how ACAP's ambition to implement a circumpolar programme of actions to respond to AMAP findings can be realised. Meeting participants that are also members of ACAP noted that ACAP Working Group members have tried to address this issue, but the ACAP activities are heavily influenced by national policies.

Regarding the request from SAOs that a "cluster" approach be applied to human health issues in AC WGs to provide a broader treatment than that currently occurring under individual WGs, John Calder reported that three meetings (held in Oslo, Lofoten, and Ottawa) have been held with SDWG to decide how to handle this issue. Russel Shearer reported that a workshop had been held on this topic in Canada in June, with participation of AMAP representatives. Following this workshop, a discussion paper had been prepared that identified three possible options; however, this paper is skewed toward SDWG and IUCH perspectives and none of the options are optimal for AMAP. It has therefore been agreed that this workshop report will not be circulated. Instead, a small group including AMAP and SDWG representatives will prepare a revised discussion paper which takes a more balanced approach; this paper would be drafted by mid-October to allow time for review by AMAP HODs before being sent to the SDWG and SAOs by the October 28 deadline. Although no decision by SAOs is anticipated at this stage, AMAP HoDs agreed that it is important to ensure that AMAP will continue to play a central role in Arctic Council human health issues, consistent with its mandate and previous work concerning this subject.

In the discussion, it was considered that greater responsibility for human health issues should not be placed on SDWG, which is a project-based group. Any changes that disrupt the work of AMAP on human health, which has been functioning well, has established expertise and funding, and is currently conducting a new updated human health assessment, would be very disadvantageous to the Arctic Council. It would be inappropriate to establish a new expert group on human health outside of this existing framework, particularly a group that might constitute an independent Working Group.

There was concern that the paper from the Canadian workshop would be released and create problems, even though there are a number of unresolved AMAP comments on this paper. It was confirmed that this paper was no longer valid and should be put aside, and that work was now concentrating on drafting the new options paper for the SAO meeting.

4. The Follow up of ACIA

The main report on this item is contained in the Minutes of the Joint Meeting between AMAP HoDs and the Climate Experts Group (CEG) (attached as Annex 4). After the Joint Meeting on 19 September, HoDs concluded their discussions and decisions on several of the points under this agenda item, as recorded below.

4.2 The AC requested projects

(i) The Cryosphere project

Lars-Otto Reiersen reported on the ultimate decisions of CEG based on the discussions at the Joint Meeting with HoDs that morning (19 September). The guiding principles for the cryosphere report are that it will be prepared in three volumes covering: 1) the Greenland ice sheet (lead country, Denmark); 2) sea ice (lead country, Norway); and 3) impacts on the terrestrial cryosphere. The first two volumes will be 100 pages each and the third volume on the terrestrial cryosphere will be divided into four parts of 50 pages each: 1) snow (lead country, Sweden); 2) permafrost (lead country, Sweden); 3) glaciers (lead country to be decided); and 4) hydrology: rivers and lakes (lead country to be decided); these four parts will be developed in conjunction with each other. Only new material will be used and the volumes will be structured so that the first one-third provides an introduction to the science and the latter two-thirds contains a description of the impacts.

It has been agreed that Jim Overland and Vladimir Kattsov will choose the model that is to be used in this project so that all work in the Cryosphere Project will be based on the same model. Jim Overland promised to deliver the results from the first run of this model within six months, i.e., by the end of March 2008.

The first version of the volume on the Greenland ice sheet should be finished in 2009, with the final, updated volume on Greenland and the other volumes ready by 2011/2013, using information deriving from IPY projects. For the Greenland ice sheet volume, work will need to start immediately, with the choice of two to five lead authors, who should be able to meet often; sub-authors will also need to be chosen and funding found for three workshops for all authors and sub-authors, to provide the most productive way of working.

A Project Steering Group of ten to twelve people will be appointed to oversee the process; this group will need international connections with, e.g., CliC, IASC, IPY. The expert group will be nominated over the next month. Recommendations for lead authors should be made to the AMAP Secretariat by 20 October. Thereafter, AMAP HoDs will endorse the lead authors, who will then choose their writing team. Reasonably detailed outlines of the volumes will be needed before requests can be made for the nomination of authors.

HoDs agreed that there should be guidelines for writing so that this project does not expand beyond the agreed scope. The report should not be a textbook! It should not cover

methodology, but should emphasize a presentation and description of the impacts. In addition, a synthesis report will be prepared by a professional writer.

The funding requirements will need to be specified and AMAP will need to provide assistance, particularly from the Nordic Council of Ministers funds. An application is already under way to the GEF/UNEP to seek funding for part of the Russian work on this project.

In terms of ensuring that IPY data would be put into this project, it was reported that a policy for access to and sharing of data has been established and this will be followed. An internet database will be used.

It was agreed that the lead authors should circulate a detailed outline and plans among themselves and prepare a paper for distribution to AMAP HoDs. The plan will then be submitted to SAOs by 28 October. In association with this work after the HoDs meeting, draft instructions for authors were prepared for the Cryosphere project, initially with reference to the Greenland Ice Sheet sub-project; these are attached as Annex 5.

Concerning the ultimate publication of this report, consideration should be given to issuing it on CD-ROM so that interactive graphics can be used.

In concluding the discussion on this topic, the HoDs commended CEG for their very good work on this issue.

4.3 The AMAP projects

(v) State of the Arctic Report on the work and future plans

Options for AMAP to become involved in the annual web-based State of the Arctic report prepared by NOAA (see 2006 report at <http://www.arctic.noaa.gov/soa2006/> and annual reports at <http://www.arctic.noaa.gov/reportcard/>) were discussed and it was decided that the following procedure should be followed:

- 1) CEG should provide suggested themes for the 2008 annual report and AMAP HoDs will review them and decide what to suggest;
- 2) AMAP can nominate potential authors for the articles, although NOAA will make the ultimate choice of authors;
- 3) AMAP will review the draft annual State of the Arctic report before its publication on the web.

Jim Overland agreed to prepare a brief paper for further discussion by AMAP on a proposed potential relationship between AMAP and the State of the Arctic reports.

This State of the Arctic report will also be posted on or available from the AMAP website.

Potential themes for the 2008 report suggested by HoDs include key issues under consideration by CEG, including the Greenland ice sheet, sea ice, black carbon, downscaling, and taking a first look at IPY products.

It was suggested CliC and IAS should also be involved in this report as sponsoring organizations. The ultimate sponsorship of this report still needs to be decided.

(vi) Update of the AMAP Monitoring Programme for Climate and UV

With regard to the results of monitoring ozone, it was reported that CEG has agreed that a small group will prepare a short report containing: 1) an update on the data (showing no expectation of an ozone improvement soon), by Betsy Weatherhead; 2) an update on the understanding, by Betsy Weatherhead and Drew Shindell; and 3) an update on the effects, by Terry Callaghan (terrestrial) and Georg Hansen (aquatic).

It was also noted that the full AMAP protocol for this monitoring has been implemented at Zackenberg and a review of the programme has resulted in the recommendation of some additions to the monitoring protocol, in particular with regard to glaciological monitoring. These will need to be made available for review within AMAP.

(vii) New Technologies for Monitoring and Research that are of interest for AMAP

Based on a presentation by Betsy Weatherhead on the potential use of unmanned aircraft systems (UAS) for monitoring in the Arctic, CEG has agreed that a small group led by Betsy Weatherhead should prepare a letter or a short white paper describing the potential importance of modern technology (e.g., UAS) for observations in the Arctic and detecting changes. This letter will be presented to AMAP HoDs. In addition, the aim is to work toward holding a workshop on aerial (UAS) technology to discuss future applications and protocols. Key points of contact will need to be developed to assure appropriate communication between countries prior to any circum-Arctic flights.

4.4 Other Issues

Black-Carbon

On the basis of a presentation by Jim Hansen concerning the role of black carbon in climate forcing in the Arctic, a small group was formed to discuss the strategy for enhancing awareness of the non-CO₂ forcing of the Arctic climate. Based on the results of a January 2007 workshop and an upcoming workshop at NILU in Norway (www.polarcat.no) to assess the state of knowledge, a presentation of the needs and action items will be prepared for HoDs. Additional results are needed, for example, on black carbon particularly because increased shipping will increase the sources of black carbon in the Arctic.

5. The Oil and Gas Assessment

Simon Wilson reviewed the Oil and Gas Assessment (OGA) activities since the AMAP WG meeting in Hanover and described the current status of the preparation of the OGA reports (AMAP HoDs 2007/5-4). This comprises parallel activities to prepare the five substantive chapters of the scientific report, Chapter 7 which summarises the overall findings and (scientific) recommendations, as well as the OGA Overview report and its Executive Summary.

The draft overview report had been distributed to OGA lead authors, AMAP HoDs, and the Chairs and Executive Secretaries of all Arctic Council Working Groups on 2 August (as both a WORD file of the texts and as a PDF showing the provisional layout) for final comments. As with previous Arctic Council reviews of the draft overview, all parties were requested to coordinate their responses and provide national comments through their AMAP HoDs. On the basis of comments mainly from lead authors (see AMAP HoDs 2007/5-5), the overview report text was revised on 11 September and had been circulated as document AMAP HoDs 2007/5-1.

The latest draft of Chapter 7 of the scientific report (AMAP HoDs 2007/5-3) had been received just prior to the meeting; scientific recommendations are still being finalised. Consequently, work on the preparation of the Executive Summary (including recommendations) was still incomplete.

Simon Wilson noted that there were still some outstanding issues in the science chapters that need to be resolved. These are mostly small and do not affect Chapter 7, the Overview or the Executive Summary; however, some issues were more important and the experts responsible for these parts of the science were working on the questions so that these could hopefully be resolved before the end of the meeting.

Subject to these outstanding questions, most lead authors of the OGA had registered their 'sign-off' of the Overview, reflecting that in their opinion the Overview was a good summary, accurately reflected the science as presented in their chapters, and was consistent with their findings.

Current plans envisage that the OGA will be released at the Arctic Frontiers conference in January 2008; to ensure that it will be available for this conference, the Overview report needs to be finalised and ready for printing in November 2007.

Simon Wilson described the current status of the science chapters as follows: Chapter 3 has been edited and the layout completed; Chapter 5 is being edited; Chapter 4 has been edited but there are some significant gaps that need to be addressed so it is being further revised by the lead authors (which will require a second round of editing); Chapter 2 has been restructured and is essentially ready for hand-over for editing once the section on Russia has been similarly restructured; Chapter 7 has been revised and will hopefully be finalised reasonably soon; and Chapter 6 is still being drafted.

