

The Social Tipping Point: Can Policy Catch Up with the Science of Global Climate Change?

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Monterey Bay Aquarium Research Institute

Globec, Rome, Italy July 11, 2008

IPCC Report: February 10, 2007

We are responsible
for
Rate of Change



US Oil and Gas Lease Sale in Chukchi Sea, Alaska
February 7, 2008



Topics

- The Crisis
- The Problem
- Tipping Points
- Scientific Evidence and Indicators
- Social Science for “So What?”
- Government/Societal Decision
- Conclusions

The Crisis

Andrew Revkin, New York Times

“...we must understand the meaning of the term “crisis” when we speak of climate change. It doesn’t mean catastrophe or imminent demise; rather, it means “a crucial or decisive moment, a turning point, a state of affairs in which a decisive change for better or worse is imminent.”

Crises

Governments must make decisions to manage change

- GHG emissions reductions
- Investments in
 - New technology
 - Mitigation strategies
 - Adaptation and resilience building
- Mobilize and empower publics through education and outreach
- Institutional adaptive capacity to receive and apply information

The Problem

Lack of recognition/acknowledgment that unrestrained economic and population growth exacerbate climate change problems.

The Problem

- Governments don't optimize scientific knowledge.
- Local Communities lack knowledge and capacity to respond to climate change risks
- Knowledge producers don't effectively communicate evidence to governments and the public.

Problem

Political Systems

- Risk averse
- Short horizons
- Struggle with complexity
- Reactive, not proactive

Societies

- Ill informed
- Resistant to change
- Not adequately engaged in political systems

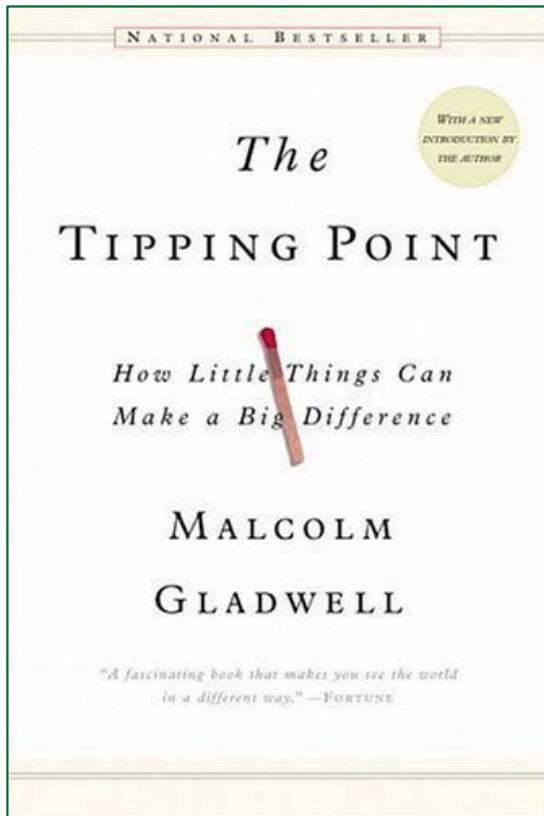
The Problem: “RATE OF CHANGE”

Rapid Social Change = Slower Environmental Change



Slow Social Change = Rapid Environmental Change

Tipping Points



- **Environmental** Tipping Points
- **Societal** Tipping Points

Tipping Points

Greatest environmental impacts will affect:

- Life furthest from the tropics
- Those in low lying areas
- Areas with fastest growing populations
- The poorest and least educated



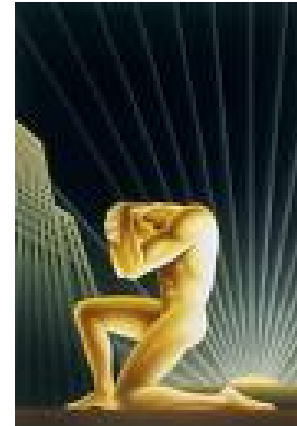
Evidence: What We Know

We know

We created the world 30 years from now.

We can't turn back time.

Only slow it down.



