AMAP Working Paper 99:1

Minutes from the First Meeting of

the Assessment Steering Group (ASG-II) of the Arctic Monitoring and Assessment Programme

Silver Spring, MD, USA
8-10 March, 1999

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MINUTES FROM THE 1ST MEETING OF THE ASSESSMENT STEERING GROUP-II (ASG II/1) OF THE ARCTIC MONITORING AND ASSESSMENT PROGRAMME (AMAP)
Silver Spring, MD, USA, 8-10 March 1999

1. Opening of the Meeting.

1.1. The AMAP Chair, Hanne Petersen, opened the meeting and gave the floor to the Head of the US AMAP Delegation, Alan Thomas.

1.2. David Evans,NOAA Assistant Administrator for Oceanic and Atmospheric Research, and Alan Thomas welcomed the meeting participants on behalf of NOAA as the host organization and informed about Arctic related programmes in the NOAA activities. The list of participants is presented in Appendix 1.

1.3. Tom Murray (NOAA) provided practical information concerning the meeting arrangements.

1.4. AMAP Executive Secretary, Lars-Otto Reiersen, informed the meeting participants on practical matter regarding the secretarial support at the meeting.

2. Adoption of the Agenda.

2.1. Hanne Petersen noted in her introduction that the Assessment Steering Group (ASG), initially established by the AMAP WG during the 1st phase, had been efficient in coordinating the previous assessment process, and that, as the result, the AMAP WG decided to reinstitute ASG during the 2nd phase. According to the earlier practice, the AMAP Vice-Chair will chair ASG. However, since the new Vice-Chair has not yet been elected, the WG had asked Cynthia de Wit (Sweden) to be the acting ASG Chair. She would chair ASG-II/1 meeting after agenda item 4.

2.2. There were no comments to the draft agenda, which had been distributed prior to the meeting. The agenda was adopted (Appendix 2).

3. The objectives of the meeting and Terms of Reference (ToR) for the group.

3.1. Hanne Petersen informed the meeting participants that the 12th AMAP WG Meeting (7-9 December 1999, Helsinki) had developed and adopted new Terms of Reference (ToR) for the ASG (See Minutes from AMAPWG-12, Appendix 7) and she asked the ASG members whether they had any comments or questions regarding this document. There were no comments or questions.

3.2. Lars-Otto Reiersen reminded the meeting participants that during the AMAP WG-12 the US Delegation had been requested to conduct internal consultation concerning whether they would be able to take on the Lead Country role in the heavy metals assessment. The US Delegation informed that they would take the corresponding

responsibility, and that Suzanne Marcy would be the Lead Country Expert (LCE). In relation to this subject, Hanne Petersen stated that the Danish AMAP Delegation was considering the possibility of taking on a supporting role in the heavy metals assessment, as it had during the 1st phase.

4. Arctic Council Action Plan to eliminate pollution of the Arctic (ACAP).

4.1. Lars-Otto Reiersen reminded the meeting participants about the history of ACAP and introduced the request from Norway to AMAP for a contribution to the ACAP development process, which should be delivered prior to the 2nd ACAP Workshop in Oslo, April 1999.

4.2. Simon Wilson informed the meeting that the former AMAP Lead Country Experts had been asked to provide input to a document to be prepared by the Secretariat. On the basis of responses received, a draft document had been prepared.

4.3. It was agreed during the discussion that the AMAP contribution to ACAP should be based on the AMAP Reports and contain assessment information which might be used as a background for the action plan. New material introduced would primarily address, e.g., recent developments in relevant international agreements to reduce pollution that had occurred since the preparation of the AMAP assessment reports. It was suggested that the format of the document should be similar to that of the ”Brief Synopsis of the State of the Arctic Marine Environment in the Context of the Development of a Regional Plan of Actions to Protect the Marine Environment from Land-based Activities (RPA)” (AMAP Report 98:4). However, it should cover a wider scope of pollution issues.

4.4. ASG members were requested to present their corresponding contributions to the draft AMAP document to ACAP by the end of the meeting, and Simon Wilson was authorized to finalize its compilation. The final draft would be forwarded to the AMAP WG for comments prior to its delivery as an AMAP contribution to ACAP.

5. Assessment work to be performed within the next five years, first draft list of content for each report.

5.1. From this Agenda item onward, the meeting was chaired by Cynthia de Wit.

5.2. Cynthia de Wit stated in her introduction that many of the meeting participants had been ASG members during the 1st phase, the success of which had been due to a great extent to the informality of the group, and the degree of cross-fertilisation that had been achieved between experts working on the different pollution issues. She suggested keeping the best traditions of the previous ASG in the future work.

Cynthia de Wit then introduced basic aspects of the future assessment strategy (See Minutes from AMAP WG-12, Appendix 5) and stressed that the development of preliminary structures for the content of future assessment reports was the main objective of the current meeting. She stressed that the future work will be mostly

focused on updating the various chapters of the AMAP Assessment Report (AAR) and incorporating new data according to these new structures. It was proposed that the meeting participants should split into small groups to work through the different pollution issues.

5.3. Lars-Otto Reiersen proposed that much of the consideration of the structures of the assessment chapters dedicated to different pollution issues should be addressed in relation to necessary changes in the scope of future assessments.

5.4. The meeting participants stressed the importance of closer collaboration with CAFF, particularly on combined effects issues. The main focus of this collaboration could best be developed at the national level.

5.5. Alan Thomas (USA) drew special attention to the assessment of combined effects and stressed that it would be necessary to establish a special group under ASG to address this issue.

5.6. The meeting participants agreed to return, if necessary, to the provisional timetable for the production of the proposed assessment reports at the end of the ASG meeting, and to define any needs for the AMAP WG to be asked to consider further changes to it.

5.7. It was emphasized during the discussion that publicity of the 1st phase of AMAP was, to a great extent, determined by implementation of a communication strategy, which was developed by the AMAP WG prior to publication of the assessment reports. The meeting participants agreed that the results of the AMAP assessment reports during the next phase should be also presented to wider audience. In this context, it was proposed that the AMAP Secretariat develop and deliver to the AMAP WG corresponding proposals, including use of the AMAP www home-page, flyers, publication of short public summaries of reports, etc.