In the discussion, the Chair reported that, as far as the U.S. is concerned, the overview report cannot be released until the science chapters have been completed. At the next SAO meeting at the end of November, AMAP will therefore need to present not only an overview of the key findings of the assessment (and indicate that the overview will be officially released at the end of January), but also a CD-ROM with the completed drafts of the substantive chapters of the science report. These can be drafts of the chapters in unedited form, but need to be complete in the sense that they should contain all the information that will ultimately appear in the scientific report.

Hein Rune Skjoldal, co-lead for the OGA, stated that this assessment had been a more difficult project than he had originally anticipated. He had underestimated the amount of work required, particularly regarding the projections of ecosystem vulnerability to an oil spill, and had overestimated the number of people who would contribute to the work.

In terms of the status of Chapter 7, Hein Rune Skjoldal stated that there are still three issues that need to be resolved:

1) the magnitude of the sources of input for the petroleum budget: where there are discrepancies in different parts of the report regarding the budget, particularly for produced water contributions and natural seeps; there are also problems with estimates of amounts in Russian rivers and in relation to oil spills;

2) the amount of “local” pollution: it was originally planned that the assessment would identify individual point sources and indicate them on maps for each field, together with concentration data and information on concentration gradients that may cause biological effects; however, the only reasonably complete information available is from Norway, and more examples of local pollution are needed to be able to provide a useful estimate of the extent of local pollution—this is considered a major weakness in the assessment and attempts are continuing to compile information for additional examples;

3) whether there are population effects in the affected biota: population-level effects are very difficult to detect, and the impact of oil and gas activities is difficult to distinguish from those of other factors, including natural variability; there is currently some disagreement among the authors on what constitutes a population-level effect, which can probably be resolved through a better definition of this type of effect, after which the chapters need to be made consistent with the definition(s).

Chapter 7 is structured as according to ten main scientific findings, with the conclusions presented first as findings followed by the supporting information for the findings. The ten findings cover scientific issues including sources and concentrations of petroleum hydrocarbons, impacts on land and in the marine environment, and implications for human health; also included are findings on oil spill response, technology and best practice, governance, and socio-economic impacts of oil and gas activities.

Hein Rune Skjoldal stated that, in his view, the introduction to the Overview report over-emphasised the issue of toxicity, whereas the issues of physical disturbance and habitat

fragmentation were under-emphasised. He therefore considered that the introduction to the Overview report needed to be amended to improve the balance in the presentation of these issues. He noted that there has been a perception that the Overview report is industry friendly, but a balanced approach has been taken to the subject as a whole.

As lead author of Chapter 6, Hein Rune Skjoldal noted that part of the work outstanding on Chapter 6 comprised the incorporation of some new LME descriptions that were being prepared by Canadian experts in response to requests made during the AMAP WG meeting in Hanover. Additional contributions to Chapter 6 had also been received from Russia. Although not all information requested for Chapter 6 had been provided, the remaining gaps were not considered significant and would not affect Chapter 7 or the Overview report. No response had, however, been received from Russia on requests relating to Chapter 2; consequently, the Chapter 2 authors faced a difficult task to interpret some of the information provided in early drafts.

The HoDs then conducted a line-by-line review of the Overview report and several comments and amendments were made to the text. Concerning the statement that the other Arctic Council Working Groups had reviewed and approved the overview report, it was pointed out that the agreement is that OGA documents are to be approved at national level. The draft overview report had been distributed to the Chairs and Executive Secretaries of all the AC WGs on 2 August with the request that they arrange for (national) comments to be returned through the AMAP HoDs by 2 September. Although only a few comments had been received, it was also noted that this was the second such round, as a similar process had been employed prior to the Hanover meeting, so a lack of additional major comments was not unexpected and adequate time has been given for comment.

In the discussion of the overview report, Yngve Brodin reported that the Swedish SAO was expecting a conclusion/recommendation reflecting consideration of the impact of the burning of the oil and gas extracted in the Arctic on global climate change, including the impact (on climate) due to increased Arctic transport of oil by ships.

However, it was pointed out that, in planning the OGA, it had been agreed that the effects of climate change on Arctic oil and gas activities (and vice versa) would be largely covered through reference to the ACIA report, or dealt with through ACIA follow-up activities. This is reflected in a short section on climate change influences in the overview report. The impact of the burning of the Arctic oil and gas on climate change has therefore not been assessed as part of the OGA, although it is recommended that such an assessment be carried out in the future. Similarly, it had been decided that the OGA would not address issues related to radionuclides, POPs, heavy metals or other issues if these had already been adequately covered in previous AMAP assessments. In connection with shipping of oil, it was noted that PAME is undertaking an assessment of marine transport in the Arctic, and this may cover the impacts of this activity on climate.

To address the Swedish comments, HoDs agreed that there should be a statement in Chapter 1 of the scientific report stating that the OGA does not include potential impacts

of increased transportation or the consequences of burning oil and gas produced in the Arctic on climate, and that the influence of climate change on Arctic oil and gas activities was covered in the ACIA report.

Noting a statement in Chapter 7 that under a scenario where 2040 is assumed to be the time of maximum Arctic oil and gas production half of the petroleum hydrocarbons entering the Arctic could be due to oil and gas activities, AMAP HoDs agreed that this scenario estimate should be reflected in the overview report.

In terms of the petroleum budget issues, it was noted that Dave Thomas is trying to resolve outstanding questions. Together with the OGA overview author, Henry Huntington, he had prepared a draft text for a box explaining the assumptions employed in developing the budget (especially those concerning natural seeps and produced water) to provide a clearer context for statements based on this component of the OGA. In addressing the questions on the budget, the data for oil hydrocarbons fluxes in Russian rivers had been re-checked revealing an error in a graphic that appears in the PTS project final report; this report therefore needs to be corrected. The text in several places in the overview will be checked following any budget re-calculations.

In connection with the concern on balance in the introduction of the overview report expressed by Hein Rune Skjoldal, discussions focussed on how this could be addressed without disrupting the layout concept of the report and avoiding un-necessary repetition. A compromise solution was eventually found whereby texts on toxicology would be relocated from the introduction to Part II of the overview, and additional detail added to the information presented on physical disturbance and habitat fragmentation. It was agreed that these changes would be introduced and a revised version of the overview report circulated to HoDs (and other Arctic Council Working Groups and PPs) as soon as possible after the meeting.

A small drafting group comprising Ruth McKechnie, Helgi Jensson, Per Dovle, Hein-Rune Skjoldal and Simon Wilson proposed a number of revisions to the draft of the Executive Summary to the OGA Overview report; however, it was not possible to complete this task as recommendations from the scientific assessment were not available and authors were still submitting suggestions. HoDs considered some of the proposed revisions; however it was not possible to complete this review in the time available at the meeting. It was therefore agreed that the AMAP Board would continue to redraft the Executive Summary and distribute it as soon as possible after the meeting (by 8 October) with a short period (two weeks) for comments. The Executive Summary will then need to be approved by correspondence. Due to the deadline for submission of documents to the SAO meeting, this work would need to be completed before the end of October.

HoDs agreed that there should be a HoD teleconference in mid-October to review the status of the OGA reports at that time, to further consider the Executive Summary and to agree to the presentation of the OGA to the SAOs. The Secretariat will arrange the teleconference. The Secretariat will also distribute a reminder of the cost estimates for printing the OGA overview and scientific background reports and repeat the call to HoDs

to provide preliminary orders for copies of the reports. This issue can be included in the teleconference, if needed.

6. The production line for the Oil and Gas reports, Overview and Science

This agenda item was not separately addressed.

7. The presentation of the Overview and Science reports: Communication strategy

John Calder stated that the aim is to release the Oil and Gas Assessment report at the Arctic Frontier Symposium on 21–25 January 2008 in Tromsø. For Russia, it has been proposed that the OGA report be presented at the Russian Offshore 2008 meeting in Moscow, 6-7 February 2008. No option for the presentation of this report in North America has yet been considered.

Owing to a lack of time, there was no actual discussion of this issue at the meeting.

8. The Financial side of the oil and gas publication

This agenda item was not addressed. The call for advance orders of copies of the reports will be re-circulated by the Secretariat (see agenda item 5).

9. AMAP-CAFF joint Biodiversity programme and other related issues

John Calder introduced the draft Green Paper on a coordination of AMAP-CAFF monitoring efforts; this paper will not be published but needs to be agreed on by all AMAP and CAFF HoDs. There is also a need to review a list of projects and choose a small number to serve as pilot projects under this new cooperation. The projects should provide more integrated monitoring to be able to understand links between physical conditions and biology. A report on the results of the projects chosen will need to be presented on a regular basis. John Calder stated that all delegations will have the opportunity to present projects at the Joint AMAP-CAFF meeting the following day, but projects do not need to be nominated during this meeting; nominations can also be made at a later time.

In the discussion of the Green Paper, questions were raised concerning the communication of data from these projects. It was noted that there are no specific plans for data communication, but objective 2 of the coordinated monitoring effort is to achieve more cost-effective collection and storage of data and a better use of the data collected in assessments and research. Thus, a data management plan should be agreed. In addition, it was suggested that the AMAP template for reporting on projects be used.

After discussion, AMAP HoDs agreed to the Green Paper and decided that the criteria for including projects under this cooperation should be: 1) the project is already receiving funding; 2) the project has a long-term perspective; and 3) the project meets both AMAP and CAFF objectives. AMAP will offer the AMAP Project Directory for reporting on the projects under this cooperation.

At the Joint Meeting between AMAP HoDs and CAFF Board Members on 18 September, national presentations of potential projects were reviewed and the meeting agreed on an outline of the types of projects to be included in the coordinated AMAP-CAFF monitoring effort. A number of specific projects were identified for inclusion in this programme, together with a partial list of contacts for each project. This list needs to be finalized so that it can be included in a paper on this pilot project for distribution to SAOs on 28 October; therefore, AMAP HoDs and CAFF Board Members were requested to send their final nominations to the AMAP and CAFF Secretariats by 15 October, who will then prepare the paper for the November SAO meeting. It was also agreed that a 2-page report on each project would be prepared by the identified contact person prior to the April 2007 SAO meeting.

10. Follow up work from last WG meeting in Hanover

There was no discussion of this agenda item specifically; a relevant topic—better coordination of the health work within the Arctic Council WGs and a paper that has been prepared on this topic—was covered under Agenda Item 3, above.

