



◦ **Considering climate change impacts & taking adaptive action**

Current conditions, opportunities, and obstacles

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Outline

- Case study: Chesapeake Bay watershed
- NEPA & CEQA
- Case study: Green building
- Back to the Bay
- Take home messages

Chesapeake Bay

December 2006, CBP
asked the STAC to:

- *Review* the implications of climate change for the Chesapeake Bay Program
- *Assess* knowledge gaps
- *Recommend* actions to address climate change



Source: Chesapeake Bay Foundation

Chesapeake Bay Program

A multi-jurisdictional partnership
working to protection and restore:

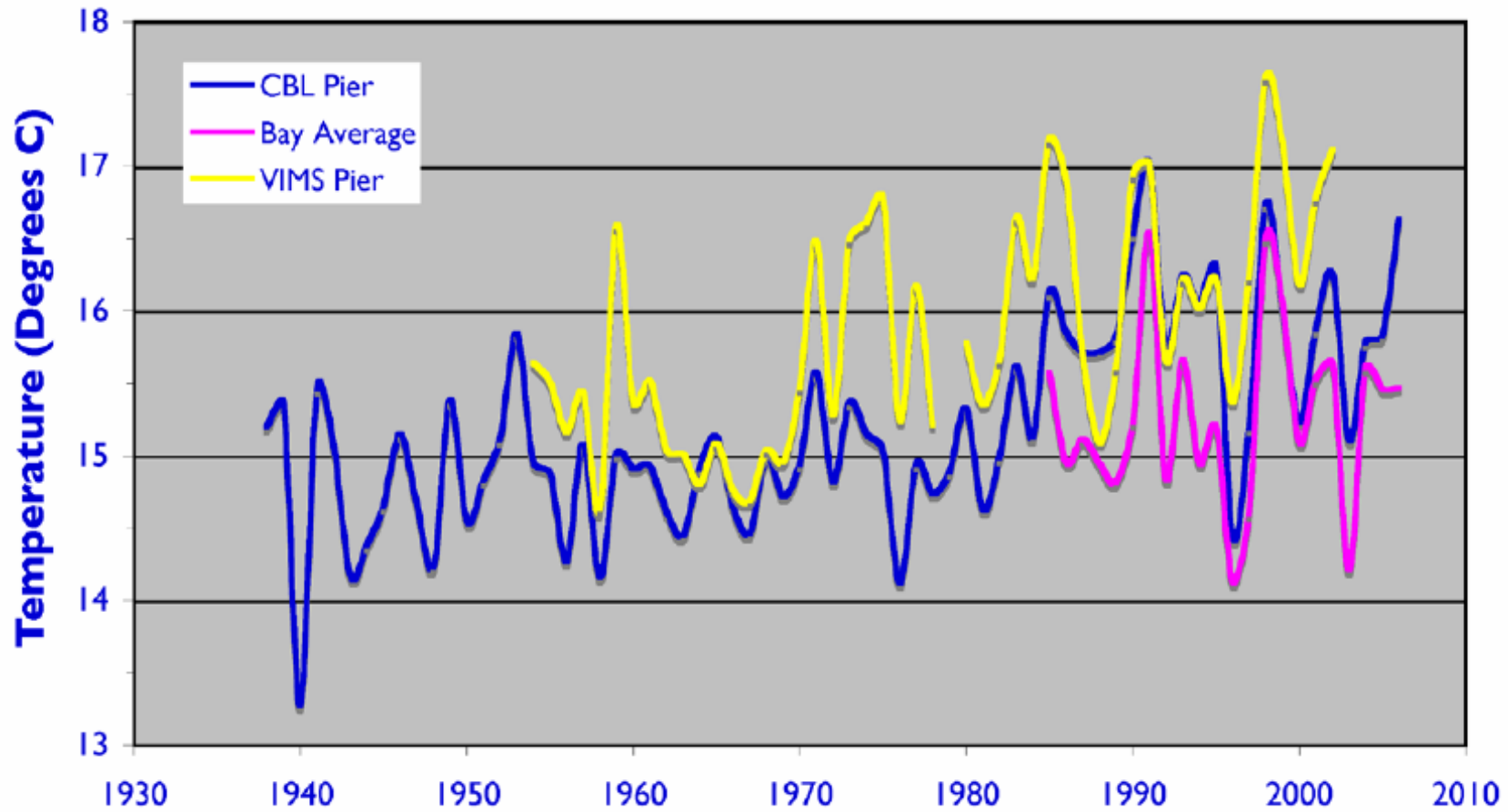
- Water quality
- Living resources

STAC response

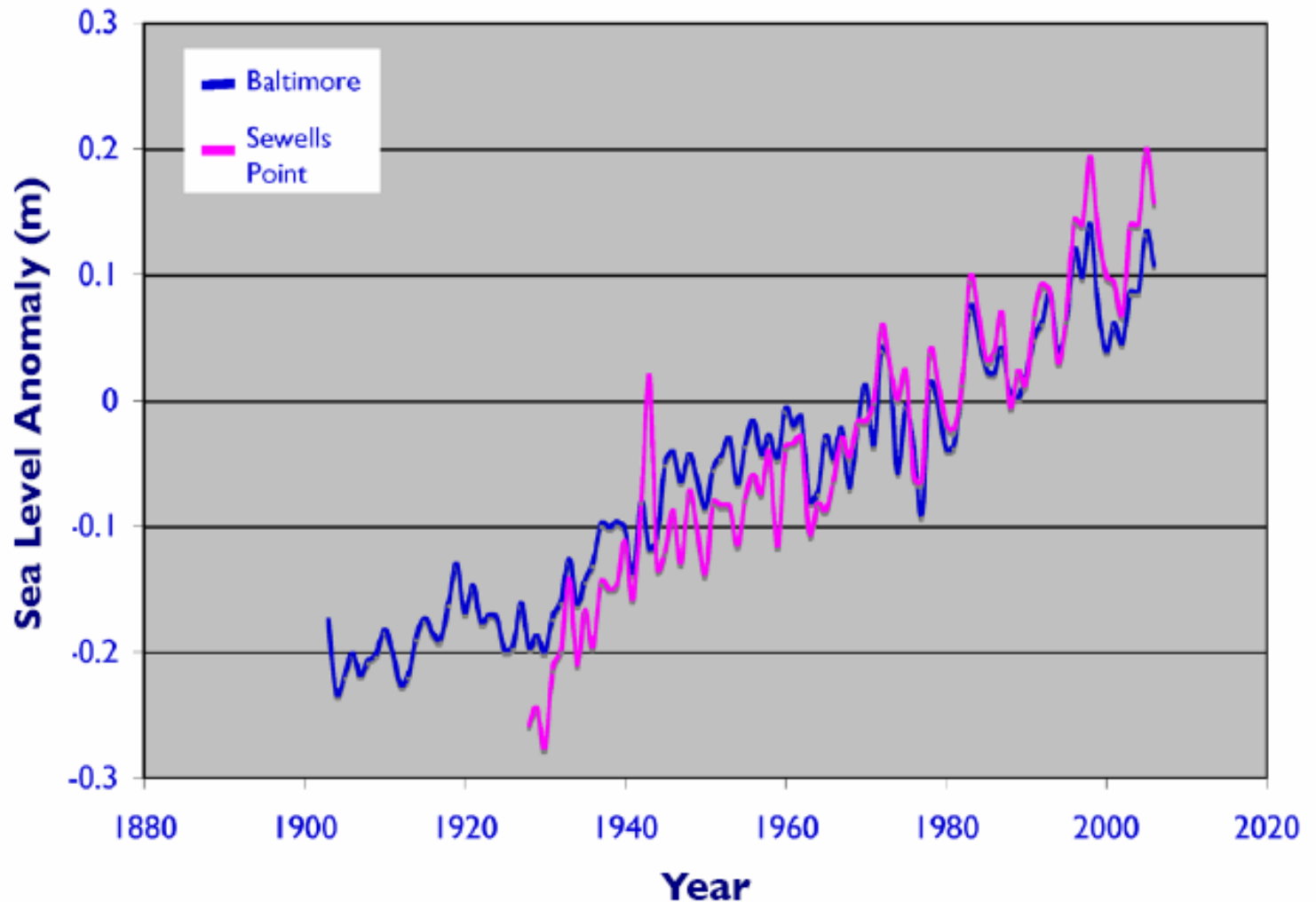
An assessment involving 14 disciplinary experts from 12 institutions focusing on:

- Climatic drivers of change
- Monitoring
- Impacts on restoration
- Implications for management responses

