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A PLAN FOR A NATIONAL CLIMATE INFORMATION SYSTEM

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INTRODUCTION

Climate variability and long term climate change are important factors in the economic and social well being of the United States. Public concerns about global climate change, rising sea level, changes in the frequency of hurricanes, severe winters or record hot summers emphasize that climate is a natural hazard. But climate is also a major natural resource and knowledge of its variability has become an important factor in resource planning, economic development, and human adaptability.

The National Oceanographic and Atmospheric Administration has the responsibility to describe and monitor the climate of the United States and to promote the use of climate information to increase the economic productivity of the United States. Toward this end, NOAA, the National Climate Program Office, and an advisory group of industry, university and private sector contributors propose the development of a major new National Climate Information System (NCIS). The system will describe the climate of the United States, demonstrate the value of climate information for decision making, and initiate a process that would stimulate economic productivity of the United States. The NCIS is conceived as a national product tied closely to the census of 1990. It will be designed to benefit industry, decision makers, educators, researchers, and students and will be organized as a cooperative project between government, industry, and educators.

What is proposed is an innovative and dynamic climate information system, including an atlas series and information disks and software for personal computers that is unlike anything now available. The rapid changes in computer technology and the wide availability of personal computers, point in the direction of a "living atlas" like system. The provision of information products on computer media for interactive use; their tailoring to match specific needs, coupled with routine revision will provide a much needed service and provide a stimulus to all segments of the economy. Much greater amounts of information will be accessed, providing greater detail and greater relevance to decision making than was previously possible. This dynamic approach opens to Americans the vast, relatively unused potential of climate knowledge at a time when it is urgently needed to serve changing social, economic and environmental needs.

A series of Atlas volumes also will be a central aspect of the NCIS. Published atlas volumes designed with wide appeal and user-oriented products will be essential to help focus general user interest, particularly for those without computers, and to gain support for the total concept; books are still an essential entity in developing human resources. Volume 1, the CLIMATE OF NORTH AMERICA: INFORMATION FOR POLICY, PLANNING AND DECISION MAKING, will break new ground in information theory, public dissemination of climate information, and in building bridges with the private sector in advancing the better use of climate information. The other atlas volumes will focus on various sectors of the United States economy (agriculture, energy, water

resources, etc.). These will be designed and implemented so that joint federal and industry support can be obtained.

This is a bold, innovative, international and exciting new project. A planning group is now prepared to organize and implement this program.

RATIONALE

NOAA has the responsibility and mission to define the climate of the United States and to make this information accessible to the public and private sector. What is proposed is an innovative climate information system unlike anything now available that will contribute greatly to the economy. The combined printed and digital products of the NCIS will become user friendly documents and tools for accessing and using new information and products. In one creative step NOAA will break new ground in promoting economic productivity, will enhance public awareness of climate information and will develop new tools for education. The Atlas, conceived as a cooperative project with industry and educators, will build new and permanent bridges with various sectors of industry and will broadly meet several of NOAA's key missions (see Table 1).

NOAA, as a lead agency in climate information, needs to assess how its vast data files can best be used to serve society. Information that cannot be accessed in timely fashion or be delivered in a form suitable for use, is of very limited utility. On the other hand, information that is closely tied to the current and future trends of society becomes a living resource. Climate information can be made a living resource: the proposed system will achieve that status by demonstrating its values and by providing new means by which society can access and interact with this information.

DIMENSIONS

The concept of a new and different means for providing climate information to the nation was developed at a meeting in July 1985 organized by the National Academy of Sciences to review the progress and future directions of the National Climate Program. This effort convened 90 leaders in the atmospheric sciences plus state and federal agency representatives and policy makers in the United States.

One of the major recommendations was that the U.S. develop a new form of climate atlas "emphasizing climate-society interactions," seen as much more useful material to government and industry than has been provided in climate atlases published over the past 100 years (National Academy of Sciences, 1985).

As a result of this scientific consensus, coupled with awareness that most citizens lack access to relevant climate impacts information, discussions proceeded inside NOAA and amongst interested scientific and industrial groups over the past 12 months.