5.8. In relation to issues raised during the AMAP WG meeting in Helsinki, it was agreed that PAH would be covered by both the POPs and petroleum hydrocarbons groups, the former concentrating on PAHs from combustion sources and the latter on PAHs associated with oil and gas development activities. TBT would be covered by the POPs group, at least in relation to initial planning and elaboration of assessment requirements.

5.9. Simon Wilson requested that the groups dealing with the different pollution issues also review the draft monitoring programme documentation that was presented during the AMAP WG meeting in Helsinki. He noted that this documentation would be further upgraded in the period following the meeting and asked the groups to provide him with any relevant input, in particular in relation to specification of missing details concerning sampling strategies/frequencies, QA/QC components, biological effects components, etc.

6. Data needs for the assessment work: sources, levels, effects data, processes, etc.

6.1. During preliminary discussion, the meeting participants agreed that most of the work under this agenda item, in common with several other agenda items, should be performed in small groups dedicated to certain pollution issues. Reports of these groups should cover all agenda items, which fall under specific pollution issues.

6.2. A special discussion was held on combined effects. Lars-Otto Reiersen informed the meeting participants about combined effects activities during the first phase of AMAP. He noted that two reports, based on the results of relevant workshops, had recently been produced in USA and Europe, the latter being an AMAP sponsored workshop on Combined Effects in the Marine Environment (the report of which is available online from the AMAP website http://www.grida.no/amap/amap.htm). The approaches described in these reports can be useful to AMAP's assessment of combined effects. He also stated that special research on this item may be needed in addition to the activities which are currently planned by the Arctic countries.

The US Delegation (Suzanne Marcy) presented its view on methodological approaches to combined effects assessment. It was stressed that combined effects assessment should be based on ecological indicators. Specifically, Suzanne Maray presented a Watershed Conceptual Model that had been used by US EPA for assessment of combined effects and suggested using this approach to identify the most important stressors and stressors that otherwise may not be considered.

The meeting participants received this presentation with interest and appreciation. However, they emphasized that the Ministers had requested AMAP to make an assessment of combined effects of specific priority pollutants, with special focus on the most affected species and humans. In this context, the approach proposed may not be the only or the most appropriate tool.

It was agreed that combination of different approaches, based on community and individual levels, might be the most optimal way of approaching the problem.

6.3. During the discussion, the meeting participants pointed out positive experience of using cruises in the Arctic, organized by the participating countries, for obtaining data relevant to AMAP assessment. They agreed to continue this practice and asked the AMAP Secretariat to send a request to the participating countries concerning cruises that are planned during the coming years.

6.4. Some proposals on this agenda item from the drafting groups for specific pollution issues are presented in Appendices 3-7.

7. Cooperative needs, e.g. other international organizations to be involved.

7.1. The meeting participants agreed that assessment process in the previous period benefited from collaboration with other international organizations, institutions from non-Arctic countries and NGOs, and that this practice should continue.

7.2. Lars-Otto Reiersen presented information about new cooperative projects, which has been initiated as a follow-up of the AMAP assessment. In particular, he informed about progress in preparation of the 1st phase of Cooperative multilateral project of phase-out of PCB use, and management of PCB-contaminated wastes in the Russian Federation, and cooperative work of the AMAP Secretariat, ICC and RAIPON on preparation of the GEF Project Proposal "Pollution, food security and indigenous peoples of the Russian Arctic" with possible financial support from other international sources.

7.3. The meeting participants informed about other international activities relevant to AMAP, and recommended considering possibilities of establishing contacts with them.

7.4. The group was asked to review existing cooperations between AMAP and other organizations and to evaluate the possible need to develop additional new cooperations.

8. Upgrading of the monitoring programmes for trends and effects, including methods and QA/QC.

8.1. Referring to conclusions from the AMAP assessment, the meeting participants reiterated that QA/QC procedures developed during phase 1 should be further improved during the forthcoming period. They agreed that it would be useful to continue employing the 4 categories of data quality developed during the 1st phase (See Guidelines for the AMAP Assessment (AMAP Report 95:1), par. 3.4), however special attention should be paid to expanding of data of the Category A. It may be necessary in future assessments to completely exclude data in the lower categories.

8.2. It was proposed that future data should be accepted from laboratories that are participating in relevant intercalibrations, intercomparison or laboratory performance or accreditation schemes, etc., and that not only participation but acceptable performance need to be documented. The Secretariat was requested to update its list of laboratories fulfilling work under National Implementation Plans (NIPs), and other that may contribute data to AMAP phase 2.

8.3. Were noted, that proposals on this agenda item from the drafting groups for each of the pollution issues are included in Appendices3-7.

9. The Thematic Data Centres (TDCs) and the flow of data.

9.1. Simon Wilson reviewed the procedures employed during AMAP phase 1 to make data available for the assessment. In particular he commented on the "data confidentiality agreement" that had proven a valuable mechanism for gaining access to unpublished data. He informed the group that an updated AMAP Data Policy (that would also incorporate possibility for a similar data restriction agreement) was under preparation and asked the group for their views on how this should best be developed given their experiences from AMAP phase 1.

9.2. He also noted the experiences during AMAP phase 1 in the system of national data managers; in some cases this had functioned well, whilst in others it had failed completely as a means of enabling flow of data. It was proposed that this system should be reviewed to continue to employ it where it had worked, but to find a replacement procedure in countries where it had failed.

9.3. Finally, the group were reminded of the established AMAP thematic data centres (TDCs) and updated on developments and activities within these centres since the completion of the AMAP first phase assessment. The group was invited to consider how best to make use of TDCs in the future, including any further developments or requests that should be made to the TDCs to upgrade their service to the future assessments.

10. Cross-fertilisation needs between the LCEs.

10.1. Lars-Otto Reiersen informed the participants of the background to the way in which cross-fertilisation was used within the AMAP assessment process, its objectives and experience from the 1st phase.
Derek Muir (Canada) stressed in his comments the importance of Workshops in cross-fertilisation process.

10.2. The meeting participants agreed that expert groups for each of the pollution issues should have first meetings with each other during the present ASG meeting, with the objective of identifying general points that might be the subject of future cross-fertilisation exercises, and to ensure the early implementation of this process. Timetables for such meetings were developed and implemented.

11. Preliminary cost estimates for the assessment exercise.

Lead Country Experts presented preliminary information about financial situation and possible problems that can be expected during assessment process. However, the meeting participants agreed that it would be difficult to present preliminary cost estimates at this stage.

