

Preparing for Climate Change: A Framework for Island Readiness

**26th Pacific Islands
Environment Conference
June 25, 2009**



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City of Tucson**



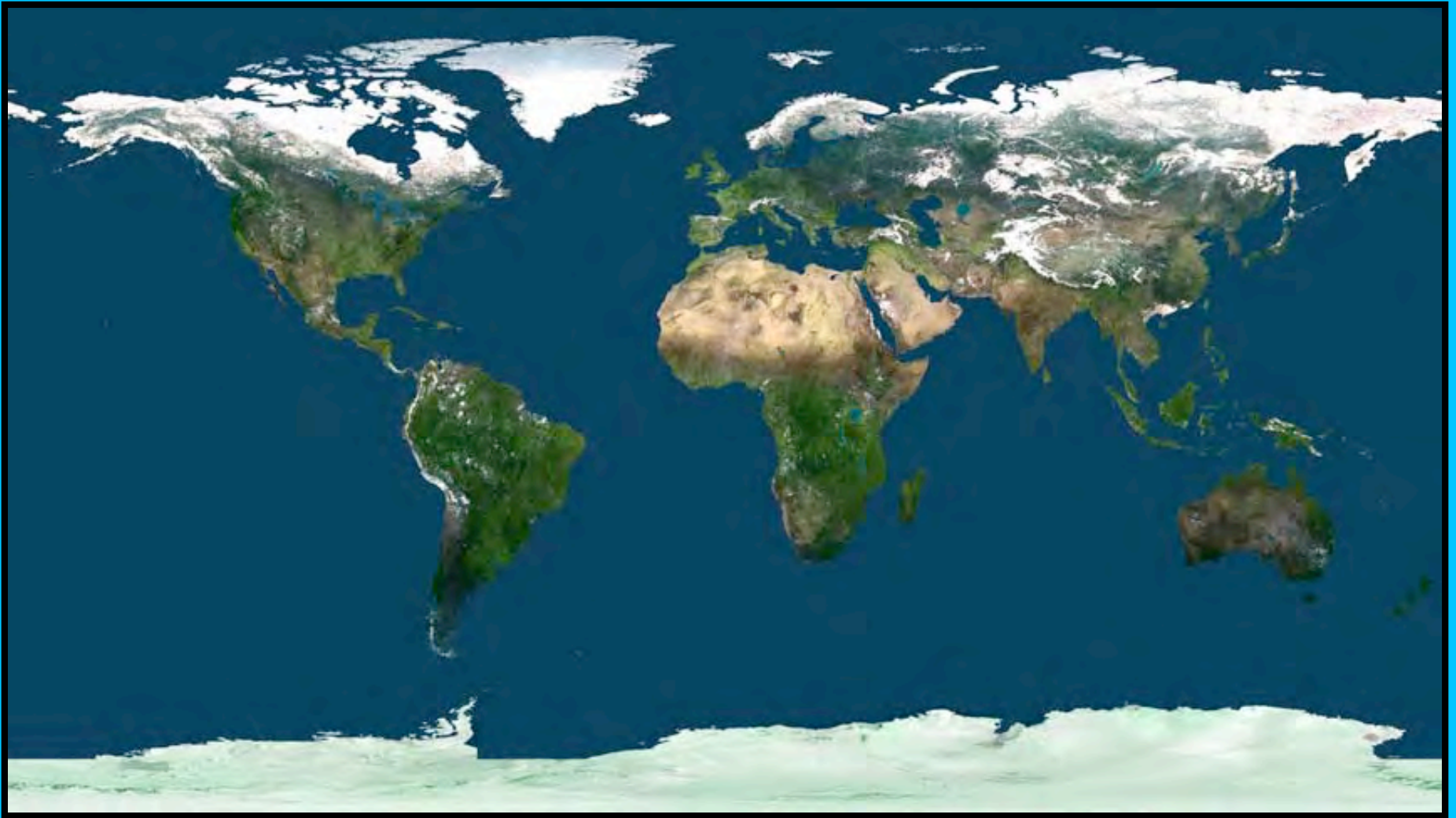
This Session is for You if Your Responsibilities Include:

- **Ensuring safe and reliable public services**
- **Ensuring environmental quality**
- **Economic development**
- **Land use planning and zoning**
- **Fiscal responsibility and risk management**
- **Capital investments**
- **Emergency response**

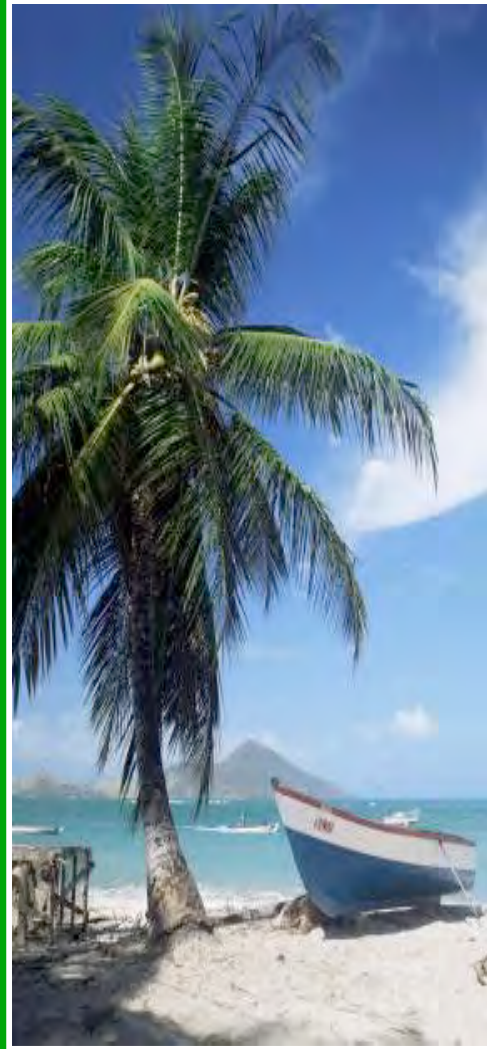
This Session is for You if Your Responsibilities Include:

- **Water resources management**
- **Public health**
- **Coastal zone management**
- **Port management**
- **Ecosystem management**
- **Transportation infrastructure**
- **Simply making sure your community is planning for climate change**

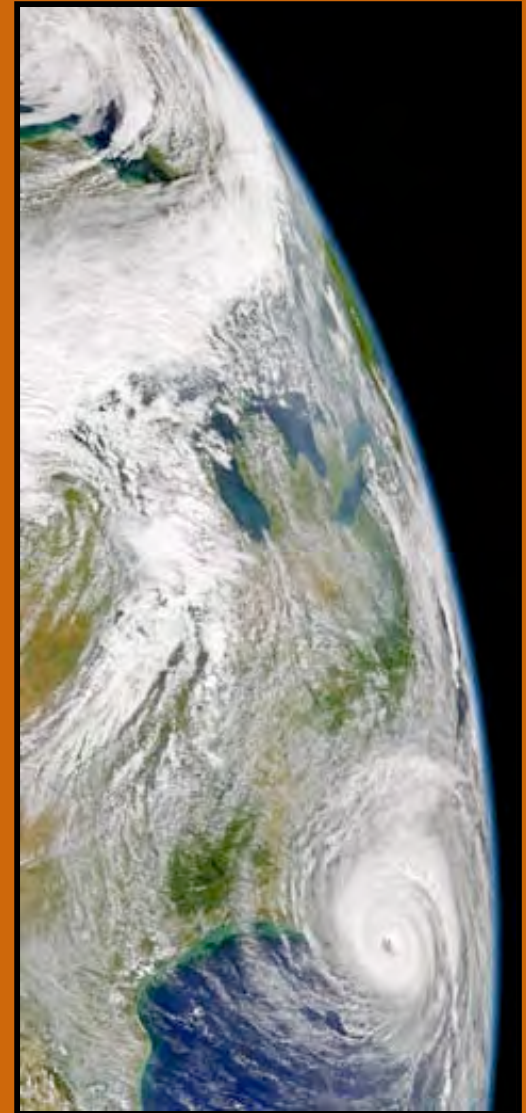
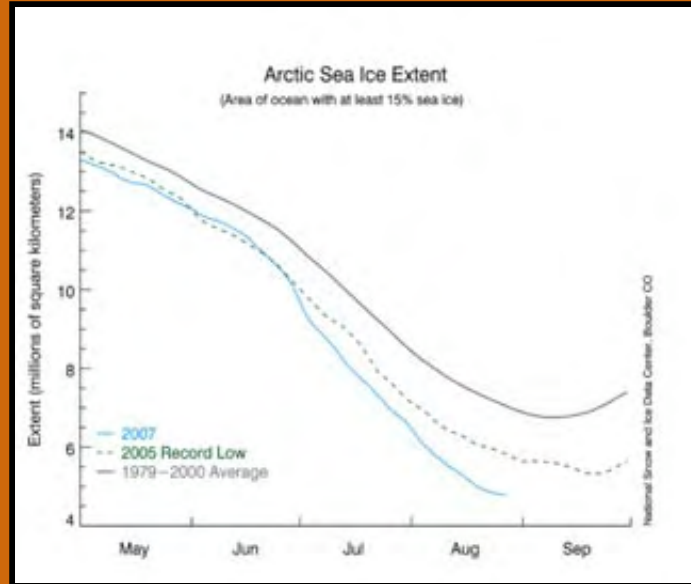
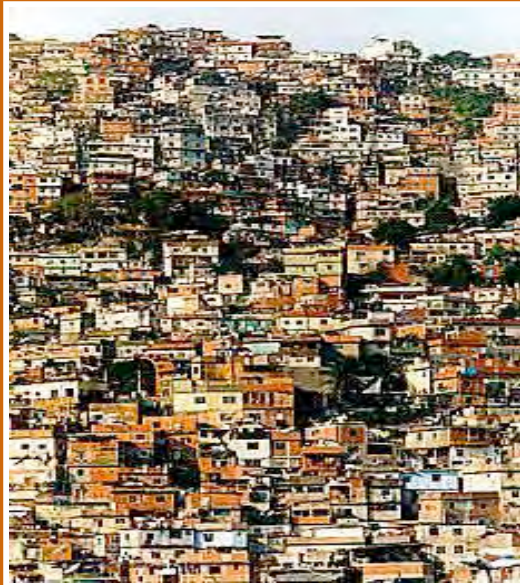
Where are you from?



