Data for Global Change Research and Assessment Studies, 1993

1. Set of slides on this subject.
   - Information about climate models and CO₂.
   - CO₂ and paleo for 160,000 years, RJ, Aug 1993, 25 p

2. Letter about IPCC assessments, 1995 (1 p, Nov 1993) ........................................p 27

3. Information about Country Studies meeting in Washington DC in Oct 1993, 8 p


5. Apr 1993 (page 34): Benioff called from EPA: Can we also provide model data for the Country Studies program?

6. 38 p here; ready Dec 26, 2002, RJ0255

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Roy Jenne
NCAR
Dec 2002
Data for Global Change Research
Including Assessment Studies

- IPCC - Climate change, the scientific assessment
- Increasing trace gases in the atmosphere
- Assessment studies that have been made
  - Crops - Rivers - Forests - etc.
  - How studies were made
  - Data needed for the studies
- Climate models
  - Model data bank at NCAR
  - Selected model output
- Information about models and climate
- Where to find data
  - Information about data
  - Lists of data at NCAR
  - Project to reanalyze the atmosphere

NCAR Scientific Computing Division
Supercomputing • Communications • Data

Roy Jenne
Aug 1993
INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE

CLIMATE CHANGE
The IPCC Scientific Assessment

1990

Report Prepared for IPCC by Working Group 1

Edited by J.T. Houghton, G.J. Jenkins and J.J. Ephraums
(Meteorological Office, Bracknell, United Kingdom)

Published for the
Intergovernmental Panel on Climate Change

CAMBRIDGE UNIVERSITY PRESS

WMO

UNEP
Carbon Into Atmosphere

<table>
<thead>
<tr>
<th>Year</th>
<th>CO₂ PPM</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ice age</td>
<td>~190</td>
</tr>
<tr>
<td>1850</td>
<td>~275</td>
</tr>
<tr>
<td>1958</td>
<td>315</td>
</tr>
<tr>
<td>1982</td>
<td>343</td>
</tr>
<tr>
<td>1989</td>
<td>350</td>
</tr>
<tr>
<td>2050</td>
<td>460*</td>
</tr>
</tbody>
</table>

Assume release rate increases to 8 GT/yr., then steady.

CLIMATE MODELS

- Natural model variability ±0.2 °C.
- Double the CO₂, warm by 2 to 5 °C.

OBSERVE

<table>
<thead>
<tr>
<th>Year</th>
<th>Temp Increase</th>
</tr>
</thead>
<tbody>
<tr>
<td>1880-1988</td>
<td>Plus .4 to .5 °C</td>
</tr>
<tr>
<td>1850-1988</td>
<td>.4 to .5 °C</td>
</tr>
</tbody>
</table>
### Table 1.1: Atmospheric CO₂ Increase in the Past 250 Years

<table>
<thead>
<tr>
<th>Date</th>
<th>CO₂ (ppm)</th>
<th>CO₂ (Gton)</th>
</tr>
</thead>
<tbody>
<tr>
<td>18K BP</td>
<td>~190</td>
<td>401</td>
</tr>
<tr>
<td>1800</td>
<td>~280</td>
<td>591</td>
</tr>
<tr>
<td>1958</td>
<td>316</td>
<td>667</td>
</tr>
<tr>
<td>1983</td>
<td>342</td>
<td>722</td>
</tr>
<tr>
<td>1994</td>
<td>355</td>
<td>749</td>
</tr>
</tbody>
</table>

*Figure 1.3: Atmospheric CO₂ increase in the past 250 years*

### Figure 1.4: Monthly Average CO₂ Concentration

- Monthly average CO₂ concentration in parts per million of dry air, observed continuously at Mauna Loa, Hawaii.

### Table 1.2: Fossil CO₂ Production Rate

<table>
<thead>
<tr>
<th>Year</th>
<th>Fossil</th>
</tr>
</thead>
<tbody>
<tr>
<td>1860</td>
<td>0.1 GT C</td>
</tr>
<tr>
<td>1915-35</td>
<td>~1.0 GT</td>
</tr>
<tr>
<td>1978-82</td>
<td>~5.1 GT</td>
</tr>
</tbody>
</table>

*Figure 1.5: Global annual emissions of CO₂ from fossil fuel*
Figure 1.6: CO$_2$ concentrations (bottom) and estimated

Figure 1.9: Methane concentrations (bottom) and estimated temperature changes (top) during the past 160,000 years as
Gtonnes Carbon

- Net carbon from forest cutting
- Total carbon release from burning fossil fuels

