

# ***Healthy People, Healthy Planet***

## **Climate Change and Chronic Disease: Common Drivers, Common Solutions**

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**Module 1: Climate Change**

**Module 2: Chronic Disease**

**Module 3: Common Drivers,  
Common Solutions**

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**Presented by:**

**Jill Stein, MD**

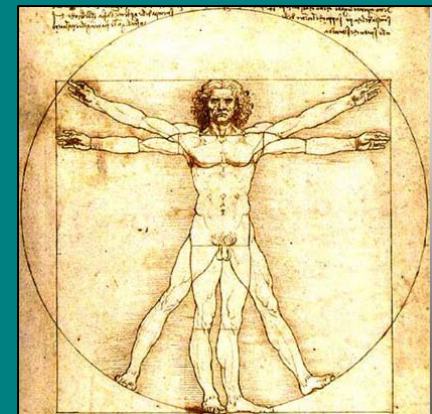
**Greater Boston Physicians for Social Responsibility**

**With Support from:**

**The Boston University Superfund Research Project**

# Healthy People, Healthy Planet: Objectives

- ◆ To inform & empower health providers to understand, mitigate & help prevent climate change & chronic disease.
- ◆ Review key science behind climate change and chronic disease.
- ◆ Clarify the major drivers of these crises – and how we can fix them.



# ***Healthy People, Healthy Planet***

## **Climate Change and Chronic Disease: Common Drivers, Common Solutions**

### **Climate Change**

**Module 1 of 3**

***Jill Stein, MD***

***Greater Boston  
Physicians for Social  
Responsibility***

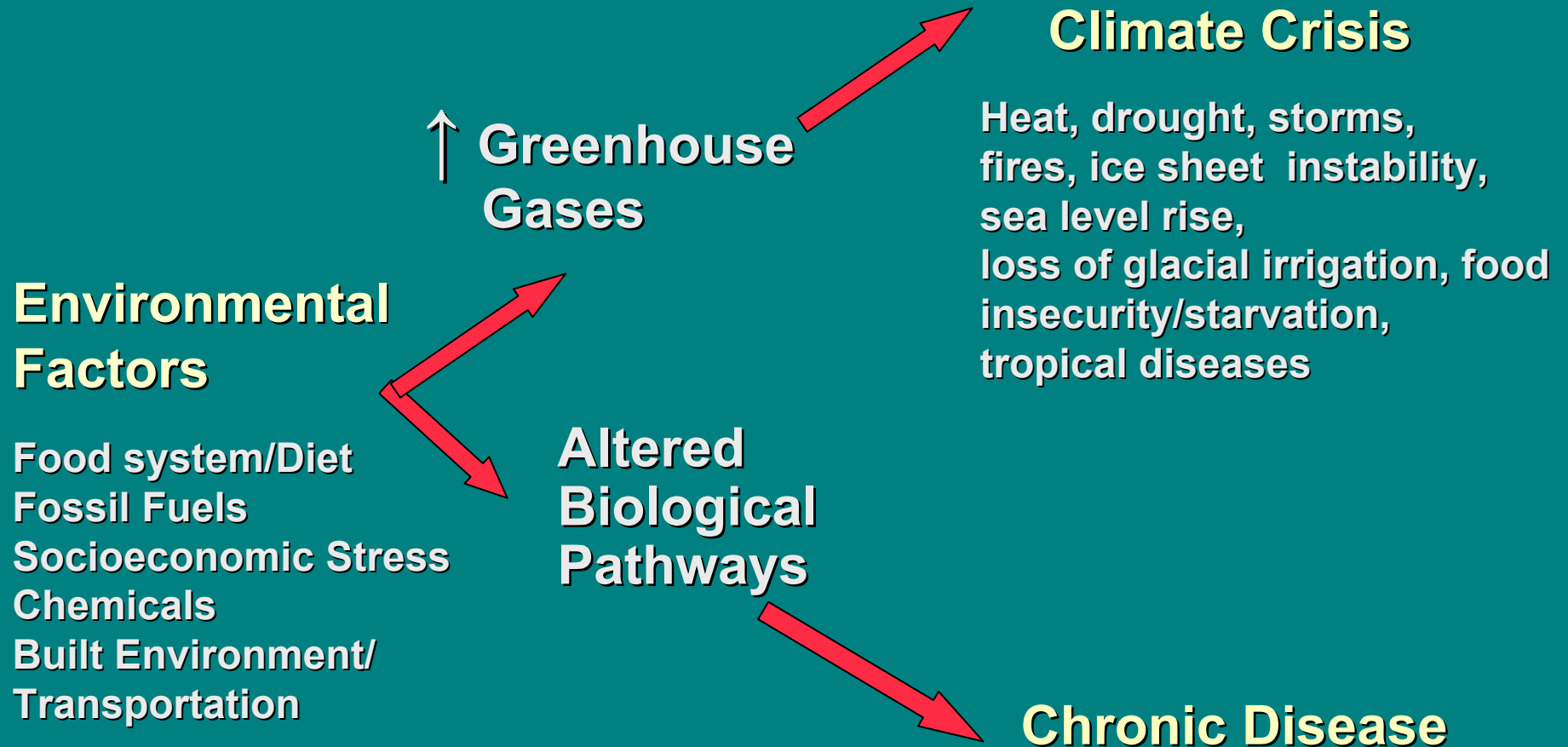


# Module 1: What We Will Cover



- ◆ The devastating human impacts, and acceleration of climate change.
- ◆ The science of climate change.
- ◆ The impacts of climate change on human health.
- ◆ The need to urgently bring atmospheric CO<sub>2</sub> down to a safe level – below 350 ppm –to reverse these impacts and prevent far worse ones in the pipeline, .