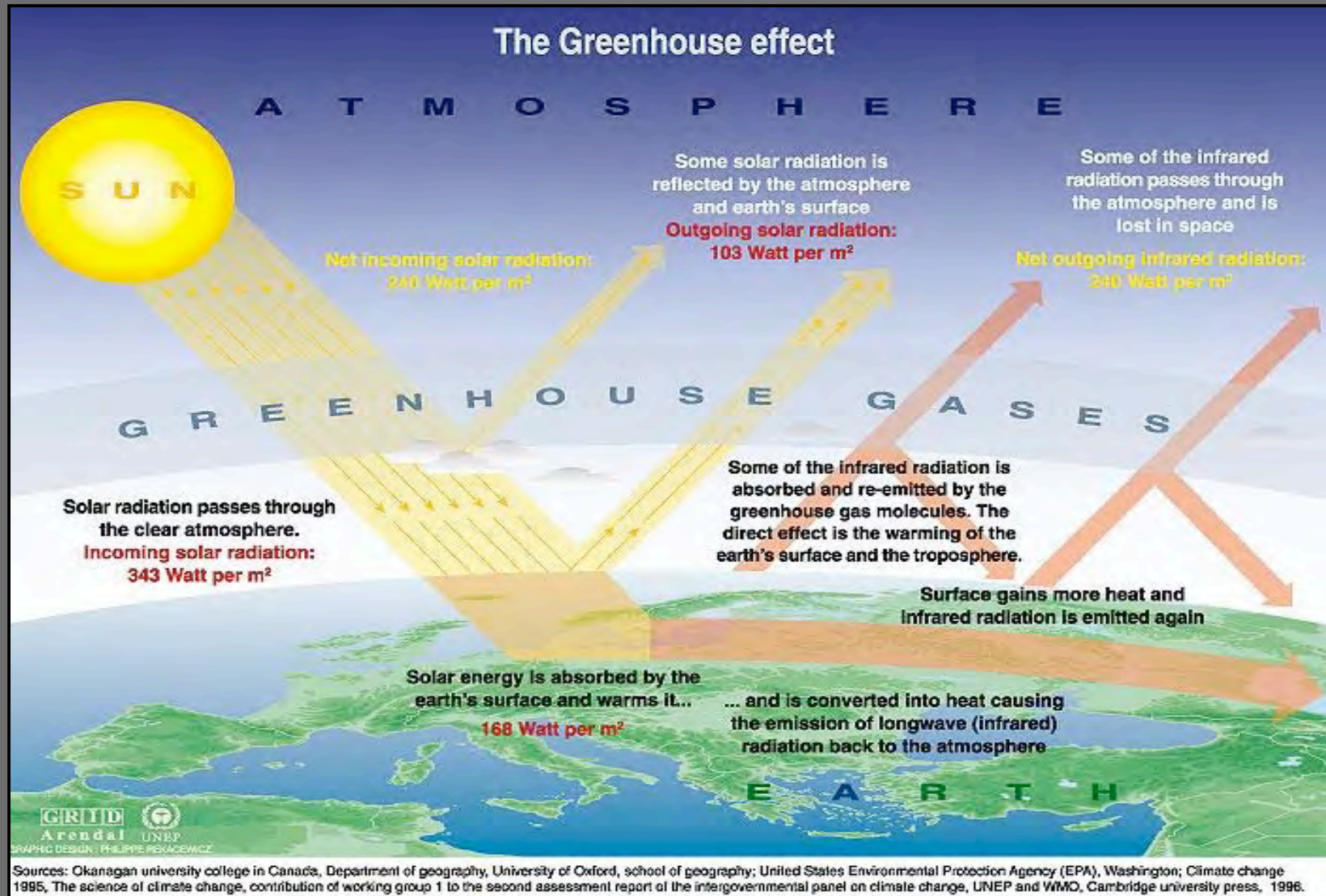
A Healthy Place



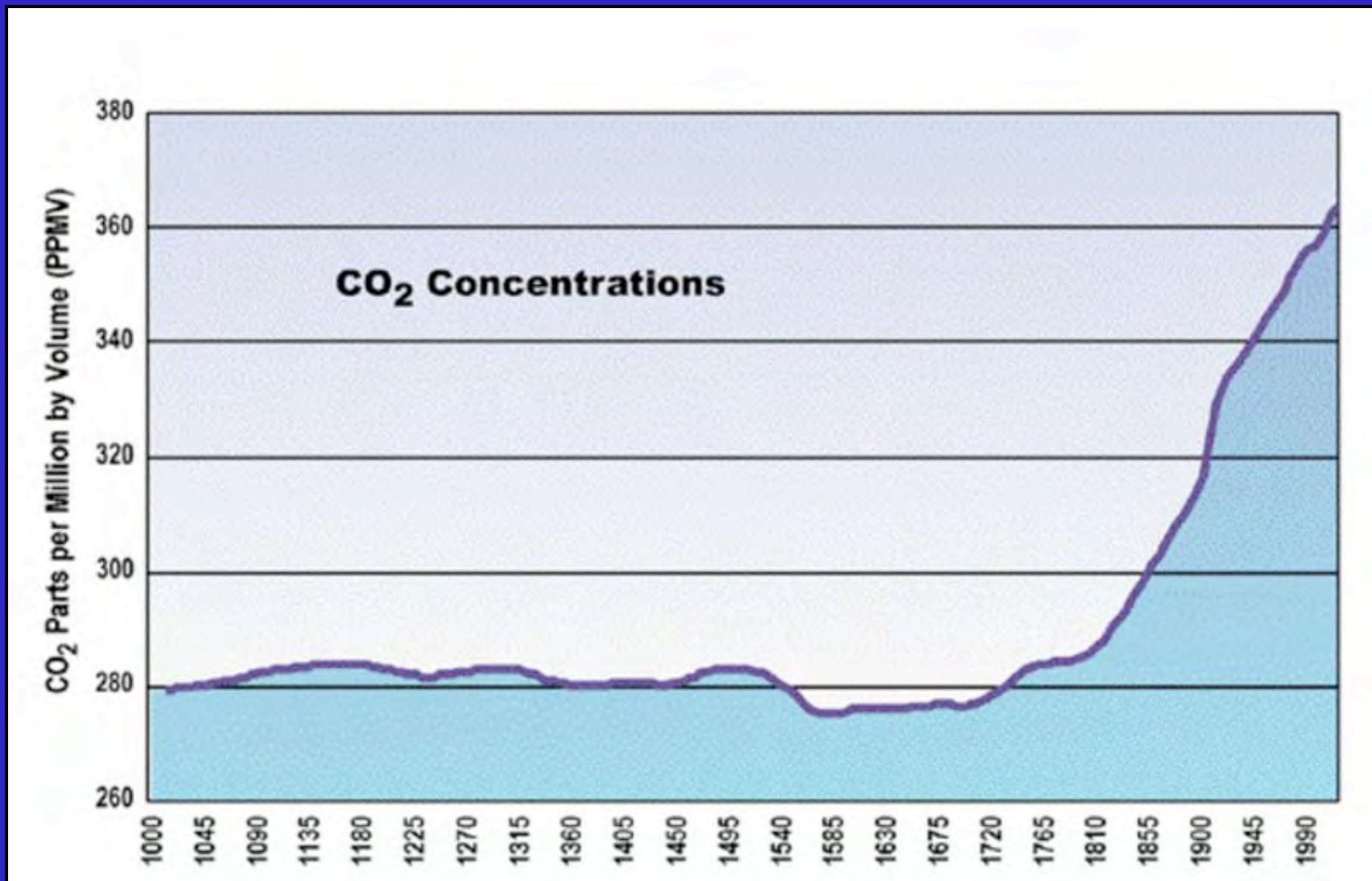
A Troubled Place



More Troubles Ahead



Of Our Own Doing





Al Gore Was Wrong

- **The Inconvenient Truth underestimated the climate threat; it implied we had time (~ 10 years)**
- **It suggested changes would occur over long time periods**
- **FAR (IPCC 2007) was based on data through 2005**
- **Consensus-based science is not good science**
- **No ability to model the ice sheet melting**
- **No modeling of feedback loops**

Climate Change Adaptation

- **The rise in greenhouse gases is unlikely to slow or reverse in the near term**
- **Additional Climate Change is already in the pipeline**
- **Climate Change will continue long after greenhouse gases are stabilized**

Climate Change Adaptation

- Adaptation is the ability of society to accommodate changes in climate with minimal potential damage or cost
- Adaptation reduces the impact of climate stresses on human and natural systems



Not Tomorrow

But Yesterday (2005)





One Degree



The Great Debate: Mitigation vs. Adaptation

Against Adaptation

- Adaptation means giving up
- Adaptation takes resources from mitigation
- Adaptation is an industry preference
- Adaptation avoids changing business-as-usual

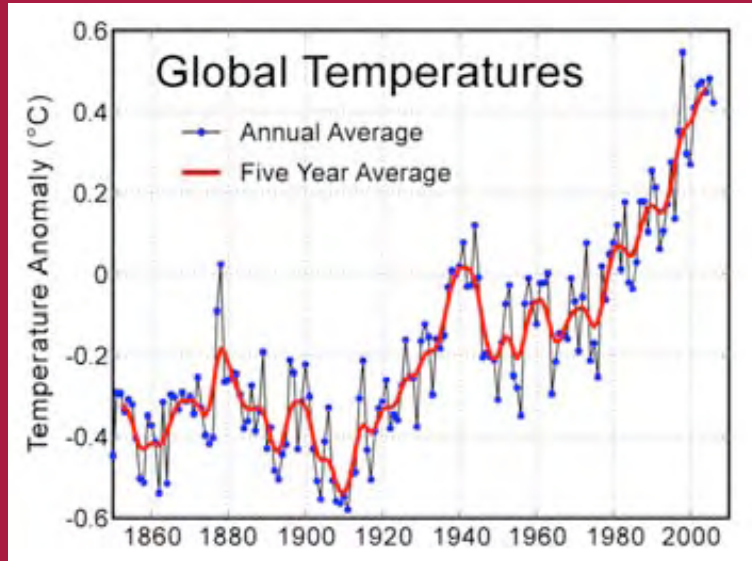
For Adaptation

- It is not an either-or choice we face,
we can and must do both
- Adaptation is good governance
- Adaptation is reality
- Adaptation (and Mitigation) is a case of
“Pay me now, or REALLY pay me later”

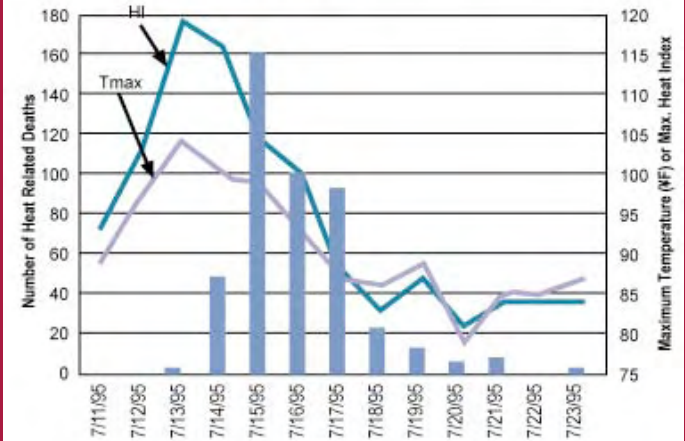
Direct and Indirect Impacts of Climate Change

