

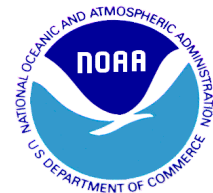
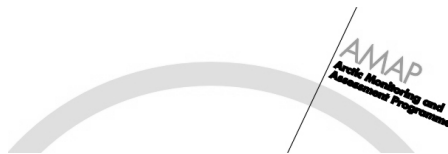
Arctic Climate Impact Assessment

**Report on the 3rd Meeting of the
Assessment Steering Committee
and a Scoping Workshop**

**February 28 – March 1, 2000
Washington, DC, U.S.A.**

**International Arctic Science Committee
Arctic Monitoring and Assessment Program
Conservation of Arctic Flora and Fauna
U.S. National Oceanic and Atmospheric Administration**

**ACIA Report No. 1
March 2000**



Robert W. Corell, Chair, Assessment Steering Committee

Pål Prestrud, Vice-chair, Assessment Steering Committee

John A. Calder, Workshop host

Gunter Weller, Interim ACIA Executive Director

Thomas E. Murray, Interim ACIA Secretariat

Breakout group on strategies for scenarios, modeling and paleoenvironmental data and information

- **Thomas Delworth, Chair**
- **Manfred Lange, Rapporteur**

Breakout group on indigenous people, Native lands, and societal issues

- **Barrie Maxwell, Chair**
- **Mark Nuttall, Rapporteur**

Breakout group on marine and coastal systems

- **Harald Loeng, Chair**
- **Ken Drinkwater, Rapporteur**

Breakout group on terrestrial environment and ecosystems

- **Betsy Weatherhead, Chair**
- **Don Russell, Rapporteur**

Breakout group on infrastructure

- **Gunter Weller, Chair**
- **Manfred Lange, Rapporteur**

ACIA Executive

- **Robert W. Corell**
- **Pål Prestrud**
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- **Gunter Weller**

Assessment Steering Committee Meeting and Arctic Climate Impact Assessment Scoping Workshop

Report of a meeting and workshop to plan a study of the impacts of climate change on Arctic regions, February 28 – March 1, 2000, Washington, DC, USA

Introduction

For several years, the Intergovernmental Panel on Climate Change (IPCC) has been preparing periodic assessments of global climate change. As this process has matured, it has become clear that there is a need to obtain a better characterization of climate variability and change on regional scales. Armed with recent knowledge of significant changes in the climate of the Arctic, the International Arctic Science Committee (IASC) proposed to the Arctic Council that an assessment be conducted of climate variability and change in the Arctic. Independently, the Arctic Council had asked its science working groups on the Arctic Monitoring and Assessment Program (AMAP) and Conservation of Arctic Flora and Fauna (CAFF) to undertake an assessment of the impacts of changes in climate and ultraviolet radiation. The three groups, IASC, AMAP and CAFF, have now joined together to conduct an Arctic Climate Impact Assessment (ACIA). The U.S. has volunteered to lead this effort, with the participation of the seven other Arctic countries.

The ACIA is a broadly conceived process, designed to include physical, biological, and socio-economic systems throughout the Arctic. It is the intention of ACIA to produce a peer-reviewed summary of the current scientific understanding of climate change and variability and increased UV radiation; a set of climate change scenarios; and an examination of the potential impacts of climate change on ecosystems, infrastructure, and other elements of society. Separately, the AMAP and CAFF working groups will consider a range of policy recommendations designed to aid mitigation of or adaptation to the impacts.

The purpose of the ACIA Scoping Workshop was to discuss and make decisions on an organization and implementation strategy for ACIA, priorities and schedule of tasks to be accomplished, and recommendations concerning experts who could contribute to the assessment by serving as contributing authors. Over 40 experts from the Arctic countries and elsewhere were invited to the workshop. The agenda for the workshop is attached as Appendix 1. Attendees are listed in Appendix 2.

An assessment Steering Committee (ASC), named jointly by IASC, AMAP and CAFF, met several times in the course of the workshop to review progress, make alterations to the agenda, and handle administrative matters. Background to the workshop was provided by the ACIA Implementation Plan, Version 2.1, that had been presented to Senior Arctic Officials at their November 1999 meeting in Washington, DC.