This amount of carbon stays in atmosphere
Effect of Greenhouse Gases on Climate

- The Temperature Effect for More Gas is Not Linear
- It is About Logarithmic

<table>
<thead>
<tr>
<th>Amount of Gas</th>
<th>Scaled Temperature Effect</th>
<th>World Temperature Change*</th>
</tr>
</thead>
<tbody>
<tr>
<td>1x (base)</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>1.5x</td>
<td>0.585</td>
<td>1.76 °C</td>
</tr>
<tr>
<td>2x</td>
<td>1</td>
<td>3 °C</td>
</tr>
<tr>
<td>4x</td>
<td>2</td>
<td>6 °C</td>
</tr>
<tr>
<td>8x</td>
<td>3</td>
<td>9 °C</td>
</tr>
<tr>
<td>16x</td>
<td>4</td>
<td>12 °C</td>
</tr>
</tbody>
</table>

*Assumes a sensitivity to double CO$_2$ of 3.0 °C.
Some Assessment Studies

How would climate change affect the U.S. economy?

- Studies started in Sep 1987, sponsored by EPA
- About 40 science teams
- For crops, forests, water supply, etc.
- NCAR set up a data bank of climate models

International work started about Sep 1989 (also sponsored by EPA). Some of the studies were:

- 25 countries study effects on crops (meeting was held in Jan 1990)
- 10 countries study effects on rivers (meeting was held in Feb 1990)
- 10 countries study effects on forests

Roy Jenne
Aug 1993
Climate Assessment Studies

1. Do sensitivity studies

Effect of temperature and precip changes
(on crop, forest, river)

<table>
<thead>
<tr>
<th>Temperature Change</th>
<th>Precipitation Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>-2°C</td>
<td>-20%</td>
</tr>
<tr>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>+2°C</td>
<td>+20%</td>
</tr>
<tr>
<td>+4°C</td>
<td></td>
</tr>
</tbody>
</table>

2. Compute changes for three climate model runs
   - Changes of crop, forest, or river, etc.
   - Adjust the present model climate to the present observed climate as follows:

observed climate → use this
model (climate now) → model climate for 2 times CO₂

Roy Jenne
Aug 1993

ClibPDF - www.fastio.com
Climate Models

- Resolution About 500 km (1984-88), or Worse.
  — Three recent runs at 300 km.
- Most Models Have 9-12 Levels.
- Have a Low Resolution Elevation of Earth.
- Assume a Given Vegetation Cover.
  — Valid for present earth (for CO$_2$ runs).
- Must Include the Effects of Oceans.
  — For some tests, just specify sea surface temperature.
  — For CO$_2$ experiments need a slab ocean, 50-60 m deep.
  — Some recent runs: crude dynamic ocean (better)
- Some Have a Diurnal Cycle.
  — Desirable to have one.
  — But more complicated (and more computer time).
- Models Assume Present Solar Output.
  THEN: Model calculates all interactions.
  — Time step each 30 minutes.
  — Calculate temperature, winds, pressure.
  — Calculate heat fluxes and evaporation.
  — Calculate clouds, rain, and snow.
    -- Calculate shower rainfall too.
  — Calculate radiation absorbed and reflected.
    -- For clouds, atmosphere, surface.
    -- Reflection is high after a snow.
  — Calculate soil water and runoff.

NOTE: Use same models to study ice-age climate, —but elevation and surface conditions differ.
Model data bank at NCAR

Volume of Global Model Outputs
NCAR
Data Support Section
02 July 1991
Dennis Joseph

The NCAR Data Support Section has generated a climate model data set from outputs provided by climate modelers at the UK Met Office, Oregon State University, GFDL, GISS, and the Canadian Climate Center. The data have been converted to a uniform character format easily readable on most computer systems. A read program is supplied with the data. The set is divided into files as shown below. All files can be easily copied to one 6250 bpi tape (normally using a blocksize of 9600 and logical record length of 120).

