

ARCTIC CLIMATE IMPACT ASSESSMENT

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Introduction

Background:

The Arctic Climate Impact Assessment (ACIA) is a four-year project of the Arctic Council that started officially in the third quarter of 2000 and is expected to be completed by the third quarter of 2004. The funding of ACIA is through support by each of the eight Arctic-rim nations, with the U. S. as the country that is providing financial support, through NSF and NOAA, to support the ACIA Secretariat at the University of Alaska Fairbanks. Contributions from other arctic countries and the permanent Indigenous Peoples organizations, as well as from the U. K., have also been secured, with each country supporting the involvement of its citizens in the ACIA, and through in-kind contributions, such as local costs of hosting meetings and workshops. The role the Arctic plays in the global scale of climate variability and change is depicted in the graphic that follows:



Objectives:

Climate variability and change, and more recently, notable increases in UV radiation, have become important issues in the Arctic over the past few decades (IPCC, 2000; Serreze et al., 2000; Weller, 2001 a, b; Weller et al, 1999). It has become imperative

to examine possible future impacts on the environment and its living resources, on human health, and on relevant economic sectors. The Arctic Climate Impact Assessment is expected to lead to useful information for the nations of the Arctic region, their economy, resources, and peoples. The assessment will be open and transparent and the review of its conclusions is intended to be credible and rigorous; also, the degree of uncertainty of the conclusions will be made clear. Fig. 1 illustrates the expected warming of the Arctic derived from a composite of nineteen computer models.



Fig. 1 Changes in annual mean temperature ($^{\circ}$ C) for a doubling of CO_2 , from a composite of 19 General Circulation Models (ACIA Stockholm Report).

ACIA Reports:

“First Order” drafts all the chapters of the scientific and technical report will have been submitted to the ACIA Secretariat by October 11, 2002. The “Strategy for the Preparation of the ACIA Policy Document” will be submitted by AMAP and to the SAO’s at their Inari meeting.

The three ACIA reports will be externally reviewed and completed by the fall 2004 Ministerial meeting of the Arctic Council in Iceland. These three reports are: (i) a peer-reviewed Scientific and Technical Report, (ii) a Synthesis and Overview Report that summarizes the principle findings of the Assessment, and (iii) a ACIA Policy Document providing recommendations for action by the Arctic Council, such as coping and adaptation measures. These reports will be based on the fundamental scientific and technical findings that document changes in the past, those changes that are occurring currently, and projections of changes that are likely to occur in the decades ahead. These projections are based on scenarios, computer simulations (e.g., those depicted in Figure 2 of the summer extent of the ice cover in the Arctic oceanic basin), and other projections of changes across the Arctic region. The Synthesis and

Over view Document will summarize the principle findings and outline those in non-technical language for the nations and residents of the Arctic region. The ACIA Policy Report will provide the nations and permanent participants from the indigenous peoples' organization with specific recommendations for action. The "Strategy for the Preparation of the ACIA Policy Document" will be submitted by AMAP and to the SAO's at their Inari meeting.