11. Follow up from the SAO meeting in April and preparation for November meeting.

Information on the topics to be covered in the November 2007 SAO meeting was provided under Agenda Item 3.

Several topics for inclusion in the AMAP report to SAOs were identified during this meeting, including the OGA overview report and the main results of the Oil and Gas Assessment and the plans for the cryosphere project.

12. Administrative work

Canada delivered a new NIP and Russia provided a progress report on its work, but there was no time for discussion of these or other issues under this agenda item.

13. Next WG meeting.

Canada presented an offer to host the next meeting of the WG; the dates and venue will be decided later.

14. Any other Business

This agenda item was not addressed.

15. End of Meeting

An Action List containing actions agreed at the meeting is attached as Annex 6.

The Chair, John Calder, thanked the participants and closed the meeting at 19:00 hrs on Wednesday, 19 September.

Annex 1: Annotated agenda for the AMAP HODs meeting in Copenhagen, September 17-19/20, 2007

- 1. Opening of the meeting and practical information.**
- 2. Approval of the Agenda.**
- 3. Short report from the Chair and the Secretariat.**
- 4. The Follow up of ACIA (This agenda item may also be the bases for the CEG work)**

At the beginning of the meeting the HoDs are requested to present special information related to the ACIA follow up that might be of interest for the Climate Expert Group (CEG) before they start their work. Later in the meeting the CEG will report back to the HoDs on the progress made and proposals for follow up.

The AC requested projects

The **Cryosphere project**. Representatives for the Lead countries (Denmark, Norway and Sweden) and the Secretariat will present the status for the three sub-projects and the Outline paper. After discussions among the CEG an updated outline, list of contents and implementation plan will be presented to HoDs and after the meeting it will be presented to the SAO meeting in November for their consideration.

The **SAON work**. The Secretariat will present the status for the project and the plans for the workshops in Stockholm in November and the follow up workshops planned for Canada and Finland during 2008. The AMAP Secretariat has implemented a project, named AKUFO for the Nordic Council of Ministers, and the results that are great relevance for SAON and AMAP will be presented by Odd Rogne.

The AMAP projects:

The lead person or his designated expert will be called upon to give a status for the projects.

The Carbon Flux report, Dave McGuire or John Walsh.

Downscaling – report from workshop in Oslo and plans for follow up; Inger Hanssen-Bauer.

Re-modelling – report on selection of the best model and re-modelling progress. Jim Overland & Vladimir Kattsov.

Summary of IPCC Arctic Chapters – initiation of the work. John Walsh
State of the Arctic Report on the work and future plans. Jim Overland.

Update of the AMAP Monitoring Programme for Climate and UV, any proposals for update and improvements are welcome.

New Technology for Monitoring and Research that are of interest for AMAP
The US will present a proposal regarding the use of unmanned aircrafts. Betsy Weatherhead.

Other Issues of Concern

Black Carbon, a presentation regarding the latest scientific observations and modelling results will be presented by Jim Hansen. The CEG and HoDs may prepare a proposal to the SAO meeting in November calling on a special work on this issue.

IPY related climate projects that may contribute to the work in progress, how to secure a close cooperation and exchange of information and data storage.

HoDs and CEG members are invited to give short presentation of new issues of concern or new results and observations that are of interest for AMAPs work related to Climate.

5. The Oil & Gas Assessment

Status for the **Scientific report**. A short presentation will be given regarding the status for the final work with the drafting of the Science report.

Final approval of the **Overview report and Conclusions and Recommendations**
The last draft has been circulated to AMAP HoDs and all the AC WG Chairs and Secretariats for final comments. To avoid presentation of conflicting National comments in different AC WGs, all comments have been asked to be coordinated through the AMAP HoDs.

In the discussion of the Overview report - chapter by chapter, the chair may establish ad-hoc drafting group to solve any proposals for re-drafting of the text.

6. The production line for the Oil and Gas reports, Overview and Science.

The Secretariat will give a presentation regarding the status for work on graphics, layout, etc. The HoDs are called upon to nominate any companies that we may contact for the printing of the reports. We will then circulate a call for offer to print.

The HoDs are kindly requested to present their preliminary national order of Scientific and Overview reports. The Oil and Gas reports should be of great interest for many organizations and companies outside the governmental structure. Please feel free to contact non governmental organizations and companies (oil and gas, etc) that might be interested in ordering reports, or hand over addresses to the AMAP Secretariat so we may do the contact.

7. The presentation of the Overview and Science reports. Communication strategy.

The Secretariat as followed up the discussion in Hanover and looked for three options to present the scientific results from the Oil and Gas Assessment.

For Europe, the Arctic Frontier Symposium in Tromsø, January 21-25 has been chosen and the status for the preparation will be presented. AMAP has joined the organizing committee, and the AMAP logo will therefore be on the front of the programme. We kindly ask the HoDs to see if they could find some financial support to this arrangement. This may help participation of experts, indigenous people, technical work etc.

For Russia, we will present a proposal to do the presentation at the Russian Offshore 2008 meeting in Moscow, February 6-7, 2008.

For North America, we are still looking for a good option. The HoDs and others are called upon to present interesting events where the results might be presented.

For the presentation of the Overview report the Secretariat is awaiting an input from the SAO Chair, to learn if the Chair would like to have one event before Christmas, or to leave the presentation until the Arctic Frontier in January.

HoDs and OGA Lead Authors are called upon to present any good ideas for the dissemination of the reports, media events, etc.

The Chair may establish an ad hoc drafting group to prepare a press release that may function as bases for you when you prepare your national press releases.

8. The Financial side of the oil and gas production.

When we know the preliminary order of reports, we will calculate the final price per copy. Any extra costs and how it might be covered will be presented.

9. AMAP CAFF joint Biodiversity programme and other related issues.

The intention is to agree on a final text regarding the cooperation and national implementation strategy and to present this text to the SAO meeting. The Chairs of AMAP and CAFF will present a draft paper prior to the meeting

10. Follow up work from last WG meeting in Hanover

There has been an initiative to achieve a better coordination of the health work within the AC and between AC and other relevant international bodies, e.g. the Barents cooperation. In connection to this work there is a wish to improve the visibility of the health work under the Arctic Council. A paper has been under preparation over the summer. Drafting meetings have been held in Oslo, Lofoten, Banff and Ottawa. The report will be presented to you for your consideration.

For the preparation of the new assessment on Mercury there has been taken an initiative to establish a joint cooperation between UNEP, UNECE and AMAP to achieve a cost efficient cooperation on this issue since will three organizations have been called upon to produce more or less the same type of reports over the coming years. A LoU between AMAP and UNEP has been prepared and will be

presented. There has also been initiated discussion the Secretariat, UNEP and the Stockholm convention secretariat regarding a formalized cooperation. The status for these cooperation initiatives and preparation of reports will be presented.

Some other issues will also be covered.

11. Follow up from the SAO meeting in April and preparation for November meeting.

A 2 page report will be presented to the SAO Chair by August 28. The HoDs may present adjustments to the report.

12. Administrative work

The HoDs are called upon to present updates of their:

National Implementation Plans (NIPs),
AMAP Project Directory (AMAP-PD) and
Reporting of data to the AMAP Thematic Data Centres (TDCs), etc.

The Secretariat will give short update on the work related to the AMAP assessments under preparation:

POPs, Radioactivity, Human health, Mercury, Combined Effects, etc.

13. Next WG meeting.

Any proposals for hosting the next WG are welcomed.

14. Any other Business

HoDs are welcome to present any issues that might be of interest for the others.

15. End of Meeting

Annex 2: Final List of Documents for the AMAP HODs; AMAP CEG and Joint AMAP-CAFF meetings, Copenhagen September 17-20, 2007

AMAP HoDs 2007/2-3
Version 17 September, 2007

AMAP Ref	Title	Distributed/Notes
AMAP HoDs Meeting		
AMAP HoDs 2007/1-1	Draft List of Participants: AMAP HoDs and AMAP Climate Expert Group meetings, Copenhagen, Denmark, 17–20 September 2007	12/9
AMAP HoDs 2007/2-1	Draft annotated agenda for the AMAP HODs meeting, Copenhagen September 17-9/20, 2007	12/9
AMAP HoDs 2007/2-2	Draft Time schedule for the AMAP HODs; AMAP CEG and Joint AMAP-CAFF meetings, Copenhagen, 17–20 September 2007	12/9
AMAP HoDs 2007/2-3	Provisional List of Documents for the AMAP HODs; AMAP CEG and Joint AMAP-CAFF meetings, Copenhagen September 17-20, 2007	14/9
AMAP HoDs 2007/5-1	Revised Draft texts of the OGA Overview Report	12/9
AMAP HoDs 2007/5-2	Revised Draft texts of the OGA Overview Report – Executive Summary	[to be developed at the meeting]
AMAP HoDs 2007/5-3	OGA Science Report – Chapter 7 – 14 September version	[not yet received]
AMAP HoDs 2007/10-1	Sustainable Development Working Group (SDWG)/Arctic Monitoring and Assessment Program (AMAP) Human Health Workshop Discussion Paper	12/9
AMAP HoDs 2007/10-2	Draft Appendix to AMAP HoDs 2007/10-1: Arctic Monitoring and Assessment Programme: Evolution, Role and Mandate vis-à-vis human health.	12/9
AMAP HoDs 2007/10-3	List of Actions agreed at the 21st AMAP WG, Hanover, New Hampshire, USA, March 12-14, 2007 (Annex 4 to WG21 Minutes)	12/9
AMAP HoDs 2007/12-1	Canadian National Implementation Plan for Contaminants under AMAP 2007/08	12/9