<table>
<thead>
<tr>
<th>Model</th>
<th>Grid size</th>
<th>Variables</th>
<th>Volume</th>
</tr>
</thead>
<tbody>
<tr>
<td>UK-Met</td>
<td>48x36</td>
<td>9 + elev</td>
<td>2.99 MB</td>
</tr>
<tr>
<td>OSU</td>
<td>72x46</td>
<td>9 + elev</td>
<td>5.60 MB</td>
</tr>
<tr>
<td>GFDL</td>
<td>48x40</td>
<td>22 + elev, land *</td>
<td>7.07 MB</td>
</tr>
<tr>
<td>GFDL Q-flux</td>
<td>48x40</td>
<td>22 + elev, land *</td>
<td>7.07 MB</td>
</tr>
<tr>
<td>GISS</td>
<td>36x24</td>
<td>25 + elev, land #</td>
<td>5.24 MB</td>
</tr>
<tr>
<td>GISS control</td>
<td>36x24</td>
<td>7</td>
<td>.474 MB</td>
</tr>
<tr>
<td>GISS Sc A decades</td>
<td>36x24</td>
<td>7</td>
<td>4.26 MB</td>
</tr>
<tr>
<td>GISS Sc B decades</td>
<td>36x24</td>
<td>7</td>
<td>2.84 MB</td>
</tr>
<tr>
<td>GFDL 10 yrs 1X</td>
<td>48x40</td>
<td>22 + elev, land *</td>
<td>31.65 MB</td>
</tr>
<tr>
<td>GFDL 10 yrs 2X</td>
<td>48x40</td>
<td>22 + elev, land *</td>
<td>31.65 MB</td>
</tr>
<tr>
<td>GFDL R30</td>
<td>96x80</td>
<td>22 + elev, land *</td>
<td>27.63 MB</td>
</tr>
<tr>
<td>CCC</td>
<td>96x48</td>
<td>6</td>
<td>5.73 MB</td>
</tr>
</tbody>
</table>

TOTAL 132.2 MB

* includes vector wind speed and downward solar at the surface derived at NCAR and vector wind components at two levels

# includes wind speed derived at NCAR and geopotential height at 3 levels
FIGURE 3. Simulation of African annual precipitation by five models compared with climatology.
Example: 1.15 means that the model simulates 15% more precipitation for the present than is given by climatology. The chart depicted by 3A is the present climatology. (FIGURE 3 continues on the following page.)
CRAY-1A or CDC 205. These were the world's fastest computers during 1977-82. A Cray could deliver about 15 hours of CPU time in a day; therefore, the model run above required about 17 days of dedicated computer time. A model experiment was actually run over a period of months. These times are for a model with about 9 levels and a resolution of 550 km. If the horizontal resolution of the model is doubled (same number of levels), the running time increases by a factor of six or seven.
Global Comparisons of Selected GCM Control Runs and Observed Climate Data

Laurence S. Kalkstein, Editor
Center for Climatic Research
University of Delaware

Report Prepared For:

United States Environmental Protection Agency
Office of Policy, Planning, and Evaluation
Climate Change Division
April 1991

Report for Subcontract Agreement with:

ICF, Incorporated
409 12th Street, SW
Suite 700
Washington, DC 20024
EPA Contract No. 68-W8-0113
NORTH AMERICA
Latitude 34 North
Jun-Jul-Aug Precipitation

Figure 1.24
Greenhouse-Gas-Induced Climatic Change: A Critical Appraisal of Simulations and Observations

Edited by

M.E. SCHLESINGER

Department of Atmospheric Sciences, University of Illinois, Urbana, IL 61801, USA

ELSEVIER
Part 1: Model Validation: How Good are the Models in Simulating the Present and Past Climates?


Part 3: Observations of Climate Circa 1850 to the Present: Has the Climate Changed?

Part 4: Forcing Other Than by Greenhouse Gases: What Has Caused the Variations in the Observed Climatic Record

Part 5: Comparison of Model Simulations and Observations: Has a Greenhouse-Gas-Induced Climatic Change Been Detected?

Part 6: Working Group Reports
Information Available about Climate Model Data for Assessment Studies

A data bank has been established at NCAR to provide easy access to selected climate model data needed for assessment studies. The main thrust is to support assessments of the effects of climate change (on food, water, forests, economics, etc.). This effort has been sponsored by EPA, with much assistance from modeling groups.

This text lists the information that is available. This includes descriptions of the data, the models, and an overview of the assessment projects. The documents are:

1. Climate Model Data (CO₂ runs) (Jenne & Joseph, Apr 1993, 3 pp).

   This text indicates the main sets of data that are available. The datasets include data most used for assessment studies, and other sets with more specialized data.


   This shows what fields are available from each model on the main model tape. It also gives the volume for each type of data. It gives data formats also.


   This short text briefly describes how climate model data have typically been used to carry out assessment studies.


   This text contains information about several climate model runs using GCMS. Most of this text was written 1987-88. Time has not been available to fully clean it up. Journal references for all of the model runs in this data bank are given.


   The main purpose is to summarize some info about the model runs, to indicate what new runs will be coming, and to include a few of the scientific questions. A table of model resolution and sensitivity is included. There also is info about planetary albedo, clouds, and radiation for a few runs.