- Direct Impacts: sea level rise in coastal areas; heat-related health issues in areas with rising temperatures
- Indirect Impacts: Loss of agricultural productivity affects distant communities; population movements from climate-impacted areas

Direct Impacts



Heat Related Deaths - Chicago, July 1995
Maximum Temperature and Heat Index



This graph tracks maximum temperature (Tmax), heat index (HI), and heat-related deaths in Chicago each day from July 11 to 23, 1995. The gray line shows maximum daily temperature, the blue line shows the heat index, and the bars indicate number of deaths for the day.

Dengue fever

A potentially lethal disease that affects 50 million people a year

- ▶ Four distinct but related viruses cause dengue.
- ▶ Recovery from one gives lifelong immunity to that strain, but not to the other three.
- ▶ Good evidence that further infection by different virus strains can lead to **dengue hemorrhagic fever (DHF)** - a lethal complication of dengue.
- ▶ **2.5 percent of DHF cases are fatal.** With intensive supportive therapy, rate can drop to 1 percent but **untreated it is as high as 20 percent.**



Symptoms

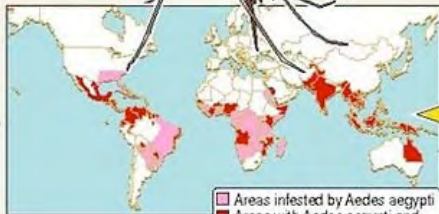
- Fever
- Vomiting
- Muscle pain
- Disintegration of blood vessels leading to heavy bleeding

- Transmitted to humans through bites of female **Aedes aegypti** mosquitoes
- Mosquito acquires virus from **feeding on infected person's blood** - incubates virus for 8 - 10 days.
- Virus circulates in blood of humans for two to seven days



● **2.5 billion people at risk.**

- Found in tropical and sub-tropical areas worldwide, predominantly in urban and semi-urban areas.



