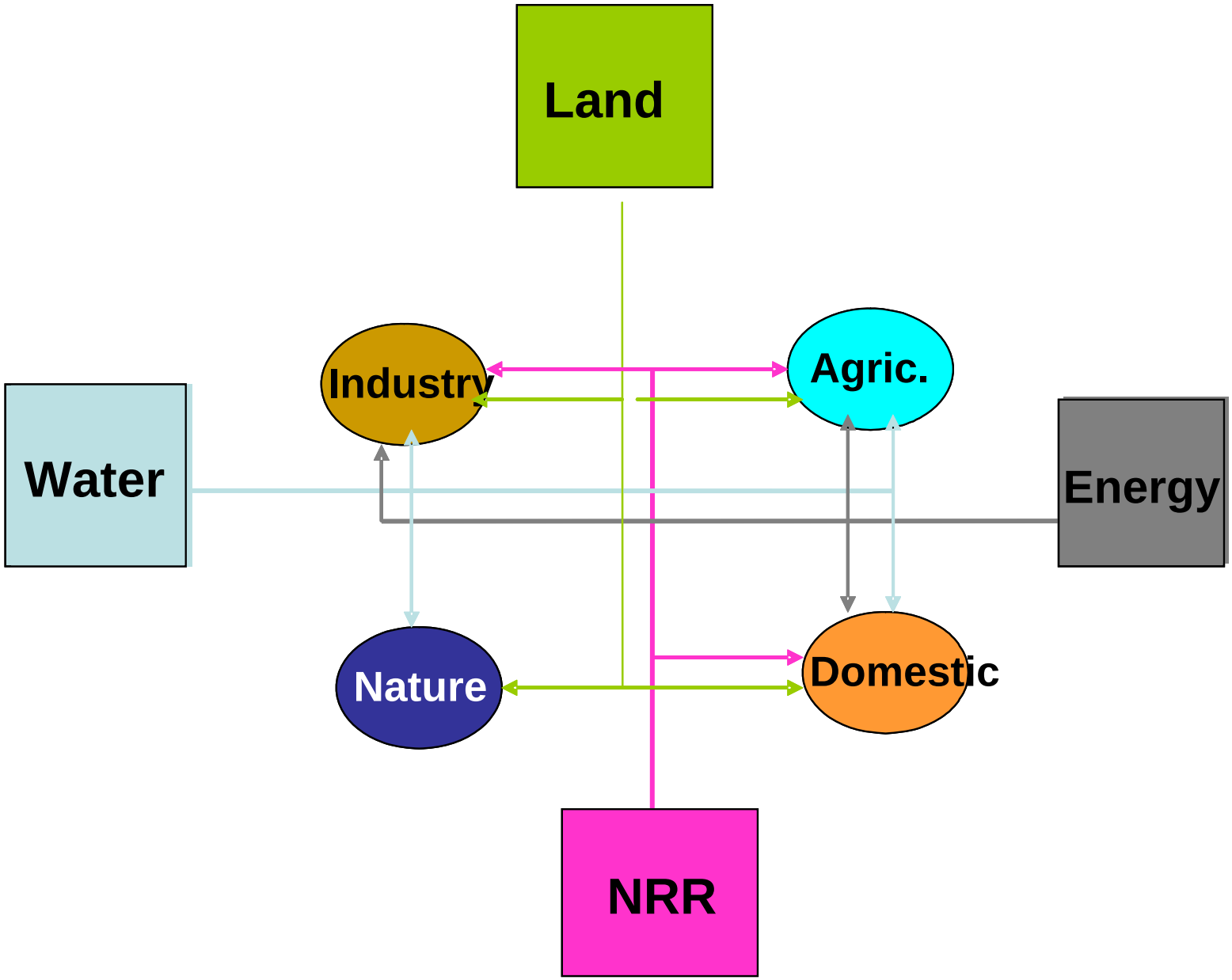
Linkages of Sustainability

Tom Graedel, Co-Chair

National Academies Roundtable on
Science and Technology of Sustainability

Oct. 28, 2010

The Challenge of Linkages

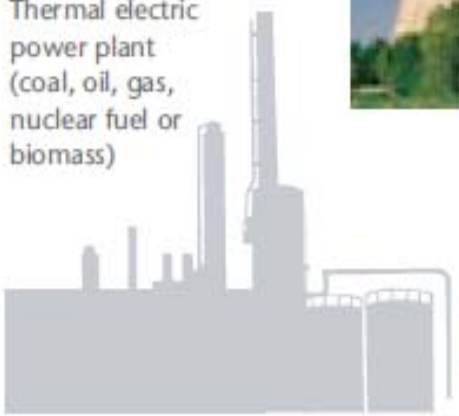

Land
Industry
Agric.
Water
Energy
Nature
Domestic
NRR

Linkage Example:

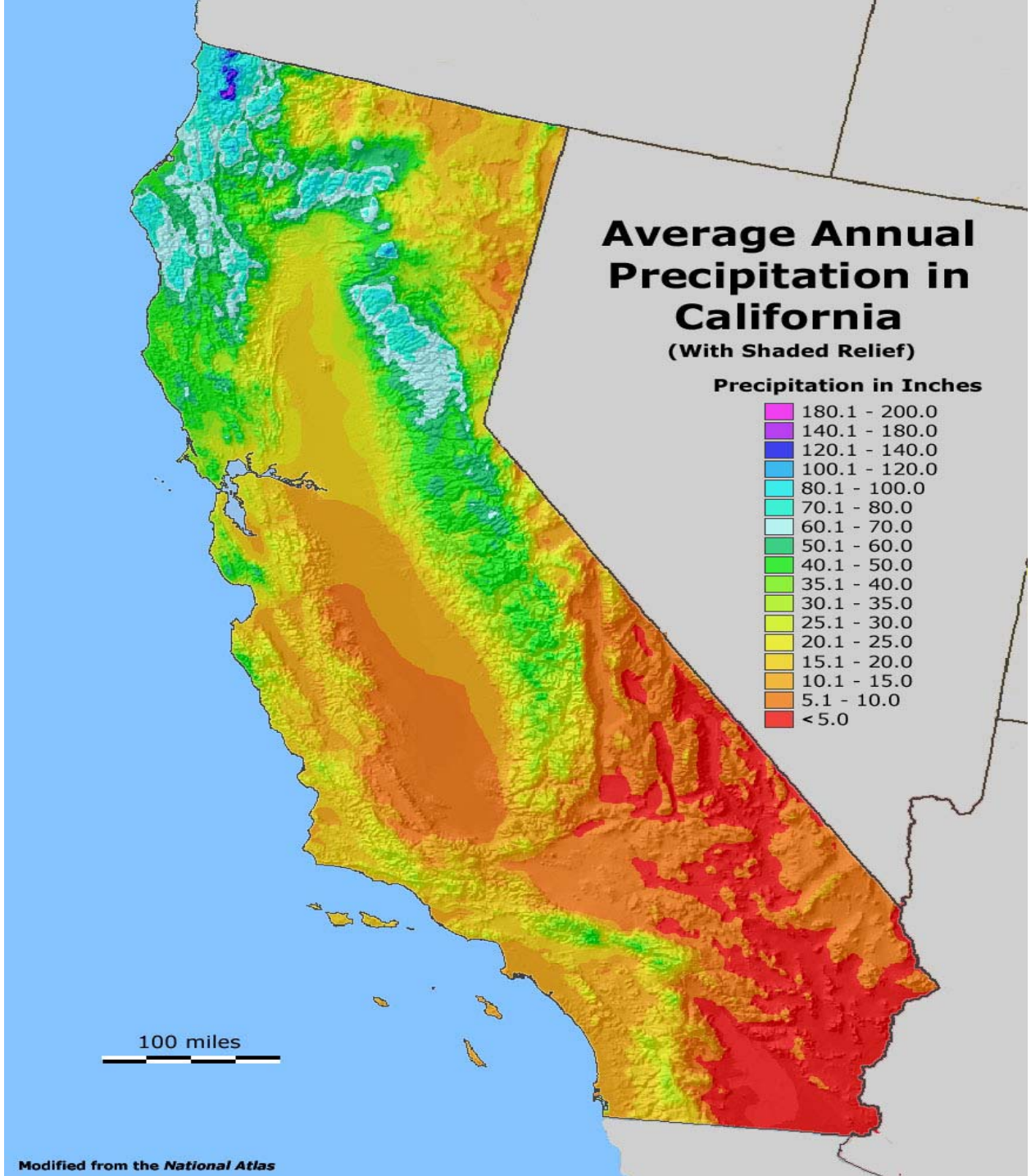
Water and Energy

Cooling water

The largest single use of water by industry is for cooling in thermal power generation.



Water for Power Production


Average Annual Precipitation in California
(With Shaded Relief)
Precipitation in Inches
180.1 - 200.0
140.1 - 180.0
120.1 - 140.0
100.1 - 120.0
80.1 - 100.0
70.1 - 80.0
60.1 - 70.0
50.1 - 60.0
40.1 - 50.0
35.1 - 40.0
30.1 - 35.0
25.1 - 30.0
20.1 - 25.0
15.1 - 20.0
10.1 - 15.0
5.1 - 10.0
< 5.0
100 miles
Modified from the National Atlas

Energy Use for Water

California:

19% electricity

33% natural gas (non-power plant)