6. Data From Climate Models; the CO₂ Warming (Roy Jenne, Aug 1988, Rev. Mar 1989, 33 pp)

   This text was written to give readers information about the response of a few climate models to increased trace gases. It also is intended to give readers a feel for the physics in a climate
Provide Access to Data

1. Gather the needed data
   — and information about data

2. Some options to distribute data
   CD-ROM: $200 - $500 (660 MB)
   Exabyte: $1900 - $2800 (2500 or 500 MB)

   **CD-ROM**
   - prepare data
   - prepare index methods
   - make master CD-ROM
     -- $1300
     -- $2 for each copy
   - prepare access software

3. Small datasets
   - floppy disks
   - networks
   - CD-ROMs

Roy Jenne
Aug 1993
DATA MANAGEMENT METHODS; DATA FOR EUROPE

Roy L. JenNE
National Center for Atmospheric Research (NCAR)
Data Support Section
P.O. Box 3000
Boulder, CO 80307
U.S.A

"Data Management Methods; Data For Europe"

KEYWORDS/ABSTRACT: data management / data handling / binary-packed data / formats / data availability / climate data for Europe / archival storage costs

There has been good progress in making climate data available. Selected data management strategies and trends as well as the changing cost of archival storage since 1960, are given. Some data organizations emphasize preparing data and making it available, others spend most time on the interactive display of data. Our activity at NCAR emphasizes the former. There is still a problem in obtaining climate datasets for all of Europe for long periods of time.

Many of the scientific disciplines face similar problems in the preparation and archival of datasets. Data are needed for both relatively small-scale problems and for all the earth. Some datasets have large enough volumes that they are difficult and expensive to use. Therefore, careful attention must be given to the way the data are structured, and to data subsets to minimize problems of access. The strategies for managing and accessing the data will be considered.

At the request of reviewers, we will first give a summary of our data activities at NCAR. Then examples of progress in data support over the last 20 years will be given. The Data Support Section, of the Scientific Computing Division at NCAR, maintains a large archive of computer-accessible research data that generally is made available to scientists around the world. The archive represents an irreplaceable store of observational data and analyses, and is used for major national and international atmospheric and oceanic research projects. There are now over 300 distinct datasets in the archive; each may be stored on one to several hundred tapes. NCAR has, millions of atmospheric analyses, each usually with 1,000 to 10,000 grid points. There are even more observations. One dataset contains a total of about 20 million reports each year from 8,000 major weather stations around the world. These data are decoded from world telecommunications bulletins. Another has over 72 million three- or six-hourly observations taken from ships at sea, after 1851.

Sources of Information about Data

- NCAR has information
  - One short text describes where to find data
  - Lists of datasets
  - List of texts about data
  - Technical note about data

- WMO Infoclima Catalog
  - There will also be a PC version

- NASA Master Directory (available on-line)
  - Datasets for the U.S. and Canada
  - Contact Goddard Space Flight Center

Roy Jenne
Aug 1993
Datasets at NCAR, Brief List and Volume

Many of the datasets at NCAR are briefly listed below. The data volume is given in megabytes, unless noted. A 6250 bpi tape holds 125 MB (one Gbit) of data. A CD-ROM holds up to 660 MB. A DAT tape is rated at 1300 MB, Exabyte 2300 MB or 5000 MB, QIC (525 or 1350 MB). (e = estimated):

One purpose of this list is to prepare for bulk dissemination of selected datasets on media such as CD-ROM and Exabyte, when time permits.

1.0 Precip, temperature, etc. data

<table>
<thead>
<tr>
<th>Description</th>
<th>MB</th>
<th>Years</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.1 Hourly obs for 303 US stations (1948 - 83), packed</td>
<td>1,950</td>
<td>36</td>
</tr>
<tr>
<td>1.2 Hourly US, Canada (1000 stns), GTS, Dec. 1976 - 90</td>
<td>4,790</td>
<td>14.1</td>
</tr>
<tr>
<td>3711 MB thru 87, then 30 MB/mo</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.3 World daily station data (7500 stns), from CAC</td>
<td>2,740</td>
<td>12</td>
</tr>
<tr>
<td>Jan. 79 - Dec. 90, volume 19 MB/mo</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.4 World monthly surface data through 1990</td>
<td>118.4</td>
<td>150+</td>
</tr>
<tr>
<td>~1800 stations, some 200 years</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.5 US Historical net (1219 good stations), monthly</td>
<td>e 1,250</td>
<td>90</td>
</tr>
<tr>
<td>temp, precip from 1900 (by NCDC)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.6 Other datasets</td>
<td>e 375</td>
<td></td>
</tr>
</tbody>
</table>