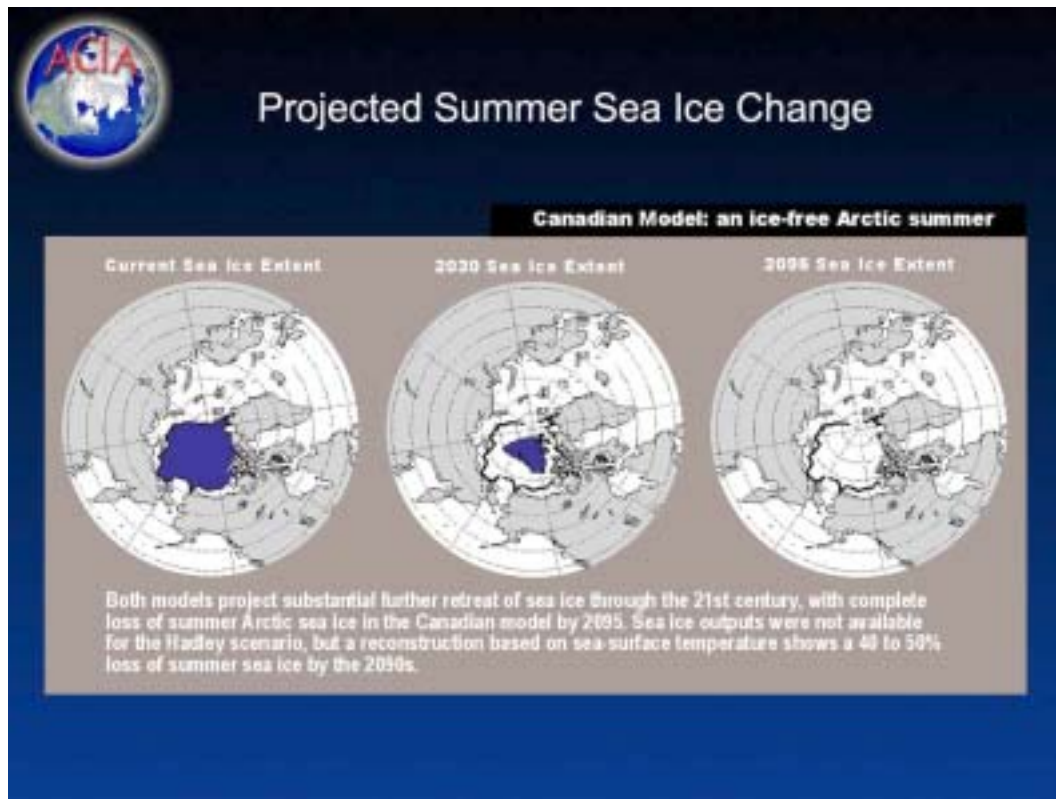


Figure 2 Projections of Summer Sea Ice Extent



Figure 3 A Graphical Depiction few of the Topics to be Addressed

The seventeen chapters of the Scientific and Technical Document are detailed below, and summarized in the pictorial Figure 3 above, of the scientific volume of the assessment with their respective lead authors (in brackets) are as follows:

- I. **Introduction and Overview**
Chapter 1: The Arctic System (All)

- II. **The Arctic as Part of the Global Climate System**
Chapter 2: The Arctic Climate System and its Global Role (G. McBean, Canada)
Chapter 3: The Role of Ozone and UV Processes in the Arctic (P. Taalas, Finland)
Chapter 4: Future Changes of Climate and UV Radiation- Modeling and Scenarios for the Arctic Region (E. Källén, Sweden; V. Kattsov, Russia; B. Weatherhead, U. S.)

- III. **Physical and Biological Systems and their Response to Climate Change**
Chapter 5: The Cryosphere and Hydrological Variability (J. Walsh, US)
Chapter 6: Terrestrial Ecosystems (T. Callaghan, Sweden)
Chapter 7: Freshwater Ecosystems (J. Reist, F. Wrona, Canada)
Chapter 8: Oceanic and Marine Ecosystems (H. Loeng, Norway)

- IV. **Impacts of Climate and UV Changes on Humans and their Activities**
Chapter 9: Indigenous Perspectives on Climate Change (H. Huntington, US; S. Fox, Canada/U.S.)
Chapter 10: Wildlife and Conservation Issues (D. Klein, US)
Chapter 11: Subsistence (hunting, fishing, herding, gathering), (M. Nuttall, UK)
Chapter 12: Fisheries and Aquaculture (H. Vilhjalmsón, Iceland)
Chapter 13: Forests, Agriculture and Land Use (G. Juday, US)
Chapter 14: Engineered Structures (A. Instanes, Norway)
Chapter 15: Human Health (J. Berner, US)

- V. **Synthesis**
Chapter 16: Assessing Vulnerabilities: A strategy for the Arctic (J. McCarthy, U.S.)
Chapter 17: Implications of Climate Change and UV Increases (All)

ACIA is working closely with the Intergovernmental Panel on Climate Change (IPCC), the Assessment associated with The Montreal Protocol on Substances that Deplete the Ozone Layer, and the Millennium Ecosystem Assessment. The Arctic Climate Impact Assessment will fit between the third and fourth IPCC assessment and will contribute to the fourth assessment. ACIA is expected to provide substantive contributions to the Millennium Ecosystem Assessment.