Large-scale Desalination

Large-scale Desalination

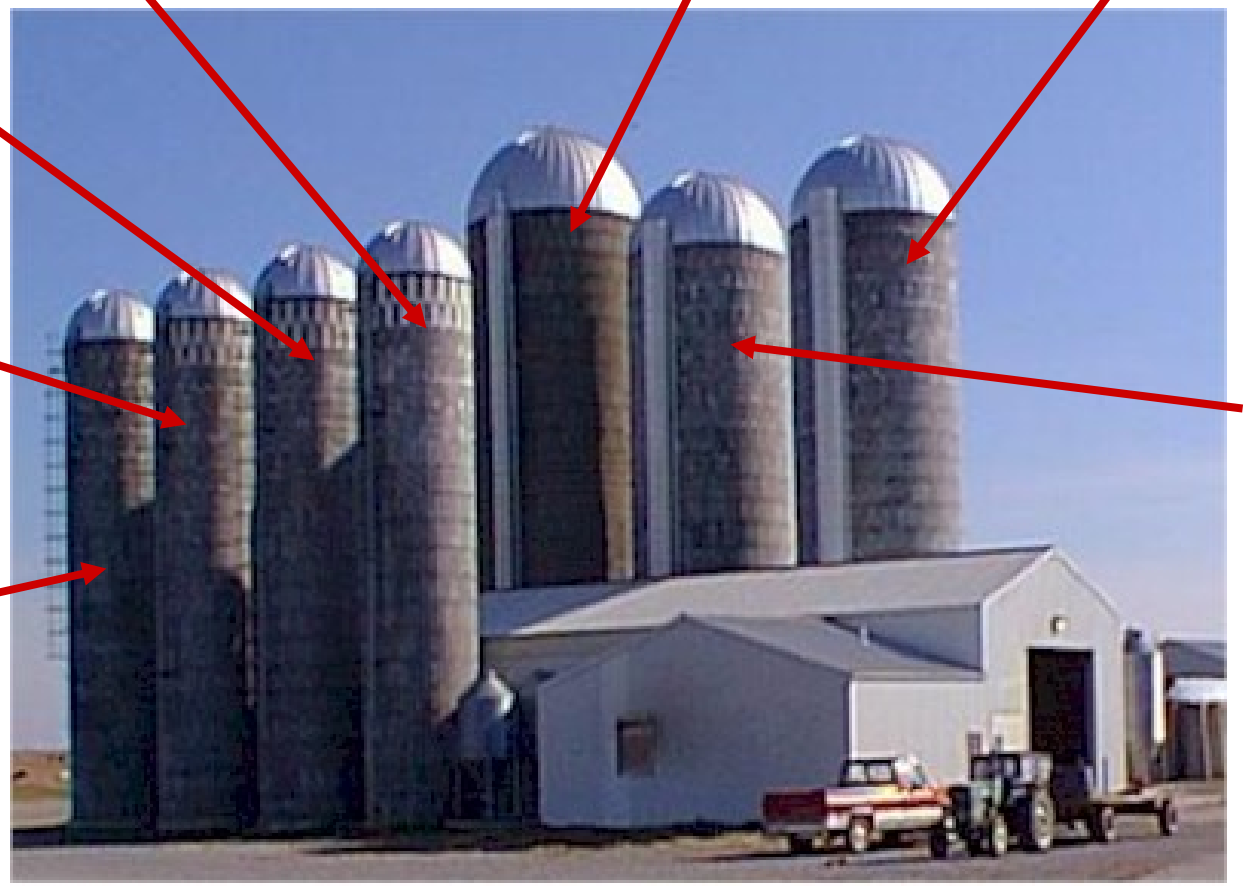
Waste = Opportunity

