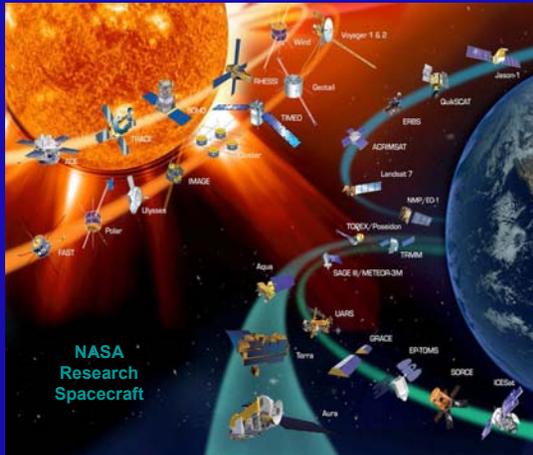


Earth Science Remote Sensing Data---Contribution to Natural Resources Policy-Making

By

Molly Macauley and Fred M. Vukovich



EARTH SCIENCE DATA AND CLIMATE-RELATED PUBLIC POLICY

INTRODUCTION

- Earth science data collected from the unique vantage point of space range from measurements of the earth's water cycle and radiation budget to observations about air quality, land elevation, and vegetation.
- Some 73 earth science satellites currently operate under national and regional government auspices or under commercial ownership.
- In 2005, the U.S. National Aeronautics and Space Administration (NASA) alone was flying some 80 instruments on 18 spacecraft.
- The instruments provide more than 1,800 science data products for study of physical, geophysical, biochemical, and other parameters.

WHY MEASURE THE CONTRIBUTION?

- Government Performance and Results Act of 1993
- President's Management Agenda
- NAS/NRC "Urgent Needs and Opportunities to Serve the Nation," Earth Science and Applications Report
- Inherent societal benefit of earth science data and products

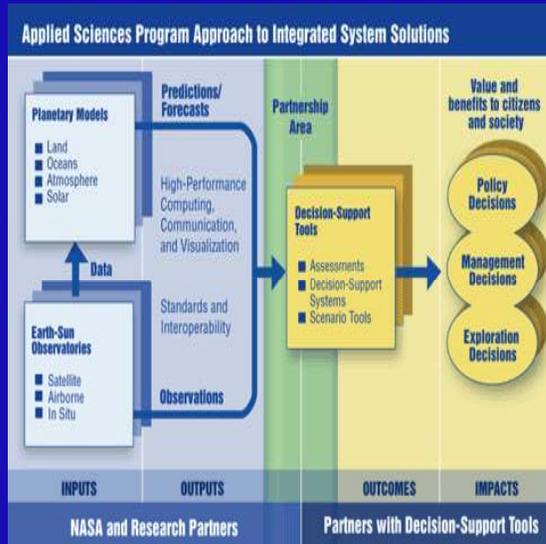
"We find the value of information is not zero, but it is not enormous, either."

William D. Nordhaus, Sterling Professor of Economics, Yale University, writing about the value of weather and climate information, 1986.

"If we'd been able to produce a forecast last spring that California would be deluged this winter, it would have been worth whatever research investment was involved, if only because of the human misery it would have relieved."

D. James Baker, then Administrator of the National Oceanic and Atmospheric Administration, writing shortly after heavy rains had flooded many parts of California, 1995.

HOW TO MEASURE THE CONTRIBUTION



FRAMEWORK FOR APPLYING NASA EARTH SCIENCE PRODUCTS IN POLICY DECISION SUPPORT

Important Caveats

- NASA itself is not a policy-making agency but affirms that its earth science data products should be developed to serve research to improve understanding and applications
- Complexities characterize attempts to "trace" contributions of data products to decision making, including ease with which data can be exchanged among analysts and used in policy discussion without detailed attribution

WHAT ARE EXAMPLES OF THE CONTRIBUTION?

- Renewable energy in the Energy Information Administration's National Energy Modeling System and Annual Energy Outlook
- Ecosystem science in the United Nation's Millennium Ecosystem Assessment Synthesis Report (2005) and the World Health Organization's Climate Change and Human Health: Risks and Responses (2003)
- Carbon sequestration under provisions of the 1992 Energy Policy Act

Example 1: EIA/National Energy Modeling System

- Renewable energy modules include measurements of the sun's energy acquired from instruments under NASA's Surface Meteorology and Solar Energy project
- Policy importance involves discussion of renewable energy as an alternative to fossil fuels, the new national policy in the 2005 Energy Policy Act (extending tax credits for producing some renewables), and state initiatives to mandate a certain share of renewables in states' energy mixes

Example 2: The UN's Millennium Ecosystem Assessment

- Earth science data products from NOAA/AVHRR and Landsat support assessment of climate on chronic and infectious water-borne disease vectors
- Policy importance includes assessment needs of the Convention on Biological Diversity, the Convention to Combat Desertification, the Ramsar Convention on Wetlands, and the Convention on Migratory Species

Example 3: World Health Organization's Climate Change and Human Health: Risks and Responses

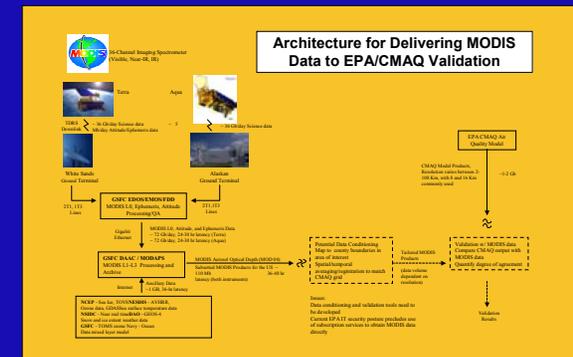
- Epidemiological, remote sensing, and GIS systems underpin analyses
- Policy importance includes recommendations on how governments around the world should respond
- Report also references the US GCRP's Climate Change Impacts on the US report

Example 4: The 1992 Energy Policy Act and Voluntary Registering of Carbon

- Section 1605(b) allows any company, organization, or individual to establish a record of carbon emissions and reductions
- NASA's Carbon Query and Evaluation Support Tools (CQUEST) together with output from the Carnegie-Ames-Stanford Approach (CASA) ecosystem model supports assessment of sequestration by participants

WHAT LIMITS THE CONTRIBUTION TO POLICY?

- Data formats [HDF is preferred format of NASA DAACs]
- Map projections [No consistent map projection used by DAACs]
- Data quality [What are NASA's validation and verification procedures?]
- Delivery of data from DAAC. [Firewall incompatibilities]
- Spatial resolution and grid spacing [Inconsistencies between need and availability]
- Required expertise [Some data products require a high level of expertise by the user]



EXAMPLE OF ARCHITECTURE FOR MODIS DATA DELIVERY

CONCLUSION, A METAPHOR, AND THE FUTURE

- The modesty of salt belies its salience; so, too, are space-derived earth science data underappreciated in their contribution to climate science in support of decision making
- Most effective applications involve a "team" of data expert, modeler, and policy analyst
- Future research will address policy drivers for earth science and climate during 2010-2020

FOR MORE DETAIL <http://appl-policy.saic.com/>

ACKNOWLEDGEMENTS

This project was sponsored by the applications program of the National Aeronautics and Space Administration.