**Planetary changes occur in geological
not ecological time...reversals will
take millions of years**

We know



Impacts will

- Cause sea levels to rise
- Expand range of tropical diseases
- Disrupt agriculture, forestry and natural resources
- Increase variability and extreme events
- Cause wildfires, droughts and flooding
- Bleach, damage or destroy coral reefs

We know (at minimum)

- 2035 - atmosphere GHG will double pre-industrial period with 2 degrees rise
- End of 21st century - 5 degree rise
- Stabilize between 450-550ppm
- Present level - 430ppm
- Present rising at 2ppm/year
- Need to reduce present levels by 25% by 2050



We know

- Biodiversity strengthens capacity of ecological systems to withstand stress
- Human activities stress natural systems



Indicators

- Track human and environmental changes over time
- Provide metrics of time and space
- Lend consistency to forecasting
- Are essential for both natural and social science research and theory creation
- Require standardization of data collection

National Ocean Economics Program: Using social and economic indicators as a bridge from science to policy





National Ocean Economics Program

New

Phase II Florida's Ocean and Coastal Economies Report

Updated Non-Market Database - 31 new studies

Data Menu

Market

[Ocean Economy](#)
[Coastal Economy](#)

Natural Resource

[Living Marine Resources](#)
[Offshore Mineral Resources](#)

Non-Market

[Valuation Studies](#)
[Value Estimates](#)
[References & Tools](#)

Population & Housing

Government Expenditures

[OMB Ocean Budgets](#)
[Ocean Time Series](#)

About NOEP

Established in 1999, the National Ocean Economics Program (NOEP) provides a full range of the most current economic and socio-economic information available on changes and trends along the U.S. coast and in coastal waters. The program is funded by federal, state, university, and private grants and contracts.



Market

Ocean and coastal economic data for the U.S. coastal states, counties, and coastal regions.



Natural Resources

Commercial fisheries information and economic data of the offshore oil and gas production of the U.S.



Population & Housing

Population and housing statistics for the coastal states and shoreline regions.



Non-Market

Non-Market valuation research studies about the coastal regions and waters.