The Issue:

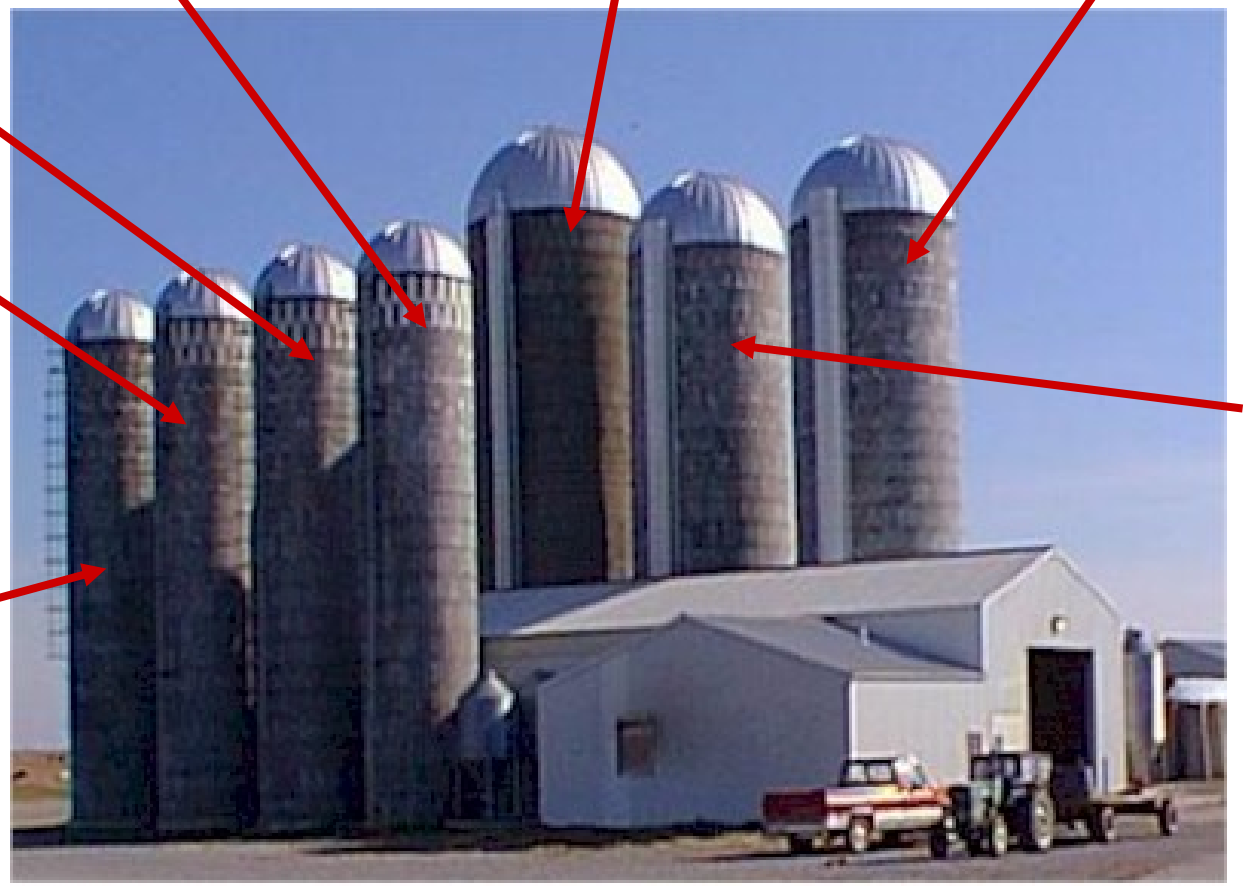
Do we anticipate having enough energy to acquire the water we need?