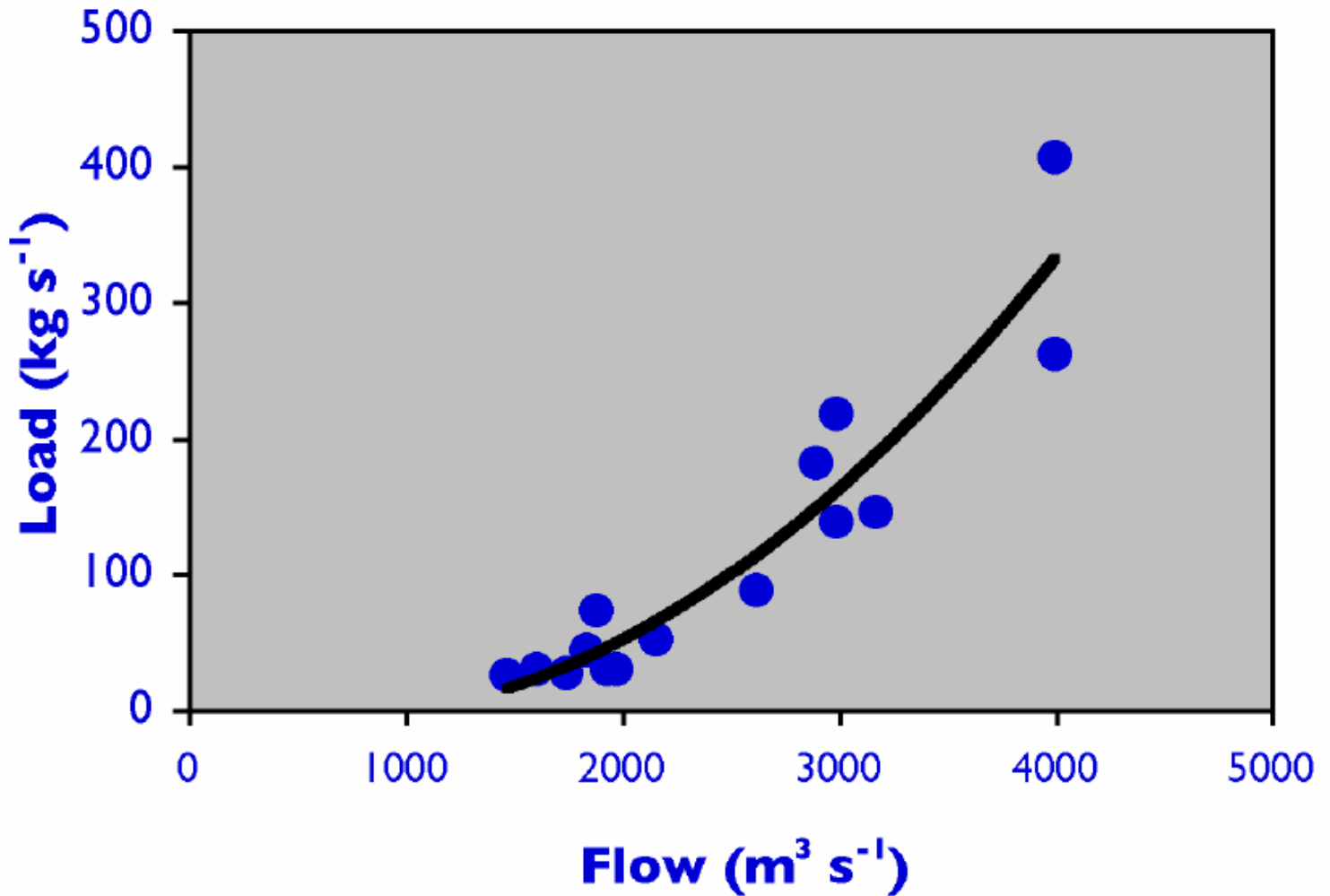
Finding: Warming waters



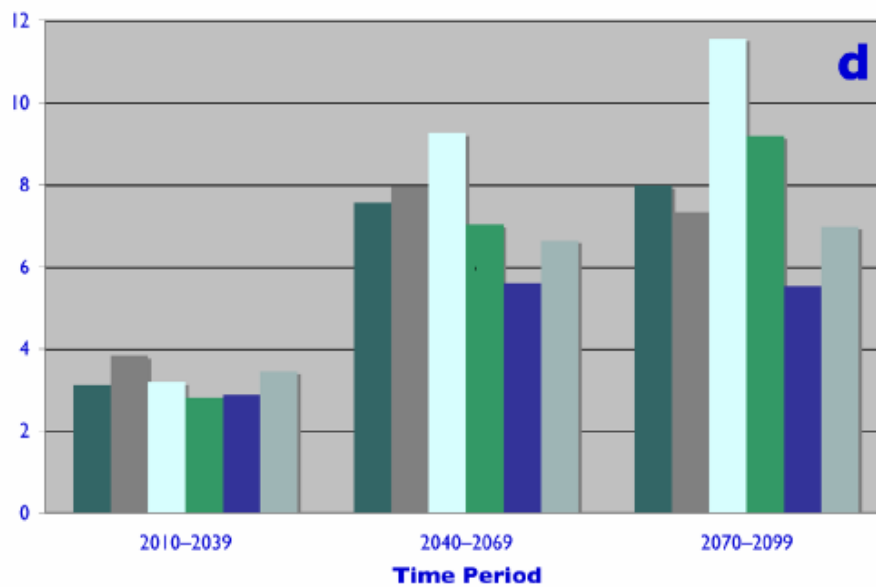
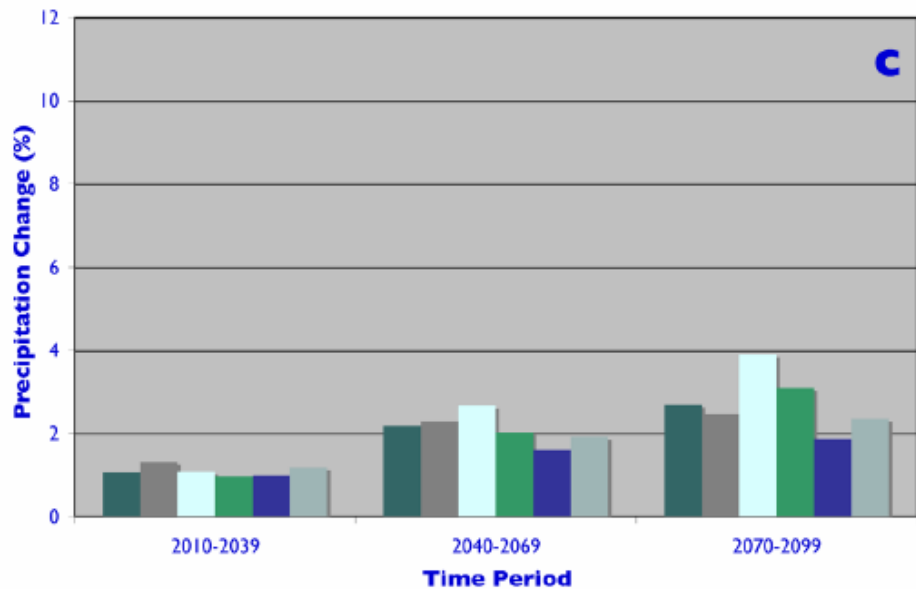