Progress Report and Accomplishments

Lead and contributing authors have been selected and first chapter drafts have been written.

The assessment is being conducted by international experts and broad participation from many different disciplines and countries in writing the three ACIA documents

has been established. The writing of the 17 ACIA chapters is being done by lead and contributing authors, guided by the ACIA Assessment Steering Committee (ASC). About 180 lead and co-lead authors, contributing authors, and consulting authors have been selected from all Arctic countries as well as scientist from other nations with strong Arctic scientific capabilities. Workshops of the chapter-writing groups have taken place and drafts of chapters are posted on a protected ACIA website for review and exchanges between chapters.

Authors, by country, participating in the ACIA are as follows:

United States	46	
Canada		38
Norway	20	
Sweden	17	
Russia	16	
Denmark	13	
Iceland	12	
Finland	9	
United Kingdom	3	
Germany	2	
Netherlands	1	
Austria	1	
TOTAL	178	

The IPCC SRES B2 climate scenario and five GCMs have been selected for the ACIA and are being used by the authors in the preparation of the scientific and technical report.

At an ACIA workshop in Stockholm in January 2001, an agreement was reached on the climate models and scenarios to be used. The ACIA is using a single IPCC-type scenario, i.e. the SRES B2 scenario. B2 is a "moderate" climate change scenario and it contains projections out to the year 2100. The B2 scenario is being implemented on five climate models (GCMs) that are readily available to scientists in North American and Europe: the models are those of the Canadian Climate Center, NCAR, GFDL, Hadley Center, and Max Planck Institute. Agreements have been signed with all five centers to provide model output to the ACIA. Time slices around 2020, 2050 and 2080 are being used, which are the ones also used by the IPCC. Fig 4. illustrates the generally good agreement between the models used by the ACIA of annual mean temperature changes in the Arctic as a function of time, particularly over the next half century. To evaluate the implications of other IPCC scenarios on the ACIA analyses, the ACIA is currently running the IPCC A2 scenarios for all five of the ACIA models. The basics assumptions implemented in the A2 and B2 scenarios as depicted in this table:

Scenario	Population	Economy	Environment	Equity	Technology	Globalization
A2	↗	→	↘	↘	→	→
B2	↗	→	↗	↗	→	→

Output from the five selected models is being distributed to ACIA authors.

Climate scenarios and simulations, based on the five GCMs used by the ACIA and tailored to individual requests from chapter authors are now being provided to the authors. This is done through two centers set up by the ACIA; one at the University of Illinois for authors in North America, the other in Stockholm for European authors. CAMP, under the direction of John Walsh, has provided the financial resources and expertise for setting up these two centers. These computer simulations provide a basis for estimations of the changes that likely to be observed in the Arctic over the decades ahead.