# Environment Drives Chronic Disease and the Climate Crisis



# Key Solutions Are At Hand

- ◆ **Green Energy**
  - **Wind → 2.6X total US electricity(1)**
  - **Parking lot solar cells→~1.5X US electricity need (2)**
  - **Conservation/efficiency→ ↓ electricity 75% (3)**
- ◆ **Local/Regional sustainable food production**
- ◆ **Relocalized, green economies**
- ◆ **Healthy food/transportation→↓ chronic disease**
  - **local/whole food, public/active transportation, safer chemicals**

1. Makhijani A, Bickel P, Chen A, Smith B. *Cash Crop on the Wind Farm: A New Mexico Case Study of the Cost, Price, and Value of Wind Energy*. Takoma Park, MD: Institute for Energy and Environmental Research, 2004.

Available: <http://www.ieer.org/pubs/index.html>. 2. Brice Smith PhD. Student PSR Conference 4/09 Mt. Sinai Medical School. 3. Amory Lovins. PSR fact sheet, Climate Change and Human Health

# Climate Crisis



“the biggest  
global health  
threat of the  
21st century”

- Lancet and University  
College London Institute  
for Global Health  
Commission, May 2009

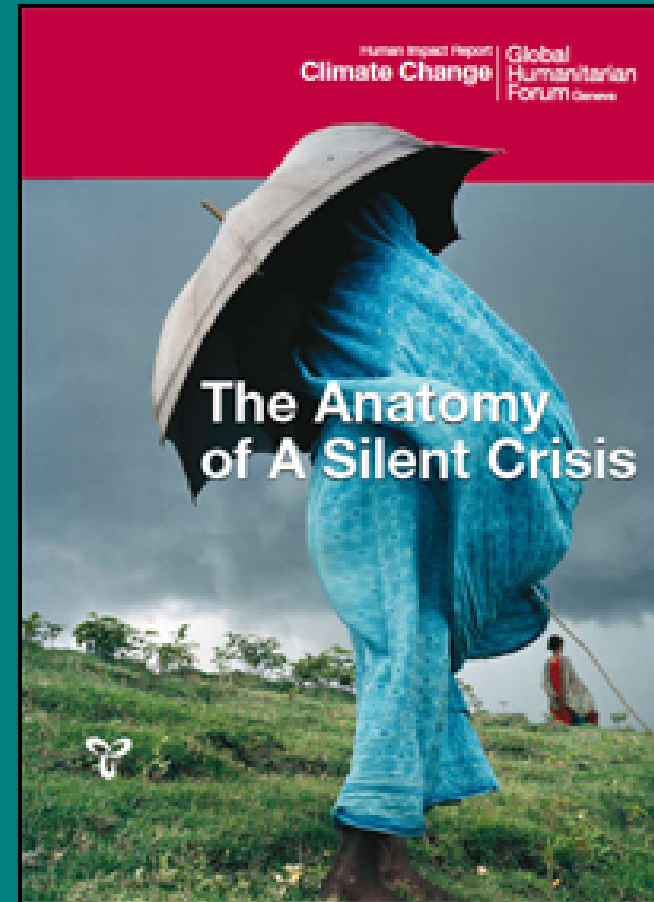
“the greatest ongoing silent crisis of  
human history ... causing widespread  
devastation and suffering around the  
planet today.”

- Kofi Annan & the Global Humanitarian Forum, 2009

# Why Call It A Crisis? Human Toll & Urgency

- ◆ ...every year climate change leaves over:
  - 300,000 people dead,
  - 325 million people seriously affected,
  - economic losses of \$125 B,
  - 4 billion people vulnerable,
  - 500 million people are at extreme risk.'
- ◆ '...climate change is already highly dangerous at well below 1degree [C] of warming. Two degrees would be catastrophic.'
- ◆ At the current rate of high emissions, some scientists predict two degrees of warming will be reached as soon as 2030.\*

\* <http://www.eci.ox.ac.uk/4degrees/ppt/1-2betts.pdf>  
<http://www.eci.ox.ac.uk/4degrees/audio/1-2betts.mp3>



**Climate Change Human Impact Report** Global Humanitarian Forum  
[www.ghf-geneva.org](http://www.ghf-geneva.org)

Cover Picture:

Laurent Weyl, Collectif Argos





**Warming is unequivocal; most of the warming of the past 50 years is very likely (90%) due to increases in greenhouse gases.**

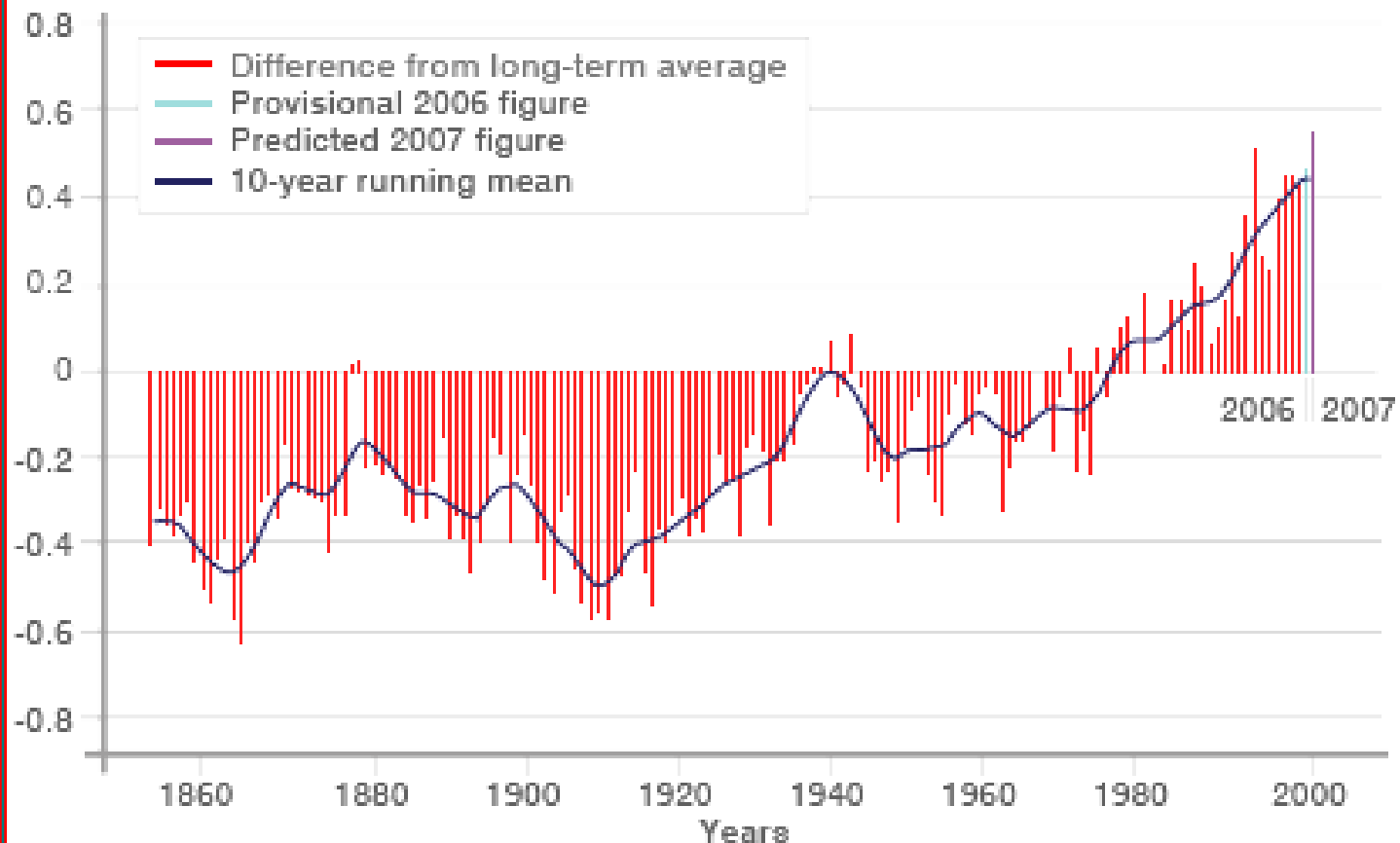
- Intergovernmental Panel on Climate Change, 2007