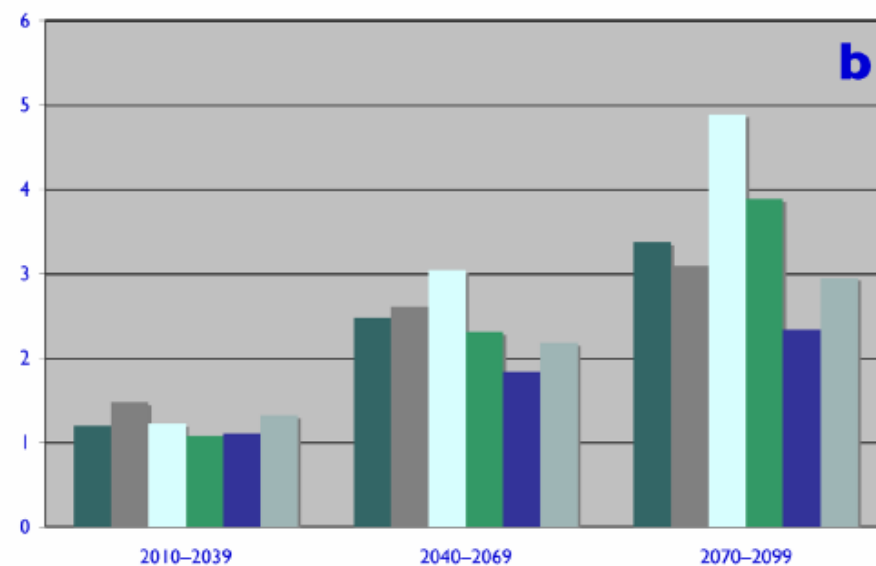
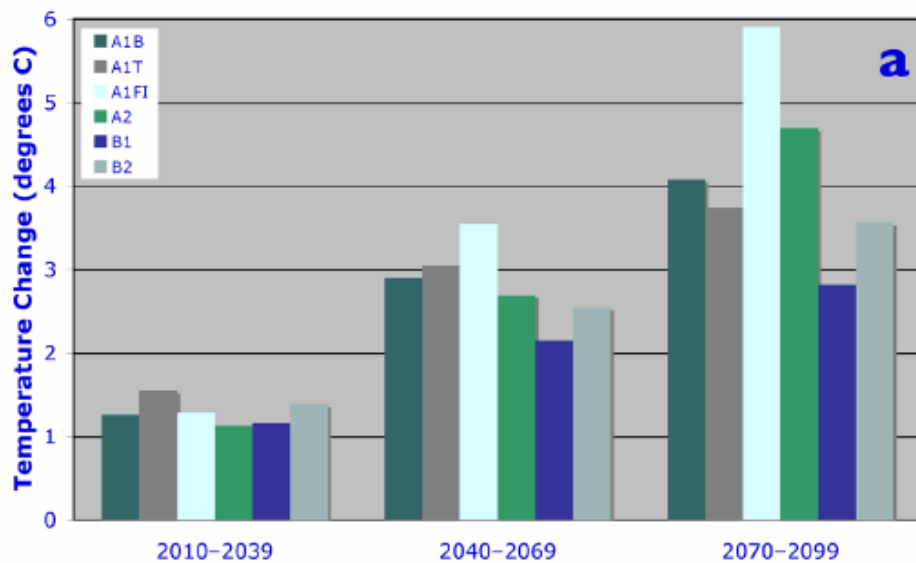
Finding: Rising sea level