AMAP Ref	Title	Distributed/Notes
AMAP HoDs 2007/12-2	AMAP Mercury Assessment Meeting, 29-31 October 2007: Responses to invitation and meeting announcement set out 25 June 2007	12/9 [distributed document was mislabelled 12-1]
AMAP HoDs 2007/5-4	Status for OGA Science Report	At meeting
-	Meeting Schedule 2007	At meeting
AMAP HoDs 2007/5-5	Distribution of OGA Overview Documents and Receipt of Comments	At Meeting
AMAP-CAFF Joint Meeting		
AMAP-CAFF 2007/9-1	Draft Agenda for the Joint meeting between AMAP HoDs and CAFF Country Board Members	12/9
AMAP-CAFF 2007/9-2	Green Paper on AMAP-CAFF Coordinated Monitoring Effort	12/9
AMAP-CAFF 2007/9-3	Summary of Country Project Lists as submitted for inclusion in the JMP	12/9
AMAP-CAFF 2007/9-4	Materials of the Russian Federation for the CAFF and AMAP meeting on the Joint Monitoring Programme	12/9
AMAP CEG Meeting		
AMAP CEG 2007/4.0/1	Draft annotated agenda for the AMAP CEG meeting, Copenhagen September 17-9/20, 2007	12/9
AMAP CEG 2007/4.0/2	Draft timetable for the AMAP CEG group, Copenhagen, 17-19 September	12/9
AMAP CEG 2007/4.1/1	Synthesis of Input Concerning ACIA Follow-on Assessment	12/9
AMAP CEG 2007/4.2.i/1	Arctic Council Cryosphere Project: Sub-project 2: Greenland's Ice Sheet. Draft Outline of Contents	12/9
AMAP CEG 2007/4.2.i/2	Arctic Council Cryosphere Project: Sub-project 2: Status Report on Greenland's Ice Sheet. Draft Outline of timeframe	12/9
AMAP CEG 2007/4.2.i/3	Arctic Council Chryosphere project. Draft Project Outline. Comments from IASC	14/9

AMAP Ref	Title	Distributed/Notes
AMAP CEG 2007/4.2.i/4	Arctic Council Project "Cryosphere": Sub-project 2: Arctic Sea Ice in a Changing Climate	14/9
AMAP CEG 2007/4.2.i/5	Comments to draft 1.5, AC cryosphere sea ice description and comments on what was taken into account in the draft 2.0 update	[will be introduced at the meeting]
AMAP CEG 2007/4.2.i/6	Suggestions for an International Project Group connected to the Arctic Council Cryosphere project, part 2 sea ice (not confirmed)	[will be introduced at the meeting]
AMAP CEG 2007/4.2.ii/1	SAON Workshop (Stockholm, November 12-14 2007) - Announcement	12/9
AMAP CEG 2007/4.2.ii/2	SAON Workshop (Stockholm, November 12-14 2007) - Announcement text	12/9
AMAP CEG 2007/4.2.ii/3	Sustained Arctic Observing Networks – Initiating Group (SAON-IG)	12/9
AMAP CEG 2007/4.2.ii/4	SAON – Organizational Diagram (ppt file)	12/9
AMAP CEG 2007/4.3.ii/1	Pan-Arctic Downscaling of Climate Model Output	12/9 [distributed document was mislabelled 4.2.ii/1]
AMAP CEG 2007/4.3.ii/2	Downscaling climate and impacts in the Arctic - web site	12/9
AMAP CEG 2007/4.3.iv/1	Synthesis of Post-ACIA Model Projections for the Arctic and Related Arctic Information from the IPCC 4th Assessment	12/9 [distributed document was mislabelled 4.2.iv/1]
AMAP CEG 2007/4.3.vii/1	Unmanned Aircraft for Environmental Monitoring In support of The Arctic Monitoring and Assessment Programme	12/9
AMAP CEG 2007/4.4/1	Present-day climate forcing and response from black carbon in snow	12/9
AMAP CEG 2007/4.4/2	Pan-Arctic enhancements of light absorbing aerosol concentrations due to North American boreal forest fires during summer 2004	12/9

Annex 3: Final List of Participants: AMAP HoDs and CEG Meetings, Copenhagen, Denmark, 17 – 19 September 2007

Country	First name	Last name	Institute name	Mailing address	Direct phone	Direct fax	e-mail	Institute phone	Institute fax	Will attend meeting:
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Annex 4: Minutes of the Joint Meeting between AMAP Heads of Delegation (HoDs) and the Climate Expert Group (CEG), Copenhagen, 17–19 September 2007

4.0 Introduction and Approval of the Agenda

The meeting was chaired by the Chair of the Climate Expert Group, John Walsh (USA), and followed Agenda Item 4 of the AMAP Heads of Delegation (HoDs) meeting. The first part of the meeting was held on the morning of 17 September and covered presentations on the status of ongoing work and proposals for new projects and activities. Thereafter, the CEG and AMAP HoDs met separately until the morning of 19 September, when CEG informed AMAP HoDs on the outcome of its discussions on the proposed projects and activities. The minutes of these two portions of the joint meeting are reported here according to agenda item, with the presentations and discussions on 17 September in normal font and *the results of discussion on 19 September and ultimate decisions in italics*.

4.1 The Follow-up of ACIA

There was no specific discussion of this issue as the entire meeting was essentially a follow-up of ACIA.

4.2 The AC-requested projects

(i) The Cryosphere projects

Greenland Project: Dorthe Dahl Jensen described results concerning the Greenland ice sheet. The contribution to sea level rise from the Greenland ice sheet has increased over the past seven years, doubling over the previous period. As the climate warms, there is more snowfall in central Greenland, but a greater loss near the coasts. The ice sheet currently loses 133 km³ per year, based on estimates from the GRACE satellite. The ice stream at Jakobshavn has retreated rapidly since 2000. The melt area on the Greenland ice sheet has increased markedly and the melting season is now one month longer. One large gap in knowledge is the reaction time for climate change and for modelling the mass balance of the ice. Based on this introduction, she provided a proposed outline for the sections in a chapter to be prepared on the Greenland ice sheet, with Denmark as the lead country.

Sea Ice Project: Sebastian Gerland described a proposed outline for a chapter on Arctic sea ice in a changing climate. He noted that the changes in ice thickness and extent have been very rapid in recent years. The chapter will cover the changes in extent of Arctic sea ice, for which there are good data, as well as changes in the thickness of the sea ice, for which the data are unfortunately inadequate. Feedback processes, including albedo feedback from different surfaces at different times, and human impacts on sea ice will also be covered. Ecosystem consequences of these changes will be described as sea ice is an important part of the Arctic ecosystem. Socio-economic consequences, such as in

relation to ship traffic and possible routes, indigenous peoples, and extreme weather events, will also be included in this chapter. Norway will serve as lead country on this chapter.

Snow cover and permafrost: Terry Callaghan described the plans for snow cover and permafrost, which he suggested should be covered in two separate chapters.

Snow cover is a dominant feature of the Arctic landscape which controls many processes: physical (including serving as an insulator), chemical, and biological, such as determining the growing period and providing protection to biota. There is also a strong relationship between snow and human activities. However, there are very poor data on snow, particularly in the Arctic. After an overall description of the role of snow in Arctic processes, the chapter will focus on a description of the impacts of changing snow cover on physical and ecological processes and on socio-economics.

Permafrost affects a number of processes including physical and hydrological processes, as well as having socio-economic impacts. The proposed outline for this chapter was described.

Terry Callaghan stated that funding was being sought for Sweden to take the lead in the preparation of both of these chapters.

In the overall discussion of the chapters described for the cryosphere project, it was proposed that there be interlinkages between all of the chapters and that a short (e.g., 30-page) report be prepared to bring together and summarize the information contained in these chapters.

It was agreed that all work in the Cryosphere Project should be based on the same model. Jim Overland and Vladimir Kattsov will choose the model that is to be used in this project. Jim Overland promised to deliver the results from the first run of this model within six months, i.e., by the end of March 2008.

At the Joint Meeting on 19 September, CEG reported that all groups had met and enhanced the outlines of their respective chapters, considered the possible composition of sub-project teams, discussed the extent to which attribution will be dealt with in their chapters, and identified ongoing activities that could provide information.

There was considerable further discussion on the contents of the chapters, particularly on how to cover terrestrial and hydrological issues: snow, permafrost, glaciers, lakes, and rivers. A number of proposals for the treatment of this material were made, which were considered by a small group who prepared a definitive proposal.

The CEG ultimately decided that the cryosphere report will be prepared in three volumes covering: 1) the Greenland ice sheet (lead country, Denmark); 2) sea ice (lead country, Norway); and 3) impacts on the terrestrial cryosphere. The first two volumes will be 100 pages each and the third volume on the terrestrial cryosphere will be divided into four

parts of 50 pages each: 1) snow (lead country, Sweden); 2) permafrost (lead country, Sweden); 3) glaciers (lead country to be decided); and 4) hydrology: rivers and lakes (lead country to be decided); these four parts will be developed in conjunction with each other. Only new material will be used and the volumes will be structured so that the first one-third provides an introduction to the science and the latter two-thirds contains a description of the impacts.

The optimal time frame is to conduct the analyses from 2009 to 2011 so that the results can be incorporated into the next IPCC report. The final volumes should be available by 2011/2013.

It was also decided that there should be a synthesis chapter, although its contents and length have not yet been determined.

(ii) The SAON work

Odd Rogne described the current work on the development of a Sustained Arctic Observing Network (SAON). The purpose is to develop a set of recommendations to build a sustained cooperation for the collection of Arctic data, collaboration, communication, and data sharing. For this, information is needed on current observing sites, systems, and networks, gaps in coverage, and access to the data.

Three workshops will be held to develop this network, with the venues in: 1) Stockholm in November 2007, 2) Alberta, Canada in spring 2008, and 3) Helsinki in autumn 2008. The Stockholm workshop will focus on user needs in a broad sense.

4.3 The AMAP projects

(i) The Carbon Flux report

John Walsh reported that a workshop on the Arctic carbon budget, held in Seattle, WA in February 2007 with 40 participants, discussed this important issue. Estimates of fluxes and stocks of carbon in the Arctic were considered and a report containing the results has been prepared. It is currently under review and will be submitted for publication as a review paper by the end of this year.

This work is on track and the report will be ready in December 2007.

(ii) Downscaling

Inger Hanssen-Bauer summarized the outcome of a workshop on downscaling held in Oslo based on the need for local impact assessments that had been identified in the ACIA report. The workshop, with 24 participants, determined that there is a further need for GCMs and RCMs, but that adequate statistical methods are available. A systematic comparison of results using different methods should be made based on data from key sites with time series of 20 to 30 years. AMAP expertise should be consulted for

downscaling. This work can be conducted either as a project or, more probably, as a coordination of activities. An EU project CECILIA currently being conducted in central Europe is relevant. Bob Corell has also proposed a very large Arctic project with a 25- to 40-year plan.

In the discussion, it was stated that some downscaling results for the Arctic should be made available for the next IPCC report. It was proposed that IPY projects should be checked for their relevance and those involved in downscaling should be conducted under a pan-Arctic umbrella.