Table 1. How the National Climate Information System
Addresses NOAA Missions.

- * promoting economic efficiency and productivity by increasing industrial access to climate information.
- * making optimum use of over 100 years of climate information in a form suitable for use by the private sector and other Federal agencies.
- * providing information required for formulation and implementation of national policies and statutes.
- * promoting the development of new climate and climate-dependent products and stimulating markets for the private sector.
- * providing a basis for assessing the impact of population changes (1990 census) on climate sensitive economic and social indices.
- * establishing a totally new concept of information exchange and filling a gap in access to existing climate information.
- * addressing the long-term climate variability and change of the U.S. as a baseline against which to measure potential human impact on climate.
- * providing information needed for the rational management of natural resources.
- * providing a valuable contribution to the international community.
- * demonstrating NOAA leadership in climate services in the United States.
- * aiding in the national effort to enhance science education.

This led to the establishment of an ad hoc planning group of experts, and a meeting was conducted at the University of Illinois in October 1986. This 12-person select group (see Appendix) examined the rationale for an atlas-like system, considered its potential dimensions, and developed an implementation plan for a multi-year, climate information system. This document constitutes an initial plan of action that, along with a brochure, should provide sufficient information to allow informed decisions on launching the proposed "National Climate Information System" (NCIS).

Theme

There are twin themes. One theme of the NCIS is that "climate is a national resource and a risk." The information to be presented will demonstrate the linkages between climate, man, and the biosphere. The second theme is that "economic and social well being can be achieved by better information and informed awareness related to the nation's climate."

Concepts

The NCIS planning group identified 12 concepts that address these themes. These encompass the planning and implementation of the System.

- * The materials selected would have a futuristic focus with selections based on future trends of North American society (population shifts, aging, more leisure time, etc.). Further, information would be presented, in part, in a time adaptable manner, allowing a change of materials presented over time to address society's ever changing needs for information.
- * The system would address a broad audience including a new audience of millions of Americans currently without access to the types of climate information presented; to students from the lower grades through college level; and to specialists from the sectors of our economy effected by climate.
- * Information would be delivered in multiple and highly varying formats to address this diverse audience and to allow for myriads of ways to access information including: publications (atlases), floppy disks and software ready for personal computers, magnetic tapes and floppy disks for various larger computers, video tapes, microfiche, and hard copy.
- * The system would be the first of a kind for delivering climate information, it is best described as an innovative new means using new technologies to present different types of information based on 100 years of quality climatic data now available in North America.

- * The information system, in part, would be a living information resource allowing periodic computer updating of the tapes and disks, and the selection of new climate information as needed.
- * Its objectives would be to illustrate how climate conditions, including their variations, impact on man, human activities and the natural environment, and to provide guidance to optimize management and gain economic benefit. Great progress has been made in recent years in identifying the complexity of climate impacts providing an opportunity to be selective in use of remedial measures and policies for the mitigation of hazards and optimization of opportunities provided by climate.
- * The system would be developed, and its atlas publications issued, at a time to be commemorative, in line with the 1990 census and the centennial of climate services corresponding to the transfer of the Weather Service into the Department of Agriculture (1891 to 1991).
- * The presentation of climate information in a myriad of formats will serve a vast need to improve science education in our grade schools, high schools, and colleges. Atmospheric information is one of the high interest science areas providing outstanding opportunities to understand and apply the principles of physics and chemistry.
- * The envisaged system and products will encompass North America, Canada and Mexico will be invited to participate in its development. Since the proposed atlases focus on the United States, these other nations probably will want to produce other atlases at their cost, tailored to their national interests. That would be greatly facilitated by the proposed continental approach to analysis and system development. The project publications and the atlases in particular, will be of enormous value to the World Meteorological Organization and its member nations, illustrating new types of climate information to present for better management of resources around the world.
- * Multi-million dollar funding will be required for such an extensive innovative system; partnerships involving the federal government, private industry, and private foundations are seen as providing the support.
- * The federal government must take the lead and have the central responsibility for the system: climate information is used to set standards, to establish national and state regulations, and to serve as the basis of legal decisions; actions requiring government-issued data and information.
- * NOAA is recommended as the lead agency since the envisioned system and its purpose are under NOAA's mandate.