Initial Assessment Steering Committee Meeting

Before the opening of the Scoping Workshop, the Assessment Steering Committee (ASC) met, under the pro temp chairmanship of John Calder, in order to review:

- the status of support for the ACIA,
- the International Arctic Research Center at the University of Alaska Fairbanks,
- the ASC's composition, leadership and terms of reference,
- recruitment of an Executive Director and Secretariat,
- the role of climate modeling in ACIA, and
- organization of the Scoping Workshop to follow.

Karl Erb reported that the National Science Foundation (NSF) is prepared to support the Secretariat, with the help of the National Oceanic and Atmospheric Administration (NOAA) and possibly other agencies. John Calder said that NOAA will help support the Secretariat, with the expectation that other agencies and governments will contribute to the support of the scientists who work on the ACIA. Gunter Weller presented an introduction to the International Arctic Research Center at the University of Alaska, its funding, the support of a number of projects in climate-related fields, and its proposal for support of the ACIA Secretariat that is now under consideration at NSF.

Snorri Baldursson reviewed the terms of reference of the ASC. It became obvious that, once lead authors are included and adequate geographical representation is achieved, the ASC could become a large body. The ASC concluded, therefore, that it should have an Executive body. A committee was appointed to draft revised terms of reference for the ASC and report back at the end of the Scoping Workshop. It was pointed out that we hope to have a person responsible for handling liaison between ACIA and the Intergovernmental Panel on Climate Change (IPCC) in place soon.

Odd Rogne reported on the composition and tasks of the ACIA Secretariat. The Secretariat will be responsible for coordination and communication, and it should draft all the papers the ASC will need to do its job. He proposed that there be an Executive Director who is knowledgeable about the science involved and experienced in science management, together with an Administrative Secretary who has broad management experience. Gunter Weller volunteered to serve as interim Executive Director until formal action can be taken on this question, and Tom Murray volunteered to continue serving as the interim Secretariat.

Lars-Otto Reiersen recommended that (1) the ASC have both a Chair and a Vice Chair, (2) the term of office be three years, and (3) the Chair and Vice Chair be one from North America and the other from Europe-Russia. Odd Rogne nominated Bob Corell to be Chair of the ASC; Lars-Otto Reiersen seconded the nomination; Bob was elected unanimously; and he accepted the position. Lars-Otto Reiersen nominated Pål Prestrud as Vice Chair of the ASC; Odd Rogne seconded the nomination; Pål was elected unanimously; and he accepted the position.

Bob Corell discussed the important role that climate models will play in the ACIA assessment. He suggested that there is profound agreement in the scientific community that we must pay a great deal of attention to models -- both climate and ozone models -- and what they are able to deliver. We may need a special effort devoted to development of a fine scale Arctic regional model. Additionally, construction of a socio-economic model will be a substantial challenge. Since we will need the results of regional scale models in order to formulate realistic Arctic climate scenarios, Bob suggested that we consider establishing a special task group on this topic. There was general agreement that climate and UV models will be important to us, we should not rely on any one model, we will have to move forward on the study of impacts in parallel with the development of better Arctic models, and we should try to engage the attention of top modelers as soon as possible.

Arctic Climate Impact Assessment (ACIA) Scoping Workshop

At the initial ACIA plenary session, Bob Corell outlined the progress and current status of the ACIA, including a brief summary of the current ACIA Implementation Plan, Version 2.1. He noted that our definition of climate is broad and specifically includes ultraviolet radiation. The group recognized that the IPCC assessment process pays limited attention to socio-economic impacts of climate change, though there was some attention to economic impacts in working group III of the second assessment and there will be attention to those impacts in the third assessment report that is now under review. Publication of the third assessment report is expected sometime in mid-2001.

The workshop then organized itself into five breakout groups primarily concerned with:

- strategies for scenarios, modeling and paleoenvironmental data and information
- indigenous people, Native lands, and societal issues
- marine and coastal systems
- terrestrial environment and ecosystems
- infrastructure

Each breakout group was charged to:

- review and make recommendations on the materials that are discussed in the first and second parts of Appendix 1 of the ACIA Implementation Plan, i.e. What do we know? (the state of knowledge) and What are likely changes in the future? (a set of scenarios);
- review and make recommendations on the materials that are discussed in the third part of Appendix 1 of the ACIA Implementation Plan, i.e. What are the possible impacts due to climate changes in the future? (key impact areas); and
- report back to a plenary session of this workshop.