In the discussion, it was pointed out that at least two cryosphere projects can use information from this downscaling work. The coordinating of downscaling activity was seen as advantageous and an interface should be established with UNEP activity. The possibility of private sector sponsorship should also be investigated.

Noting that downscaling variables, locations, and temporal resolution will differ according to geographical area, it was decided that a sub-project should be established to formulate the needs in relation to downscaling.

(iii) Re-modelling: selection of the best model and re-modelling progress

Jim Overland reported that the IPCC report used 18 to 32 modelling groups and often simply averaged all their results for projections. A more thorough analysis of the results of the individual models is needed, as some results were outliers. Under this re-modelling project, a more thorough evaluation will be conducted of the various models, with the aim of completing the work before the next ACIA report. The work should aim to increase confidence in climate projections for ACIA by developing criteria for evaluating the models and reducing outliers. This should be conducted under a sub-group of CEG, with Vladimir Kattsov nominated to lead the sub-group.

In the discussion, it was pointed out that this work will be applicable to dynamical downscaling, used by Denmark for Greenland, as well as for statistical downscaling, as applied in regional activity in Siberia, Greenland, and Alaska.

It was agreed that this activity should continue to evolve, with the Cryosphere Project as an early “customer”. The present AMAP group (Overland, Walsh, Kattsov) should consider including others from the climate modelling community (Bjerknes Center, Norway, ECMWF or Hadley Centre, Canadian Climate Center, NCAR, GFDL). The workshop in early 2008 was considered a possible forum for bringing in new groups.

In the discussion, it was stated that it was important to include some of the major centers in this cooperation so that better results can be obtained for the Arctic. The last IPCC report averaged the results from all models, but next time the best models will be selected and the IPCC would like more evaluation of the performance of the models. In this regard, it was suggested that a list be made of IPY projects that are using relevant models.

(iv) Summary of IPCC Arctic Chapters

John Walsh indicated that he was interested in providing a short compilation, synthesis, and distillation of the Arctic parts of the three IPCC reports. He had identified a small group of scientists and a potential source of funding, but there was a need for further discussion of this possibility.

The CEG decided that there was no need for this activity. It was recommended that this be absorbed into or replaced by the model evaluation/selection project and the State of the Arctic Report.

(v) State of the Arctic Report on the work and future plans

Jim Overland stated that the NOAA State of the Arctic Annual Report was published in October 2006 (<http://www.arctic.noaa.gov/soa2006/>) in hard copy to provide an update of some of the time series in the ACIA report. This report was considered relatively accessible by a wide range of scientists, policymakers, and the public. This year a web-based Arctic Report Card 2007 is being prepared, with six themes covered including a section on Greenland and one on biology. It is currently under peer review and will be posted on the website in October (<http://www.arctic.noaa.gov/reportcard/>). Future annual report cards will continue to be web-based and cover approximately six themes that have been chosen to highlight important issues of the year. He offered AMAP a role in the decisions on and production of these annual reports, if AMAP were interested.

It was agreed that CEG should discuss this report and whether it could become an AMAP report and cover the entire Arctic. The CEG should report back to the AMAP HoDs at the joint meeting on 19 September.

CEG recommended that this work be continued but with steps toward greater international coverage. Jim Overland agreed to prepare a brief paper for further discussion by AMAP on this issue.

(vi) Update of the AMAP Monitoring Programme for Climate and UV

Concerning the results of monitoring ozone, CEG agreed that a small group will prepare a short report containing: 1) an update on the data (showing no expectation of an ozone improvement soon), by Betsy Weatherhead; 2) an update on the understanding, by Betsy Weatherhead and Drew Shindell; and 3) an update on the effects, by Terry Callaghan (terrestrial) and Georg Hansen (aquatic).

In addition, Morten Olsen reported that the full AMAP protocol for this monitoring has been implemented at Zackenberg and a review of the programme has resulted in the recommendation of some additions to the monitoring protocol, in particular with regard to glaciological monitoring.

(vii) New Technologies for Monitoring and Research that are of interest for AMAP

Dr Betsy Weatherhead of the University of Colorado gave a presentation on unmanned aircraft systems (UAS) that could potentially be used for monitoring in the Arctic, given the currently inadequate level and the difficulties of monitoring in the remote Arctic areas. She pointed out that satellites are often inadequate in their observations of the Arctic and that ground stations are quite limited, particularly in the Arctic. There are many uses for UAS operations, including in observations for weather, climate, sea ice, marine mammals, and fisheries. Dropsonde technology is being developed for atmospheric measurements and ultimately water measurements. She noted that most Arctic countries have UAS operations or are exploring them. Although this is an emerging technology, it has already shown great value for the Arctic by taking measurements in areas that are not safe to send manned aircraft.

Given its value to the Arctic and the potential for increased use across the Arctic, there is a need to coordinate efforts and develop guidance on the use of UAS in environmental measurements. Issues that need to be addressed include air safety, communication, and privacy. Flying over the Arctic requires acceptance and cooperation by Arctic countries, and communities under the flight path will also need to be educated on the value of such flights. Agreements on communications, data sharing, joint missions, protocol, and points of contact need to be discussed.

Betsy Weatherhead stated that she will write a position paper on the use of this technology in the Arctic and requested that she be informed of points of contact for this issue in each Arctic country.

In the discussion, it was pointed out that climate monitoring requires measurements at the same place over long periods and it was not clear how this technology could be used. In response, Betsy Weatherhead stated that, although costly, there is a proposal to drop sondes every three days at, for example, twelve sites over the Arctic. Furthermore, NASA is currently working with NOAA to re-equip two UAS for environmental measurements; this will be considered at a workshop in Boulder, CO in two weeks.

Noting that this is a very interesting methodology that could be useful for the Sustained Arctic Observing Network (SAON), it was agreed that it would be discussed further by CEG as well as by AMAP HoDs. Maria Victoria Gunnarsdottir requested that this issue be coordinated through the Arctic Council and suggested that Dr Weatherhead present appropriate information at the SAO meeting in November.

CEG reported that a small group led by Betsy Weatherhead will prepare a letter or a short white paper describing the potential importance of modern technology (e.g., UAS) for observations in the Arctic and detecting changes. This letter will be presented to AMAP HoDs. In addition, the aim is to work toward holding a workshop on aerial (UAS) technology to discuss future applications and protocols. Key points of contact will need

to be developed to assure appropriate communication between countries prior to any circum-Arctic flights.

4.4 Other Issues

Black-Carbon

Jim Hansen gave a presentation concerning the role of black carbon in climate forcing in the Arctic. He stated that, given the inertia of the system, we are approaching tipping points in the climate system, including the loss of Arctic ice and the loss of ice mass. Limiting the temperature change to 2 °C is probably inadequate to avoid passing the tipping points. There is a need to know more about the system, but given that we cannot stop the increase in carbon dioxide quickly, we need to concentrate on non-CO₂ forcings to avoid tipping points. Overall, the impact of methane, tropospheric ozone, and black carbon is similar to that of carbon dioxide, and the non-CO₂ forcings in the Arctic are larger than CO₂ forcings. However, there are few data on these other factors and there is an urgent need to develop an understanding of all forcings to be able to save the cryosphere.

A small group has been formed to discuss the strategy for enhancing awareness of the non-CO₂ forcing of the Arctic climate. Based on the results of a January 2007 workshop and an upcoming workshop at NILU in Norway (www.polarcat.no) to assess the state of knowledge, a presentation of the needs and action items will be prepared for HoDs. Additional results are needed, for example, on black carbon particularly because increased shipping will increase the sources of black carbon in the Arctic.

In the discussion, it was reported that there is a U.S. research cruise in summer 2008 to study non-CO₂ forcing in the Arctic.

Short-lived pollutants

Drew Shindell described the role of short-lived pollutants in climate change. He noted that the indirect aerosol effect in the Arctic can be different from that in temperate areas during winter. There is a much stronger response in the Arctic to tropospheric ozone and aerosols than to carbon dioxide. This raises a number of questions concerning the relative impact of local versus remote pollutants and why short-lived pollutants in the Arctic are more effective than long-lived greenhouse gases in causing Arctic climate change.

The Arctic is also most sensitive to European black carbon emissions at lower levels and the physics of these transmissions is not understood. There is a need for modelling of aerosol physics to better understand this issue.

Modelling

Rune Gravensén presented modelling results on Arctic temperature amplification. He pointed out that temperature trends at the different levels in the atmosphere are different

for different latitudes and in the different seasons. There is a northward energy transport in the atmosphere: results show an increased energy transport to the central Arctic, with cooling at the surrounding land. The largest warming is in summer at a height of about 2 km.

ARKUFO

Odd Rogne described this Nordic initiative on climate change and its impacts. This is a cooperative effort among Nordic research communities to create a global leading potential. The study will be published in the NordForsk series this autumn. It contains various recommendations for future work in a Nordic context including the creation of a Nordic unit on holistic climate research.

Action items for CEG

Cryosphere project

A paper should be prepared by 15 October describing the cryosphere project for ultimate submission to the November SAO meeting.

Downscaling

- 1) Some downscaling results for the Arctic should be made available for the next IPCC report.
- 2) IPY projects should be checked for their relevance and those involved in downscaling should be conducted under a pan-Arctic umbrella.
- 3) A sub-project should be established to formulate the needs in relation to downscaling with respect to downscaling variables, locations, and temporal resolution that differ according to geographical area.

Re-modelling

- 1) The re-modelling project should conduct a more thorough evaluation of the various models including work to increase confidence in climate projections by developing criteria for evaluating the models and reducing outliers. The aim is to complete the work before the next ACIA report. This should be conducted under a sub-group of CEG, led by Vladimir Kattsov, with John Walsh and Jim Overland as members.
- 2) The group should consider including others from the climate modelling community (Bjerknes Center, Norway, ECMWF or Hadley Centre, Canadian Climate Center, NCAR, GFDL) in this cooperation so that better results can be obtained for the Arctic.
- 3) A list should be made of IPY projects that are using relevant models.
- 4) Jim Overland and Vladimir Kattsov should choose a model to be used in the Cryosphere project. Jim Overland should deliver the results from the first run of this model within six months, i.e., by the end of March 2008

AMAP ozone monitoring programme

A small group under CEG will prepare a short report on the results of the AMAP ozone monitoring programme comprising an update on: 1) the data (Betsy Weatherhead); 2) the

understanding (Betsy Weatherhead and Drew Shindell); and 3) the effects (Terry Callaghan (terrestrial) and Georg Hansen (aquatic)).