# Rising Temperatures

## AVERAGE GLOBAL TEMPERATURES SINCE 1850

GLOBAL AVERAGE NEAR-SURFACE TEMPERATURES

Temp difference (degrees C) from long-term average



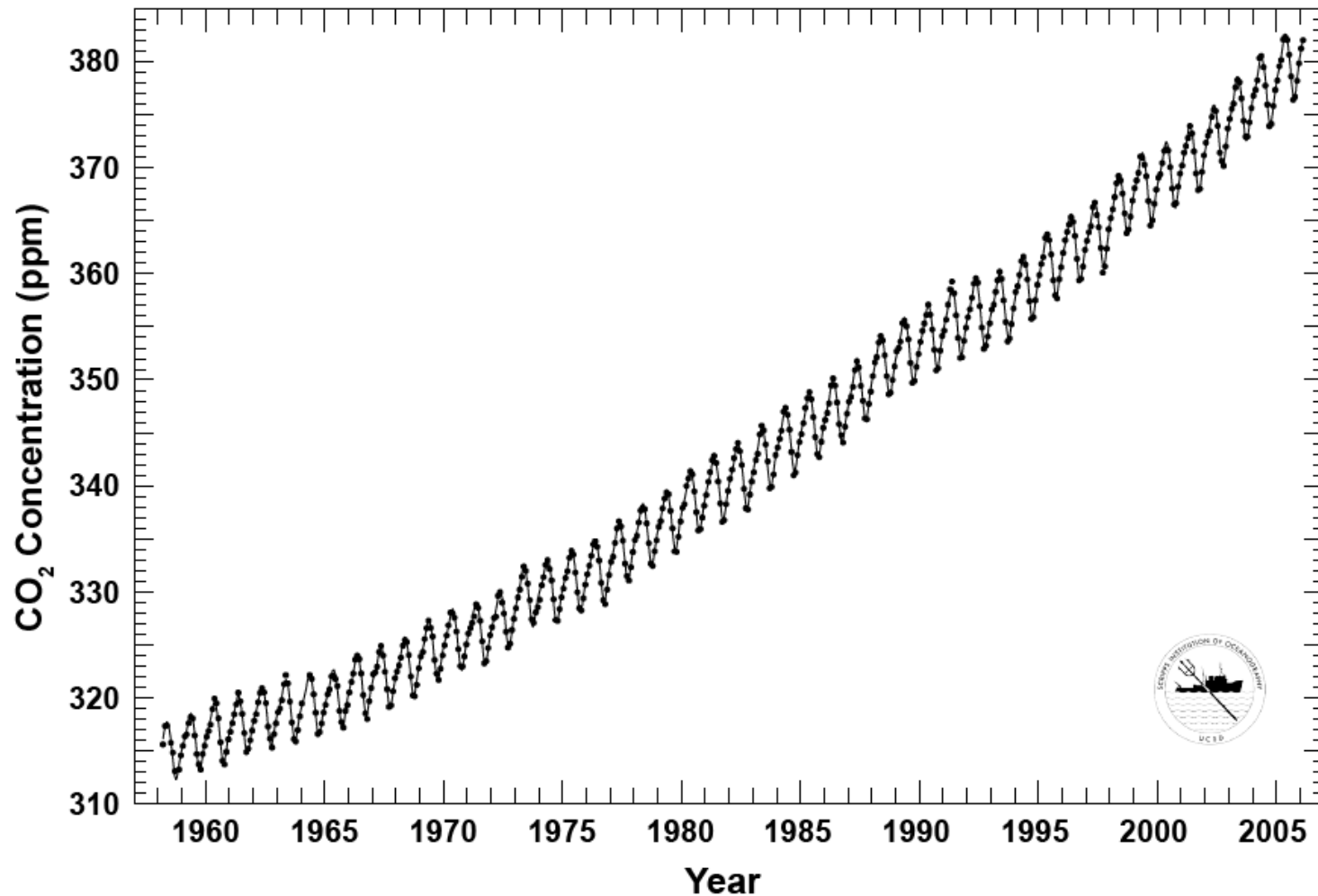
SOURCE: Met Office/Univ of East Anglia/Hadley Centre