Due to the nature of ACIA, primary attention was to be paid to impacts. Relevant questions included: How should the ACIA address or integrate the 14 topics mentioned in Appendix 1 of the ACIA Implementation Plan? Is the list of topical areas sufficiently inclusive or does it need to be expanded? What data and information will be needed in the study? Is there a connection between Arctic impacts and processes at global scales? Are there scenario needs specific to Arctic impact areas and, if so, what are they? How can the ACIA study address the spatial and temporal variabilities manifested across the Arctic? What approaches, workshops, task groups, etc. should ACIA use to broaden participation and enhance the content of the assessment of impacts? Who are the individual scientists/experts who should be asked to serve as contributing authors?

After a day of lively discussions in individual breakout groups, the groups reported back to a plenary workshop session. Their reports are given in Appendices 3 – 7 below, and their principal conclusions are mentioned here.

Breakout group on strategies for scenarios, modeling, and paleoenvironmental data and information. This group focused primarily on what model results would be needed in order to develop realistic climate scenarios. They acknowledged that the Arctic region is difficult to handle in Global Climate Models. In view of the characteristics of existing models and time constraints on this study, they suggested a two-tiered approach toward scenario development: (a) to use existing results as much as possible, and (b) to start to develop a reliable Regional Climate Model for the Arctic. The group thought we might look at a number of specific regions, e.g. western Greenland and eastern Canada, the Bering Sea region, and the European Arctic. With respect to ozone/UV-B issues, they felt there would be merit in a combination of the proposed ozone research centers (refer to “Ultraviolet International Research Centers,” IASC Report No. 7, 1997) and a modeling approach for stratospheric temperature; but they advised that this be separated from the task of providing climate scenarios for impact studies. The group recommended that a modeling task force be established to evaluate Intergovernmental Panel on Climate Change (IPCC) scenarios for the Arctic and to plan a longer term initiative to develop Arctic climate models. The full breakout group report is given in Appendix 3 below.

Breakout group on indigenous people, Native lands, and societal issues. This group recommended that social environment/human concerns be integrated into all sections of the ACIA study right from the start. They pointed out that indigenous people have to be made responsible in the process from the very beginning and not only in the steering committee. The Association of World Reindeer Herds, for instance, represents a network of 22 different ethnic reindeer people groups in northern Russia, Nordic countries, and North America; and it could be an important door opener for ACIA work in the next few years.

They pointed out that a substantial amount of potentially useful local traditional indigenous knowledge on climate change and its impacts already exists, but that much of it has not yet been systematically analyzed. They felt that attention to human concerns should be broadened to include all Arctic residents – both Native and non-Native. They

identified the following “mega-impact topics” that should receive emphasis in the ACIA report:

- marine environments, including such topics as commercial fishing, hunting and fishing, marine mammals, sea level rise, animal health, conservation and environmental governance, and culturally important marine species;
- terrestrial environments, including such topics as traditional food production, reindeer herding, caribou hunting, forestry, and culturally important terrestrial species;
- human health and well-being, including the distribution and patterns of infectious diseases, ultraviolet radiation, wildlife hosts and vectors of disease, zoonotic diseases, water quality, and the health of communities; and
- cultural and community sustainability, including land use and occupancy and sustainable livelihoods.

The full report from this breakout group is in Appendix 4 below.

Breakout group on marine and coastal systems. Bob Dickson presented a strawman matrix to help organize this group’s discussion of available evidence, models, impacts and needs for four time periods that stretch from paleoclimate to the future. This was regarded as an excellent starting point, but some gaps were identified dealing with coastal inputs, effects on anadromous fish, and coastal erosion. The group noted their lack of expertise from Pacific and Bering Sea regions. They recommended that biological impacts of climate change be stressed in the ACIA report, along with the problem of changes in UV radiation levels. They thought there are gaps in our knowledge of Russian meteorological, hydrographic and sea-ice data; and a data rescue effort would be needed to address these topics. The group suggested a set of potential contributing authors for the ACIA study, and the suggested names are included as part of this group’s report in Appendix 5 below.