12. AMAP Workshops and International Symposia.

12.1. In his introduction, Lars-Otto Reiersen pointed out that international workshops and symposia have been successfully used in the previous work of AMAP, both in relation to the monitoring and assessment work, and that this practice should be continued in the future. He informed about a number of workshops and symposia with AMAP involvement that are already planned. The first workshop will address AMAP needs for modelling and source related information and will take place 14-16 June 1999 in Bergen, Norway. The next is the 4th International Conference on radioactivity in the Arctic, 20-23 September 1999 in Edinburgh, Scotland. The 3rd is a Workshop on human health and POPs to be held in Rovaniemi, Finland 17-21 January 2000.

Finally, an International Conference on biomarkers of human health is planned to be held in USA at the end of 1999.

12.2. The meeting requested the expert groups to consider, whether other workshops or symposia should be organized by AMAP, or with its involvement.

13. Time table for each of the assessments.

Proposals for timetables on preparation of specific reports have been considered by expert groups and are presented in Appendices 3-7.

14. Next ASG meeting.

It was agreed that the next ASG meeting would be held back-to-back with the 13th AMAP WG Meeting in November 1999 in Toronto, Canada.

15. Any other business.

No other business was raised.

16. End of the meeting.

The Chair of the Meeting, Cynthia de Wit, closed the meeting 10 March 1999 at 17:00.

Appendix 1.

List of Paricipants : Assessment Steering Group Meeting, Silver Spring, MD, 8 – 10 March, 1999

Country	First name	Last name	Institute name	Mailing address	Direct phone	Direct fax	e-mail	Institute phone	Institute fax
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Appendix 2: Agenda of the 1st Meeting of the Assessment Steering Group-II (ASGII/1) of the Arctic Monitoring and Assessment Programme (AMAP)

1. Opening of the Meeting.
2. Adoption of the Agenda.
3. The objectives of the meeting and Terms of Reference (ToR) of the group.
4. Arctic Council Action Plan to eliminate pollution of the Arctic (ACAP).
5. Assessment work to be performed within the next five years, first draft list of content or each report.
6. Data needs for the assessment work: sources, levels, effect data, processes, etc.
7. Cooperative needs, e.g. other international organizations to be involved.
8. Upgrading of the monitoring programmes for trends and effects, including methods and QA/QC.
9. The Thematic Data Centres (TDCs) and the flow of data.
10. Cross-fertilization needs between the LCEs.
11. Preliminary cost estimates for the assessment exercise.
12. AMAP Workshops and International Symposia.
13. Time table for each of the assessments.
14. Next ASG meeting.
15. Any other business.
16. End of the meeting.

Appendix 3: Report of the POPs expert group.

1. Proposed outline for the content of the POPs Assessment

Persistent Organic Pollutants and Other Organic Contaminants

Update on organochlorines previously treated in AAR (new data), current use pesticides, PAHs, TBT and new substances as found in the Arctic. Where appropriate in the text, refer to AAR for detail.

Potential substances: AMAP monitoring programme analytes, POPs protocol substances (aldrin, dieldrin, chlordane, toxaphene etc.), PCDD/PCDF, PAHs, lindane, PCP, short chain paraffins, BCPS, bromocyclen, organophosphates, triazines, haloacetic acids, brominated flame retardants, PCDEs, alkyl phenols/ethoxylates, etc.

Do we need to address natural organohalogen compounds?

1. Introduction (something here about the UN ECE, LRTAP protocols, UNEP, OSPAR)
    - 1.1. Physical and chemical characteristics of persistent organic pollutants (POPs)
        - 1.1.1. Industrial products and byproducts (e g PAHs)
        - 1.1.2. Chlorinated pesticides
            - 1.1.2.1. Persistent pesticides
            - 1.1.2.2. Less persistent chlorinated pesticides
        - 1.1.3. Other pesticides
            - 1.1.3.1. Tributyltin (TBT)

2. Sources of persistent organic pollutants
    - 2.1. Pathways
    - 2.2. Global sources
    - 2.3. Sources in circumpolar countries
    - 2.4. Local/regional sources within the Arctic

3. Toxicology
    - 3.1. Toxicokinetics
    - 3.2. Types of effects
    - 3.3. Effects of specific POPs
        - 3.3.1. Halogenated industrial chemicals and by-products
        - 3.3.2. Persistent organic pesticides
        - 3.3.3. Less persistent organochlorine pesticides
        - 3.3.4 PAHs
        - 3.3.5. Other pesticides
            - 3.3.5.2. Tributyltin (TBT)

4. Regional and circumpolar levels and trends in abiotic and biotic media
    - 4.1. Air and precipitation
        - 4.1.1. Air
        - 4.1.2. Precipitation
        - 4.1.3. Summary and conclusions - air and precipitation

6.2. Freshwater environment
6.3. Marine environment
6.4. Summary and conclusions - biological effects
6.4.1. Observed effects
6.4.2. Assessment of current levels in biota

7. Conclusions and recommendations
7.1. Levels and effects
7.1.1. Air and precipitation
7.1.2. Seawater and freshwater
7.1.3. Sediments and suspended solids
7.1.4. Biota
7.2. Sources
7.3. Spatial trends
7.4. Temporal trends
7.5. General monitoring

Appendices

AMAP monitoring programme for POPs and biological effects (POPs).

Data tables

2. POPs Assessment time table

March 1999	First ASG meeting
Autumn 1999	Assistant employed?, start annotated outline/first draft
January 2000	Workshop - POPs/Human Health, presentation of first draft, prep of progress report
Spring 2000	Second draft preparation
June 2000	Second draft review
September 2000	Ministerial meeting - Arctic Council, progress report submitted
December 2000	Follow-up workshop? Draft revision
June 2001	Last draft ready
June 2002?	Rio + 10
September 2002	Ministerial meeting - Arctic Council

3. Information to the Working Group pertaining to the POPs assessment report

In discussions within the ASG, the LCEs for POPs have agreed with the LCEs for Oil/PAH to include PAHs of primarily pyrogenic origin in the POPs report and PAHs of primarily petrogenic origin in the Oil/PAH report. The LCEs from both groups will exchange drafts and update each other to ensure that nothing falls between the cracks.