Linkages, Experts, and the Federal Government

The Sustainability Silos of the Experts



The Sustainability Silos of the U.S. Government



Sustainability at the National Academies

Science and Technology for Sustainability Program

Policy and Global Affairs Division

Study Proposal:
Sustainability Linkages in the Federal Government

Rationale

- Understanding the linkages between domains is essential for the development of policies and programs supporting long term sustainability.
- These linkages are not always recognized or accounted for by federal policies and programs and, in fact, often trigger unintended consequences.

Sustainability Linkages in the Federal Government

Objectives

- To identify and describe the most critical linkages between domains, with potential sustainability impacts highlighting temporal, geographic, and spatial differences.
- To develop a decision framework which could be used to analyze or assess consequences, tradeoffs, and synergies of policy choices among linked domains.

Linkages Issues to be Addressed

- Linkages form potential constraints to many key components of sustainability
- The linkages are generally not considered in sustainability discussions or analyses
- Linkages need to be much better quantified
- The policy implications of linkages need to be explored and communicated to government agencies

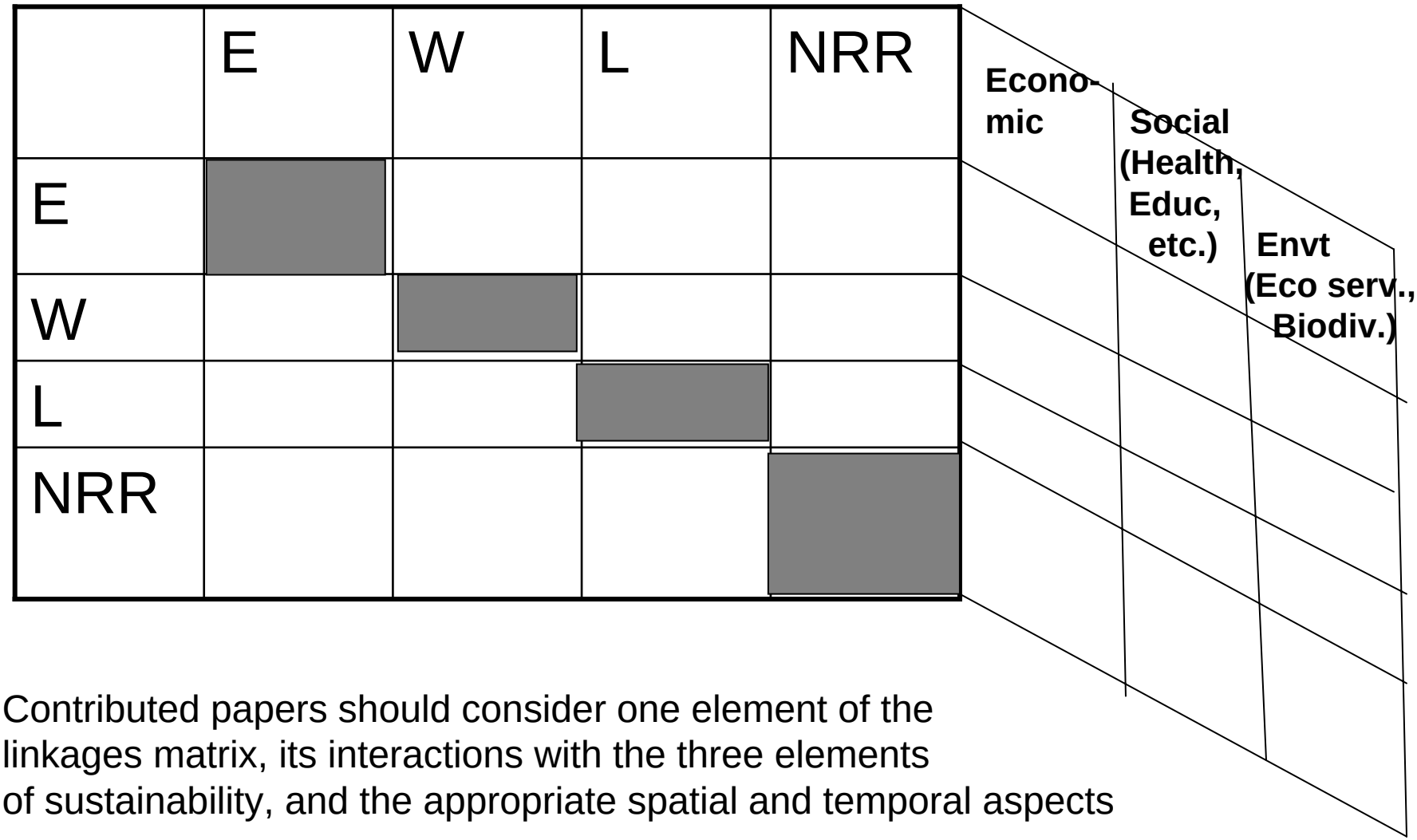