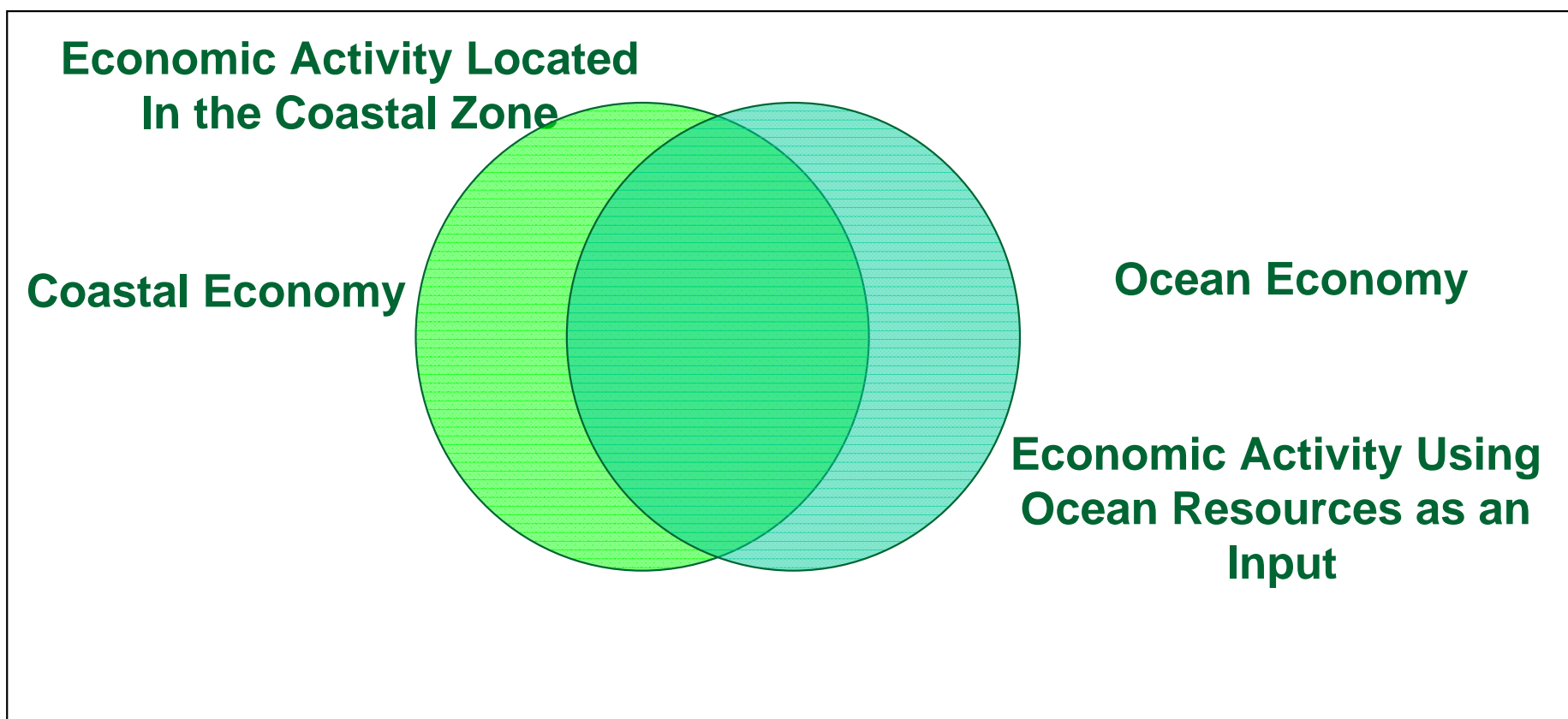
Government Expenditures

Historical data of federal marine expenditures for ocean and coastal activities collected from the U.S. Office of Management and Budget.

updated 18-Jun-2008



The Coastal and Ocean Economies Are Not The Same Thing



Structure of the Market-based Indicators

Indicators

- Employment
- Earned wages
- Gross State Product (GSP)
- Population changes/density
- Housing Units