Breakout group on terrestrial environment and ecosystems. This breakout group recognized that impacts of Arctic climate change have to be addressed sub-region by sub-region. They want to have country level summaries as part of the ACIA report. They proposed a structure for the study along the following lines: (a) physical aspects, including soil, atmosphere, and water; and (b) biological aspects, including ecosystem structure, ecosystem function, and implications for people and resources. They pointed out that other things, such as pollution, population and land use, are changing at the same time as climate and these changes should be taken into account. The full report of this breakout group is in Appendix 6 below.

Breakout group on infrastructure. This group organized its thoughts around two tables: one on impacts of changes in permafrost, sea ice, glaciers, river and lake ice, seasonal snow cover, and direct climate change effects; the other on issue-driven assessments of impacts on engineered structures, resource development, transportation, and community development. They proposed subdivisions for assessing the impacts of climate change in the Arctic; and they pointed out topics for which we need additional information. They

also suggested people who might contribute to the assessment. The report of this breakout group, including the tables, is in Appendix 7 below.

At the conclusion of the read-back session, Bob Corell charged all participants to consider two questions for discussion at the final plenary session of the workshop:

- (a) What organizing principles did we see in the presentations by the various breakout groups, i.e. organizing principles that we might profitably use in putting the ACIA report together? Should we, for example, structure the assessment around various Arctic sub-regions?
- (b) What tasks should we tackle right away? Development of climate change scenarios? Models? Socio-economic elements?

Final plenary session of the workshop. In the final workshop session, Bob Corell pointed out that our first job was to agree on some organizing principles around which we could structure the assessment of impacts of climate change on the Arctic. These organizing principles will be included in Version 3.0 of the ACIA Implementation Plan. This new version of the Implementation Plan is due to be presented to the Senior Arctic Officials for their approval at the April 2000 meeting of the Arctic Council in Fairbanks. Bob also asked participants to help specify those tasks that we should begin to carry out in the near future.

The following section is a brief summary of the rich discussion that ensued.

Organizing principles.

- (a) **Sub-regions.** ACIA will be a circumpolar assessment, but it will most likely be necessary to base it on special cases of sub-regional assessments. These sub-regions can be selected on the basis of observed changes in temperature, settlements of indigenous people, economic development, resource exploitation, etc. The sub-regions have not yet been selected. A strong data and information base already exists for some of them, while this is not so for others.
- (b) **Key impact topics.** Appendix 1 of the current ACIA Implementation Plan suggested 14 potential topics for the impact assessment. It will be necessary for the ASC to reduce these to a smaller number of key impact topics that can be dealt with for each of the sub-regions, but the ASC has not yet done this.
- (c) **Participation of indigenous people and stakeholders.** The participation of indigenous people and stakeholders should be sought right from the beginning of the study – before position papers or advanced draft documents have been written. Existing networks and organizations can help here. A modest beginning of communication with these groups can be made at already-scheduled meetings of

the Association of World Reindeer Herders, the Indigenous Peoples Secretariat, the Arctic Council, etc. We will undoubtedly find it useful to organize regional workshops for two-way communication purposes.

- (d) **The state of our knowledge.** It will be advisable to specify what we know and what we do not know on climate change impacts in the various sub-regions. This will help in setting future research priorities. We should concentrate our thinking on the ACIA report that is to be delivered to the Arctic Council in 2004, since the 2002 report will clearly be preliminary.
- (e) **Arctic processes in a global context.** We should pay attention to the effects of oceanic circulation and exchange processes, trace gas fluxes, and albedo changes and its influence on radiation budgets. Note that, while ACIA is not part of IPCC, it is important that we stay connected with IPCC.
- (f) **Involvement of Russian scientists and communities.** It may be possible to do comparative studies, e.g. comparisons of impacts on Yakutia or Chukotka with impacts elsewhere in the Arctic. It was noted that the Global Environment Facility is a potential source of funding to support Russian participation in the ACIA study.
- (g) **Development of policy recommendations.** Policy issues will be left to CAFF and AMAP. They have already made science and action recommendations to the Arctic Council as part of their earlier activities. It is important that policy recommendations be consensus recommendations. It is not necessary to put off policy recommendations until the whole ACIA scientific study is finished. Policy recommendations can be addressed to communities and regions in addition to the Arctic Council.
- (h) **Enlarge participation beyond Arctic countries.** It was pointed out that considerable expertise in Arctic research exists in non-Arctic countries. Since IASC has 17 member countries and comprises all countries making a significant Arctic research effort, relevant scientists from non-Arctic countries can easily be mobilized through IASC. UK and Germany, for example, have experts who could contribute to the study. And the European Union is a potential source of support for research on the impacts of Arctic climate change.
- (i) **Data sets.** The ACIA study will demand the use of relevant data sets, especially long-term data sets. We need to pay attention to validation of these data sets. Data rescue efforts may be required. It is important to include data on traditional knowledge in this data collection. It was agreed that we should appoint a task group on data issues.
- (j) **Time scales.** The study should look at both inter-decadal impacts (e.g. 2030) and longer term impacts (e.g. 2100). The UV research community is used to thinking