Discussions about TBT indicate that new data is becoming available about TBT in marine mammals in the Arctic, and new types of sources besides antifouling paints. Some of this information is coming from laboratories working with the analysis of POPs. The question was raised as to whether TBT should be presented in a separate report or if it should be incorporated into the POP report. To facilitate the gathering and compilation of TBT data, the LCEs from the POPs report agreed to preliminarily include TBT in the POPs report. The POPs LCEs leave it to the Working Group to come with clarification as to whether this is acceptable or if they would rather see a separate TBT report.

Because of the inclusion of PAHs and TBT in the POP report, we recommend that the title of the report be changed to "Persistent Organic Pollutants and Other Organic Contaminants". If TBT is removed, the inclusion of PAHs would still make the use of this title recommendable.

Cynthia de Wit
LCE POPs

4. Human Health and POPs Joint Workshop

Third week of January 2000

Two days of presentations, one day for progress reports, one day for POPs drafting work on assessment report.

Day 1 Human health meeting

Day 2 Morning - Joint session human health and POPs
Afternoon - Parallel sessions, short presentations

Day 3 Morning - Parallel sessions, short presentations
Afternoon - Joint session with human health

Day 4 Discussion of assessment report drafts with experts attending workshop

Day 5 Progress reports pulled together by LCEs

Workshop participation

60 people total for both health and POPs. Some invited speakers others open. Announcement out via AMAP, website, etc.

Need a list of who should be invited, identify those people in particular with new data after the previous assessment for presentations, those needed for help in the assessment.

Preliminary suggestions for experts for POPs part

Terry Bidleman
Len Barrie
Someone from NILU
Ross Norstrom
Derek Muir
Janneche Skaare
Cynthia de Wit
Geir Wing Gabrielsen
Björn Serigstad
Kristín Ólafsdóttir
Mats Olsson
Marianne Kleeman
Jarle Klungsøyr
John Stein/Teri Rowles/Paul Becker, cetaceans, pinnipeds, polar bears, fish
Phil Johnson sea birds, sea otter, walrus, polar bear
Jaako Mannio
Sergei Melnikov
Tatiana Savinova
Frank Wania
Todd O'Hara (Barrow) bowhead, beluga, polar bear on the North Slope
Mary Matta (risk assessment for NOAA)
Yuri Treger (Russia)
Indigenous peoples organizations

Appendix 4: Report of the heavy metals expert group.

1. Proposed outline for the content of the HM Assessment

Heavy Metals (HM) Assessment Report for AMAP Phase II: Focus on Mercury

Table of Contents

I. Introduction:
- a. Summary of how Phase II enhances Phase I AMAP activities.
- b. Why focus on mercury?
- c. Description of Conceptual Model using mercury as a test case for HM.
  Steps: activities, system stressors, ecological effects, assessment endpoints, measures.
- d. Use of the Conceptual Model for directing monitoring, modelling and assessment objectives in AMAP.

II. Assessing activities which impact the Arctic.
- a. Fate and Transport.
  - i. Atmospheric transport and deposition processes.
  - ii. Marine/Freshwater processes and reactions.
  - iii. Transformations in biological systems, i.e. methylation, bioaccumulation.
- b. Source assessment.
  - i. Emission Inventory. Air sources of HM.
  - ii. Mass balance: comparison of relative contribution of sources.
  - iii. Data from hot spots, e.g., Kola, Norilsk.
  - iv, Natural sources of mercury.
  - v. Modelling: predicting impact of climate change, new sources, reduction measures, etc.

III. Characterizing system stressors: focus on mercury.
- a. Toxicological characteristics: summary of Phase I report and new information.
- b. Levels and trends:
  - i. Data from ”gap areas”: Russia and Alaska.
  - ii. Temporal trends: defining areas of interest (where trends are thought to be best observable, i.e. areas where large reductions and/or increases in loadings have occurred or are predicted to occur).

IV. Biological Effects.
- a. Human.
- b. Ecological.
  - i. Terrestrial.
  - ii. Freshwater.
  - iii. Marine.
- c. Combined Effects: status of current research.

V. Assessment Endpoints and Measures.
- a. Reduction of Arctic ecosystem health: measures to be determined but based on above program.

VI. Conclusions and Recommendations.

Including recommendations on conducting assessments of other metals, proposed actions on combined effects, proposed reduction actions, etc.

2. Multi-Lateral Project proposal on the Assessment and Reduction of Atmospheric Mercury Transport and Deposition to the Arctic

The purpose of this initiative is to cooperate with Russia to identify and reduce sources of atmospheric mercury to the Arctic by monitoring and assessing mercury in the atmosphere at strategic locations in the Arctic, especially in the U.S. and Russia. Though there are many source regions of mercury to the Arctic, this project will focus on the assessment and reduction of Russian sources *to strengthen Russia's implementation of circumpolar commitments and build international cooperation in monitoring efforts and in identifying sources of mercury to the Arctic ecosystem.* ***Specific Russian sources would be determined via modeling and a representative source would be selected for a cost-effective prototype pilot demonstration project. This activity is timely for the following reasons:***

- ***The Arctic Monitoring and Assessment Program (AMAP) State of the Arctic Environment Report identified mercury as a critical pollutant with significant data gaps, particularly from U.S. and Russian sites;***
- ***This initiative supports AMAP's charge from the Ministers to develop and implement a workplan for the Heavy Metals monitoring subprogram in Phase II of AMAP;***
- ***To date the Russians are the only Arctic country not to have signed the Heavy Metals Protocol of the United Nations Economic Commission for Europe (UNECE) Convention on Long Range Transport of Air Pollutants (LRTAP). This multilateral initiative would encourage cooperation with Russia to initiate activities which are supportive of the goals under the LRTAP Protocol;***
- ***The Arctic Regional Plan of Action (RPA) for the Protection of the Marine Environment (PAME) from land-based activities stresses the importance of assisting Russia in implementing actions to reduce heavy metals in support of meeting goals under the Heavy Metals Protocol of the UNECE LRTAP Convention;***
- ***A prototype pilot demonstration project could be carried out under the Arctic Council's framework of action.***

Background

Mercury is a persistent, bioaccumulative and toxic compound that accumulates in fish and mammals to levels of concern for human health when consumed. Indigenous peoples of the Arctic and their children are highly dependent on these sources of food for their subsistence. Any contamination of the food supply is of concern. Because mercury is a

volatile compound and can travel long distances to deposit in remote areas, a major mechanism of mercury input to the Arctic is from the atmosphere. The chemical form of mercury is an important factor in determining mercury fate and transport. Thus it is important to know what forms are emitted by sources, how the mercury is transformed in the atmosphere and how it is converted to its most toxic and bioaccumulative form, methylmercury, in the environment. Also, there is a need to understand how selenium works in living tissue to reduce the toxic effects of methyl mercury. This project will focus on determining the form of mercury that travel long distances in the atmosphere, e.g., elemental mercury. As the project evolves, it is hoped that the analysis of additional forms of mercury will enhance the understanding of mercury cycling in the Arctic.