2.0 Selected precip and water data

<table>
<thead>
<tr>
<th>Description</th>
<th>MB</th>
<th>Years</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.1 Daily US coop data, 9000 stations, 1900 - 90, packed</td>
<td>3,280</td>
<td>91</td>
</tr>
<tr>
<td>2.2 Hourly US precip, 3000 stations (1948 - 90)</td>
<td>1,250</td>
<td>43</td>
</tr>
<tr>
<td>2.3 US radar, 20 nmi and 40 nmi (1973 - Dec. 1991)</td>
<td>826</td>
<td>19</td>
</tr>
<tr>
<td>2.4 US sum of day and 3 hr - 6 hr (255 stations), 1969 - 76</td>
<td>e 500</td>
<td>8</td>
</tr>
<tr>
<td>2.5 Monthly precip over Africa (1087 stations), to 1974</td>
<td>e 90</td>
<td>70</td>
</tr>
<tr>
<td>2.6 Daily station precip for India (2000 stations), to 1901 - 1970</td>
<td>e 403</td>
<td>70</td>
</tr>
<tr>
<td>2.7 Daily station precip E. Africa</td>
<td>e 50</td>
<td>e 30</td>
</tr>
<tr>
<td>2.8 Daily station precip China, 180 stations, 1951 - 82</td>
<td>10</td>
<td>32</td>
</tr>
<tr>
<td>2.9 World monthly precip data (5563 stations, long period)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

3.0 Special climate trends datasets

<table>
<thead>
<tr>
<th>Description</th>
<th>MB</th>
<th>Years</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.1 Jones, Wigley 5 x 5 grids (1851 - April 1990), world</td>
<td>21.3</td>
<td>140</td>
</tr>
<tr>
<td>3.2 Hansen grids</td>
<td>e 40</td>
<td>100</td>
</tr>
<tr>
<td>3.3 Several others</td>
<td>e 90</td>
<td></td>
</tr>
</tbody>
</table>

4.0 Observed data summary (mostly GTS in synop order)

<table>
<thead>
<tr>
<th>Description</th>
<th>MB</th>
<th>Years</th>
</tr>
</thead>
<tbody>
<tr>
<td>4.1 All world NMC UA obs., 1962 - 72</td>
<td>e 3,400</td>
<td>11</td>
</tr>
<tr>
<td>All NMC UA obs., 1973 - Dec. 1991</td>
<td>18,820</td>
<td>19</td>
</tr>
<tr>
<td>Raob and pibal subset (1973 - Dec 1991)</td>
<td>11,022</td>
<td>19</td>
</tr>
<tr>
<td>4.2 NMC 3 hr surface, July 1976 - Dec. 91</td>
<td>37,400</td>
<td>15.5</td>
</tr>
</tbody>
</table>

--- etc ---
NMC ANALYSES

- Global 2.5° analyses start July 1976
  Tropical winds bad until Sept. 1978
- Advanced analyses

<table>
<thead>
<tr>
<th>Start</th>
<th>Resolution</th>
<th>Time</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jan. 90</td>
<td>R30</td>
<td></td>
<td>10-day forecasts. No precip</td>
</tr>
<tr>
<td>Mar. 90</td>
<td>Re. T80</td>
<td>6-12</td>
<td>Flux fields (30). Precip, heat flux, radiation, clouds, etc.</td>
</tr>
<tr>
<td>Sept. 90</td>
<td>T80</td>
<td>6 hr</td>
<td>Full model sigma coordinates</td>
</tr>
</tbody>
</table>

Note: Start T126 resolution on 6 March 1991
4 November 1993

Dr. Cynthia Rosenzweig  
Goddard Institute of Space Studies  
1301 New York Avenue NW  
Washington, DC 20005-4788

Dear Cynthia,

This is in reply to your letter about possible participation in IPCC Assessments, 1995. As you know, we have prepared a data bank of climate model data, tailored to help assessment studies. In this text, I could contribute a few pages that would give a little information about climate models, describe the main data, briefly outline how the data is used in assessment studies, and point to sources of more information. I imagine this as being only 6-9 typed pages (or shorter), since Volume I should have lots of information about climate models.

I could also help to look over the material on IPCC scenarios. I think that the paper by Wigley and Raper entitled "Implications for Climate and Sea Level of Revised IPCC Emissions Scenarios" is an important text (Nature, Vol 357, 28 May 1992).

I also have a lot of statistics on global population and energy use that could be discussed.

Cynthia, I think that we may need a phone conversation to figure out whether (and how) I could help.