Finding: Sediment loading



Finding: Change to come



Finding: Watershed Modeling



Summary of the Max, Min, and Median Values of the Nine Full CB Watershed Test Scenarios

Scenario - GCM - Emission Projection	FLOW	TN	TP	TSS
Flash 10 High - ECHM - B2	-0.6%	3.7%	4.1%	75.7%
Flash 10 Middle - GFDL - B2	-6.0%	0.6%	0.7%	21.9%
Flash 10 Low - CSIRO - A2	-12.9%	-4.8%	-7.4%	-7.0%
Flash 30 High - NCAR - A2	4.5%	3.3%	7.8%	21.3%
Flash 30 Middle - HADC - B2	-4.8%	-1.6%	-2.1%	4.9%
Flash 30 Low - CSIR - B2	-13.1%	-5.7%	-9.4%	-15.1%
Uniform Factor High - NCAR - A2	5.0%	3.2%	5.2%	7.3%
Uniform Factor Middle - CCSR - B2	-6.4%	-2.4%	-4.8%	-5.4%
Uniform Factor Low - CSIRO - A2	-14.0%	-6.1%	-10.2%	-20.5%
Min	-14.0%	-6.1%	-10.2%	-20.5%
Max	5.0%	3.7%	7.8%	75.7%
Median	-6.0%	-1.6%	-2.1%	4.9%

Source: L. Linker (2008)

Finding: Sample of implications

On-going and anticipated climatic changes have the potential to:

- Alter assumptions underlying TMDL load allocations
- Influence the success of living resource restoration activities
- Change the cost or effectiveness of water quality BMP and shoreline management strategies

Summary: Drivers of change

Key findings:

- Sea level and temperature are rising
- Precipitation changes are anticipated

Key question:

- How will climate change alter regional precipitation regimes and what are the most important aspects of precipitation change for ecosystem and watershed processes?

Summary: Monitoring

Finding:

- Need to detect and attribute changes in conditions

Key question:

- How should a Bay-wide monitoring system be designed, deployed, and operated to differentiate climate-driven changes from other sources of change?

Summary: Program Impacts

Finding:

- Climate change will impact the CBP's mission to protect and restore the Bay

Key questions:

- What are the implications for the Bay-wide TMDL?
- What are the implications for the Tributary Strategies?
- What are the implications for restoration programs, such as SAV, oysters, and fisheries?

Summary: Adaptive responses

Findings:

- Lack of strategies for adaptation

Key question:

- How can restoration strategies be designed, deployed, and monitored to ensure that they are resilient and adaptive to changing climatic conditions?

STAC recommendations

The Bay Program should take action to:

- Establish an *climate champion* within the Bay Program
- Take a *leadership* role in the development of a Bay-wide Climate Action Plan
- Provide *direction and support* for targeted research and development

Beyond the recommendations

We know:

- There is a problem.
- The problem has far-reaching implications.

We don't know:

- If or when decision makers *need* to act. In tough times, is climate a *must do* or a *should do*?
- How to act. What constitutes constructive action?

Start with existing mandates

Federal agencies have responsibility to effectively implement:

- National Environmental Policy Act
- Clean Air Act
- Clean Water Act
- Endangered Species Act
- Coastal Zone Management Act
- Many, many others...