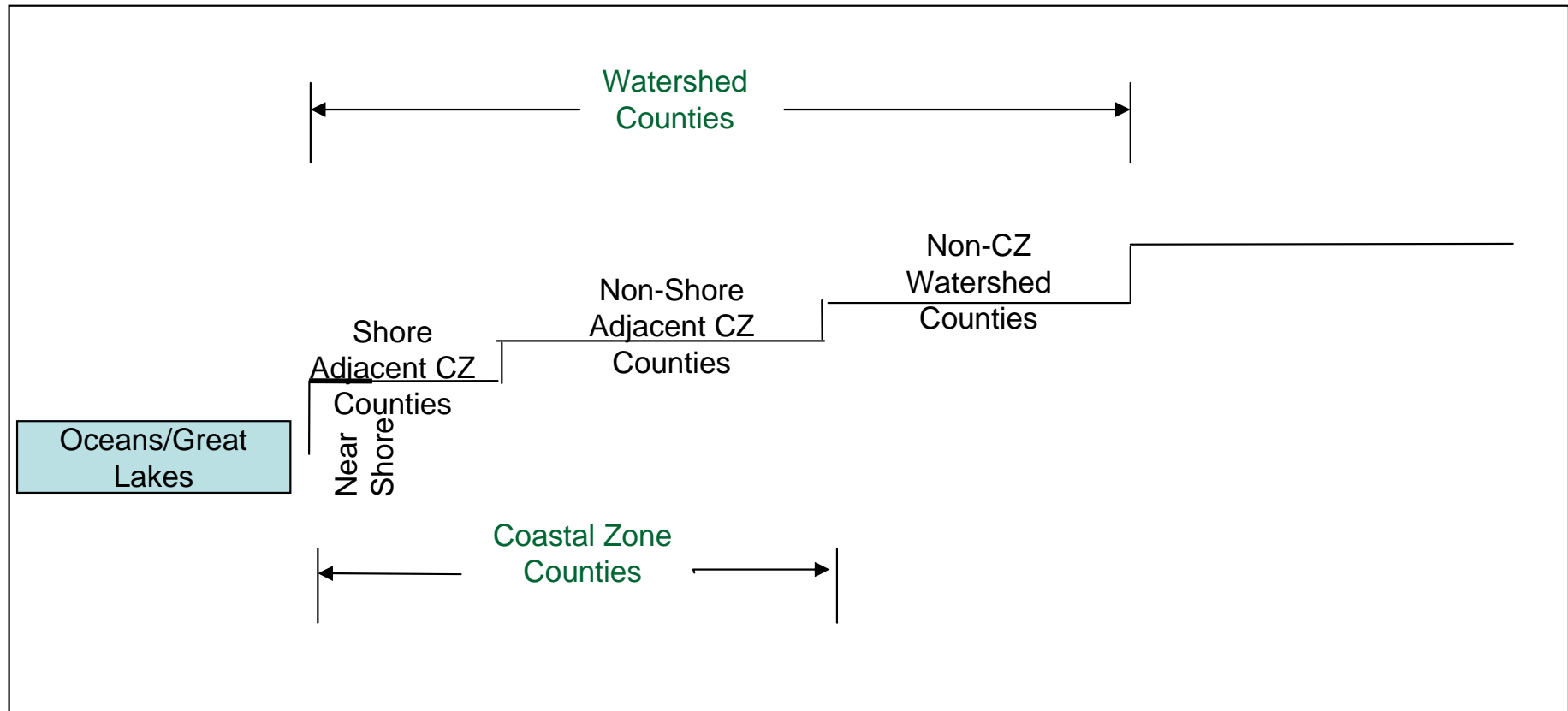
Sectors/Functions

- Coastal Construction
- Marine Living Resources
- Marine Transportation & Ports
- Offshore Minerals
- Ship & Boat Building
- Coastal Tourism & Recreation

Geographies

- Nation
- State
- Regions
- Watershed Counties
- Coastal Zone counties
- Coastal Zip codes

The Coastal Economy By Geography



Structure of the Natural Resources Indicators

- Living Resources
 - Landings
 - Landed Value
 - Price per pound
- FOR
 - Fish
 - Kelp
 - Farmed products
- By year
- State
- Major Harbor
- Species
- Top ten/year

Other Natural Resources

- Offshore Minerals
 - Price
 - Production
 - Total Revenue
- FOR
 - Oil
 - Gas
 - Sand and Gravel
- By Federal OCS
- State Waters
- National Totals
- Annually 1980-Present

National Ocean Economics Program

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Market Data

Coastal Economy Data

[Market Data FAQs](#)
[Need Help?](#)

from recent [NAICS classifications](#). Do you want to search [historical SIC data](#)?

Coastal Economy data includes all activities and industries reported by the Bureau of Labor Statistics for the coastal counties. To access Ocean Economy Data, which contains only industries dependent on the ocean, see [Ocean Economy Data](#).

To obtain data for Establishments, Employment, Wages, and/or GDP for coastal states, **start by selecting one or more states**, then select one or more categories in any box and click the *Start Search* button.

Select State(s):

Select a state first
United States (National)
All Coastal States

Select Coastal County(s):

Select a State

Select Year(s):

All
2006
2005

Select Comparison Year:
(optional)

Choose Supersector(s):

Total, all industries
Construction
Financial Activities

Select Value(s):

All
Establishments
Employment

Check for Optional Regional Totals:

Coastal Zone Counties
 Near Shore Shore Adjacent Non-shore Adjacent

[What are regions?](#)

Watershed Counties
 Coastal Zone Counties Non-CZ Watershed

Inland Counties

Convert Dollars:

to Year 2000 Values

Output To:

Display in Window

[Start Search](#)