# Rising CO<sub>2</sub>

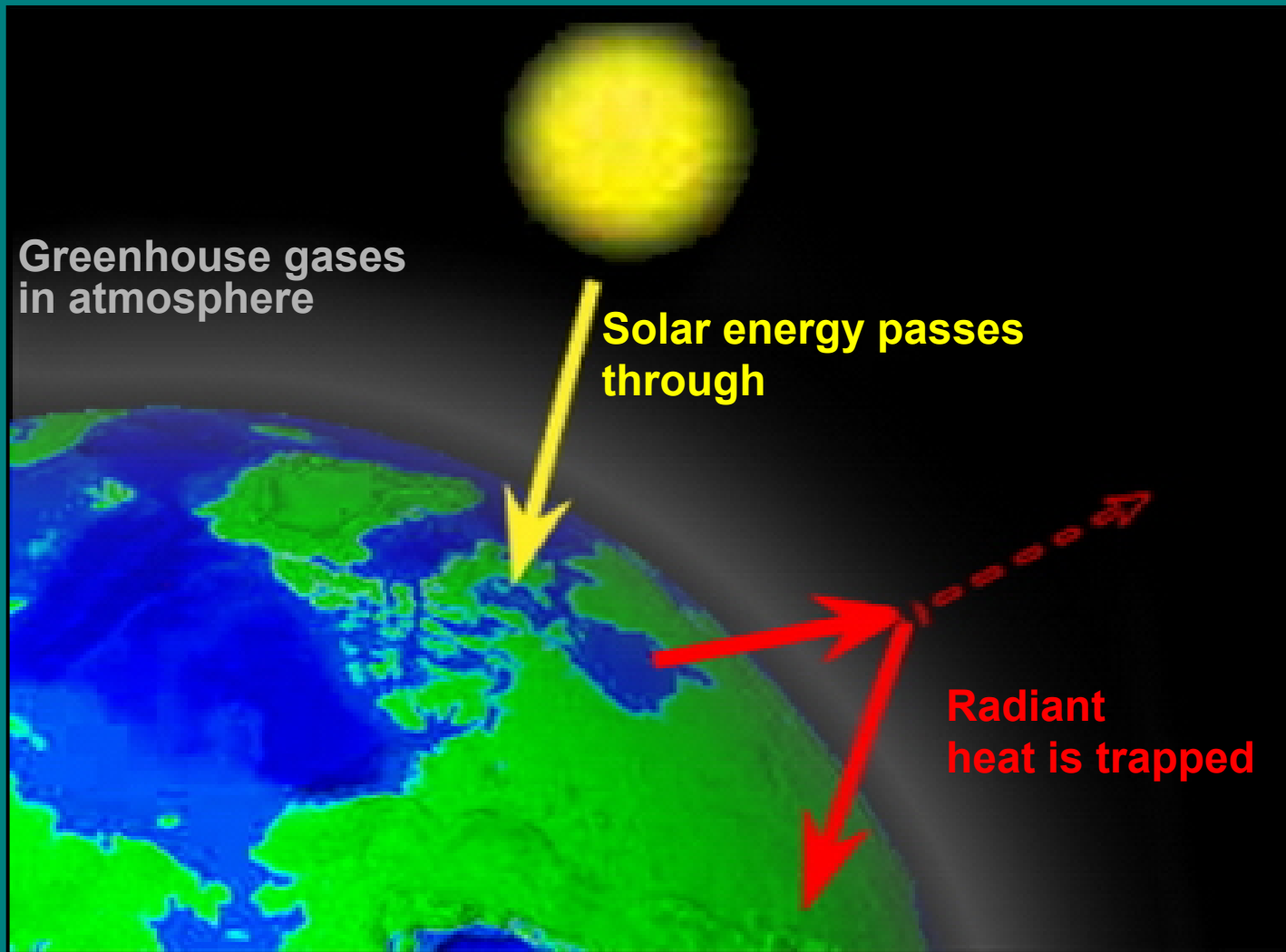
## Mauna Loa Observatory, Hawaii Monthly Average Carbon Dioxide Concentration