Modern technology

A small group under Betsy Weatherhead will prepare a letter or a short white paper describing the potential importance of modern technology (e.g., UAS) for observations and detecting changes in the Arctic for presentation to AMAP HoDs.

Black carbon

The small group formed to discuss the strategy for enhancing awareness of the non-CO₂ forcing of the Arctic climate should prepare a presentation of the needs and action items for AMAP HoDs, based on the results of a January 2007 workshop and an upcoming workshop at NILU in Norway to assess the state of knowledge.

Annex 5: Arctic Council Cryosphere Project Instructions to Authors

Sub-project 2: The Greenland Ice Sheet in a Changing Climate

Draft

The Arctic Council's Cryosphere Project includes three sub-projects. AMAP has been tasked with the overall implementation of the project which will produce three peer-reviewed publications, each covering c. 100 pages.

This "Instruction to Authors" targets specifically sub-project 2 "The Greenland Ice Sheet in a Changing Climate" (hence called G.I.S.) and the scientists providing written or graphic input to the chapters.

Henning Thing (het@fi.dk; phone +45 7248 8120), the Danish Polar Center, is the administrative and publication coordinator of sub-project 2. Please, direct questions relating to the sub-project to him.

The timetable for the sub-project is available at <ftp://amap.no/xx/zz.pdf>

1. Language

The language to be used in production of the sub-project is U.S. English.

2. Document registration and identification

The drafting process will involve the generation and exchange of a large amount of text and documentation. It is vital that all drafts are identified with a draft number, a revision or version number etc. and also the name of the author(s) and the date to ensure that the correct versions can be dealt with, referred to, and distributed.

The following registration system must be used:

G.I.S. – Chapter / Section / Draft # / Initials / Date

Example: G.I.S. – 5 / 5.2 / 1 / KS / 15.12.07

which means:

Sub-project 2 "The Greenland Ice Sheet in a Changing Climate" – Chapter 5, section 5.2.
First draft. Author is Konrad Steffen. The contribution is dated 15 December 2007

3. Exchange and distribution of G.I.S. texts

All drafts of the G.I.S. should be marked with a page header or footer including the text 'Cryosphere sub-project 2 – *Draft* – Do not circulate or cite without permission'. In addition, where possible the words 'Cryosphere sub-project 2 – *Draft*' should be applied as a faint watermark to all pages of the draft. (See last page for enclosed document template)

Microsoft Office Word (or other fully Word compatible program) will be used. During the drafting process the revision marking and annotation tools will be extensively used in order to track and comment changes in the document versions.

For each chapter draft, all relevant texts, supporting documentation (e.g. reference lists) and graphical materials must be compiled and checked by the chapter author(s), and subsequently submitted as e-mail attachment(s) to the publication coordinator (het@fi.dk), by the agreed deadlines, in the following form:

- ◆ A clearly legible document version written in Arial font, size 12, and saved in .doc format.
- ◆ Graphical materials and tables must be provided as separate files – and their preferred embedment indicated in the text document.
- ◆ Graphics (incl. photos) must be in at least 200 dpi resolution and in any of the following formats: jpg, jpeg, gif, tiff, or psd.
- ◆ All supporting documentation should also be supplied as e-mail attachment(s).
- ◆ Do not use any advanced layout features (columns, integrating graphics in text, text boxes, heading styles, etc.). If specific presentation features are desired, these should be indicated by clearly identifiable notes.

4. Units / Symbols / Abbreviations

Metric units belonging to the International System of Units (SI units) must be used and designated by their international symbols (see http://www.bipm.org/en/si/base_units/).

Use of "/" for "per" rather than negative superscripts is recommended. Subscripts should be used for indices in chemical formulas (e.g. H₂O). 10 in corresponding power should be used if the number of "0's" exceeds 3 (e.g. 10⁴ m² rather than 10,000 m²). Radionuclide's should be given as ¹³⁷Cs rather than Cs-137 or 137Cs.

In the drafts, the use of a prefix-word construction (micro g/l) is strongly preferred to the use of the Greek symbol (as in µg/l). The commonly applied use of the letter 'u' as a substitute for 'micro' (as in ug/l) must also be avoided.

All acronyms must be defined at the first instance of their use.

5. Statistics

Standard statistic practices include mean value, standard deviation, standard error on simple linear estimates, and geometric means. Trimmed means and trimmed medians should be accomplished with the level of trimming which has taken place. All smoothing of data should indicate the statistical tool used for smoothing with a published reference to the smoothing techniques and any parameters which may be relevant.

6. Bibliographical references

Bibliographical references shall be indicated in the text by the last name of the author or – in the case of collective publication or report – the abbreviated title, followed by a comma and the year of publication (e.g. Bewers, 1992; World Resources, 1992). Where

an author is cited twice for publications in a given year, the references must be distinguished by an alphabetic sequence following the year (e.g. Reiersen, 1992a; Reiersen, 1992b). References are separated with a semicolon.

The bibliographical details should be given in the following sequences:

Reference to a paper in a periodical:

1. Last name and initial(s) of author(s).
[e.g. Bowers P] [e.g. Bowers P and Jones HA] [Bowers P, Jones HA and Smith B]
2. Year of publication.
3. Full title of paper.
4. Name of periodical abbreviated in accordance with the principle of the World List of Scientific Periodicals.
5. Volume No.
6. First and last page of paper.

Reference to a book:

1. Last name and initial(s) of author(s), and an (ed.) or (eds.) for editor(s).
2. Year of publication.
3. Full title of book.
4. Publisher.
5. Place of publication.
6. Total number of pages.

Reference to a chapter or paper in a compound work:

1. Last name and initial(s) of author(s).
2. Year of publication.
3. Full title of chapter/paper.
4. Last name and initial(s) of editor(s).
5. Full title of book or publication.
6. First and last page of chapter or paper.
7. Publisher.
8. Place of publication.

All chapter or sub-chapter authors must compile a list of all references used in their (sub-) chapters. A complete list of all sub-project references will appear at the end of the G.I.S. publication.

7. Graphical material

For maps, schematic diagrams, sketches, plots, charts, graphs, and photographs, please provide all source information. This may include the source of the original graphic, the source of the data used to create the graphic, the photographer, artist, etc.

All copyright issues need to be resolved prior to publication. If you have graphical material which is a copy of another source, please arrange for permission to use the graphic from the copyright owner. Obtaining copyright permission is primarily the responsibility of the chapter or sub-chapter authors.

Graphical material must be in at least 200 dpi resolution and in any of the following formats: jpg, jpeg, gif, tiff, psd, nef, or raw.

8. Geographical locations

Authors shall maintain a list of all geographical locations referred to in their texts, in particular locations that are not widely known (e.g. outside of national context). These lists must be supplied to the sub-project secretariat together with relevant geographical coordinates or maps showing locations, e.g. to allow preparation of a map of areas and locations referred to in the publication.

Geographical coordinates must be given in the form of latitude / longitude in decimal degrees (DD) or degrees-minutes-seconds (DMS) notations. Place names should comply (where possible) with spelling conventions used in the Times World Atlas. Where places have different names (e.g. in indigenous and other national languages, especially where indigenous names are being reintroduced) please provide both alternatives.

**Annex 6: Action List from AMAP HoDs meeting, Copenhagen, 17–20
September 2007**

Agenda item	Section	Action	For	By
3	Human health issues	Prepare paper providing options to enable broader treatment of human health issues in AC WGs	Russel Shearer and Canadian colleague	15 October
3	Human health issues	Review options paper on human health issues in AC WGs	AMAP HoDs	22 October
4	Cryosphere project	Nominate lead authors for chapters and suggest needs for additional expertise from other countries	Lead countries for project (Denmark, Norway, Sweden, plus ??)	20 October
4	Cryosphere project	Prepare paper describing cryosphere project suitable for submission to SAO meeting	CEG	15 October
4	Cryosphere project	Review paper on cryosphere project	AMAP HoDs	22 October
4	Cryosphere project	Appoint Project Steering Group for project	AMAP HoDs	24 October
4	Cryosphere project	Deliver results from the first run of the model chosen for use in the Cryosphere project	Jim Overland	31 March 2008
4	State of the Arctic report	Provide suggested themes for 2008 report	CEG	15 November
4	State of the Arctic report	Review suggested themes and make final suggestions; nominate potential authors	AMAP HoDs	15 December
4	State of the Arctic report	Prepare report suggesting a potential relationship between AMAP and these reports	Jim Overland	1 December
4	AMAP monitoring programme for ozone	Prepare a short report on ozone covering: (1) an update on the data; (2) an update on current understanding, and (3) an update on the effects.	(1) Betsy Weatherhead (2) Betsy Weatherhead and Drew Shindell (3) Terry Callaghan (terrestrial), Georg Hansen (aquatic)	
4	New technologies	Prepare letter or short white paper describing the potential importance of modern technology (e.g., UAS) for observations/detecting changes in the Arctic	Small group led by Betsy Weatherhead	Next AMAP HoDs meeting

Agenda item	Section	Action	For	By
4	Black carbon	Prepare paper providing needs and action items to develop a strategy for enhancing awareness of the non-CO ₂ forcing of the Arctic climate	Small group under CEG	Next AMAP HoDs meeting
5	Oil and Gas Assessment	Correct graphic on petroleum fluxes in Russian rivers in PTS project final report	AMAP Secretariat	As soon as practicable
5	Oil and Gas Assessment	Distribute final draft of Overview Report to AC WG Chairs (with reminder that had received earlier version on 2 August) and AMAP HoDs	AMAP Secretariat	Completed on 1 October
5	Oil and Gas Assessment	Prepare and submit a document that informs the SAOs that the OGA has been completed and that the results of the OGA are planned to be released at the Arctic Frontiers meeting in January 2008	AMAP Secretariat	12 October
5	Oil and Gas Assessment	Distribute redrafted Executive Summary to HoDs, AC WGs, and PPs	AMAP Secretariat	8 October
5	Oil and Gas Assessment	Review Executive Summary and submit comments	AMAP HoDs	15 October
5	Oil and Gas Assessment	Provide revised cost estimates for printing the overview report and the scientific background document, including cost per copy of the OGA report	AMAP Secretariat	ASAP
5	Oil and Gas Assessment	Arrange teleconference in mid-October to review status of Overview report, Executive Summary, and scientific report	AMAP Secretariat	Tentatively 18 October
9	Coordination of monitoring efforts	Send final nominations for lead countries and key contacts for the pilot projects to the AMAP and CAFF Secretariats	AMAP HoDs (and CAFF Board Members)	15 October
9	Coordination of monitoring efforts	Prepare paper on pilot monitoring projects for November SAO meeting	AMAP and CAFF Secretariats	28 October

Annex 7: Joint Meeting between AMAP Heads of Delegation and CAFF Board Members Copenhagen, 18 September 2007

The meeting was co-chaired by the Chair of AMAP, John Calder (USA) and the Chair of CAFF, Inge Thaulow (Greenland). The agenda is attached as Appendix 1 and a list of participants as Appendix 2.