U.S. Indicators for 2005

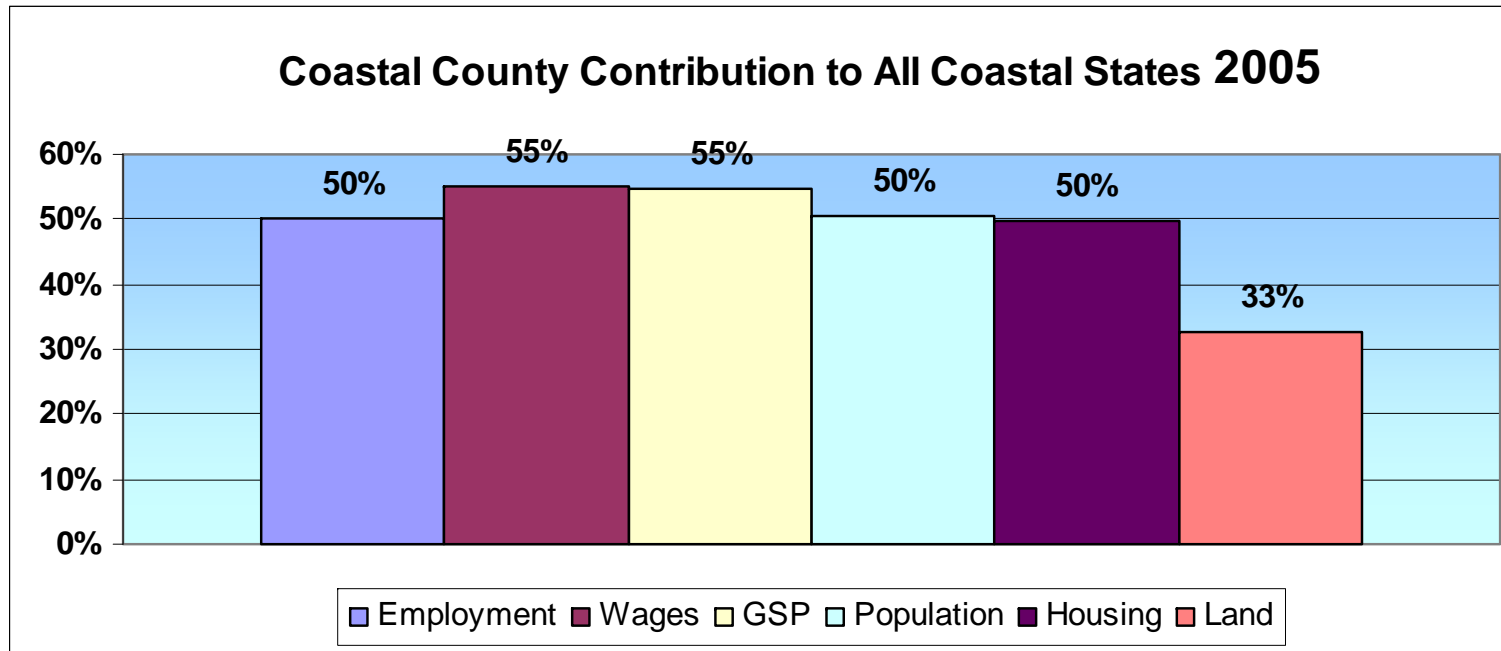
- **US *Ocean* Economy*** = \$138+ Billion
- **US *Coastal* County Economy** = \$5.6 Trillion
- **US *Coastal* State Economy** = \$10.3 Trillion
- **US Total Economy** = \$12.4 Trillion

*Includes these ocean-dependent sectors:

Living Marine Resources, Offshore Minerals, Marine Construction,
Ship Boat Building, Coastal Tourism & Recreation, Maritime Transportation



Indicators of US Economic Risk



- **US Coastal Counties:**
 - 50% of Jobs
 - 55% of Wages
 - 45% of GDP
 - 50% of Population
 - 50% of Housing
 - 33% of Land