Data from Scripps CO<sub>2</sub> Program

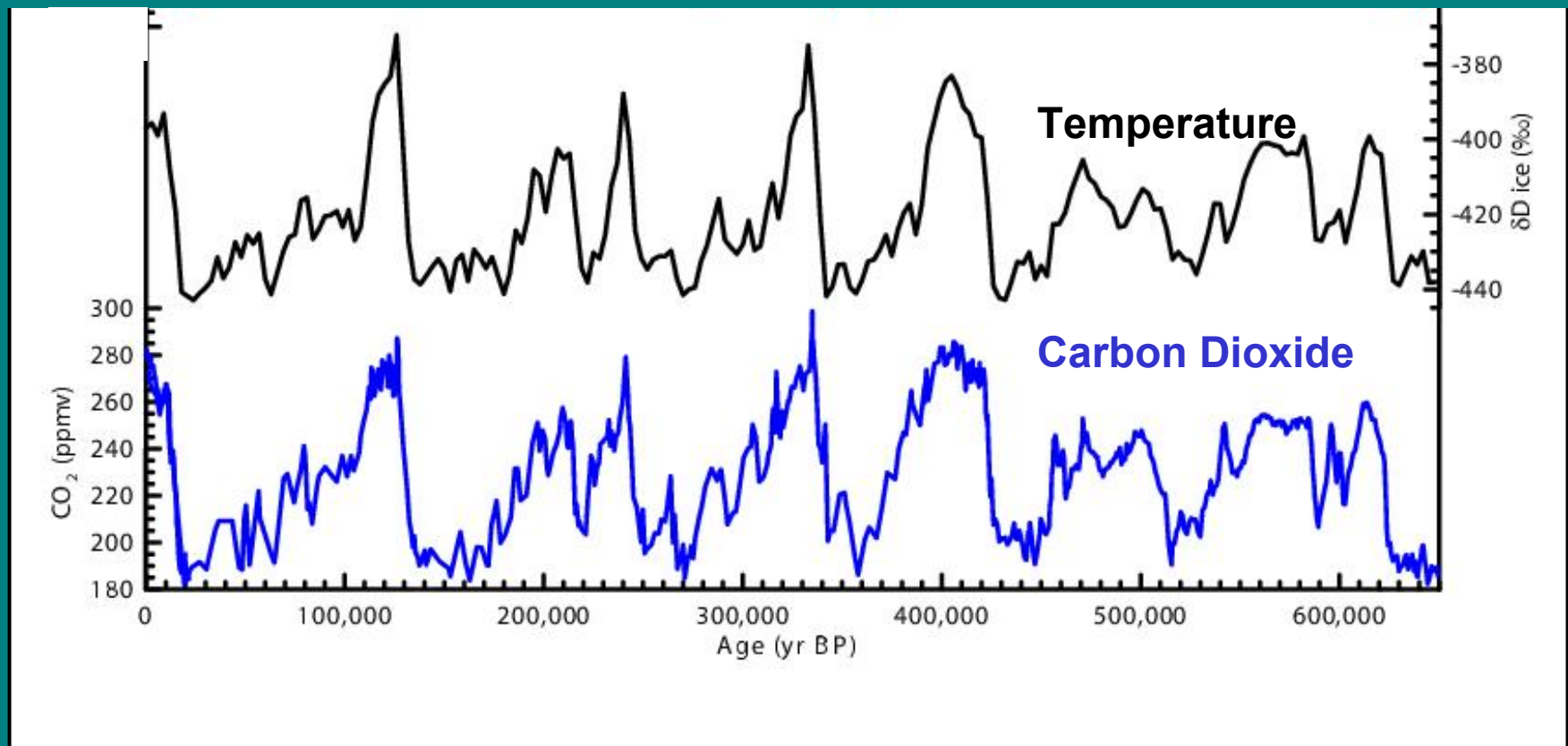
Last updated February 2006



# The Greenhouse Effect: Why Rising CO<sub>2</sub> Causes Rising Temperature



# CO<sub>2</sub> and Temperature Closely Linked Over the Ages



Source: <http://www.realclimate.org/epica.jpg>

# Rising CO<sub>2</sub>/Temperature Also Linked To Melting Ice/Rising Sea Level

*The safe upper limit of CO<sub>2</sub> is somewhere below 350ppm.*

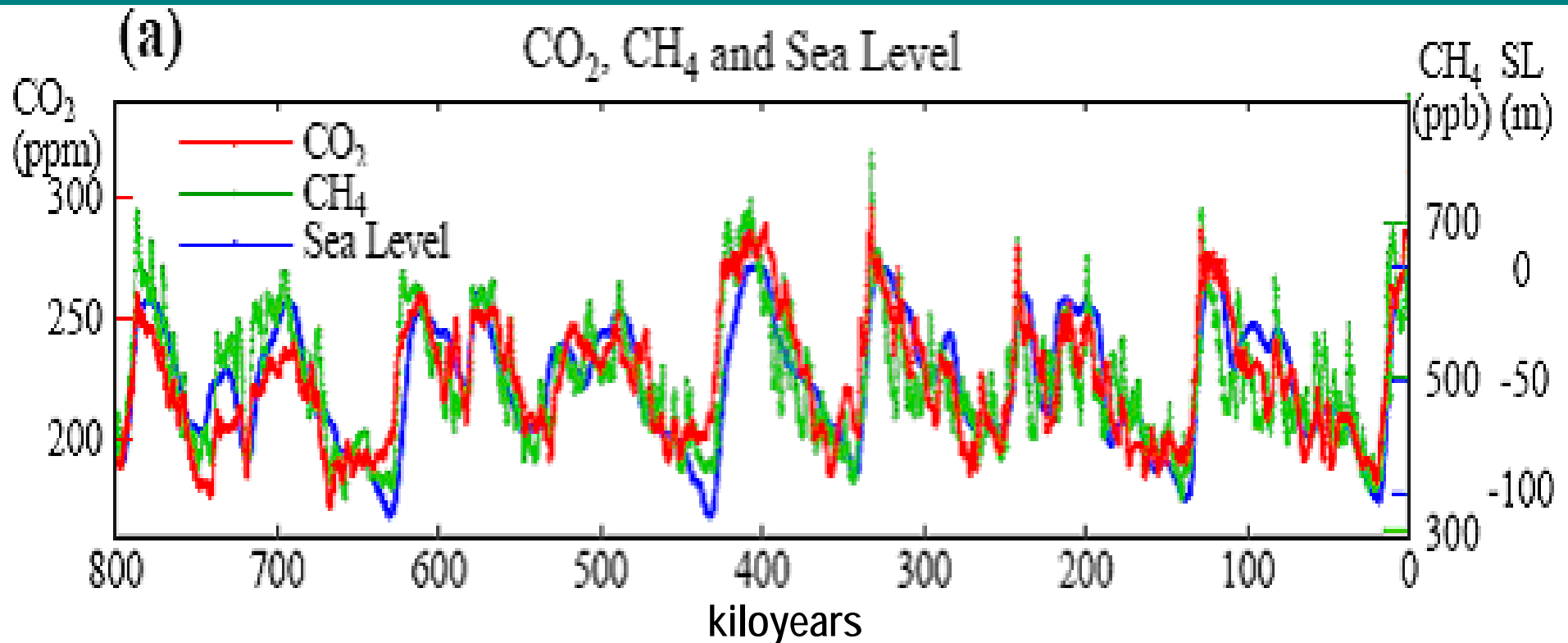


Figure from: Hansen et al, 2008 Target atmospheric CO<sub>2</sub>: Where should humanity aim? *Open Atmos. Sci. J.*, 2, 217-231