Item A The AMAP-CAFF Coordinated Monitoring Effort

Both AMAP HoDs and CAFF Board Members accepted the Green Paper (AMAP-CAFF 2007/9-2) on coordination of AMAP and CAFF monitoring efforts. The next step is to determine the pilot projects that would be included as part of this coordinated monitoring effort. It was agreed that the following criteria would be applied in reviewing the projects proposed by the delegations:

- 1) The project must meet the goals of both AMAP and CAFF;
- 2) Funding for the project must already be in place, and the project producing results;
- 3) The project must have a long-term perspective (not just three or five years);
- 4) There should preferably be a data management plan and a plan for the dissemination of results.

At its November meeting, SAOs will be informed of the projects that have been identified as pilot projects under this coordinated monitoring effort. Thereafter, these projects will need to present annual reports (approximately two pages) at SAO meetings, beginning in April 2008.

Each delegation then presented information on relevant projects that could be considered for this coordinated monitoring effort.

Canada

The Canadian representatives reported that Canada has a long history of studies of contaminants and biodiversity, so there are many possible projects that can be recommended as a pilot project. Based on a two-pronged ecosystem and network approach, six projects are proposed:

- 1) The Circumpolar Caribou Project (an international project currently under IPY);
- 2) The Arctic Char Project (covering contaminants and char populations);
- 3) A project on beluga populations (ecology, contaminants, and involvement of PPs);
- 4) The Ringed Seal Project (populations and contaminants);
- 5) Seabirds (contaminants in several populations; population monitoring);
- 6) The Polar Bear Project (populations, contaminants, and involvement of PPs).

Ecosystem projects include projects in the Western Arctic Beaufort Sea and the Canadian Arctic Shelf Study, both covering contaminants and populations.

Denmark, Faroe Islands, Greenland

Three projects have been selected that integrate CAFF and AMAP objectives; these are all site-specific and cover ecosystem change and cause-effect relationships as well as the use of natural resources:

- 1) The Faroese project ENVOFAR, covering biodiversity, climate, and pollution mainly from current long-term monitoring programmes. Monitoring covers: marine mammal populations, ecology, pollution levels and their health effects on whales and humans; seabird populations, ecology, and pollution levels; ocean currents, climate, fish stocks, and pollutants; and now also terrestrial ecology, vegetation, climate, and some pollution levels (moss and mountain hare). There is also an ITEX station since 2001.
- 2) A new low-Arctic project in southwest Greenland at Nuuk, providing integrated monitoring of the marine environment, climate, terrestrial biology, and geophysics, and the high-Arctic station at Zackenberg, which has operated for the past ten years. Using data from these two stations can provide an overall picture of climate change impacts from low-Arctic to high-Arctic areas;
- 3) Monitoring of polar bears, including contaminant burdens and their impact on polar bear health and the effects of rapid climate change.

Finland

Finland has a number of long-term ecological research and monitoring sites. Integrated monitoring for climate and contaminants parameters is carried out at the Pallas and Sodankyla stations in northern Finland. Other relevant programmes include monitoring of seabird populations (inland from the Arctic Ocean), terrestrial mammals, Arctic char (also monitored for contaminants), and ringed seals (but not in the Arctic).

Iceland

Iceland has submitted a paper with a list of seven relevant projects mainly covering climate change and contaminants. The climate change projects relate well to the CAFF objectives; they are:

- 1) Murre populations and climate change (associated with the CAFF bird project);
- 2) Black-legged kittiwakes and climate change;
- 3) The International Tundra Experiment (ITEX) and new highland ecosystems, covering a description of flora in relation to climate change and an experiment on the effects of very rapid climate change.

The contaminant programmes have been conducted for decades; they are:

- 1) Black guillemots and contaminants;
- 2) White-tailed eagles and contaminants;
- 3) Gyr falcon and contaminants.

In addition, there is a new project on freshwater monitoring in an Icelandic lake that monitors chemical and biological status.

Norway

Norway runs studies in marine, limnic, and terrestrial areas and conducts some monitoring programmes that are partly relevant. Activities regarding seabirds and polar bears may be nominated for the coordinated pilot projects.

Russian Federation

Russia conducts monitoring programmes related to climate, pollution, and abundance of plants and animals, etc., information from which is collated and published in annual state of the environment reports. Two programmes monitoring biodiversity in the Russian Arctic are particularly relevant:

- 1) Observations of nature in reserves: a long-term programme conducted by personnel working in national parks;
- 2) Annual census of hunting animals: covering populations, dynamics, stresses, and hunting quotas.

An ongoing project to monitor the breeding condition of shorebirds in the Russian Arctic is also relevant. The Russian representative stated that a circumpolar programme on specific species would be of particular interest.

Sweden

Joint monitoring in Sweden is almost fully integrated at the national level (by the Swedish EPA) and also at the county level; steps are now being taken to integrate climate change and biodiversity into this monitoring work. The monitoring is conducted on a long-term basis, but there are also programmes for more limited purposes. New ideas can be incorporated easily into this programme. Out of a total of eleven different activities, three have particular potential for a joint AMAP-CAFF effort:

- 1) Monitoring terrestrial predators, e.g., brown bears or eagles;
- 2) Monitoring marine top predators, e.g., ringed seals;
- 3) Monitoring freshwater ecosystems.

United States

U.S. representatives to AMAP and CAFF have discussed this issue and nominated four projects:

- 1) The Russian-American Long-Term Census of the Arctic: this includes long-term observations on causes and consequences of the loss of sea ice in the Bering and Chukchi Seas, with a focus on zooplankton, fish larvae, fish, benthos, and ocean conditions;
- 2) The Bering Sea Climate and Ecosystem Project: monitoring in the Bering Sea and Gulf of Alaska of marine resources using remote sensing to detect changes in ecosystems;
- 3) Seabird study: collection of tissue samples from selected populations of seabirds to determine contaminant levels and relate to mortality, etc.;

- 4) Seabird Monitoring Program: a more circumpolar program in CAFF to monitor populations, but also with a contaminant component.

There are also many terrestrial monitoring programs, but they are related only to CAFF objectives; some of these will be reviewed to relate them to the joint project.

Based on these presentations, the Joint Meeting noted that there are a number of ongoing activities that meet the AMAP-CAFF criteria. To draw up a list of projects with potential for inclusion in a coordinated effort, it was proposed that projects be selected that are either based on species networks or on integrated environmental monitoring. A list of potential projects under these two classifications was drawn up and, after further discussion, the Joint Meeting proposed the list attached as Appendix 3.

In addition, for each item on the list, a potential lead country and, when known, a key contact were identified to provide a brief annual report on the main results during the past year. This list needs to be finalized so that it can be included in a paper on the proposed pilot projects for distribution to SAOs on 28 October; therefore, AMAP HoDs and CAFF Board Members were requested to send their final nominations to the AMAP and CAFF Secretariats by 15 October, who will then prepare the paper for the SAO meeting.

The annual report for each project should comprise about two pages of text and two PowerPoint slides. AMAP/CAFF will define a common framework for the reports. The first reports should be presented at the SAO meeting in April 2008.

In the discussion, it was suggested that a map be prepared showing the locations of integrated environmental monitoring sites; criteria for integrated monitoring would need to be defined to enable an appropriate identification of such sites.

Item B: Sustainable Arctic Observing Network (SAON)

Odd Rogne reported on the activities planned to develop a Sustained Arctic Observing Network (SAON), as requested by the Salekhard Declaration. For this, there is a need to define the goals, prepare a strategy, and develop a programme. The SAON is intended to assist joint work and cooperation among the various parties to Arctic research: agencies, scientists, and northern residents. There is also a need to connect both global and local observing systems and to facilitate the use of the enormous amount of data that will be generated in the 25 IPY projects.

The goal of SAON is to achieve long-term Arctic-wide observing activities that provide free, open, and timely access to high-quality data that will realize pan-Arctic and global value-added services and provide societal benefits. This should include a pan-Arctic view, comprehensive Arctic coverage, and global connections; coordination, collaboration, and communication; data and information standards and management; and inclusiveness.

In order to develop SAON, three workshops will be held, the first of which will be in Stockholm on 12–14 November 2007. This is intended identify whether the current Arctic observing and data and information management activities are sufficient to user needs. The second workshop will be held in Alberta, Canada in spring 2008 to consider how Arctic observing and data and information management activities can be coordinated and sustained over the long term. Finally, a third workshop is planned for Helsinki in autumn 2008 to review the information gathered and develop a final set of recommendations for the promotion and coordination of sustained, integrated Arctic observing activities. Further information is found at: <http://www.arcticobserving.org/>.

In the discussion of this presentation, it was noted that the scope of the monitoring to be covered by this project was very broad, and could also include socio-economic issues, but would depend on user needs. It was further pointed out that CAFF has a great deal of experience in Arctic networks based on its involvement in the Circumpolar Biodiversity Network since 2000; this would be very relevant to the development of SAON. Furthermore, the Arctic Portal is now functioning and can be used for the dissemination of information on the Arctic.

Item C: Project directory and interactive maps

Simon Wilson, AMAP Deputy Secretary, demonstrated the project directory (PD) which was originally established by AMAP to assist in identifying data and information for use in its assessments. The PD currently contains information on approximately 650 programmes and projects relevant to the Arctic, covering a range of subjects (contaminants, climate, biodiversity, health, diet, socio-economics, etc.), that is, not only projects and programmes directly related to AMAP's work. This project directory is implemented as a user-maintained online database, including information on project objectives, contacts, data management, parameters and media measured, etc. A simple search engine is used to identify projects/programmes of interest.

The URL for the PD is: <http://www.amap.no/Resources/ProjectDirectory.htm>.

Other groups, e.g., ENVINET, also make use of the same underlying resource as their 'project directory' (see <http://pusnes.grida.no/amap/amappd/index.asp?org=2>). ENVINET was an EU FP6 project and the ENVINET PD is linked to another ENVINET online database that stores information on monitoring stations and activities at these stations (see <http://www.amap.no/envinet>). Although the ENVINET project is now finished, countries continue to register their station and project information in the databases. UNEP have also shown an interest in using this resource as a basis for registering information on activities that may contribute to the (Stockholm Convention) Global Monitoring Programme.