Option 1: A Domain-Based Approach

- Energy and its Linkages
- Water and its Linkages
- Land and its Linkages
- Biodiversity and its Linkages
- Non-Renewable Resources and their Linkages
- Human Factors and its Linkages

A Partial Domain Linkages Matrix

	Energy	Water	Land	Non-Ren. Resources
Energy				
Water				
Land				
Non-Ren. Resources				

Adding the Three-Legged Stool



Contributed papers should consider one element of the linkages matrix, its interactions with the three elements of sustainability, and the appropriate spatial and temporal aspects

Option 2: A Landscape-Based Approach

Urban

Coastal

Mineral Rich

Agriculture/Forest

The Landscape Approach

POSSIBLE CASE STUDIES (2-3 per landscape)

- **Urban:** Atlanta, Phoenix, Baltimore or Las Vegas
- **Coastal:** Gulf Coast, California Bay Delta, Chesapeake Bay
- **Mining:** Morenci Mine (Arizona), Pebble Mine (Alaska)
- **Agriculture/Forestry:** Mississippi River Basin (nutrient deposition), Agriculture production of bioenergy crops, Forested lands in southeast U.S.

Sustainability Linkages in the Federal Government

Final Report

- Describe linkages and policies and programs that support long term sustainability
- Identify gaps in understanding of these linkages and consequences for sustainability
- Identify institutional impediments
- Suggest next steps for overcoming institutional impediments