A particular transformation of mercury that has recently been observed in the Arctic is the depletion of mercury from the vapor phase when the sun rises during the Arctic spring (Arctic sunrise phenomenon). The spatial extent and mechanism of this phenomenon is not yet known, but is estimated to contribute significantly to the bioavailability of mercury in the Arctic environment. To date this phenomenon has been observed at an Arctic site in Canada (Alert) and at Barrow, Alaska. This project would extend the spatial assessment of this phenomenon to sites in other key monitoring areas, such as in Russia (Pevek).

Due to the high observed levels of mercury in the Arctic environment, the observed "Arctic sunrise phenomenon", and the potential threat of increased emissions of heavy metals, mercury was identified as a critical pollutant in AMAP's State of the Arctic Environment Report (SOAER). Mercury thus continues to be a priority pollutant in AMAP's draft workplan for the Heavy Metals monitoring subprogram for Phase II of AMAP, and the initial phases of this initiative would assist in implementing the monitoring and modeling approach suggested in the workplan.

Monitoring and modeling activities would be implemented through the AMAP workplan. This proposed initiative is designed to strengthen Russia's implementation of circumpolar commitments and build international cooperation in monitoring efforts and in identifying sources of mercury to the Arctic ecosystem.

Sources of mercury to the atmosphere are anthropogenic and natural. The relative contribution of anthropogenic versus natural emissions has been estimated to be 50 to 75 per cent. This analysis is complicated by the fact that mercury once it is deposited can be re-emitted from soils and thus it is difficult to distinguish between historical and current emissions.

This project will focus on determining anthropogenic sources of mercury, and, where possible, distinguish these from natural sources. A major source of anthropogenic mercury emissions globally is coal-fired energy generation. Recent findings of an AMAP screening report underscore the importance of the atmospheric pathway for mercury

loadings to the Arctic from Russia, China and Eastern Europe, especially from coal combustion in these regions, which would be likely to increase in importance in the future as global energy demand increases. Based on this information, reductions of atmospheric mercury sources are important for reducing risks to Arctic ecosystems and populations. The focus in this Arctic initiative is on reducing Russian sources, because Russia is an Arctic Rim country. Information on other source countries identified outside of the Arctic Rim would be brought to the appropriate international fora to address reductions. In the Arctic context, because of the concern of impacts from Russia on the Arctic marine environment, the Arctic RPA for the Protection of the Marine Environment (PAME) from land-based activities stresses the importance of assisting Russia in implementing actions to reduce heavy metals. In a broader context, this multilateral initiative would provide for cooperation with Russia to commence activities which are supportive of international agreements such as the Heavy Metals Protocol under the UNECE LRTAP Convention.

Mercury emissions controls, engineering solutions and pollution prevention measures to reduce emissions from coal-fired boilers and other major atmospheric mercury sources, such as incineration, have been developed. Cooperative efforts by Arctic Rim countries to evaluate the extent of transport and deposition of mercury to the Arctic from atmospheric sources, especially from Russia, and actions to reduce these sources should enhance the reduction of risk to the Arctic ecosystem and human populations.

This initiative should be focused on:

- assessment of the spatial extent and mechanism for the Arctic sunrise phenomenon
- determination of atmospheric mercury sources to the Arctic, with a focus on Russian anthropogenic sources
- assessment and prioritization of sources and evaluation of appropriate reduction measures
- technology transfer and implementation of a cost-effective prototype pilot demonstration project to achieve reductions in an Arctic targeted source

This initiative would address priorities of the Arctic Council to promote international cooperation, achieve reductions in emissions of contaminants posing a threat to the Arctic, facilitate technology transfer, broader utilization of existing systems, and reduce risks to indigenous peoples and Arctic ecosystems.

Phase I of this project would carry out monitoring of atmospheric mercury levels to assess the Arctic sunrise phenomenon and identify major sources of mercury to the Arctic. Participants might want to consider additional measurements of other trace metals, such as selenium, in order to better identify sources and assess risk. Measuring levels of selenium

input to the system may help clarify a little-understood phenomenon. Levels of mercury in Arctic organisms have been observed that are so high as to cause health effects, and yet none are seen, possibly due to the modifying effects of selenium. Also, trace metals, such as zinc, lead, aluminum, selenium, and antimony, act as tracers for emissions from certain sources of atmospheric mercury. Additional measurements of reactive gaseous mercury (RGM) would also enhance the understanding of the Arctic sunrise phenomenon by identifying possible mechanisms of mercury transformation and would also contribute to source identification efforts. RGM is emitted by many combustion sources and, though very reactive, can indicate sources of mercury pollution. Also, understanding the trends in RGM would enhance the understanding of mercury fate and transport in the Arctic.

Activities in Phase II involve the prioritization of sources for reduction activities and the design of management options to reduce these sources. Appropriate international fora may be notified to address sources identified outside of the Arctic. Phase III consists of the implementation of a cost-effective prototype pilot demonstration project to reduce an appropriate targeted source of mercury to the Arctic.

Phase I: Evaluation of current status of the problem with respect to atmospheric loadings and transport.

1. *Mercury monitoring capability:* strengthen the capability to monitor mercury in the Arctic atmosphere at a new site located at Pevek in the Russian Arctic complementary to the existing "key monitoring areas" in the Arctic at Ny-Ålesund in Norway, at Barrow in the United States, at Alert in Canada and at Amderma (Pechora River) in the Russian Arctic); (see attached map)

2. *Mercury trends characterization* : assess spatial variability of mercury concentrations in the Arctic atmosphere to determine extent and possible mechanisms of Arctic sunrise phenomenon and to determine loadings;

3. *Mercury source term characterization:* identification of the atmospheric mercury sources contributing to deposition in the Arctic.

4. *Arctic Mercury Task Group*: form an Arctic mercury task group to address complex issues of mercury environmental transport and transformation.