By using the same underlying database, different organizations get access to a wider range of information than would be the case if each independently establish their own PD systems; at the same time, they can readily identify projects registered through their own networks if they so wish. Also, by a single registration scientists can make their project

information available to several different user-communities, so this also saves unnecessary effort on their part.

AMAP continues to encourage the Arctic countries to ensure that all of their relevant projects are registered in this directory, so that the information is readily available to AMAP, but also to other AC groups including CAFF. In addition to serving the networks, the PD is also used by the wider scientific community, by scientists who may wish to identify potential research collaborators or to identify sources of data or information that may assist in their work, etc.

Regarding mapping activities, Simon Wilson reported on the cooperation between AMAP and EPPR concerning pilot online mapping applications. This work, which has been undertaken together with GRID-Arendal and other organizations, has currently focused on adopting common standards and avoiding duplication of effort so that (GIS) datasets can be developed and maintained by those groups most qualified. These products can then be made available through a suitable online mapping application and the underlying data shared (taking into account necessary agreements concerning ownership and acknowledgement of data sources, etc.). AMAP have agreed with EPPR that EPPR would take the lead in instigating the next steps in this cooperation, which is likely to involve convening a workshop for current interested groups and also a number of other groups that have indicated their interest in this activity. All Arctic Council groups will be invited to involve their GIS/mapping specialists in this activity.

AMAP and CAFF are cooperating on the generation of data and have also had some initial discussions concerning a common presentation of data on the web. On one level, such an activity could contribute to the groups' respective assessment activities; however, this could probably also be achieved in other (less resource-demanding) ways. The main reason for an online AMAP-CAFF solution would presumably be to provide outreach to the general public, but in this respect Simon Wilson expressed the opinion that some careful thought needs to be given to the types of data/information that should be made available. In general, the AMAP approach to date has been to deliver 'interpreted' information or data products, which reflect an AMAP or Arctic Council agreed consensus view. If all data are simply made available to a public system, one implication is that these data may be used in a manner that is not consistent with AMAP or CAFF views, but by being sourced to AMAP or CAFF this might give the products some credibility as Arctic Council products. These and a number of other such issues need to be addressed before the relatively straightforward but resource-demanding work of putting data online is undertaken. Part of the planned workshop on GIS and mapping should be devoted to developing a clear policy for what should be put on the web, the reasons for doing this, and the target audiences. This workshop will involve Arctic Council Working Groups and other users and will be organized by EPPR in early 2008.

In the discussion, it was proposed that a possible mapping/GIS cooperation might also be of interest to the Integrated Oceans Monitoring Programme, and Norway agreed to act as a contact point in this respect.

Item D: Production of Arctic Environmental Assessments.

Noting that CAFF is preparing for the conduct of an Arctic Biodiversity Assessment, Lars-Otto Reiersen, Executive Secretary of AMAP, described several lessons learned from the Oil and Gas Assessment, which is nearing completion under the coordination of AMAP. First, it is important to have an assessment steering group that is led by someone who is not an author, as there can be potential conflicts between the role of assessment lead and author. Second, each chapter needs to have several authors; one or two may be identified as lead authors, but these individuals must have adequate support to contribute to the drafting of the chapters, also including support for reviewing draft material. This both spreads out the work and provides greater balance and consensus. Third, the data and information required for the assessment must be accessible; this has been a serious problem in the conduct of the oil and gas assessment.

In terms of funding, most of the assessment work conducted or coordinated by AMAP is based on national in-kind contributions; some countries also provide funding for some core activities. Nonetheless, common funding is required for editing, graphics, layout, and printing of the report.

In the discussion, it was pointed out that obtaining commitments from authors also requires a commitment from their national authorities, as represented by the Working Group Heads of Delegation. This may require making funding available to pay authors (or their institutes) for their work to draft parts of a chapter.

In terms of the amount time required for an assessment, a large assessment typically requires five years from the start of planning to delivery of final reports. It takes two years to carry out good planning: developing an outline for the report, identifying experts to write the various chapters, and obtaining commitments for the work. Thereafter, three years are needed for the writing, (peer) reviewing, editing, and publication. Time for the technical work to prepare reports for publication should also not be underestimated—this requires months rather than weeks, and possibly many months for a large and complex report or series of reports.

Item E: Any other issues or initiatives of common interest for AMAP/CAFF

The list of actions agreed at the meeting is attached as Appendix 4.

It was proposed that the next meeting between AMAP HoDs and CAFF Board Members take place toward the end of 2008.

Appendix 1

Draft Agenda for the Joint meeting between AMAP HoDs and CAFF Country Board Members Copenhagen, 18 September 2007

To be chaired by the AMAP and CAFF chairs. If necessary the two chairs may ask for an ad-hoc drafting team – working after this Agenda Item – to adjust the Green paper and the presentation to be made to the SAO's, reflecting the discussion.

- Item A** **The AMAP-CAFF Coordinated Monitoring Effort.**
- A.1 Introduction by the two chairs. Presentation of the latest version of the Green paper and country submissions.
 - A.2 Round table Country – by Country presentation of ongoing national programs relevant for CAFF/AMAP joint monitoring and presentation of how the countries expect to implement a joint monitoring effort in the future.
 - A.3 Presentation to the SAO meeting in November.
- Item B:** **Sustainable Arctic Observing Network (SAON)**
The AMAP Chair and Secretariat will inform about the work related to SAON, and especially the workshop planned for November in Stockholm.
- Item C:** **Project directory and interactive maps**
Several AC WGs have expressed interest for project directory and interactive maps. AMAP and EPPR have been cooperating for several years and the CAFF Secretariat has expressed interest to join in these initiatives. The AMAP Secretariat will present the status for this work and potential joint future work.
- Item D:** **Production of Arctic Environmental Assessments.**
The Oil and Gas assessment and the Arctic Biodiversity Assessment, lessons learned and potential future cooperation.
- Item E:** **Any other issues or initiatives of common interest for AMAP/CAFF**

Appendix 2

List of Participants

Full details of the affiliation, office address, telephone and fax numbers, and e-mail address for each participant can be found in the minutes of the meeting of the CAFF Executive Board or the AMAP Heads of Delegation associated with this joint meeting.

CAFF

National Representatives (12)

Inge Thaulow – **Chair**, Greenland
Tom Christensen - Greenland
Flemming Merkel – Greenland
Anna Maria Fossa – Faroe Islands
Risa Smith – Canada
Ævar Petersen – Iceland
Valery Orlov - Russia
Esko Jaakkola – Finland
Sune Sohlberg – Sweden
Janet Hohn – USA
Berit Lein – Norway

Tom Barry – CAFF Executive Secretary (ES)

Permanent Participants (3)

Rune Fjellheim - IPS
Colleen Henry - AAC
Bobby Joe Greenland - GCI

Observers (2)

Christoph Zöckler - UNEP/WCMC
Joan Eamer - UNEP/GRID - Arendal

Arctic Council (1)

Tana Lowen Stratton

Others (1)

Interpreter

AMAP

Heads of Delegation (10)

John Calder – **Chair**, USA
Russel Shearer – Canada
Morten Olsen – Denmark
Maria Dam – Faroe Islands
Outi Mähönen – Finland
Helgi Jensson – Iceland
Erik Syvertsen – Norway
Yuri Tsaturov – Russia
Yngve Brodin – Sweden
Peter Murdoch – USA

Simon Wilson – AMAP Deputy Executive Secretary

Odd Rogne –AMAP Secretariat

Janet Pawlak – AMAP Secretariat

Permanent Participants (1)

Jan-Idar Solbakken –Saami Council

Appendix 3

AMAP CAFF Coordinated Monitoring Pilot Projects (Contribution to Developing SAON)

1. Species Networks: integrated ecology, climate, and contaminants
 - a. Seabirds– U.S. – David Irons
 - b. Polar bears– Denmark – Jesper Madsen
 - c. Ringed seals– U.S.?
 - d. Caribou/Reindeer - Canada
 - e. Arctic char – Canada - Jim Reist
2. Integrated Environmental Monitoring (Circumpolar mapping of existing sites as an approach for reporting – see CEON map)
 - a. Fully integrated sites
 - i. Zackenberg/Nuuk/Faroes - Denmark – Mads Forchhammer
 - ii. Yukon River – U.S. – Peter Murdoch
 - b. Marine/coastal ecosystems (seek to develop a circumpolar “network” including a. above) (connect to best practices in Ocean Management activity in AC)
 - i. U.S.-Russia in Bering and Chukchi Seas – U.S. – Kathy Crane
 - ii. Canada Beaufort Sea and Circumpolar Flaw/Lead – Canada – Gary Stern
 - iii. Norway input
 - c. Freshwater ecosystems
 - i. Large, deep oligotrophic lakes – Sweden?
 1. Iceland
 2. Sweden
 3. Finland
 - ii. U.S. input
 - d. Terrestrial ecosystems
 - i. ITEX-type (selected sites) – Canada (Greg Henry?)
 - ii. Pallas (Finland) – Outi Mähönin
 - iii. Reserves /National Park/ monitoring – Russia, – Yuri Buivolov?

Appendix 4

List of actions arising from the Joint Meeting between AMAP Heads of Delegation and CAFF Board Members, Copenhagen, 18 September 2007

Agenda item	Section	Action	For	By
A	Coordination of monitoring efforts	Send final nominations for lead countries and key contacts for the pilot projects to the AMAP and CAFF Secretariats	AMAP HoDs and CAFF Board Members	15 October
A	Coordination of monitoring efforts	Prepare paper on pilot monitoring projects for November SAO meeting	AMAP and CAFF Secretariats	28 October
A	Coordination of monitoring efforts	Define common framework for annual pilot project reports to SAOs	AMAP and CAFF Secretariats	Late January 2008
A	Coordination of monitoring efforts	Communicate frequently with other participants and with AMAP/CAFF WGs	Lead Countries/Key Contacts	Continuing
A	Coordination of monitoring efforts	Prepare report to SAO meeting in April 2008 showing key results (~ 2 pages plus 2 PowerPoint slides)	Lead Countries/Key Contacts	late February 2008
C	Interactive maps	Act as contact point for possible mapping cooperation with the Integrated Oceans Monitoring Programme	Norway	Continuing