Sincerely,

Roy Jenne  
Senior Scientist

RJ:ob

cc: John Reilly
ARGONNE NATIONAL LABORATORY
U.S. COUNTRY STUDIES PROGRAM
VULNERABILITY AND ADAPTATION ASSESSMENTS
Project Planning Meeting

9:00 AM, Friday, October 8, 1993
U.S. Department of Energy
1000 Independence Ave., SW, Washington, DC
Room 5A-092

AGENDA

GENERAL ADMINISTRATIVE DISCUSSIONS

9:00 Argonne Team Meeting

10:30 Country Studies Program Overview (CSMT)

REVIEW OF OUTLINE OF GUIDANCE DOCUMENT AND TECHNICAL APPENDICES

11:00 Chapters 1, 2, 3 (ANL)

11:30 Chapter 4 Defining Scenarios (J. Smith, RCG/Hagler-Bailley)
   Section 4.1 Climate Scenarios
   Section 4.2 Non-climate Scenarios

12:00 Working Lunch

12:30 Section 4.3 GCM Models and Data (R. Jenne, NCAR)

1:00 Chapter 5 Conducting Biophysical Impact Assessments and Technical Adaptation Analyses

   Section 5.1 Crops (Cynthia Rosenzweig, Columbia University)
   Section 5.2 Grassland/Livestock (B. Baker, Colorado State) - deferred
   Section 5.3 Forests (T. Smith, U. of Virginia)
   Section 5.4 Water Resources (K. Strzpeck, IIASA) - deferred
   Section 5.5 Coastal Resources (S. Leatherman, U. of Maryland)
   Section 5.6 Other Potentially Vulnerable Resources (ANL)

2:00 Chapter 6 Integration (ANL)

2:30 Chapter 7 Analysis of Adaptation Policies (ANL)

2:45 Chapter 8 Documentation and Presentation of Results (ANL)

3:00 Workshop for Country Teams (ANL/CSMT)

3:30 Wrap-up (ANL/CSMT)
U.S. Country Studies Program
Vulnerability and Adaptation Assessments
Program and Technical Guidance

1. INTRODUCTION (3-4 pages/ANL/CSMT)

1.1 Overview of the U.S. Country Studies Program

- Drawn from CSP Brochure
- Identification of elements: GHG inventory sources/sinks, vulnerability and adaptation assessments, mitigation
- General schedule of activities for participating countries

1.2 Vulnerability and Adaptation Assessments

1.2.1 Elements of the Vulnerability and Adaptation Assessments

- What is included

1.2.2 USCSP Technical Assistance Approach

- Guidance document delineating fundamental approach to be employed by all countries; options for more sophisticated methodologies.
- Workshop to present methodologies and analytical tools and to provide limited training.
- Provide ongoing technical support to countries including site visits and possibly regional seminars to facilitate implementation of methodologies and to solve problems.

1.2.3 Expected Outputs

- Type of information to be developed/analyses to be conducted
- Schedule for vulnerability and adaptation assessments

1.3 Vulnerability and Adaptation Guidance Document

1.3.1 Purpose and Use

- To describe a primary methodology and possible supplementary methods for conducting vulnerability and adaptation assessments
- To provide step-by-step guidance on the implementation of the primary methodology
2. GENERAL CONSIDERATIONS FOR VULNERABILITY AND ADAPTATION ASSESSMENTS (3-4 pages/ANL)

- Definition of terms
- Description of the general V/A process (see flowchart)
- Issues to be addressed in designing the V/A process
- Drawn heavily from IPCC Impact Assessment and OTA report

[Note: Balance of the document follows flowchart structure]

3. DEFINING VULNERABILITY PROBLEMS OF INTEREST (1-2 pages/ANL)

- Selecting sectors and systems to be studied
- Selecting the geographical study area
- Selecting the time frame of the assessment
- Drawn heavily from IPCC Impact Assessment and OTA report

4. DEFINING AND APPLYING SCENARIOS AND USING GCM DATA FOR VULNERABILITY ASSESSMENTS (5-10 pages)

4.1 Climate Change Scenarios (J. Smith/RCG/Hagler-Bailley)

- Alternative rates and extent of climate change using one or more of the following techniques:

4.3.1 Use of GCM to generate scenarios

4.3.2 Sensitivity analyses using incremental changes

4.3.3 Analog warm periods for generating scenarios

4.2 Baseline Non-Climate Scenarios (J. Smith/RCG/Hagler-Bailley)

- Scenarios that define the country’s growth and development
  - Population
  - Economic growth
  - Urbanization
  - etc.
The Climate Change Vulnerability and Adaptation Assessment Process