Specific tasks and estimated costs for phase I	**Costs**
1. Strengthen gaseous mercury monitoring capability [*] (E.g., at Russian Arctic site at Pevek) - costs include equipment, QA/QC, site operator training, travel - an optimum monitoring set up for Arctic sunrise phenomenon assessment and source identification would also include measurements of mercury in particulate, reactive gaseous mercury and certain trace metals, e.g., aluminum, selenium.	$ 100,000
2. a.) Project coordination by AMAP to include QA/QC, data collection, data exchange and reports	$ 20,000
b.) QA/QC in 2.a. to specifically include all relevant archived Arctic data (e.g., Russian data)	$ 40,000
Total Leveraged Funds	**$ 100,000**
3. Conduct source-receptor and back-trajectory modeling to identify sources [**]	

[*] Funds to Russian Federation

[**] Participating countries may conduct in-kind modeling efforts to identify transboundary sources

Phase II: Assessment and prioritization of major sources for targeted reduction activities

1. *Source evaluation:* evaluate major sources identified by modeling in phase I and verify results with existing emission inventories where possible;

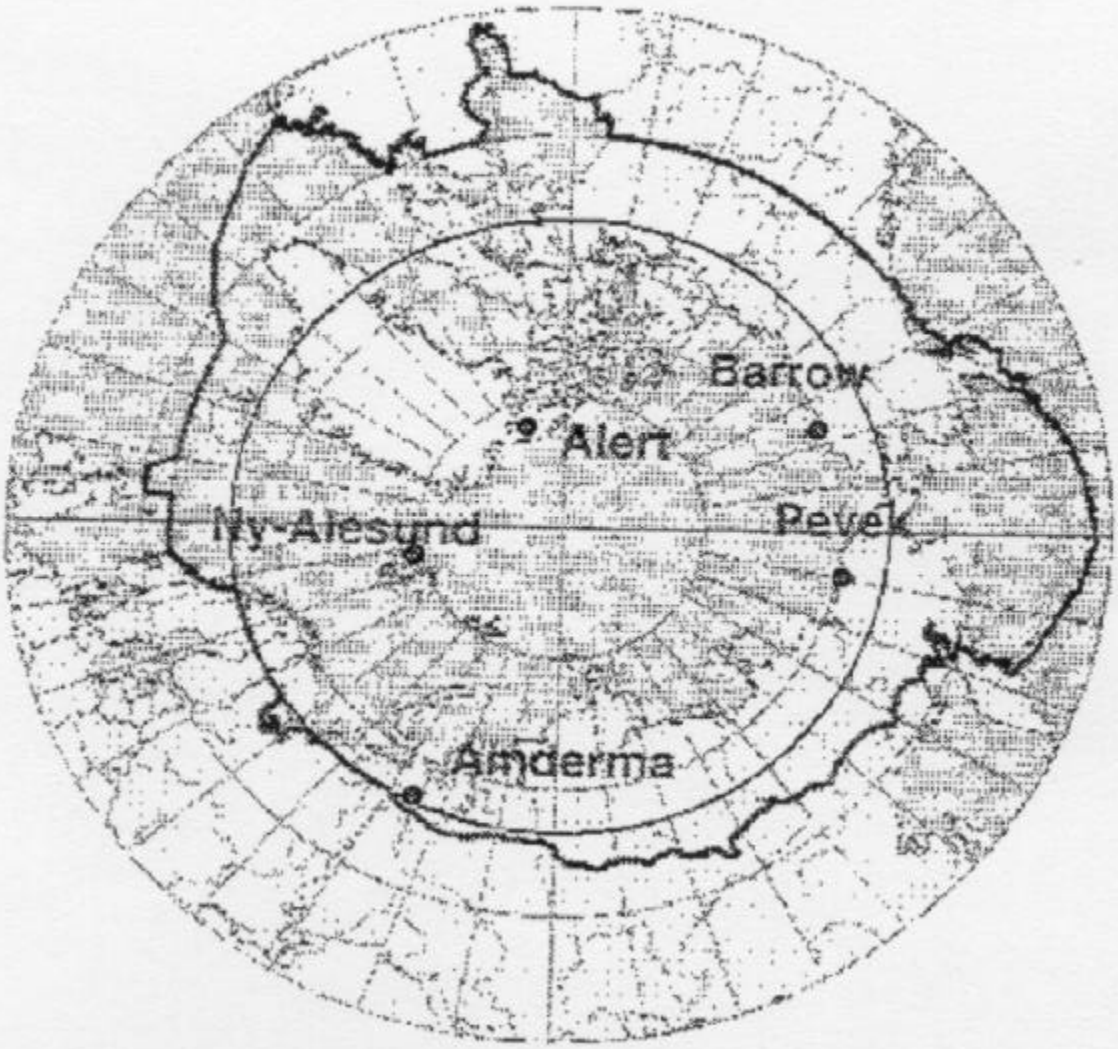
2. *Source reduction prioritization*: establish selection criteria and prioritize major sources for potential reduction activities based on highest potential impact to the Arctic environment. For sources identified outside of the Arctic, develop strategy to engage appropriate international fora;

3. *Identification/selection of reduction measures:* based on the targeted source selected for reduction identify existing emission control technologies, engineering solutions and pollution prevention measures and select most cost-effective approach to achieve desired reduction.

Phase III: Implementation of cost-effective prototype pilot demonstration project

1. *Source selection:* based on the results of Phase II, select a high priority source for pilot project implementation;

2. *Implementation of demonstration pilot project*: based on results of Phase II and source selection in Phase III.1, appropriate actions will be determined.



Boundary of the main geographical region addressed in the AMAP (source related) assessment.

AMAP Mercury Atmospheric Monitoring Activities (and related measurements)

AMAP Country	Site Location	Parameters	Frequency/Method
Canada	Alert	Vapor phase Hg^0, ozone	Continuous, since '95, Tekran
United States	Barrow	Vapor phase Hg^0, ozone	Continuous, since 12/98, Tekran
Finland	Pallas	Vapor phase total Hg (Hg^0, Hg^{2+}), trace metals	Weekly, since ?, manual method?
Norway	Ny-Ålesund	Vapor phase total Hg (Hg^0, Hg^{2+}), trace metals	
Denmark/Greenland	Station Nord ✓	?? same as above ?	??
Sweden	??	??	??
Russia	Anderma?	Vapor phase Hg^0	Continuous, Tekran?
Iceland	??	??	??