California Vulnerabilities



Commercial Fishery

70% drop in catch since 1950

81% drop in value since 1980

42% drop in catch: 2000-04

11% drop in value: 2000-04

Greenhouse Gases

Ocean Acidification

–Loss of Biodiversity

–Loss of Commercial and Recreational Fish



California Coastal Counties 2005



11% of National Economy

1.1% of US Land Area

79% of California's Workforce

**83% of California's GSP
\$ 1 Trillion+**

75% of California's Residents

25% of State Land Area

#1 US Tourist Destination

Florida at Risk

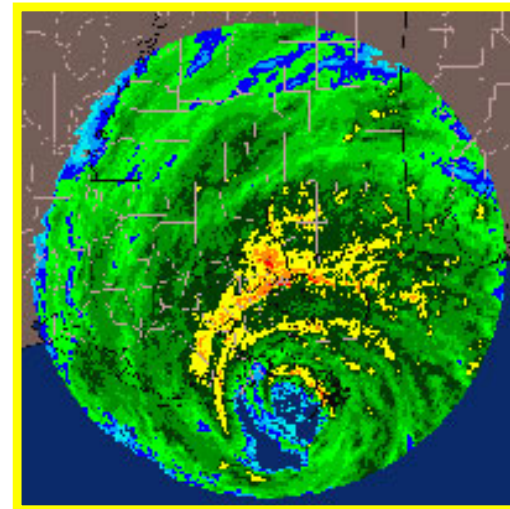
Ocean Warming

- Sea Level Rise - Shoreline Erosion



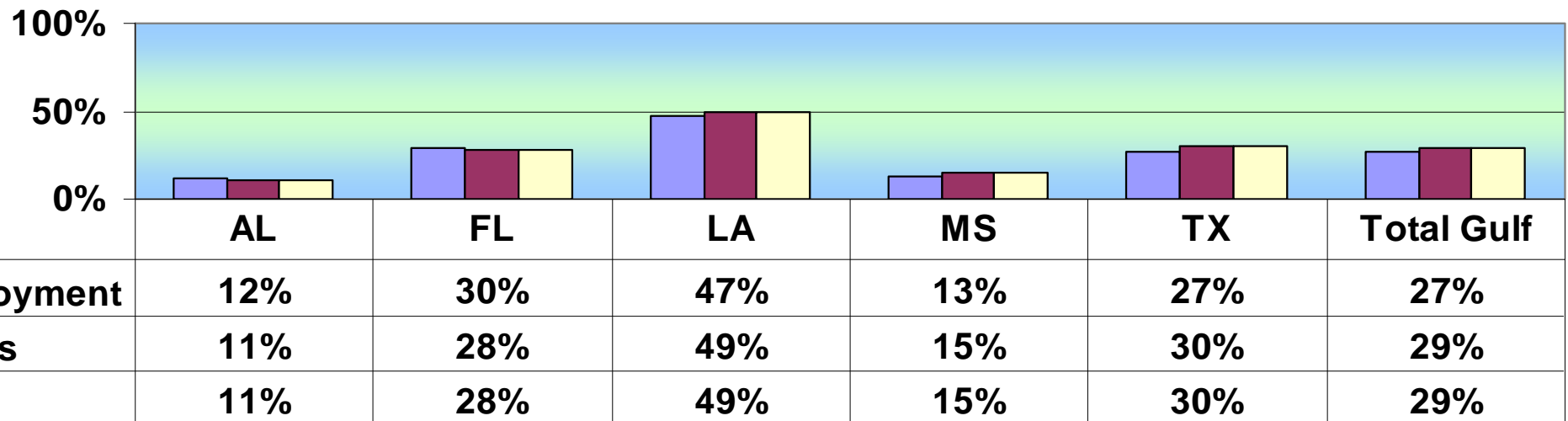
Sea Temperature Rise

- Weakens Living Marine Systems
- Intensifies Storms
- Contributes to Eutrophication and Toxic Blooms