- Define Problem(s) and Adaptation Assessment Process
  - Choose Scenarios:
    - Socioeconomic
    - Environmental
    - Climate Change

- Conduct Biophysical Impact Assessments and Technical Adaptation Analyses
  - Crops
  - Grassland/Livestock
  - Forests
  - Water Resources
  - Coastal Resources
  - Other

- Integrate Impact Results

- Analyze Adaptation Policies

- Document and Present Results

Chap. 3
Chap. 4
Chap. 5
Chap. 5.1-5.6
Chap. 6
Chap. 7
Chap. 8
October 21, 1993

Mr. James Gallagher  
Argonne National Laboratory  
Procurement Department  
9700 South Cass Avenue  
Argonne, Illinois 60439-4873  

Dear Mr. Gallagher:

The Scientific Computing Division (SCD) of the National Center for Atmospheric Research (NCAR) proposes to have Roy Jenne write the following section of "U.S. Country Studies Program, Vulnerability and Adaptation Assessments, Program and Technical Guidance" as described below, according to the terms listed in the attached Scope of Work statement:

Section 4.3 GCM Models and Observed Data, including subsections 4.3.1 through 4.3.7.

We estimate the cost of this document preparation to be $3,000.00. A budget outlining these costs is attached for your information. Please make out your purchase order as follows:

National Center for Atmospheric Research  
Scientific Computing Division  
P.O. Box 3000  
Boulder, CO 80307-3000

(The purchase order should be mailed to my attention, using the above address.)

Please call me at (303) 497-1209 if you have any questions.

Best regards,

Pete Peterson  
Deputy Director

PP/jj

Enclosure

cc:  Roy Jenne  
NCAR proposal no. 94-U.L.3
SCOPE OF WORK

1. The contractor shall provide the services of Roy L. Jenne to prepare the following section of the document "U.S. Country Studies Program, Vulnerability and Adaptation Assessments, Program and Technical Guidance" as described in the outline in Attachment 1:

- Section 4.3 GCM Models and Observed Climate Data, including subsections 4.3.1 through 4.3.7.

The structure and titles of the subsections may be changed with the agreement of ANL.

2. It is expected that the length of this section will be in the range of 5-10 pages each. Changes in these estimated lengths can be made with the agreement of ANL.

3. In the course of preparing these sections, the contractor shall communicate as necessary with other members of the ANL Country Studies Program team, who are preparing other sections of the document, to facilitate coordination and integration of the document.

4. The contractor will provide the first draft of these sections to ANL by November 5, 1993 or within one week from contract execution, whichever is later. After receiving comments from ANL on the first draft, the contractor will provide a revised draft that includes the comments within one week.

5. The first draft and revised draft will be provided to ANL both in printed copy and on computer floppy disk using either WordPerfect (for IBM-compatible machines) or Word (for Apple Macintosh machines) word processing software. Other word processing software may be substituted with the agreement of ANL.
More Climate Model Work; Assessment Studies

Before the global Rio meeting (June 1992), President Bush promised countries that the U.S. would assist them in analyzing the effects of environmental change, such as CO₂ warming. We would help support emissions inventories also. Official requests for support are coming in to EPA from countries. This year they have funds for studies in about 20 countries. Each country will set up a more general office for various assessment studies than before. About 10 U.S. Federal agencies are involved.

People liked our help on previous studies

Ron Benioff from EPA called on Apr 23, 1993. He asked if we could help with the climate model data again. I told him yes, with some support. We can make it easy to access the data, but we do not want to do the interface work to various models, such as crop or forest models. He said that people such as Cynthia Rosenzweig (GISS) will also be involved to help with some of the other tasks. Our data support involvement and the studies will probably start about Oct 1993.

Ron Benioff - EPA phone number: 202-586-6564
fax number: 202-586-0538

- End -
Climate Model Data (CO₂ Runs)

A data bank has been established at NCAR to help provide easy access to selected climate model data. The main thrust is to support assessments of the effects of climate change (on food, water, forests, economics, etc.). This effort has been sponsored by EPA, with much assistance from modeling groups. Other texts have information about the models. The text, “Data from Climate Models, the CO₂ Warming,” is available. It is a brief description of the characteristics and output of selected models.

1. Primary Tape of Climate Model Data (CO₂ runs)

This tape has long-term means for a number of 1x, 2x CO₂ runs and the decade means for two GISS transients and some year-month data. The tape content was chosen to fill the needs of most assessment studies. Total volume 94.4 MB.

1.1 1x and 2x carbon dioxide runs, slab ocean. Monthly averages over about 10 years. The date given is when the model run was completed.