3. Comments to the "Multi-Lateral Project proposal on the Assessment and Reduction of Atmospheric Mercury Transport and Deposition to the Arctic"

l. The project proposes to strengthen the monitoring capability of mercury in the Arctic by establishing a new site at Pevek in the Russian Arctic. In principle, all initiatives to enhance the monitoring capacity in remote areas with relevance for long-range transport of pollutants are most welcome.

However, this proposal presents a very general monitoring program giving only a broad indication of the monitoring priority substances Given the difficulties of sampling heavy metals, the proposal should recommend sampling and analysis techniques the periodicity and length of data collection and quality control routines.

2. Instead, the proposal focuses on the use of the sampling data to produce a mercury source term characterization. It is not clear how the atmospheric sources of mercury can be identified from the monitoring results. The proposal loosely suggests back-trajectory modelling and source-receptor analysis as methods to be used by "participating countries" as in-kind contributions.

It is questionable how back-trajectories/source-receptor models can be used for determining Russian sources of mercury in the Russian Arctic. Long-Range Transport (LRT) models for Hg available today have problems with simulating long-range transport from well known anthropogenic sources of Hg in Europe. For examp1e, computed concentrations and depositions are much lower than measured during the selected episodes of transport from Central Europe to Ny Alesund.

This is mainly related to three major problems in modelling LRT of Hg:

A. The role and location of major natural sources of Hg is not clear yet.
B. The re-emission processes of Hg are not well enough parameterized in the models and have to be improved.
C. The sea-air exchange processes of different forms of Hg are poorly understood and require more research.

The authors of the proposal would have to clarify how they intend to deal with these limitations in their apportionment of sources to the measured air concentrations of mercury.

3. The proposal is also vague with respect to source evaluation. What is meant by a "representative Russian source"? How is this representativity to be assessed? The proposal should specify what emission inventories the project relies upon and what criteria are envisaged for giving priorities to different sources.

In general, a weakness of the project is that it covers very (too?) broad research areas and relies on external research which is still under development. The proposal could gain if it focuses on one single topic (as for example, the management of a new monitoring station in Russian Arctic).

However, actions to reduce emissions are needed and we should not delay initiation of work (phase II & III) that can result in such actions.

We miss a connection with EMEP in the project. I believe the topic centre in Moscow should be involved in the project development?

With regards

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Appendix 5: Report of the radioactivity expert group.

AMAP EXPERT GROUP MEETING

Silver Springs Washington
9. - 11. March 199

Agenda

Agenda

1. Report from AMAP Working Group Meeting in Helsinki 7. - 10. December 1998
2. AMAP Monitoring Programme
3. AMAP - Assessment Work
4. AMAP Datacentre
5. Report from actions in each country or bilateral/multilateral co-operation
6. Arctic Conference
7. Workplan for AMAP Expert Group for 1999
8. Financing activity
9. Other.

1. Per Strand informed about AMAP-working group meeting in Helsinki, Finland, 7 - 10 December 1998. An Assessment Steering Group consists of the leading countries experts for heavy metal, persistent organic, radioactivity oil was established. It was also agreed to establish separate expert groups for the same contaminants.A joint Assessment Steering Group was established between AMAP - CAFF on climate change and UV.

   For radioactivity the working group has asked for a progress report on radioactivity in year 2000 and a main report in 2002. The later one should be co-ordinated with the meeting in RIO + 10.

   Per Strand also expressed satisfaction with the increased participation, shown in this meeting, from USA. The future AMAP- radioactivity work would clearly benefit on the involvement from USA.

2. The proposed monitoring programme was discussed and a modified monitoring programme was drafted.

Action - Kristina Rissanen finalises the proposal and will send this to the members of the expert group for comments.

3. 3.AMAP - Assessment Work.

   Per Strand informed about some of the future proposals based on the work from the first phase of AMAP. The future work should be based on assessment on sources which were not dealt with in phase 1, and specially those connected to future potential accidents. Further one should develop the vulnerability concept and the assessment and exposure of flora and fauna. There was also identified a need to adverse risk management.

   A long discussion took place about the second phase of AMAP. From this discussion the need to have a simplified description of the second phase of AMAP and the connection to the first phase of AMAP, was identified. The target group on this information is decision makers, politicians and other scientific comments not directly involved is the ???? radioactivity want Vincent McClelland made a draft of a «Road Map» for the assessment. This was commented by the other participants.

Action - Per Strand will produce a version based on the draft from McClelland and the comments given. This will then be sent to Vincent Midland for comments before being sent to all participants of the Expert Group for their comments.

The discussion on the rest of the assessment work focused on the list of content for the future AMAP report. The preliminary list is shown below.

Proposed outline for the content of the Radioactivity Assessment

1. Introduction

2. New data: Sources
   By sources: source terms and contamination of vicinities

3. New data: Contamination levels
   - 3.1 Oceans and seas
   - 3.2 Freshwater ecosystems
   - 3.3 Terrestrial ecosystems

4. Assessment of human exposure
   - 4.1. Methodology
   - 4.2 Exposure levels - by countries, regions, population groups and/or sources

5. Assessment of exposure to biota
   - 5.1. Methodology
   - 5.2 Exposure levels - by regions and/or sources, different species

6. Arctic vulnerability to radioactivity
   - 6.1. GIS for arctic regions
   - 6.2 Radiological models
   - 6.3 Maps of vulnerability

7. Potential accidents (by sources)
   - 7.1. Scenarios and source terms
   - 7.2 Environmental transfer
   - 7.3 Potential exposure of humans and biota

8. Risk management
   - 8.1 Nuclear safety/surely
   - 8.2 Radiation protection (intervention, etc.)
   - 8.3 Monitoring

9. Conclusions and recommendations

Before next meeting in Edinburgh in September, the agreement was to provide information, specially on the following topics.

1) USA: DOE Midland provides information on assessment connected to potential accidents of submarines taken out of operation.

2) Per Strand will follow up and co-operate with IUR on the subject of exposure and protection of flora and fauna.

3) Michael Balonov looks into the possibility on assessing the consequences after Underground Nuclear Explosions in Arctic.