NEPA

McGinty/CEQ (1997)

- NEPA provides an appropriate and feasible mechanism for considering climate change
- NEPA should be used to assess:
 - Potential for Federal actions to influence global climatic change
 - Potential for global climatic change to affect Federal actions

CEQA

California Environmental Quality Act is an action-forcing “mini-NEPA” required for public and private plans and projects.

- Consideration for impacts on GHG emissions *and* the consequences of changing climatic conditions
- Quantification and disclosure of emissions
- Measures to ensure consistency with state goals, particularly AB 32

Implications for plans and projects

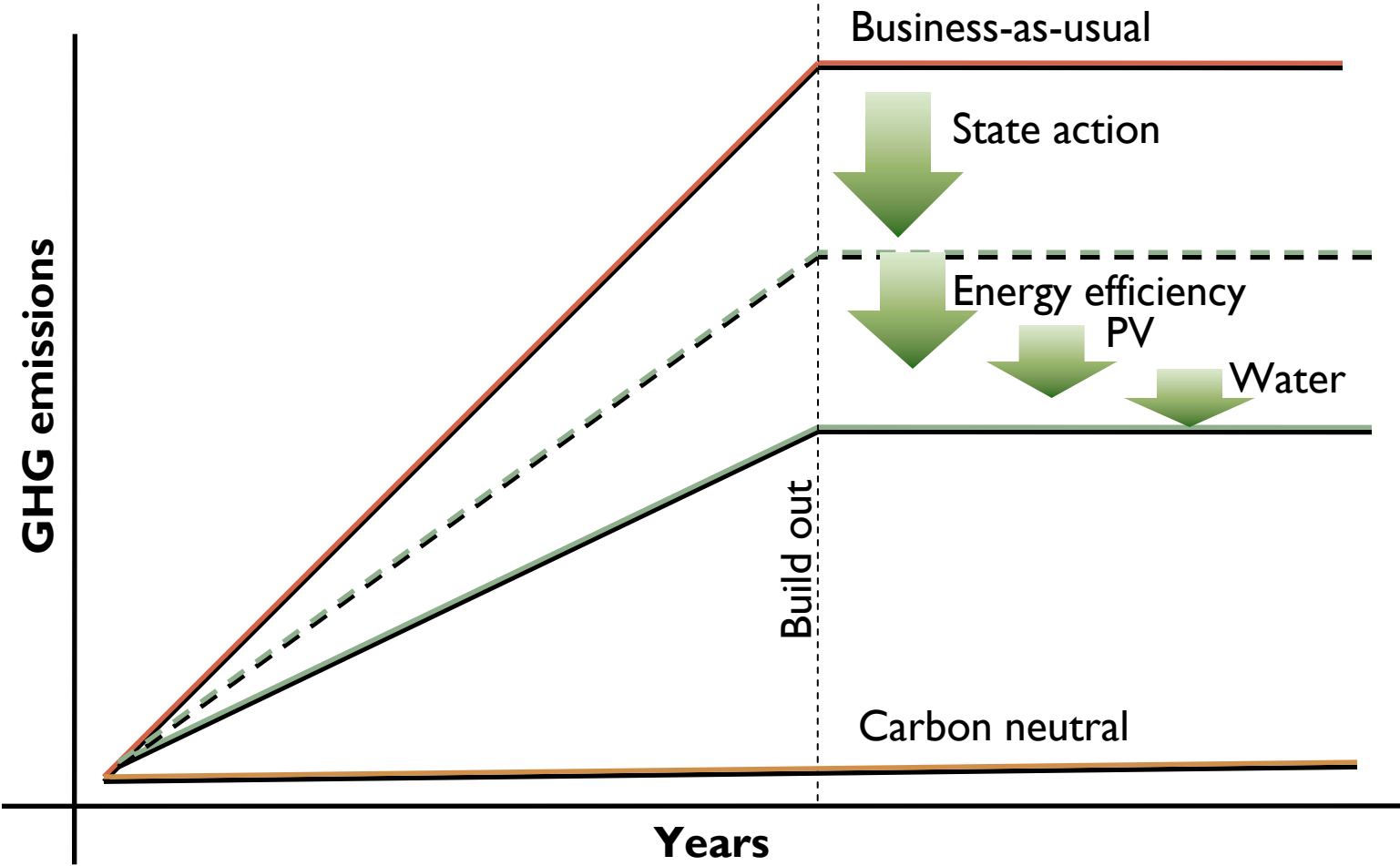
Pre-2007: Climate change rarely/never considered in CEQA documents

Today: 270+ *public* documents include climate change and greenhouse gas analysis; many more in process

Examples

- Residential and commercial land use projects
- Schools and universities
- Public infrastructure
- Energy production and distribution facilities
- Electricity generation and transmission plans and projects
- Land use plans
- Transportation plans

CEQA commitments



Sample GHG reduction commitments

Location	GHG reduction from BAU*	Features
San Diego County	>90%+	Energy efficiency + PV
Los Angeles	35%	Energy efficiency + PV + reclaimed water + xeriscape + sequestration
Encinitas (current)	28.8%	Energy efficiency + PV + water
Encinitas (early)	25%	Energy efficiency + PV + water
San Diego (2007)	22%	Energy efficiency + PV + water
Orange County	Not quantified	Green building program

* Reduction in non-transportation operational GHG emissions

Next step for CEQA

Explicit requirements from public agencies for:

- Consistency with rigorous local and regional plans

OR

- Compliance with rigorous performance standards for energy use, water consumption, waste generation, and transportation

Impacts and adaptation?

CEQA documents now contain brief, qualitative discussions about the impact of climate change:

- No quantitative performance thresholds
- No widely available analytical tools
- No demonstrable change in plan or project design
- No reason for action in the preparation of plans or projects

What about...