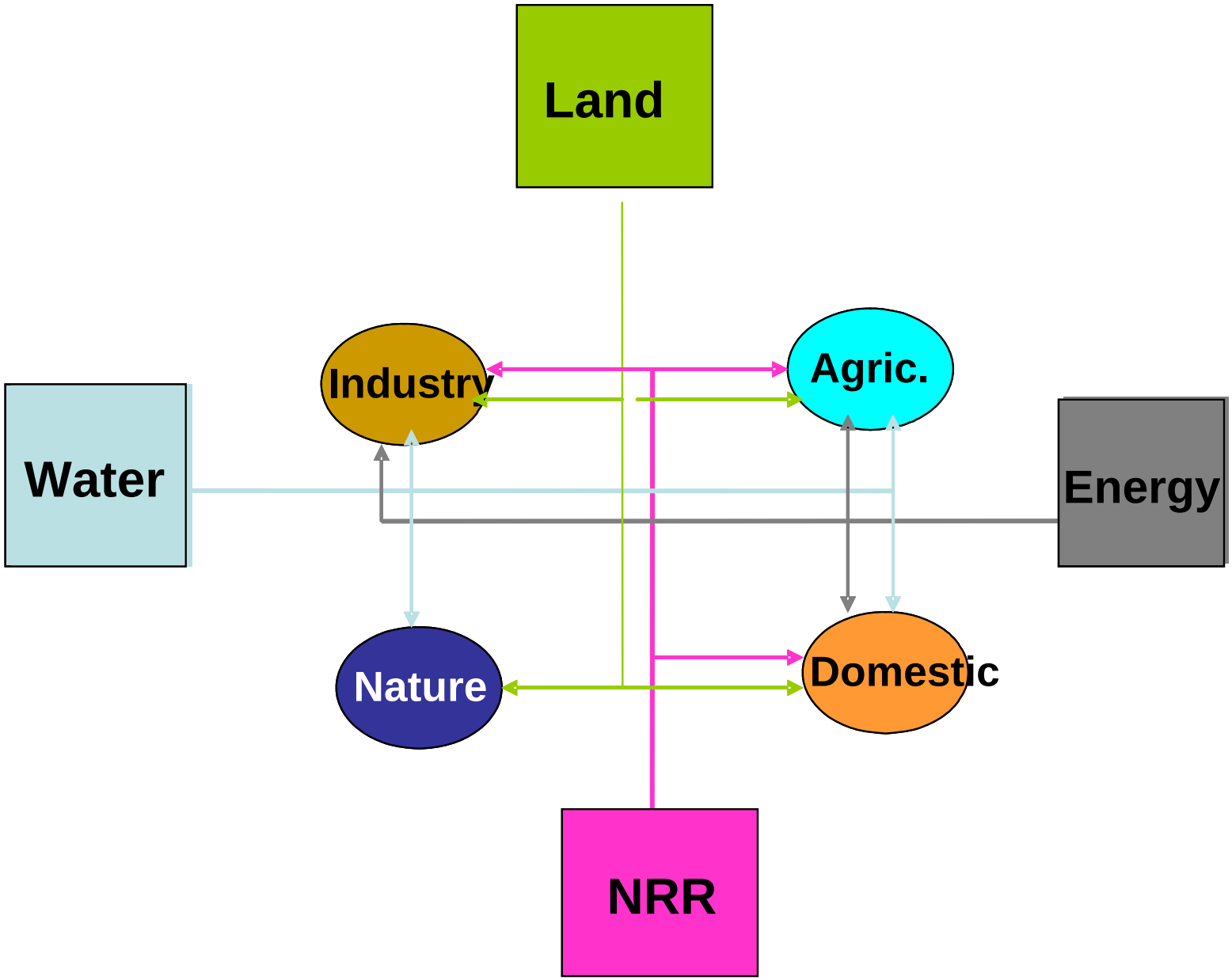
Sustainability Linkages in the Federal Government

Current Status

- Funding commitments received from EPA, DOE, USGS, NASA, and others
- Additional funding requested
- Suggestions for committee nominations being solicited
- Refine formal study work plan
- Launch study in late Fall 2010

Possible Time Line

- Nov., 2010 — Funding in place, committee appointed
- Dec., 2010 — First committee meeting
- Mar., 2011 — First and second fact-finding meetings
- May, 2011 — Third and fourth fact-finding meetings
- Aug., 2011 — Second committee meeting
- Oct., 2011 — Fifth and sixth fact-finding meetings
- Dec. 2011 — Third committee meeting
- Feb. 2012 — Consensus report to review
- Apr., 2012 — Report issued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