# The Melting Arctic: September 1979



Source: NASA/Goddard Space Flight Center, Scientific  
Visualization Studio, 2009

# The Melting Arctic: September 2007

b

Sept. 2007



Source: NASA/Goddard Space Flight Center, Scientific  
Visualization Studio, 2009



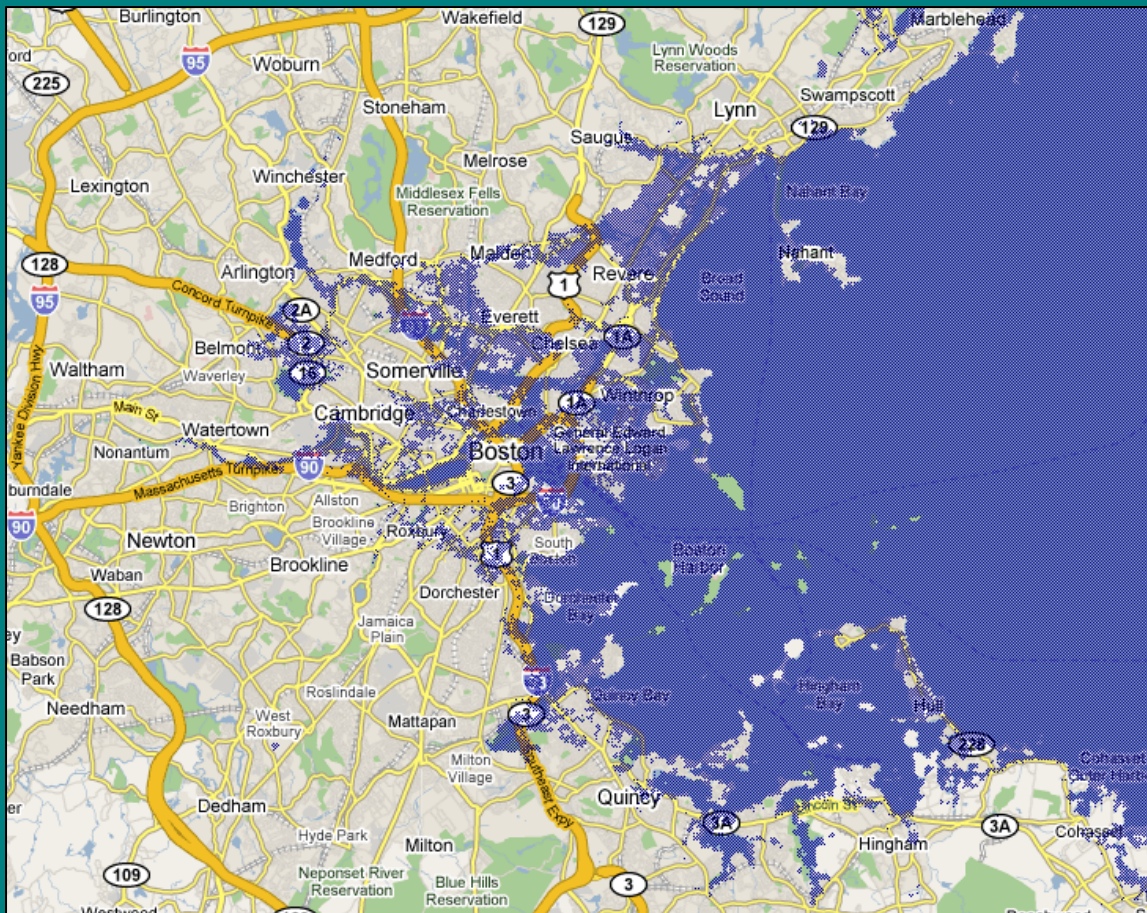
# The Arctic - Gone: September 2013-2030?



Original Image: NASA/Goddard Space Flight Center, Scientific  
Visualization Studio, 2009