Products

The products will be published, computer based, or in visual formats, but all would be assembled around topical issues. Where pertinent, the information will be presented regionally based on economic, social, and environmental coherence.

Climate impacts also relate to temporal and spatial variations of weather conditions; hence a product theme will be to present material focused on the temporal behavior of various weather conditions and their spatial variability.

Publications. A central product of the NCIS will be an atlas series. Volume 1 with the proposed title of "Climate of North America: Information for Policy, Planning and Decision Making" would be generic, presenting a myriad of climate information that is important across many sectors and activities. It's production is seen as the responsibility of NOAA in coordination with other Federal agencies and advisory groups. The objectives of this volume would be:

- * to provide a definitive basis for evaluating the implications of climate change and variations including those resulting from human activity on social and economic issues over the next decades; and
- * to provide a basis for the rational exploration of the nation's climate in support of national goals and generally enhanced productivity.

Other atlas volumes would each feature the theme of "Climate Resources and Risks" as relevant to 1) agriculture, 2) energy, 3) water resources, 4) human health and resources, 5) transportation, 6) structural design, construction and operations, 7) commercial and industrial planning and operations, and 8) recreation. Each of these specialty volumes will be designed by climate impact specialists and funded by interested agencies, foundations and firms that have direct and specific interest in their themes. It is likely that they will differ greatly in how they are assembled and what is presented since they are to be user-oriented and user friendly.

Computer-Based Climate Information. Presentation of climate information, both in a generic sense and by specialty areas, such as planned for the atlases in computer formats, offers two great advantages that past climate information publications could not address. First, computer-based information allows for presentation and hence availability of much more extensive relevant climate information than could ever be presented in atlases, thus allowing specialty audiences much greater access to extensive information. For example, one computer disk (and related software) could provide climate information about severe local storms--in essence presenting hundreds of graphs, tables, and related texts about tornadoes, hurricanes, hailstorms, flash floods, etc.

The other very major advantage of the computer-based- information portion of NCIS is that it allows updating; many publications become outdated before they reach the users. Routine updating of the computer information is recommended as a means to keep the NCIS current and a "living climate information resource."

The planning committee is convinced that the computer-based information products will be used extensively by a wide audience. Hence the information and programs should be designed to be utilized on a broad spectrum of personal computers, as well as on micro and macro computer systems used for sophisticated research, decision analyses, and corporate management.

Visual Aids. Other NCIS products will be made available on video tapes, movies, and microfiche as means to visually access and study climate information. The potential uses of video-taped climate information in the classroom is very great; thus visual aids will help fulfill the educational needs.

Volume One: The Climate of North America: Information for Policy, Planning, and Decision Making

This volume is recommended as the first of the NCIS atlases. It will be a showpiece, featuring 150 to 250 product pages. A typical 2-page spread will have maps and/or graphs on one page with text and explanations of how the information is utilized on the other page. Illustrative case studies of use of information in decision making and management will be included. The materials selected for Volume One will have broad relevance. For example, information on extreme rainfall rates which affect agriculture, water resources, transportation, and other major sectors would be one candidate for inclusion in Volume One.

The proposed contents of Volume One are presented below.

- I. Climate as a Resource for the Nation's Economy:
- II. Climate in the Nation's Future: long-term climatic trends, the need for benchmark, climate and societal projections to the year 2000 and possible socio-economic implications (e.g., due to urbanization).
- III. Coping With Climate: the climate system and elements, their temporal and spatial variations, topographic effects, climate extremes (point and area), climate scenarios and impacts, measurement, information, information sources.
- IV. The Social and Legal Dimensions of Climate: building codes, federal statutes, state laws
- V. Climate and Risks: to energy, to health, affects on population growth and movement, risks to agriculture, coastal conditions, and water resources
- VI. Appendix: description of the NCIS, the organization of its products, and description of the available computer disks and software related to Volume One.