about 20 to 50 years into the future in its work. We should try to integrate paleoenvironmental information into the study as much as possible, and we could look back 100 years searching for trends.

- (k) **Modeling task group.** The workshop recommended that there be a modeling task group to examine the applicability of currently existing GCMs and look into the development of RCMs for the Arctic region.
- (l) **Scenario task group.** The workshop recommended that there be a separate scenario development task group that would use climate models but not be totally dependent on them. It was pointed out that the scenario task group will have to explicitly consider human issues. There will have to be scenarios of environmental and socio-economic sectors that describe the development of those sectors without regard to any climate change/variability, i.e. comparison of base case scenarios and climate change scenarios.

Short-term tasks

Workshop participants discussed some short-term tasks that should be addressed by the Senior Arctic Officials, IASC, CAFF and AMAP.

- (a) **Communication/dissemination strategy.** The workshop recommended that ACIA quickly develop a communication strategy designed to reach out to all participants in the study and the entire Arctic scientific community, along with indigenous communities and stakeholders. We should use a variety of media, e.g. an ACIA web page, CD-ROMs, electronic media. All reports and other documents should be circulated via E-mail, with attachments in MS-Word, Adobe PDF and JPEG. We should avoid using the very latest versions of software. To the extent possible, all communication should be in “plain language.”
- (b) **Schedule.** Participants urged the Assessment Steering Committee to develop a specific and realistic schedule for the steps involved in production of both the 2002 and 2004 reports. To the extent feasible, ACIA assessments should interface with the schedule for IPCC assessments.
- (c) **Links to other organizations.** ACIA should develop or strengthen connections to IPCC and other relevant bodies, e.g. GCOS, ACSYS. IPCC should be urged to appoint its liaison person to the ACIA Secretariat as soon as possible.
- (d) **Time scales.** The workshop asked the ASC to specify the time scales to be used in the assessment.

- (e) **Modeling task group.** It was recommended that the modeling task group get underway soon, evaluate IPCC model runs that may be useful for ACIA, and plan the development of additional Arctic climate modeling capabilities.
- (f) **Scenario task group.** The scenario group was urged to quickly begin development of realistic climate change scenarios that can be useful in assessing impacts on sub-regions and topical areas.
- (g) **Space scales and topical areas.** The workshop wanted the ASC to specify both space scales and topical areas to be used in the assessment. This includes definition of what we mean by the Arctic, with recognition that we may find we have to use different definitions of the Arctic in different circumstances. We should consider the advisability of including boreal forests within our definition of the Arctic.
- (h) **Reference material.** A number of assessments of climate change impacts have been carried out, and relevant and useful reports of these assessments have been published. The Secretariat should begin to build a collection of such materials and make them available to the contributing authors in the ACIA study.
- (i) **Funding issues.** While the U.S. government has pledged to support the ACIA Secretariat, the contributing authors of the study will be expected to secure support from their own national sources. This may not be as difficult as we imagine. The Canadian government, for example, is supporting a climate change action fund. The ASC will discuss funding further at a meeting during Arctic Science Week in Cambridge in early April.
- (j) **Indigenous people/stakeholder involvement.** As mentioned above under organizing principles, outreach to indigenous people and stakeholders should begin now, starting with already-scheduled occasions such as the reindeer herders meeting in Norway and the Arctic Council meeting in Fairbanks. All participants in the workshop can help in the outreach process. Note that, before approaching these groups, it is advisable to clarify the issues and questions we want them to address.
- (k) **Contributing authors.** It is essential that we begin to identify the scientists who can best contribute to the ACIA study. The question of lead authors can be left for later consideration.