▶ **Southeast Asia and Western Pacific the most seriously affected.**

□ Areas infested by Aedes aegypti
■ Areas with Aedes aegypti and recent dengue epidemics

Source: WHO/CDC/Stanford U

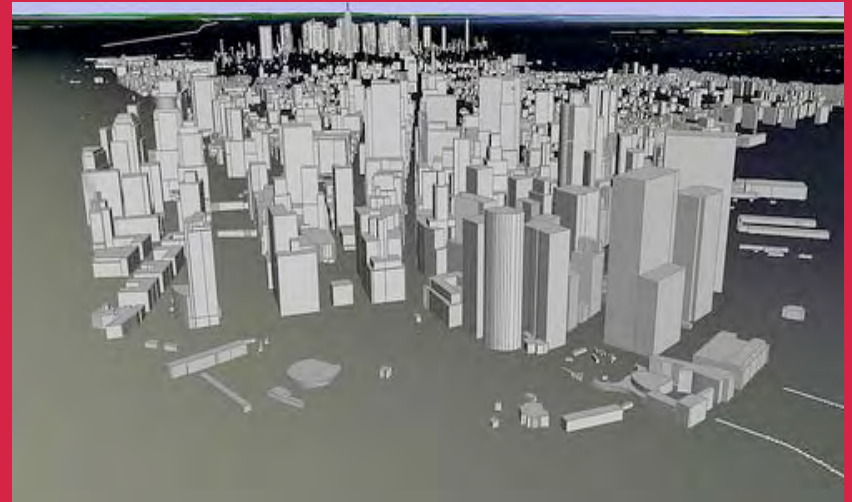
2000? AFP



World's Most Dangerous Animals



Direct Impacts



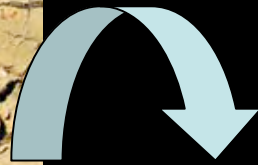
Sea Level Rise and Storm Surges





Infrastructure at Risk





Indonesian workers sift rice at a warehouse in Jakarta, Indonesia, Monday, April 7, 2008. A global rice shortage that has seen prices of one of the world's most important staple foods increase by 50 per cent in the past two weeks alone is triggering an international crisis, with countries banning export and threatening serious punishment for hoarders. (AP Photo/Achmad Ibrahim)



Indirect Impacts - Agriculture and Food Security



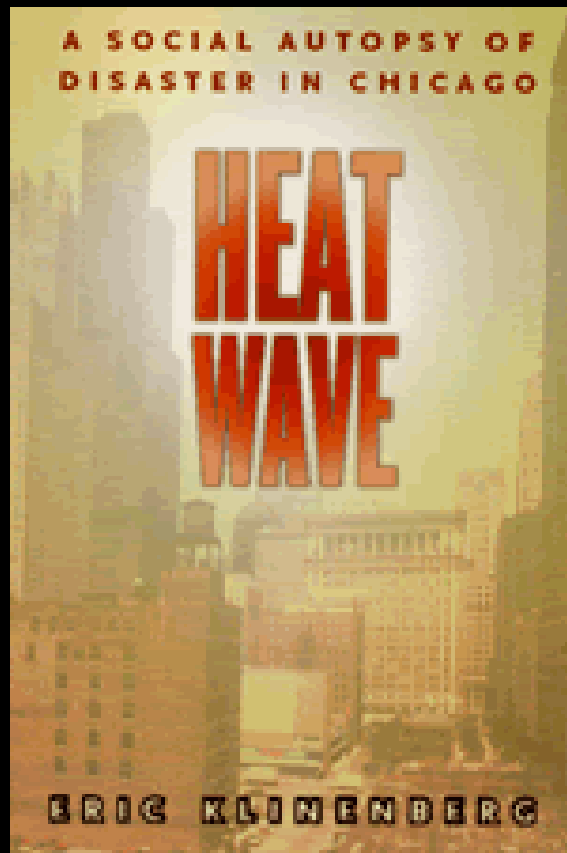
Avoiding Social Breakdown



Adaptation is about more than physical infrastructure - it is also about social and economic infrastructure

It will disproportionately affect the poor, the sick, the young and the old

Climate change will be a threat multiplier - its physical impacts will likely be amplified by social dysfunction



Climate Change Adaptation in the Face of Heat Wave - What We Learned From the Chicago Heat Wave of 1995

**“Heat Wave is not so much a book about weather,
as about the calamitous consequences of forgetting
our fellow citizens. . . . A provocative, fascinating
book, one that applies to much more than weather
disasters.”**

—Neil Steinberg, Chicago Sun-Times



“Of course forces of nature played a major role. But these deaths were not an act of God. The authors of an article in the American Journal of Public Health said that the most sophisticated climate models "failed to detect relationships between the weather and mortality that would explain what happened in July 1995 in Chicago.”
Hundreds of Chicago residents died alone, behind locked doors and sealed windows, out of contact with friends, family, and neighbors, unassisted by public agencies or community groups.
There's nothing natural about that.”