Canada (CCC, Nov 1989)
— Each run has 7-24 variables such as surface air temperature and humidity, precip,
runoff, evaporation, surface wind, downward surface radiation, etc.

1.2 Transient runs: Two long runs from GISS (one is 1958-2062). Only the average data
for each decade is in the standard format. The basic data has each year (on other tapes).
A program interpolates annual values between the decade means for the user.

1.3 The primary tape includes ten years of data for individual months (21 vrbl) from the
GFDL Q-flux run (the 1988 run above). The volume of this run (60 MB) is included in
the above.

1.4 A short text lists variables and volume on this tape.

2. Set of Three PC Disks (3 models; 1x, 2x CO₂)

These disks have only three variables (temperature, precip., downward solar) from three
models: GISS (1982), GFDL (Feb 1988), and UK (June 1986).

Access software is available that will select a lat/lon window from any of the global grids.
Another program selects data for all 12 months from both 1x and 2x CO₂, for one grid point.

A similar floppy disk is available for the Canadian model described below.

3. GISS Transient-A on a PC Disk

Has averages for control run and decades of 2010s, 2030s, 2050s. Access software allows one to select a lat/lon window and calculate a difference (or ratio) between any two fields (to look at temperature or precip change). Another program selects data for all 12 months from the control and for one decade, for one grid point.

4. Data Each Year-Month From GFDL Q-flux Model (version Feb 1988)

Data each year-month (10 years) from 1x, 2x CO₂, model. GFDL model completed Feb. 1988.

— Global data for 21 variables as above, mostly for the surface (in Item one above)
   Volume: 60 MBytes
— Global data for all 171 variables. Volume about 640 MBytes, five tapes.

5. Daily GFDL Data

GFDL sent NCAR a long sample of three years of daily data from the 1x run and three years from 2x, for the Q-flux run, Feb 1988. Total of 24 tapes, 171 vrbl. The basic data is in a difficult format. Extracted data for the six years, only 21 vrbl, is in an easy format on six tapes.

6. Full Basic Data From 1x, 2x CO₂ Runs Above (long period monthly data)

From some models, NCAR has rather full sets of output from the statistics, not just a few selected variables. These data are in native formats; some are difficult.

— GISS 1x, 2x run, 54 vrbl, has height levels to 30 mb, and two wind levels
— GISS transients, 56 vrbl
— GFDL 1x, 2x run (1985), 160 vrbl
— GFDL 1x, 2x run (1988), 171 vrbl. This tape has the 10-year monthly means of the monthly data above.

7. Climate Model Data from Canada

Climate model runs (CCC model) were completed by Canada about Nov 1989. These runs were for 1x and 2x CO₂ climates. The model resolution was T32, 10 levels (3.75° x 3.75°). A global grid has 96 x 48 points. NCAR obtained two products: global grids of long-term monthly values for 6 surface variables, and twice daily grids for N. America.

a. Global Grids — There are monthly long-term grids for 6 variables (the total volume is 5.73 MB).

b. Daily Climate Model Data from Canada — This dataset for N. America (20°N to the North Pole, 40-150°W) has 12-hourly model output for a large set of surface variables,
and it includes height data for 500 mb (the only upper air grid). The grid is 30 x 19 points (3.75° x 3.75° resolution). There are 10 years of simulations of the present climate and 10 years for the 2x CO₂ climate. The volume is 20 tapes, each with 134 MB (the total volume is 2.68 GB). The dataset has surface temp, humidity, and wind plus daily max/min temperature. There are surface pressure, albedo, precip, evaporation, surface heat and radiation fluxes, snow information, etc. This is from the same model run as the 3.75° global dataset.

8. Output from the Hamburg Climate Model

NCAR received year-monthly output data from three long transient runs made using the German climate model in Hamburg. There is one control run (for 100 years). Also there are two transient runs (A and D) with differing greenhouse forcing. Run A has gases for "business as usual." There are many variables at the surface (temp, precip, radiation, heat fluxes and many more) and data for 15 levels at 1000, 950, 900 through 30 mb. The data are on 15 cartridge tapes (about 200 MB each). The atmospheric model was T21 resolution (and 19 levels), and there was a coupled ocean model. A global array has 64 x 32 points (resolution 5.63° x 5.63°).

In the global average the surface atmospheric temperature rises by 2.6°C (scenario A) and by 0.6°C in scenario D for the 100-year period. The 1x and 2x CO₂ runs were also made (NCAR does not have them). The model sensitivity for doubling CO₂ was also 2.6°C. NCAR received the scenario data in Feb 1993.

Note: This text is not fully updated to May 1993.

- End -