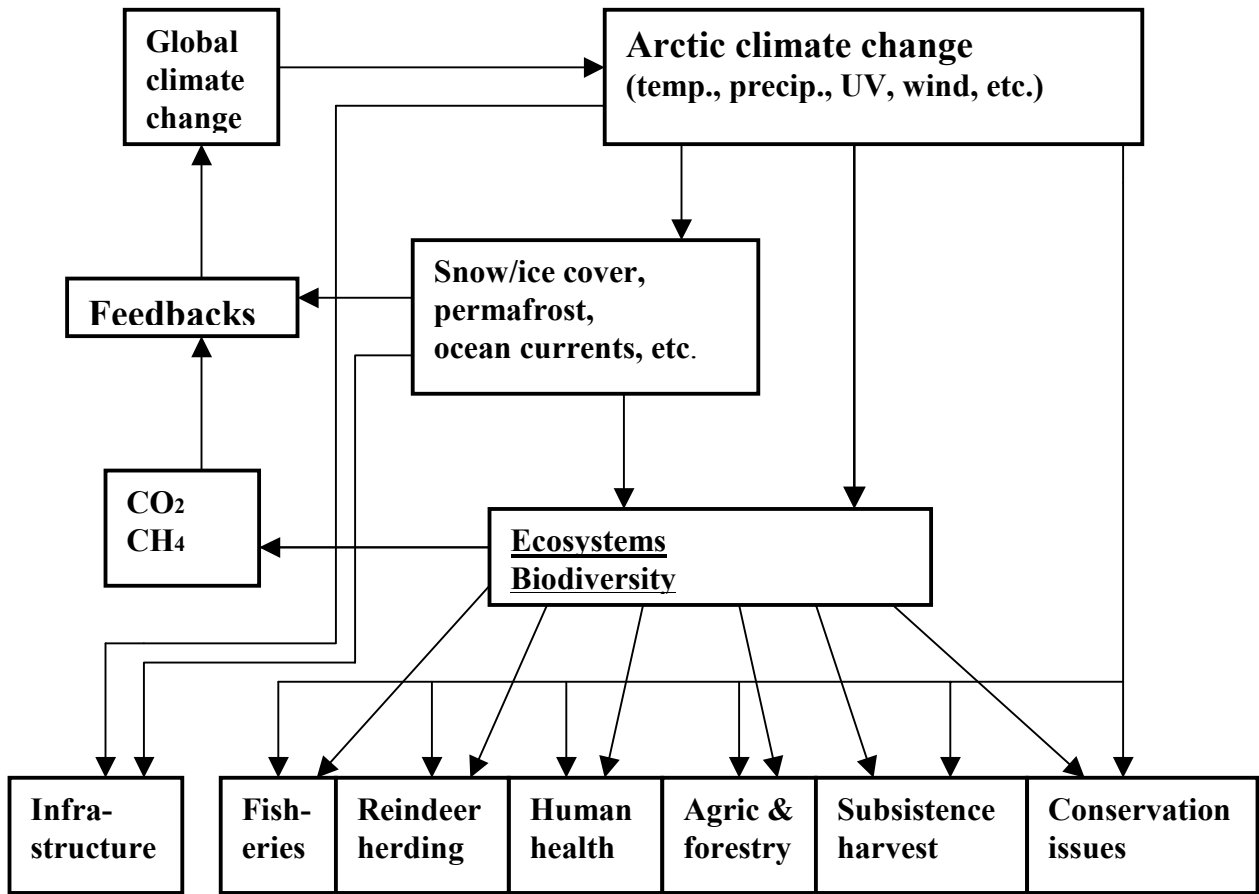
The last session of the ACIA Scoping Workshop concluded at midday on March 1.

Assessment Steering Committee Meeting

Wrap-up. The steering committee met briefly to review what had been accomplished in the workshop and what remained to be done.

PΔI Prestrud produced a diagram of the ACIA process which emphasized how changes in Arctic climate can cause changes in ecosystems, and ecosystem changes in turn can affect key impact areas such as agriculture, wildlife, fisheries, reindeer herds, etc. Members of the Assessment Steering Committee (ASC) thought PΔI's diagram portrayed the relationship between climate change and climate change impacts rather well. The diagram is on the next page of this report.