Eric Kleinenberg

©2002 The University of Chicago

Public Health Role

- **Despite existing breadth of organizations and sectors with initiatives on climate change**
- **Despite the anticipated health effects of climate change**

The public health effects of climate change remain largely unaddressed

Health Effects of Displacement

- Exacerbation of chronic disease
- Depression
- Suicidality
- Disempowerment
- Disengagement
- Community paralysis





DESPAIR

CLIMATE CHANGE: The Limits of Our Thinking

- **Highly technical and complex**
- **Beyond anyone's experience or imagination**
- **Terrifying to contemplate**
- **Resistance to necessary changes**
- **Misinformation actively disseminated**

6 Adaptive Response Options

- Preventing loss
- Tolerating loss
- Spreading or sharing loss
- Changing use or activity
- Changing location
- Restoration

Carter, et al, 1996

Enhancing Adaptive Capacity

- **The ability of a system to adjust to climate change**
- **Identifying stakeholders and engaging them**
- **Assess generic adaptive capacity - we all don't start from the same place**
- **Assess social and institutional capabilities**

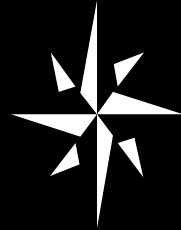
Determinants of Adaptive Capacity

- **Consider adaptation as part of a broader sustainable development policy**
 - **economic resources**
 - **access to appropriate technology**
 - **availability of information and skills**
 - **infrastructure**
 - **adequate institutions**
 - **equitable access to resources**

Anticipatory

Reactive

Natural Systems



Human Systems

private

public

- Purchase of insurance
- Construction of house on stilts
- Redesign of oil rigs
- Early-warning systems
- New building codes, design standards
- Incentives for relocation
- Changes in length of growing season
- Changes in ecosystem composition
- Beach migration
- Changes in farm practices
- Changes in insurance premiums
- Purchase of air-conditioning
- Compensatory payments, subsidies
- Enforcement of building codes
- Beach nourishment

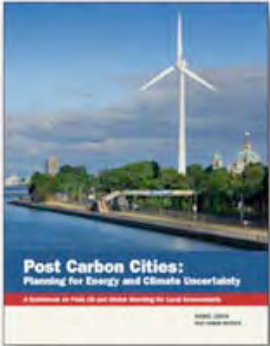
TYPES OF ADAPTATION AND EXAMPLES

McCarthy et al. 2001

Who is Already Preparing for Climate Change?



Is your city ready for peak oil and global warming?



Post Carbon Cities:
Planning for Energy and Climate Uncertainty
A Handbook for Peak Oil and Global Warming for Local Governments

Post Carbon Cities:
Planning for Energy and Climate Uncertainty

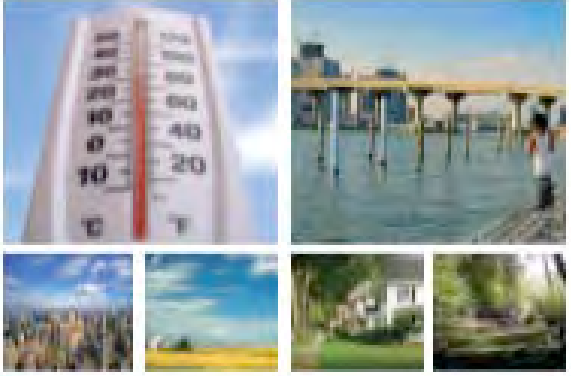
A new guidebook for local governments.
Fall 2007. 113 pages, \$30.

Water Utilities Climate Alliance




World Bank

PREPARING FOR CLIMATE CHANGE
A Guidebook for Local, Regional, and State governments



Edited by:
Clare Holmbeck, Director of the Urban Center for the Climate Impact Study
Institute for the Study of the Atmosphere and Ocean
University of Washington
King County, Washington
With an introduction by King County Executive Ron Sims





CDC's Priority Actions for Climate Change

- #1 Serve as a credible source of information on the health consequences of climate change.**
- #2 Track data on environmental conditions, disease risks, and disease occurrence related to climate change.**
- #3 Expand capacity for modeling and forecasting health effects that may be climate-related.**

CDC's Priority Actions for Climate Change

- #4 Enhance the science base to better understand the relationship between climate change and health outcomes.**
- #5 Identify locations and population groups at greatest risk for specific health threats, such as heat waves.**
- #6 Communicate the health-related aspects of climate change, including risks and ways to reduce them, to the public, decision makers, and healthcare providers.**