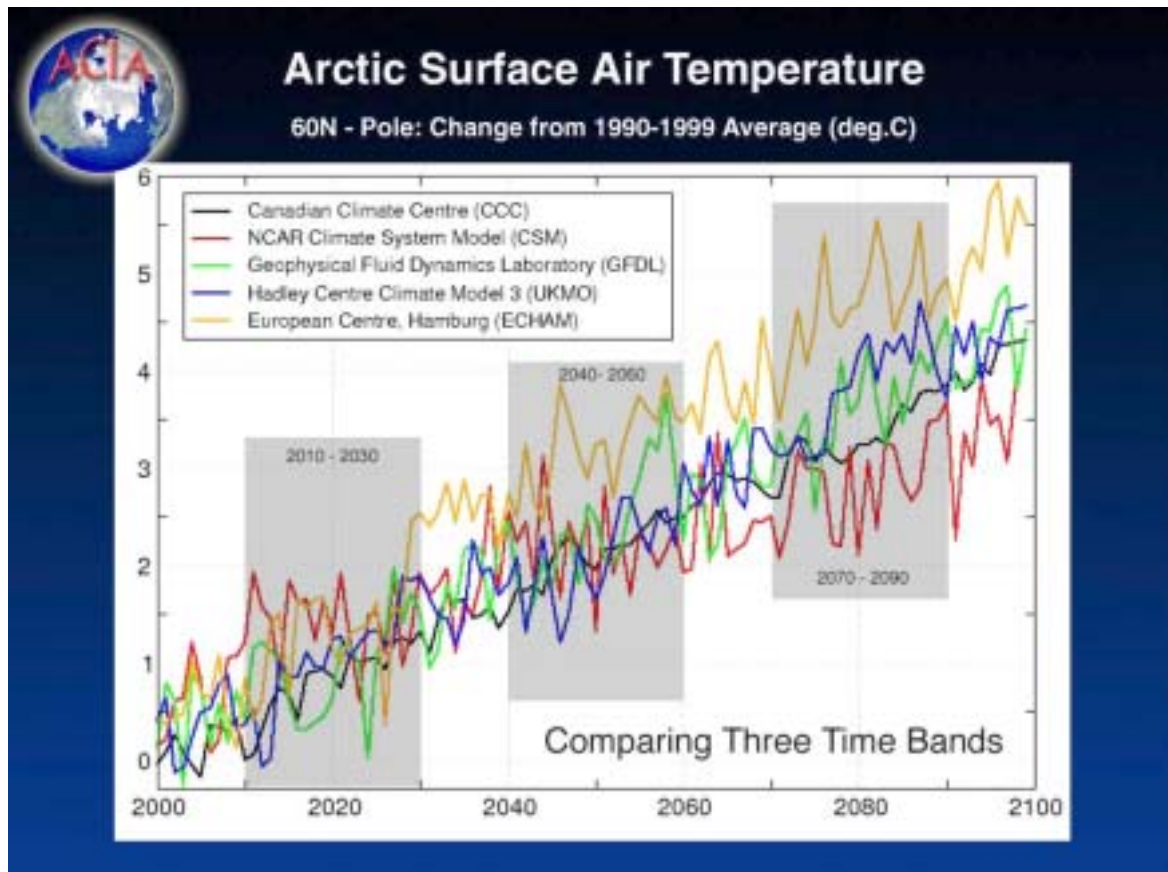


Fig.4

GCM projections of arctic surface temperatures from the five ACIA models

Editorial and graphics services to the authors are now being provided.

An editor and a graphics expert have been selected by the ASC to provide help to ACIA authors. The editor is Susan Hassol and the graphics expert Paul Grabhorn. The Paul Grabhorn Studio has been deeply involved with climate and global change work for over 12 years. It has provided services to a wide array of projects that involve graphics and editorial work. Grabhorn and Susan Hassol did the entire U.S. set of documents on climate change impacts in the United States, for example. Both have begun to review and help ACIA lead authors with their chapters. A set of guidelines on formats, illustrations etc. have been drawn up.