- Clean Air Act
 - State Implementation Plans
- Clean Water Act
 - Anti-degradation
 - TMDL programs
- Endangered Species Act
 - Section 4, 7, and 10
- Many others...

Opportunities for leadership

1. Articulate the problem
 - Climate change *is* relevant to existing mandates.
2. Identify *specific* concerns
 - TMDL load allocations, SIP control measures, shoreline permits...
3. Create *processes* to assess and disclose performance
4. Create *procedures* to prioritize and plan alternative actions

Caveats

- Every decision cannot be a research project
- Decision making needs to be supported with protocols, procedures, tools, and information products
- Requirements for tools and information cannot be developed without explicit information on decision making processes

Example: green building

Green building is a set of flexible, voluntary guidelines and rating systems that:

- Identify superior practices
- Recognize performance
- Work to shift performance across a specific market segment

**ENERGY
USE**

24%* -50%**

**CO₂
EMISSIONS**

33%* -39%****

**WATER
USE**

40%**

**SOLID
WASTE**

70%**

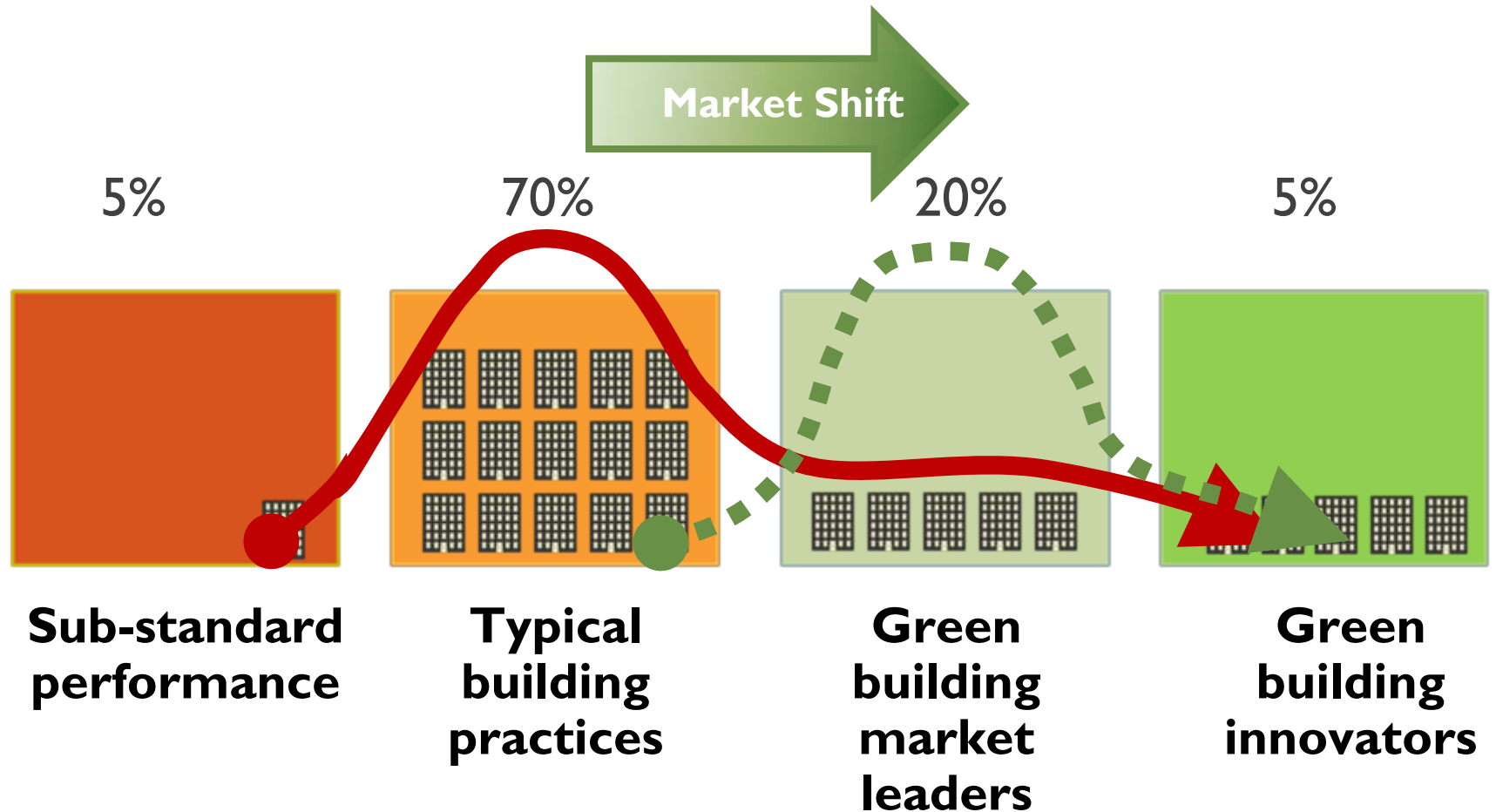
Green Buildings Can Reduce...

* Turner, C. & Frankel, M. (2008). Energy performance of LEED for New Construction buildings: Final report.

** Kats, G. (2003). The Costs and Financial Benefits of Green Building: A Report to California's Sustainable Building Task Force.

*** GSA Public Buildings Service (2008). Assessing green building performance: A post occupancy evaluation of 12 GSA buildings.