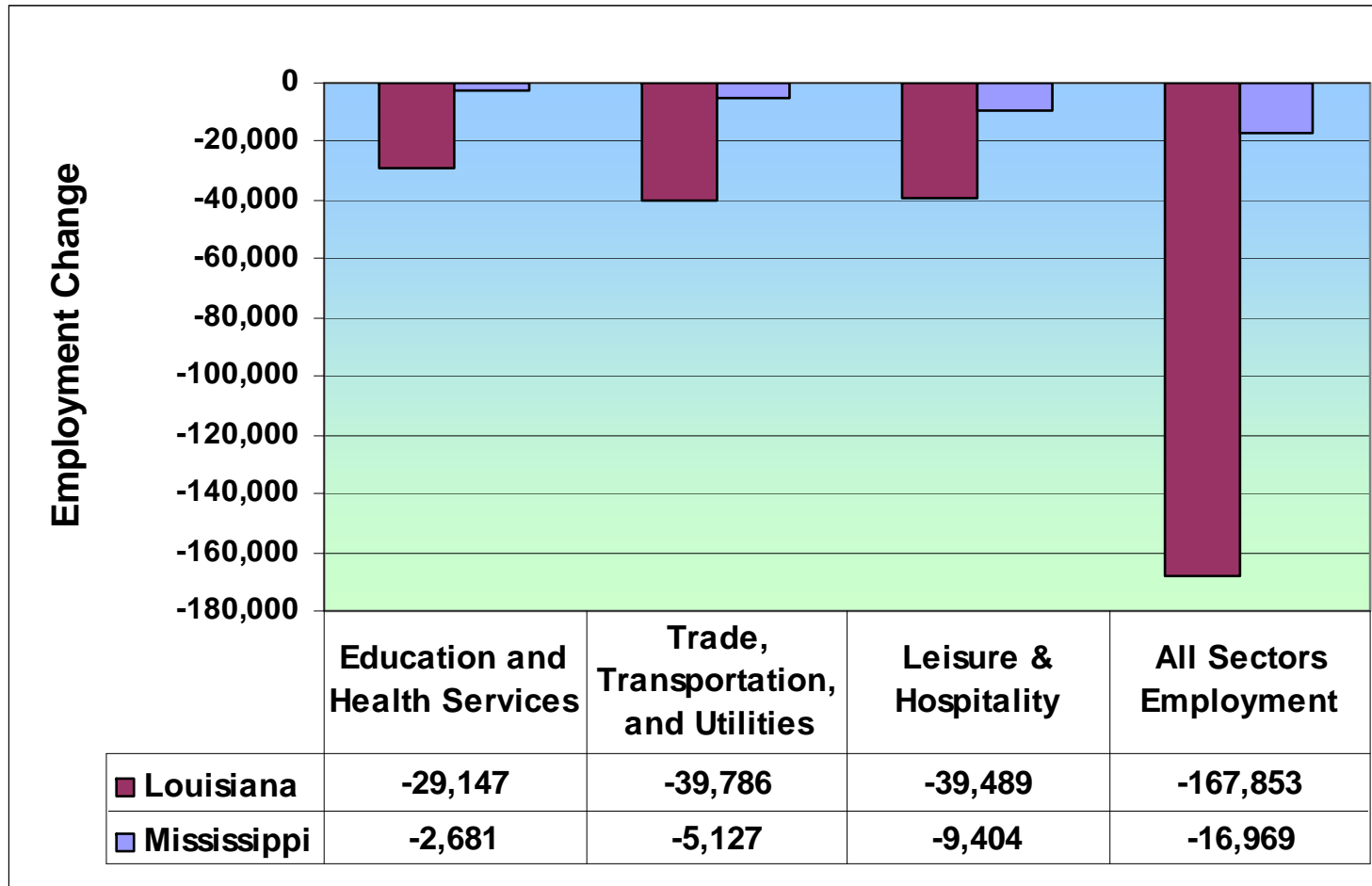
Gulf Vulnerability

**Gulf Coastal Counties as Percentage of State Economy
2005**



A Year After Katrina (2004-2005)

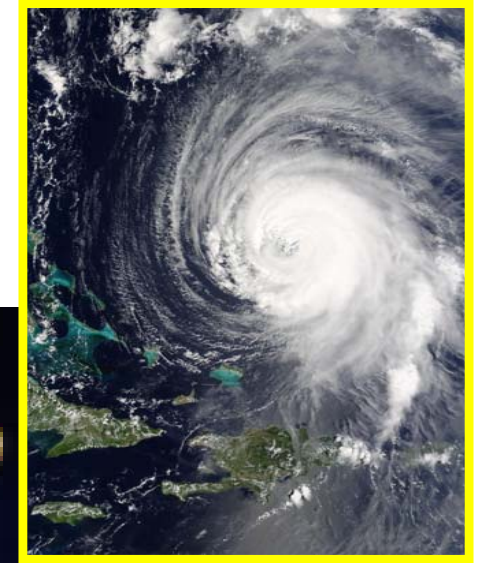
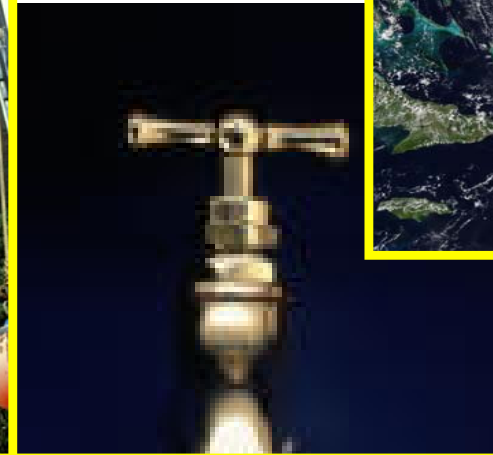
Mississippi and Louisiana Coastal County *Employment*