Requirements

The interdisciplinary nature of NCIS requires a wide variety of design skills; the development and realignment of existing climate data bases; applied research to define certain impacts; the development of software needed with the disks; and diverse technical and scientific expertise. Involvement of specialists in climate and climate impacts is essential. The participation of several federal agencies and private entities is essential to ensure adequate funding, planning, and conduct of the NCIS.

A living information system with annually updated computer-based products, will require a long-term commitment by NOAA to sustain this effort for periodic updating and maintenance of the NCIS. As in all complex, multi-party endeavors, strong leadership with committed support are the key elements. These issues are addressed more fully in the next section on implementation.

IMPLEMENTATION

The significant scope of such an innovative climate information system will require five years to implement. A target of 1991 for the completion of the atlas volumes is realistic. This "living" system will extend beyond 5 years as updated computed-based information continues to be generated. The 5-year target is to complete the initial first round of all products including the atlas volumes.

This effort will involve participation of diverse groups, many individuals, and several federal agencies needed to plan and to insure that state of the science and the latest, most meaningful information is developed and presented. Data bases and software must be developed. Such an effort requires leadership and a supporting organization.

NOAA should take the lead in this new national effort in view of its basic mandate. Support for NCIS must be garnered from diverse sources—private firms, federal agencies, foreign countries, and private foundations; this too takes organization and commitment. NOAA should provide the focused leadership for this effort.

Implementation requires a structure with NOAA leadership and staffing for the National Climate Information System (NCIS); an interagency committee; an external advisory/action committee; and a series of advisory committees in the climate-impact specialty areas. These specialist committees will be needed to guide the careful selection of the materials to be presented relating to climate effects on agriculture, water resources, energy, and the other sectors.

Implementation of NCIS can be thought of in five broad phases.

- * initial planning and assessment of the value of NCIS
- * decision to launch NCIS
- * comprehensive planning and the gathering of support
- * design and development of products
- * updating and maintenance of NCIS.

The first steps of the implementation plan consists of 1) the development of this initial plan; 2) the development of an illustrative brochure; 3) the limited discussions with potential constituents and influential supporters. These should be accomplished in early 1987, and presented at that time to NOAA/DOC leadership.

If a decision to proceed to accomplish NCIS is made, a 5-year plan of action is envisioned. Initial activities that largely follow in a sequential order include:

- * The establishment of a NCIS office inside NOAA with a leader and staffing (this could be done largely externally) and funding by NOAA.

- * Development of an external advisory committee and an interagency committee.
- * The development of a detailed plan of action for the NCIS with specific annual milestones done in concert with representatives of federal agencies, the private sector and foundations, and NOAA leadership.
- * Initial design and preparation of Volume One on the Climate of North America.

These and other envisioned activities over the 1987-1991 period are represented in a schedule depicted in the Appendix. Such a schedule offers annual milestones needed to monitor progress.

The ensuing implementation effort includes three major activities, largely performed in parallel. The first of these is the planning and organizational effort required to provide the diverse expertise needed for NCIS funding. Involvement of potentially interested and affected entities, be they federal agencies or private companies, will be essential. They and the representatives of their sectors are needed to provide the expertise to select the types of information needed in the specific impacted sectors of agriculture, energy, water resources, etc.

The second major activity will be a marketing effort. The potential of the atlas and the computer information products to serve the needs of the impacted sectors will require a well organized and extensive series of interactions with potentially interested parties including federal agencies, commercial and business interests affected by climate, and by private foundations whose goals fit portions of those of the NCIS.

In parallel, a third major activity of the implementation effort will be a research and development effort. This includes the studies needed to define and select the information to best describe climate impacts, some of which is not available. Development efforts will be needed to assemble climate data sets and to develop software packages to serve the needs of varied users. This effort will require diverse expertise including cartographers, computer programmers, managers of geographical information systems, climatologists, economists, geographers, etc.

APPENDIX

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SCHEDULE