Market transformation model



Current Market = 
Market Shift = 

USGBC LEED 2009

“Next generation”
rating system for:

- New Construction
- Existing Buildings
- Neighborhoods

CLIMATE CHANGE

INDOOR ENVIRONMENTAL QUALITY

RESOURCE DEPLETION

HUMAN HEALTH CRITERIA

WATER INTAKE

HUMAN HEALTH-CANCEROUS

ECOTOXICITY

EUTROPHICATION

HABITAT ALTERATION

HUMAN HEALTH-NONCANCEROUS

SMOG FORMATION

OZONE DEPLETION

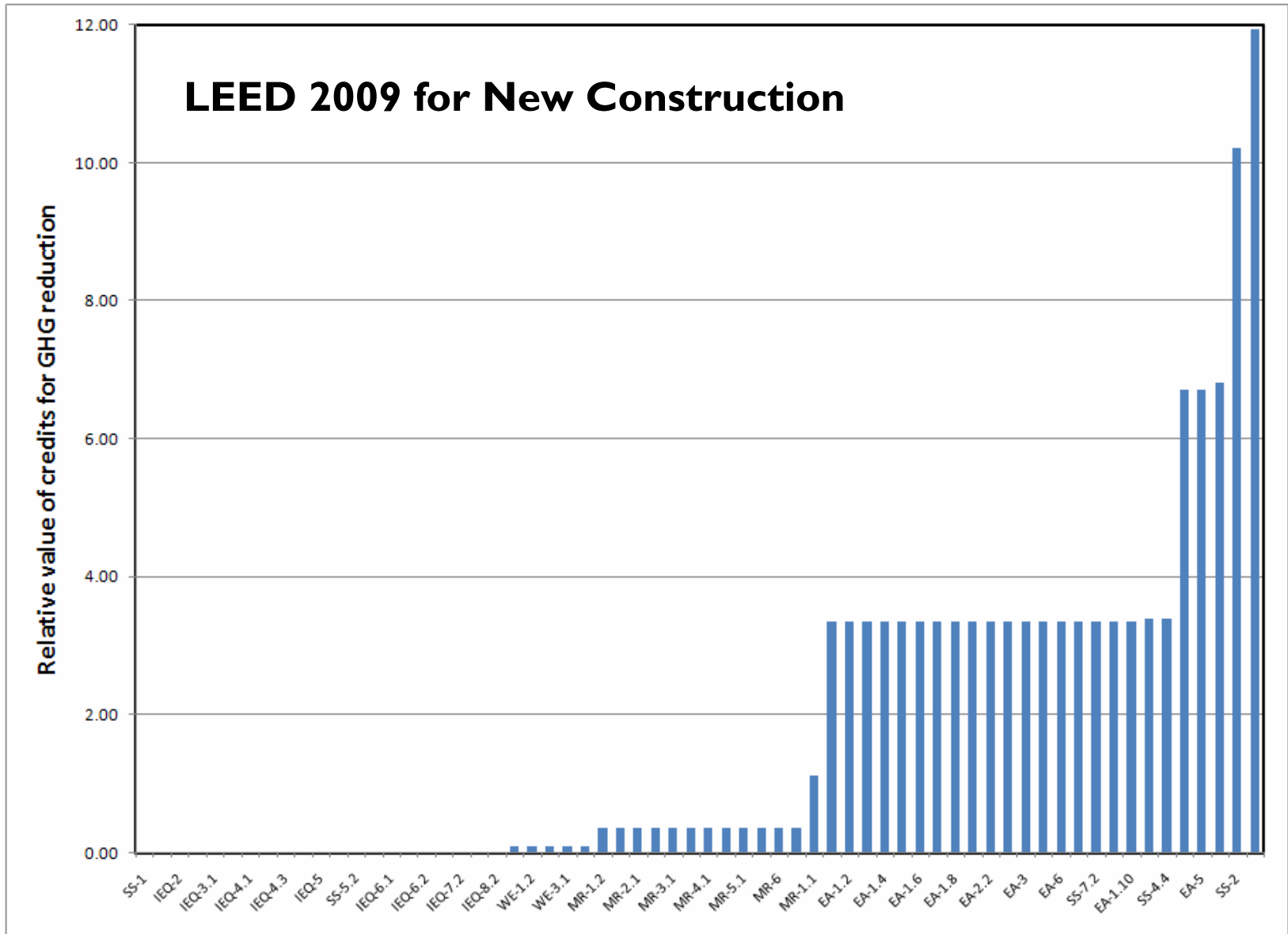
ACIDIFICATION

Achieving GHG reduction

The LEED rating system can be used to:

- Identify design features with value for emissions reduction
- Prioritize features
- Document achievement of features
- Receive recognition for performance

Value of LEED credits for GHG reduction



Impacts and adaptation?

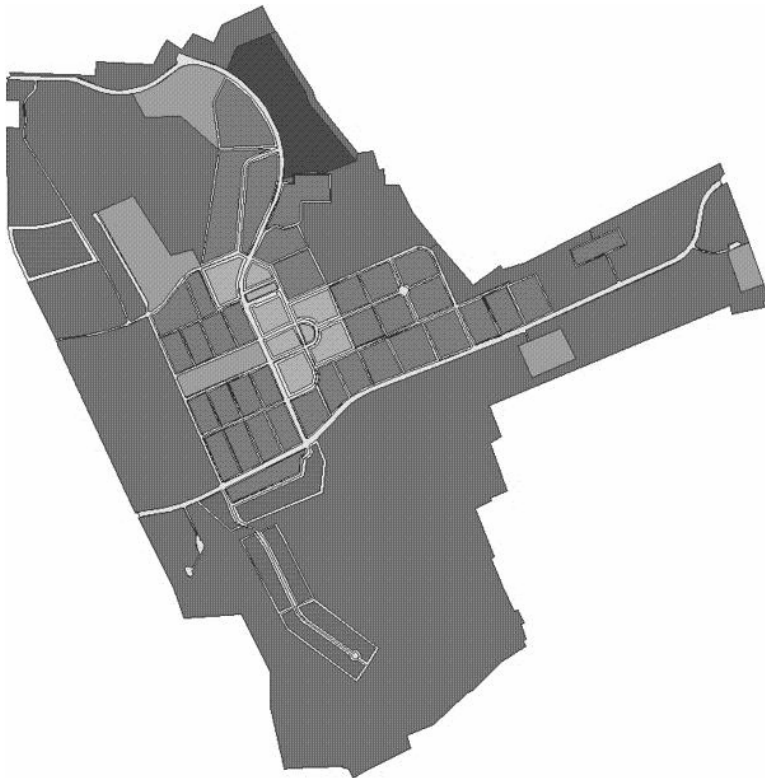
Climate change for USGBC (and by extension LEED) = GHG emissions.