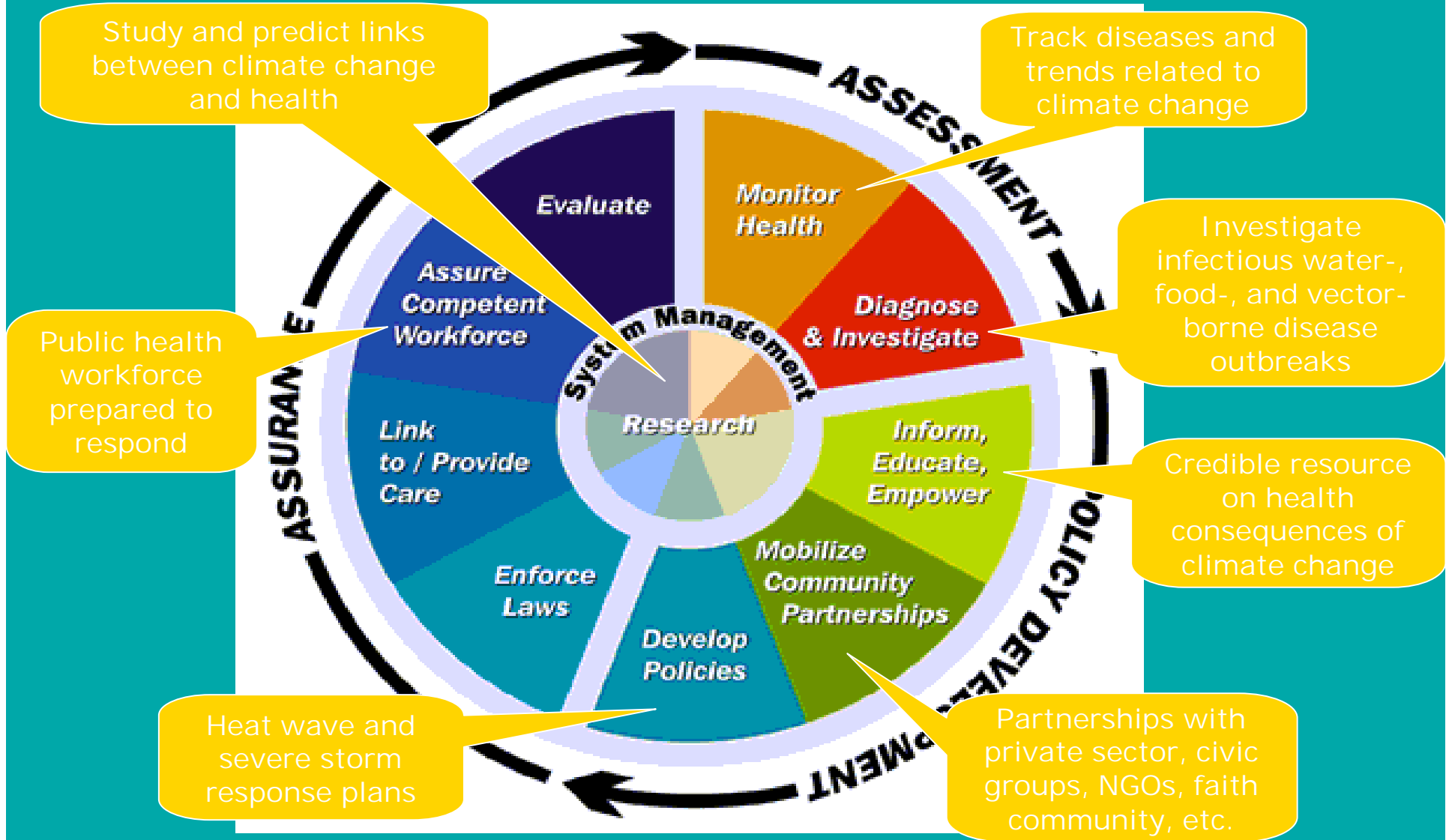
CDC's Priority Actions for Climate Change

- #7 Develop partnerships with other government agencies, the private sector, nongovernmental organizations, universities, and international organizations**
- #8 Provide technical advice and support to partners in developing and implementing response plans for health threats such as heat waves, severe weather events, and infectious diseases.**

CDC's Priority Actions for Climate Change

#9 Promote workforce development by ensuring the training of a new generation of competent, experienced public health staff to respond to the health threats posed by climate change.

Climate Change Leadership





**NATIONAL SECURITY
AND THE THREAT OF
CLIMATE CHANGE**

- **Climate Change is a threat to the national security of the United States**
- **Climate Change will destabilize currently stable societies**
- **Climate Change will further destabilize already unstable societies - becoming a “threat multiplier”**
- **Climate Change is a threat to national security infrastructure world-wide**

Planning for Sea Level Rise - 3 Serious Responses

- **New York City - Columbia University and the NYC Department of Environmental Protection**
- **California Department of Water Resources**
- **United Kingdom**



“Scheduled Adaptation”

- Storm surge barriers
- Sea walls
- Infrastructure hardening
- Infrastructure relocation
- Population relocation

“California panel urges 'immediate action' to protect from rising sea levels”

55 inch sea level rise by 2100 - according to climate models



San Francisco Bay Scenarios for Sea Level Rise SFO



This is based on USACE San Francisco and National Oceanic and Atmospheric Administration data. This is illustrative and depicts a potential inundation scenario in 2100. Limitations of the computer file include: this is not a scientific map; should not be used for planning purposes.

**This would
give new
meaning to
the words:
“In the event
of a water
landing....”**



Aerial view of the Thames Barrier with all gates up from the bottom of the river to staunch the flow of the water in the river. Source: <http://www.the-river-thames.co.uk/weather.htm>; accessed January 5, 2006.



Aerial view of the Thames Barrier with a ship passing through. Source: http://www.bbc.co.uk/london/content/images/2005/08/25/089_430x308.jpg; accessed January 5, 2006.

The Thames Barrier - Keeping the North Sea out of the London Underground

In the United Kingdom, the response is being called “managed retreat.” Coastal areas are no longer being shored up and property owners are being left to their own resources. Relocation is underway.



Time to Move?





Galveston Ponders the “Ike Dike”

Why Local Government Leadership in Climate Change Adaptation?

- Localities are on the front line of Climate Change; inaction is not an option**
- Adaptation is good governance and good risk management**
- Early actions avoid the high economic and social costs of delayed adaptation**
- Climate Change preparedness is similar to local emergency preparedness but over a much longer time frame**

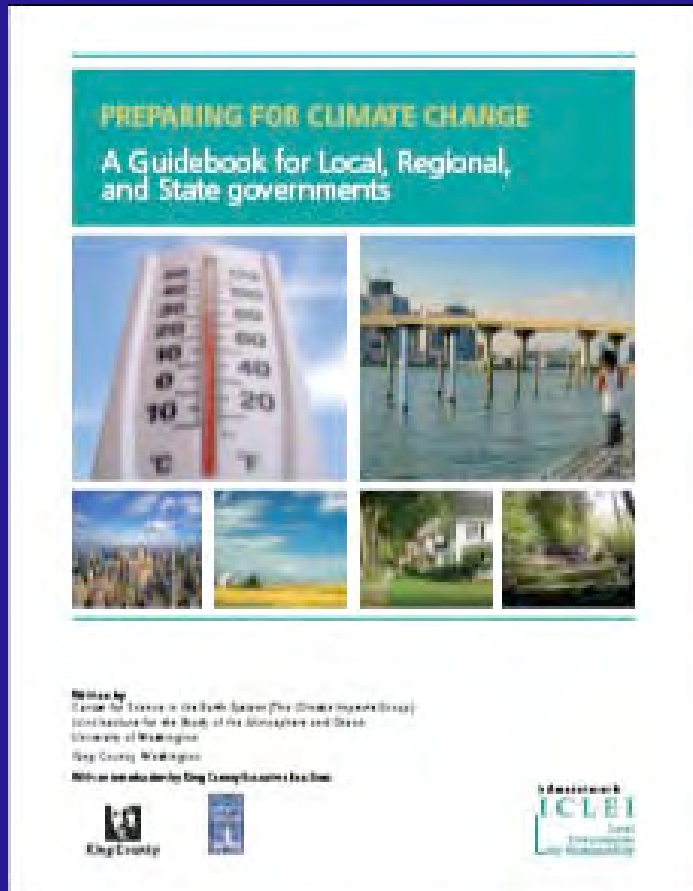
Why Local Government Leadership in Climate Change Adaptation?