4. AMAP Data Centre.

Per Strand informed about the Data Centre which have been developed during phase 1 of AMAP. The Data Centre has information about sources, inventory releases, source terms, levels and trends and a lot of additional information such as land use, soil types, food production, population etc. In addition this data centre has collected, modified and

developed necessary model tools for the assessment. The Data Centre should be involved in the future monitoring work

5. The different countries informed about the ongoing work relevant to the expert group.

   NORWAY: The focus of the bilateral work between Norway and Russia is the Joint Environmental Commission and the agreement between the Norwegian Ministry of Foreign Affairs and the Russian Ministry of Atomic Energy. (Minatom).

   The objectives in the bilateral work is:

   1. Nuclear Safety
   2. Waste management
   3. Assessing and investigation of radioactive contamination of the Northern Areas
   4. Weapon related risks

   under 3 the major project have been:. Dumping of radioactive waste in the Barents and Kara Sea, assessing sources and releases from Majak reprocessing plant, investigation of radioactive contamination at the Atomflot installation and in the Kola fjord, monitoring radioactive contamination in the Northern Seas, participation in AMAP, establish and running the International Data centre for radioactive contamination in Arctic, French Norwegian co-operation on transport of radioactive contamination through rivers, studies of long-term behaviour of radioactive contamination in Arctic, monitoring network in North west Russia, and installing solar panels instead of Sr, RTG.

   Input from the other countries is outstanding.

6. The Arctic Conference was discussed in a separate meeting section.

   The proposed programme will be sent to the members of the Expert Group.

Action (Per Strand).

7. Workplan for AMAP Expert Group for 1999

   The major task this year will be to develop the list of content, the Road Map, and provide as much as possible information from the 4. International Conference and make this available for the future assessment. During the Edinburgh Meeting a plan for drafting will be finalised.

   The following meetings were agreed

   24. September in Edinburgh and possibly a joint IUR/AMAP meeting in Georgia September/October

   26. January year 2000 in USA, at the Nevada test site.

8. When the work load is identified in the assessment plan and the monitoring programme has been finalised the finalised resources will to be addressed.

Appendix 6: Report of the petroleum hydrocarbons and PAHs expert group.

Update on the major anthropogenic source of hydrocarbon contamination in the Arctic i.e. oil and gas development. Releases from shipping and burning of fossil fuels are additional sources within the Arctic. Accidental spills and chronic releases from poorly maintained pipelines from ships, and during transfers at oil storage depots pose the greatest threats from petroleum hydrocarbons.

l. Introduction

2. Sources of Oil and PAHs
    - 2 1. Pathways
    - 2.2. Sources
        - 2.2.1. Oil production (offshore, landbased, produced water)
            - 2.2.1.1. Oil drilling production and pipeline chemicals
        - 2.2.2. Transport of oil (pipelines, ships, ballast water)
        - 2.2.3. Release from shipping and fisheries combustion of oil)
        - 2.2.4. Petrochemical industry (release of process water)
        - 2.2.5. Natural seepage
        - 2.2.6. Accidental spills (use of chemical dispersion)

3. Toxicology
    - 3.1. Toxicokinetics
    - 3.2. Types of effects
    - 3.3. Effects of specific oil components
        - 3.3.1. WSF
        - 3.3.2. WAF
        - 3.3.3. Phenoles
    - 3.4. Effects of oil production chemicals
    - 3.5. Chemical oil dispergens

4. Regional and circumpolar levels and trends in abiotic and biotic media
    - 4.1. Marine environment
        - 4.1.1. Seawater (levels)
            - 4.1.1.1. Sea ice
        - 4.1.2. Marine sediments
        - 4.1.3. Marine bacteria and algia (primary production)
        - 4.1.4. Marine invertebrates
        - 4.1.5. Marine and anadromous fish
            - 4.1.5.1. Aquaculture
        - 4.1.6. Seabirds
        - 4.1.7. Pinnipeds and cetaceans
        - 4.1.8. Polar bear
        - 4.1.9. Arctic fox
        - 4.1.10. Sea otter
        - 4.1.11. Oil on shoreline
            - 4.1.11.1. Soft bottom
            - 4.1.11.2. Hard bottom

Appendix 7: Report of the human health expert group.

Human Health Update Report Content

1) Introduction (JCH + AG)

2) The concept of combined effects (JCH et al.)

3) Cellular Effect Models (EBJ)

4) Genetic susceptibility (EBJ)

5) Biomarkers of effect (Chris S.)

6) Environmental Monitoring (each nation)

7) Biological Monitoring: The Circumpolar Study (Jay V.O.)

8) Lifestyle determinants (Jon Øyvind + Eric) Food, smoking, alcoholism, work

9) Health outcome (Jim B.).

10) Socio Economic Conditions (Peter B.)

11) Conclusions and recommendations

The Human Health Expert Group (HHEG) will focus its assessment activities during the period of AMAP II on the evaluation of the combined effects of exposure to multiple contaminants and other stressors. Of major concern to human health are the high levels of mercury and several POPs. In order to properly evaluate the combined effects of these substances on health (measured through biomarkers of effect and clinical findings), it will be necessary to consider other factors such as life style and socio-economic conditions.

The assessment approach will be to examine the items listed in the draft table of contents of the report.

The HHEG will also gather data for children exposed to POPs, metals, radionuclides, and airborne and waterborne contaminants in the circumpolar region. Outside AMAP, but under the Arctic Council's activities, information on life style factors will be gathered for incorporation in to the HHEG assessment of combined effects.

Information on biomarkers of exposure and effects most relevant to humans in the Arctic will be forthcoming from a workshop to be held in Washington in late 1999. This workshop will take advantage of cross-disciplinary findings of wildlife and human health experts.

AMAP will also convene an interdisciplinary workshop on the Human Health and POPs early in 2000 in Rovaniemi. Up to 60 experts will present and review new data and progress on POPs issues that impact on the health of Arctic people and especially children. This

workshop will be completed with a meeting of the HHEG and preparation of a draft progress report.

The draft assessment report is expected to be available for publication by January 2002. Costs for publishing the Human Health Assessment Report will be born by the two lead countries (Denmark and Canada).

AMAP has indicated its interest in participating in the AC's Future of Children and Youth in the Arctic project proposed by Canada in Iqaluit in 1998. The AMAP WG has requested that the HHEG lead the evaluation of the environmental contaminant exposure of children, This will be accomplished without any significant increase in budget. Canada will provide some funds to AMAP for this work.