Towards science in support of decision making: Characterizing the supply of carbon cycle science

Lisa Dilling

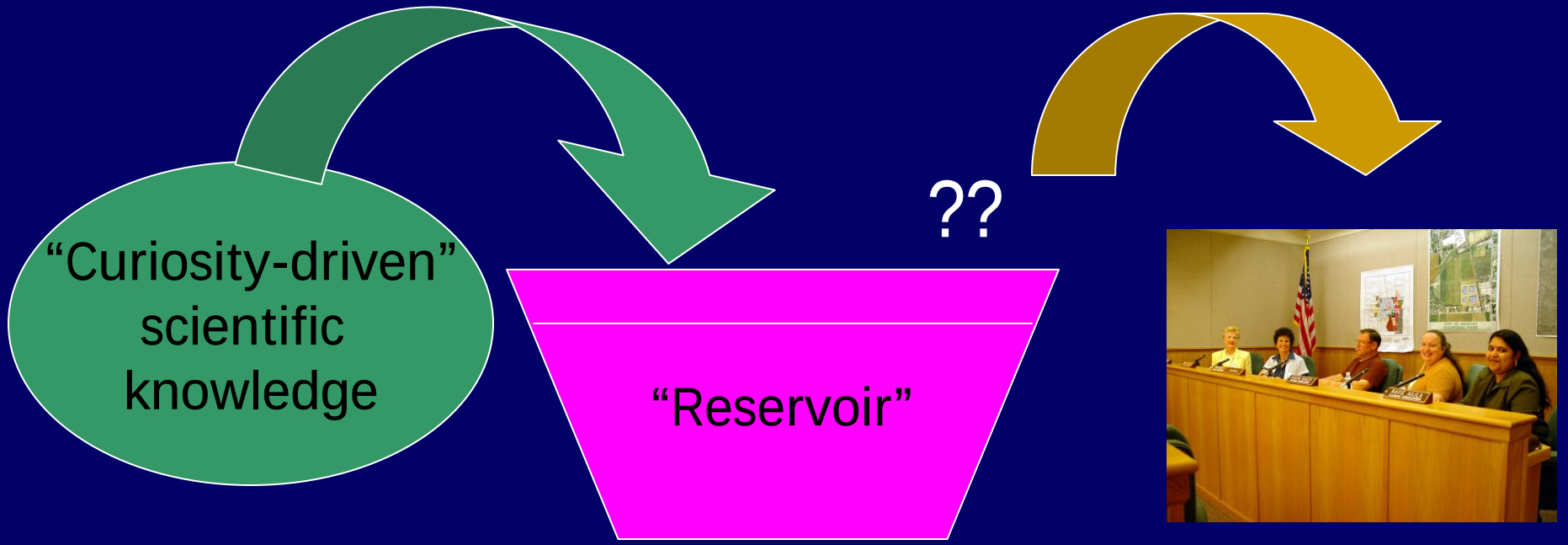
Outline

- Carbon science justified for policy relevance
- Implemented according to classic US science policy paradigm
- As a result, carbon cycle science is largely not created to be of use
- Missing opportunities
- Alternative science policies?

Evolution of U.S. Carbon Cycle Science Policy

- 1957 Keeling begins Mauna Loa atmospheric CO_2 monitoring under IGY
- 1977 NAS: research "involved in the carbon dioxide problem" to "close gaps in knowledge so that future decisions regarding the exploitation of energy resources can be made on as sound a basis as possible"
- 1978 DOE: "predict the environmental, social and economic costs of increasing atmospheric CO_2 concentrations with sufficient confidence to permit policy decisions to be made on the future use of fossil fuels"
- 1978 U.S. National Climate Program Act; CO_2 research under DOE incorporated in "Responding to impacts and policy implications of climate, carbon dioxide, environment and society,"
- 1990 U.S. passes Global Change Research Act (USGCRP) to produce "usable information on which to base policy decisions relating to global change"
- 2001 U.S. Administration announces Climate Change Research Initiative, of which carbon cycle science is a focus to "best support improved public debate and decision making in the near term"
- 2003 U.S. Administration reorganizes USGCRP under the Climate Change Science Program "to provide the best possible scientific information to support public discussion and decision making on climate-related issues"

The Vannevar Bush paradigm (~1945)