- **Adaptation can secure multiple community benefits (i.e. rapid solar energy deployment) creates local jobs, keeps money locally, and positions communities securely in a regional and global economy**

Climate Change Synergies

Heat wave plans, “buddy systems”	Improved social capital
Reduced vehicular travel	Fewer accidents, reduced air pollution
Fuel efficiency	Reduced air pollution
Locally grown food	Reduced pesticide loading
Energy-efficient buildings	Lower operating costs
Alternative energy sources	Business opportunities

A Guidebook for Local, Regional, And State Governments



Building a Climate Preparedness Plan

- 1. Scope Impacts in Your Major Sectors**
- 2. Build Support for Action**
- 3. Establish a Preparedness Team**
- 4. Identify Planning Areas Relevant to CC**
- 5. Conduct a CC Vulnerability Assessment**

Building a Climate Preparedness Plan

- 6. Conduct a Climate Change Risk Assessment**
- 7. Set Preparedness Goals and Develop Your Preparedness Plan**
- 8. Implement the Plan**
- 9. Measure Progress and Update the Plan**
- 10. Share Findings**

SCOPE THE IMPACTS IN YOUR MAJOR SECTORS:

**(HEALTH, TRANSPORTATION, AGRICULTURE,
UTILITIES, FORESTS, WATER RESOURCES, ETC.)**

**COLLECT
EXISTING
INFORMATION**

**CONSIDER
A RANGE
OF SOURCES**

**UNDERSTAND
UNCERTAINTY
IN THE DATA**

**SIZE OF
CHANGE
COMPARED TO
RECENT
CHANGES**

BUILD AND MAINTAIN SUPPORT TO PREPARE FOR CLIMATE CHANGE

- 1. IDENTIFY A CHAMPION**
- 2. IDENTIFY AND UNDERSTAND
YOUR AUDIENCES**
- 3. DEVELOP A PREPAREDNESS MESSAGE**
- 4. SPREAD THE MESSAGE**
- 5. USE SOCIAL MARKETING AND OTHER
COMMUNICATION TOOLS**

BUILD YOUR CLIMATE CHANGE PREPAREDNESS TEAM

- **WHY A TEAM**
- **SELECTING TEAM MEMBERS**
- **SELECTING A TEAM LEADER**
- **IDENTIFY THE TEAM'S
RESPONSIBILITIES**

IDENTIFY PLANNING AREAS RELEVANT TO CLIMATE CHANGE

- **AREAS FOR WHICH PLANNING
BODY HAS AUTHORITY**
- **AREAS ARE SUBSETS OF BROADER
SECTORS -**
 - Sector - Transportation**
 - Planning Area - Road Maintenance**
- **LINK STRESSORS TO EACH AREA**

CONDUCT A CLIMATE CHANGE VULNERABILITY ASSESSMENT

- 1. REVIEW AND SUPPLEMENT
IMPORTANT CLIMATE INFORMATION**
- 2. CONDUCT A CLIMATE SENSITIVITY
ANALYSIS**
- 3. EVALUATE THE ADAPTIVE CAPACITY
ASSOCIATED WITH SYSTEMS IN YOUR
PLANNING AREA**
- 4. SUM AND ASSESS THE VULNERABILITIES**

CONDUCT A CLIMATE CHANGE RISK ASSESSMENT

$$\text{RISK} = \text{CONSEQUENCE} \\ \times \text{PROBABILITY}$$

A SAMPLE RISK ESTIMATE

PLANNING AREA	CURRENT & EXPECTED STRESSES	PRO- JECTED CC IMPACT	CONSE- QUENCE OF IMPACT (HIGH, MEDIUM, LOW)	PROBABI- LITY OF IMPACT (HIGH, MEDIUM, LOW)	ESTMATED RISK TO SYSTEMS IN THIS PLANNING AREA
WATER SUPPLY	SUMMER DROUGHT	MORE WATER STRESS IN SUM- MERS	HIGH - THREAT TO PUBLIC SAFETY, LOSS OF CONSUMER CONFIDENCE	HIGH - ALREADY A CONCERN AND WARMER, DRIER CON- DITIONS EXPECTED	HIGH

SET PREPAREDNESS GOALS AND DEVELOP PREPAREDNESS PLAN

- ESTABLISH A VISION AND GUIDING PRINCIPLES**
- SET PREPAREDNESS GOALS**
- IDENTIFY POTENTIAL PREPAREDNESS ACTIONS**
- SELECT AND GIVE PRIORITY TO PREPAREDNESS ACTIONS**

IMPLEMENT THE PLAN

**MEASURE PROGRESS AND UPDATE
- REVIEW ASSUMPTIONS**

SHARE LESSONS LEARNED

Community Responsibility

- Learn the risks
- Support local government action
- Participate in your local adaptation planning process
- Use a climate change filter on all expenditures
- Prepare for worst-case and seek co-benefits of adaptive measures



Easter Island: They Didn't Make It!





Now we get to decide

How Gutsy Are We?