**Relationships between Arctic climate change
and its multiple impacts**



Note: When two lines cross in this diagram, it is assumed that they do not intersect or influence one another.

Note: Fisheries, reindeer herding, human health, etc. are only illustrations of sectors that are expected to be influenced by Arctic change. Others could be added to the diagram, but that would make it too complex.

Discussion among ASC members yielded general agreement on the following points:

- A number of productive ideas came out of the breakout groups. We did not spend enough time on the effects of climate change on ecosystems. It will not be difficult to write Version 3.0 of the ACIA Implementation Plan, but it will be difficult to do the many tasks involved in the actual assessment.
- There is concern about the time schedule, since only two years remain before the first ACIA report is due to be delivered to the Arctic Council. But we should probably concentrate more on the 2004 report and treat the 2002 report as a preliminary effort.
- The Secretariat will have to start work immediately.
- The highest priority seems to be development of the climate change scenarios as a baseline for the remainder of the work. We should try to involve some people who have had experience in developing climate change scenarios – people who have stubbed their toes already and know how hard a job it is.
- We must set terms of reference for the scenario development and modeling task groups.
- We cannot afford to use a linear approach in planning the assessment, i.e. completing the scenarios before doing the impact assessments. Scenario development and impact assessment must go in parallel.
- We will need climate change scenarios for each region. But we might develop these scenarios by looking first at the entire Arctic, and then stripping away the parts that do not apply to particular regions.
- We were happy with the meeting. It accomplished more than a number of participants expected.
- The main task of the meeting was to determine how the socio-economic parts of the assessment fit with the natural science parts. The ministers will want to hear about direct effects on humans. So we did what was most needed.
- We need a report from this workshop and a short time period to think about the results. We also need suggestions on who should be contributing authors of the study.
- Upcoming meetings of Arctic scientists in Cambridge (early April) and Senior Arctic Officials in Fairbanks (late April) will be opportunities for the ASC to continue the planning process.

Contents of the ACIA study. Since there had been some questions about the planned contents of the “What do we know?” section of the ACIA study, Bob Corell offered an alternative way of viewing the study. It would include:

1. our understanding of the changing state of climate, related environments, UV, etc. in the Arctic region (both scientific and indigenous knowledge)
2. our understanding of the changing state of ecosystems (marine, terrestrial, etc.)
3. scenarios – model-based projections, example-based projections, including cultural aspects, economic aspects, etc.
4. potential impacts of climate change on sectors/topical areas
5. potential impacts of climate change on regions/localities (sometimes called “place based”)

It was agreed that this alternative approach clarified what was desired in the “What do we know?” section. It also illustrated how careful the ASC will have to be in balancing natural science elements with socio-economic elements of the study.

Work plan. Bob Corell suggested a first-order work plan for the immediate future:

- Rough out a better long term schedule (2004) and short term schedule (1 year) by early April
- Work out terms of reference for the scenario development and modeling task groups
- Outline how we are going to implement the study as a prelude to outlining the content of the final document
- Plan the phases in which the parts of the document will be done and delivered
- Condense the 14 topics suggested in Appendix 1 of the ACIA Implementation Plan into a smaller number and set priorities among them

The suggested work plan was accepted.

Terms of reference of the Assessment Steering Committee. Snorri Baldursson reported on revised ASC terms of reference that had been developed by a working group in the course of the workshop. After it was clarified that the ASC Executive will have five members, the terms of reference were accepted. The terms of reference will be submitted to IASC, CAFF and AMAP for their approval. The terms of reference are given in Appendix 8 below.

Gunter Weller agreed to serve as the ACIA Interim Executive Director until an Executive Director can be recruited. It will be arranged within NOAA that Tom Murray can continue to serve as the ACIA Interim Secretariat.

In accordance with the ASC Terms of Reference, the current members of the ACIA Executive are Bob Corell, Pål Prestrud, Lars-Otto Reiersen, Jan-Idar Solbakken, and Gunter Weller.

Finances. It was acknowledged that contributing authors will have to be supported by their national sources. Further discussion of this item was deferred until the Cambridge meeting.

Closing. Bob Corell promised to send a message to all workshop participants thanking them for their contributions, asking them to pitch in and help with the assessment, and requesting that they help us build a collection of appropriate reference works.