- LA and MS Coastal Counties 185,000 jobs lost (17.5%)
- Sectors most affected: Education and Health Services, Trade, Transportation, Utilities, and Leisure & Hospitality: 124,000 (22%) jobs



So What?



So What?

Economic Risks in US:

Loss of Social Fabric:

jobs...

homes...

economic productivity...



- 81% of US population in coastal states
- 50+% of US economy in coastal counties
- 50+% of US jobs in coastal counties

So What?

Largest Industries challenged

- Insurance and Financial
- Power
- Tourism
- Transportation
- Agriculture
- Forestry
- Fishing AND MORE.....



So What?

Oceans acidify and pH drops 3-5 points



Marine Mammals

Coral Reefs



Loss of Commercial & Recreational Fisheries



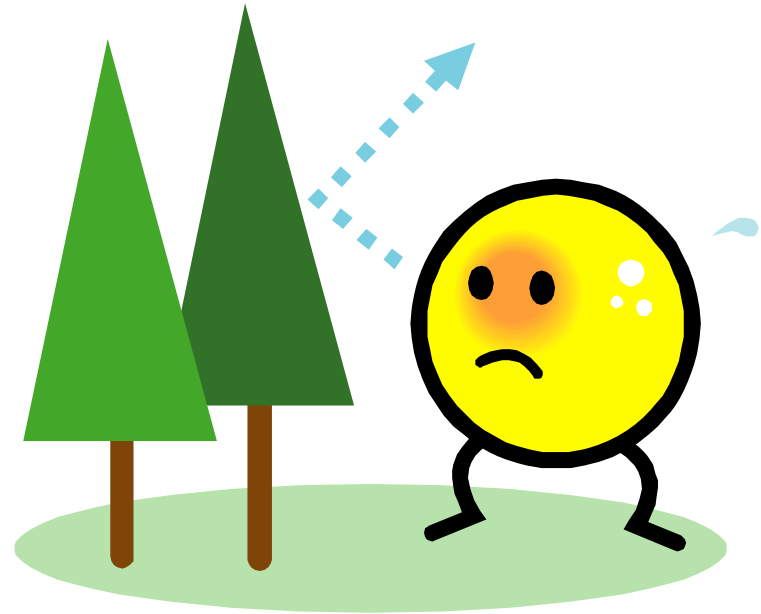
So What?

- Food Shortages
- Water Shortages
- Public Infrastructure threatened
- Geopolitical Conflicts
- Widespread Disease
- etc

Conclusions

Technology Fixes are not solutions

- Plant trees
- Fertilize ocean
- Sequester carbon
- Rezone coast



Oceans outstrip all others as a sink - 60%

Humans are the Solution

- Scientists' clear and effective communication of timely policy-relevant knowledge
- Public education, understanding and engagement:
 - **So what? Perceptions of Risk**
 - Insurance risk vs. GHG risk?
- Government receipt and effective use of information and knowledge
- Message of urgency needs emphasis

Decision Choices - U.S.

- **Accept destruction Costs**
 - Katrina losses
 - Florida shoreline inundation
 - West coast fishery shifts from acidification and water temperature rise
- **OR/AND**
- **Embrace prevention Costs - Stern Report**
 - Investments in
 - New industries, jobs, technologies, efficiencies,
 - Shoreline realignment
 - Education and capacity building
 - Social paradigm shift

The Crisis: Decisions

- Business as Usual
- Continue Economic Growth with mitigation and adaptation investments
- Stabilize Economic and Population Growth in a carbon-free society

IT'S OUR CHOICE

WHAT WILL IT BE?

POGO:

11.95

WE HAVE MET
THE ENEMY
AND HE IS US



Walt Kelly

QUESTIONS
??