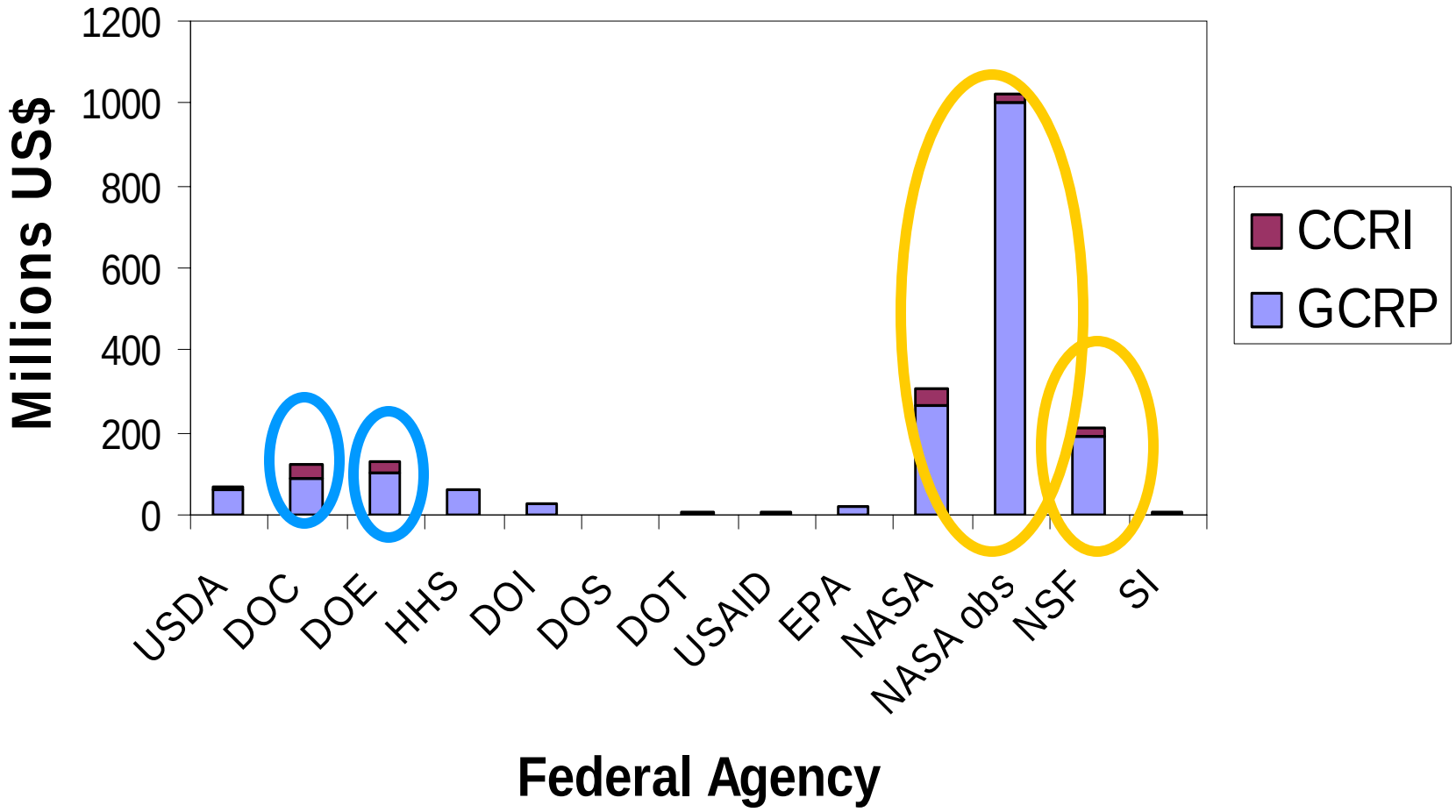
Decision makers

E.g. Stokes, 1997

Current science policies

- Vast majority of funding goes to ‘basic’ science
- Basic science is conducted separately from considerations of use, even in ‘mission’ agencies such as DOE
- Scientific community drives program norms:
  - Peer review
  - Academic standards of success (e.g. publications)
  - Priorities set by NAS panels, scientific committees, program managers (from scientific community)

U.S. Climate Change Science Program Budget FY2004



Supply consists of:

- Advances in the basic understanding of global budgets of carbon fluxes
- Process understanding of exchanges of carbon between various reservoirs
- Measurements of concentrations and fluxes
- Terrestrial vegetation and ocean chemistry at both a global scale and a very local scale
- Models that now couple biogeochemical dynamics to physical elements of the Earth system at a global scale
- And, more recently, research on carbon sequestration potential in agricultural lands and forests

E.g. IPCC 2001 WGI, chap. 3

Supply has been used:

- To alert the public and policy makers to the issue of CO_2 and global warming
- To support negotiating positions in UNFCCC process on carbon sinks
- To further refine international rules for carbon crediting
- In other words, mainly for international, highly technocratic policy processes

E.g. Lovbrand 2005

Usable science should:

- Directly reflect expressed constituent needs
- Be understandable to users
- Be available at the times and places it is needed
- Be accessible through the media [meaning mechanisms of obtaining information] available to the user community

Lemos and Morehouse, 2005

- As such, carbon science is “missing opportunities” to be usable

In international processes...

- Policy sometimes dependent on information beyond scientific capabilities, e.g. separation
- Information not always available or understandable (e.g. see Lovbrand, ESP issue)
- Carbon sinks becoming realm of a few select knowledge brokers, highly subject to politicization (e.g. nationalization of carbon sinks)

And certainly in domestic ones...

- Public
  - Elected officials
  - Agency Civil Servants
  - National, Regional, State, Local
- Private
  - Individuals
  - Industry
  - Small-scale business
  - Shareholders
- Non-profit

The Era of Carbon Management?

Inadvertent carbon management
- Existing for millennia
- Will continue to dominate C management
- Depends on land type, land use, actors, markets, policy

Deliberate carbon management
- Increasing interest in past 10 yrs
- Small scale
- Pilot projects
- Voluntary efforts

FUTURE ??

Carbon Governance?
- Both deliberate and inadvertent
- Rules TBD
- Effective across scales
- Role of public policy
- Role of markets

SPARC Center for Science and Technology Policy Research Colorado University of Colorado at Boulder CIRES

- Carbon science does not have mechanism to evaluate these needs and create usable knowledge (exception in some ag research?)

Alternative processes for carbon cycle science:

- Knowledge seeks application (e.g. NASA App.)
- Problem-oriented research
  - Explicit design of research projects (e.g. RISA)
  - Science-practice interface
  - Ongoing interaction with decision makers
  - Co-production of knowledge
- Boundary organizations (e.g. USDA Ext. service, some RISAs)

Some questions:

- Which users? (Resources are limited)
- Why these users?
- If carbon science is "used", e.g. in UNFCCC, is that enough?
- If the goal is to support decision making, should science governance be more inclusive?
- Which knowledge is the public sector responsible for (vs. private)?
- Carbon knowledge is only part of decision makers' universe– how should programs organize effectively to serve those needs?
- Are the alternatives to the VB paradigm better? What are their downsides?