- Climate change impacts on performance are not considered
- Opportunities for adaptation are not considered
- There are no widely-available processes or procedures for considering impacts or adaptation despite typical performance periods of >50 years

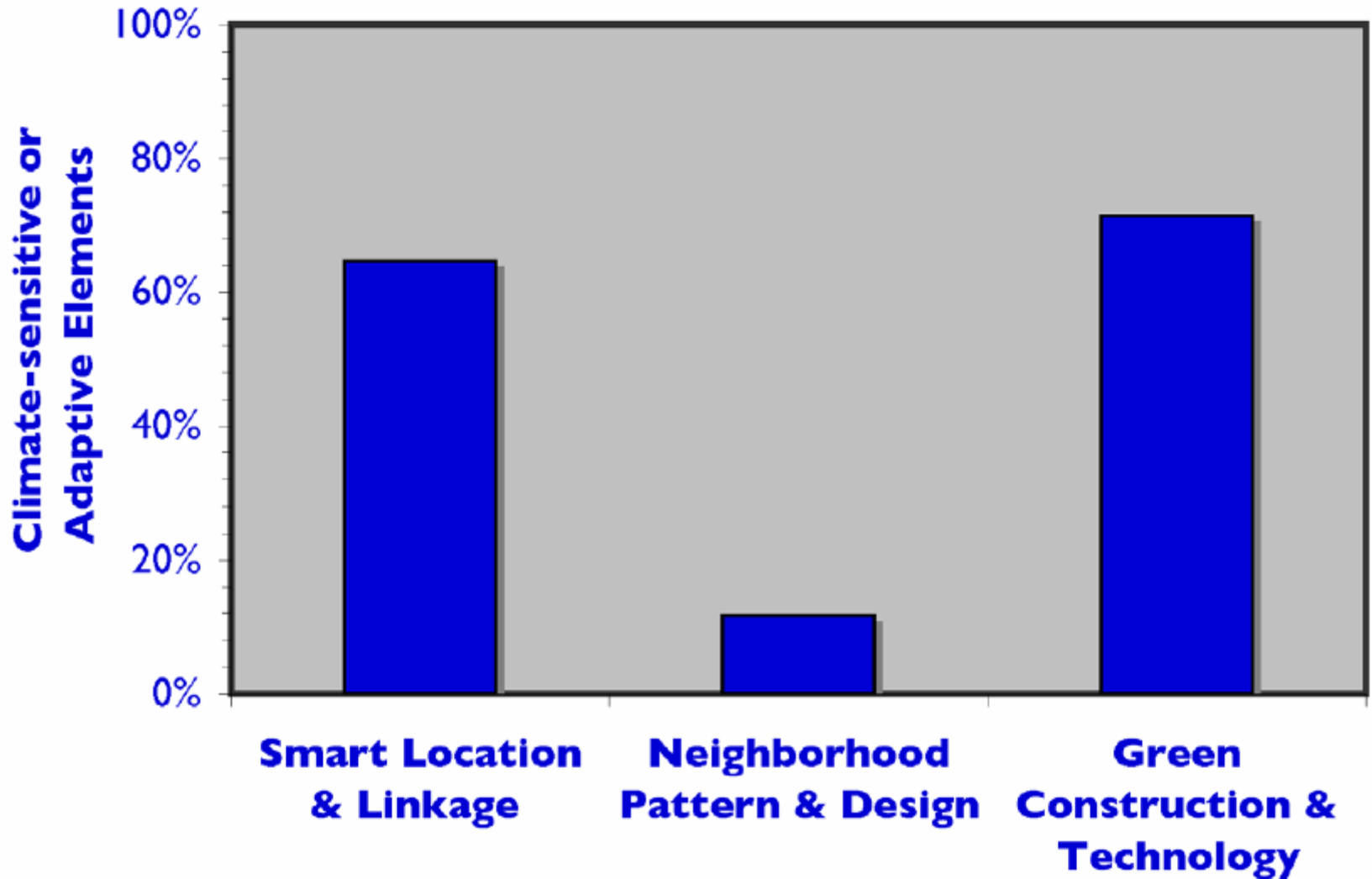
Land use: LEED-ND

A rating system for community-scale development. 100+ elements in three categories:

- Smart Location
- Neighborhood Pattern & Design
- Green Technology



Adaptation through LEED-ND



But...

- No compelling reason for action
- No widely-available, accessible processes for bringing relevant information into decision processes

Consequently...

- Impacts are considered superficially
- Adaptive action are not taken

Back to the Bay

The Bay Program and its partners need to help:

- Create the reason to act
- Describe the desired market transformation
- Recognize and reward performance



Take Home Messages

Chesapeake Bay reflects national issues:

- Compelling information exists about climate impacts
- There is no compelling need for decision makers to *act* on this information
- There are few processes to differentiate better actions from worse actions
- The time is now to create a foundation for action

Questions

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