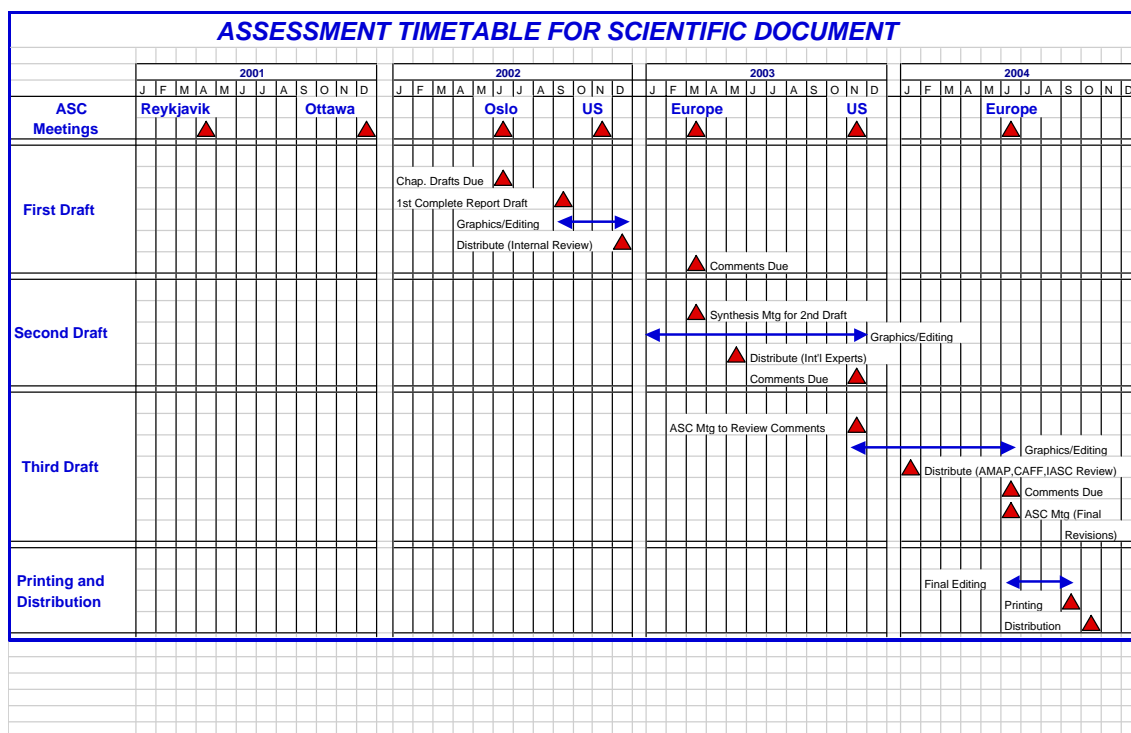
Nominations for external reviewers of the ACIA scientific document are being requested.

The ACIA Secretariat has requested nominations for external reviewers of the ACIA scientific document by 1 November. This request has been sent to the AMAP, CAFF, IASC, IPS Secretariats, and others, as well as asking ACIA lead authors to nominate reviewers. We expect to have 3-4 reviewers for each of the 17 chapters. The reviewers should be internationally recognized experts in the fields relevant to the chapters, and should preferably have broad expertise covering as many of the diverse topics and regions in each chapter as possible. They should not have been involved in the assessment or have any personal interest in the ACIA production. We have requested brief descriptions or CVs for each nominated reviewer. On 20 November the ACIA Executive will review the submitted names.

Management and Oversight:

The Arctic Council (AC) and two of its working groups (Arctic Monitoring and Assessment Programme, AMAP; and Conservation of Arctic Flora and Fauna, CAFF) and the International Arctic Science Committee (IASC), have established an Assessment Steering Committee (ASC) to provide an on-going coordination mechanism for the assessment. The members of the ASC include all the lead authors, several scientists appointed by the three sponsoring bodies, and three individuals appointed by the indigenous organizations in the Arctic Council. The three sponsoring bodies have established oversight processes for the ACIA, and the Arctic Council, including its Senior Arctic Officials, provide oversight through progress reports and documentation at all of the AC meetings.

Timetable for the ACIA



Webpage and Contacts:

The ACIA webpage, which contains details on the ACIA, can be found at:

Web address: <http://www.acia.uaf.edu>

Secretariat: Dr. Gunter Weller (gunter@gi.alaska.edu)

Chair of the ACIA: Dr. Robert W. Corell (global@dmv.com)

References

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