# Potential Sea Level Rise

## Possible Melting of Other Ice Sheets

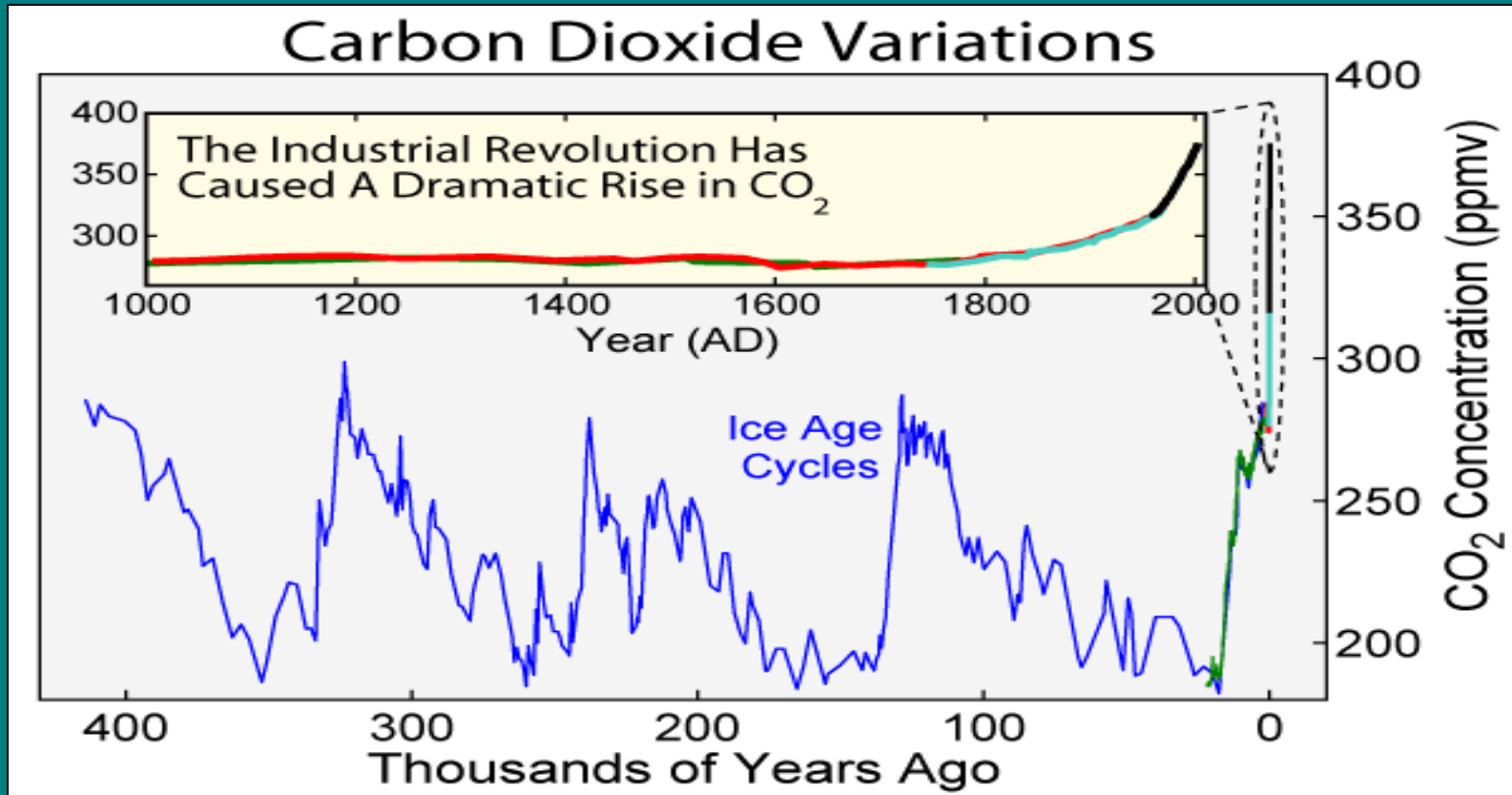


**A 10-meter rise in sea level would displace 23 million Americans.**

**This is equivalent to 23 Hurricane Katrinas.**

**Sea level rise in Boston Area**

# Since the Industrial Era, CO<sub>2</sub> Has Soared



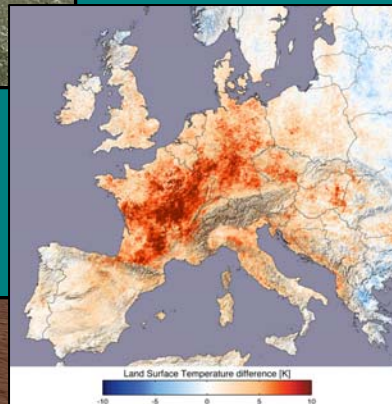
- ◆ *Through at least 800,000 years, CO<sub>2</sub> never exceeded 300ppm.*
- ◆ *Since the start of the industrial era CO<sub>2</sub> climbed from 275 to 387ppm.*
- ◆ *CO<sub>2</sub> is increasing now at 2.2ppm/year and accelerating.*

# **At 387 ppm, Earth Is In Energy Imbalance**

**Heat absorption exceeds radiation → net warming**

- ◆ **polar ice melting, glaciers retreating**
- ◆ **tundra thawing, methane pluming**
- ◆ **climate zones shifting pole-ward**
- ◆ **forest fires, extreme weather events increasing**
- ◆ **sea level rise – if complete melting → 200 feet**

# Effects Of A Warming Climate on Health



# Extreme Weather Events and Disasters

- ◆ Floods represent 43% of weather-related disasters between 1992-2001.
- ◆ Droughts and associated famine are the most deadly.
- ◆ Globally, 65.5 million children annually were affected by disasters between 1990-2000.
  - ✓ Infectious diseases from sewage, poor sanitation, lack of clean water, refrigeration, crowding, insects
  - ✓ Posttraumatic stress disorder, high rates of sleep disturbance, aggressive behavior, sadness and substance use/abuse

# Drought



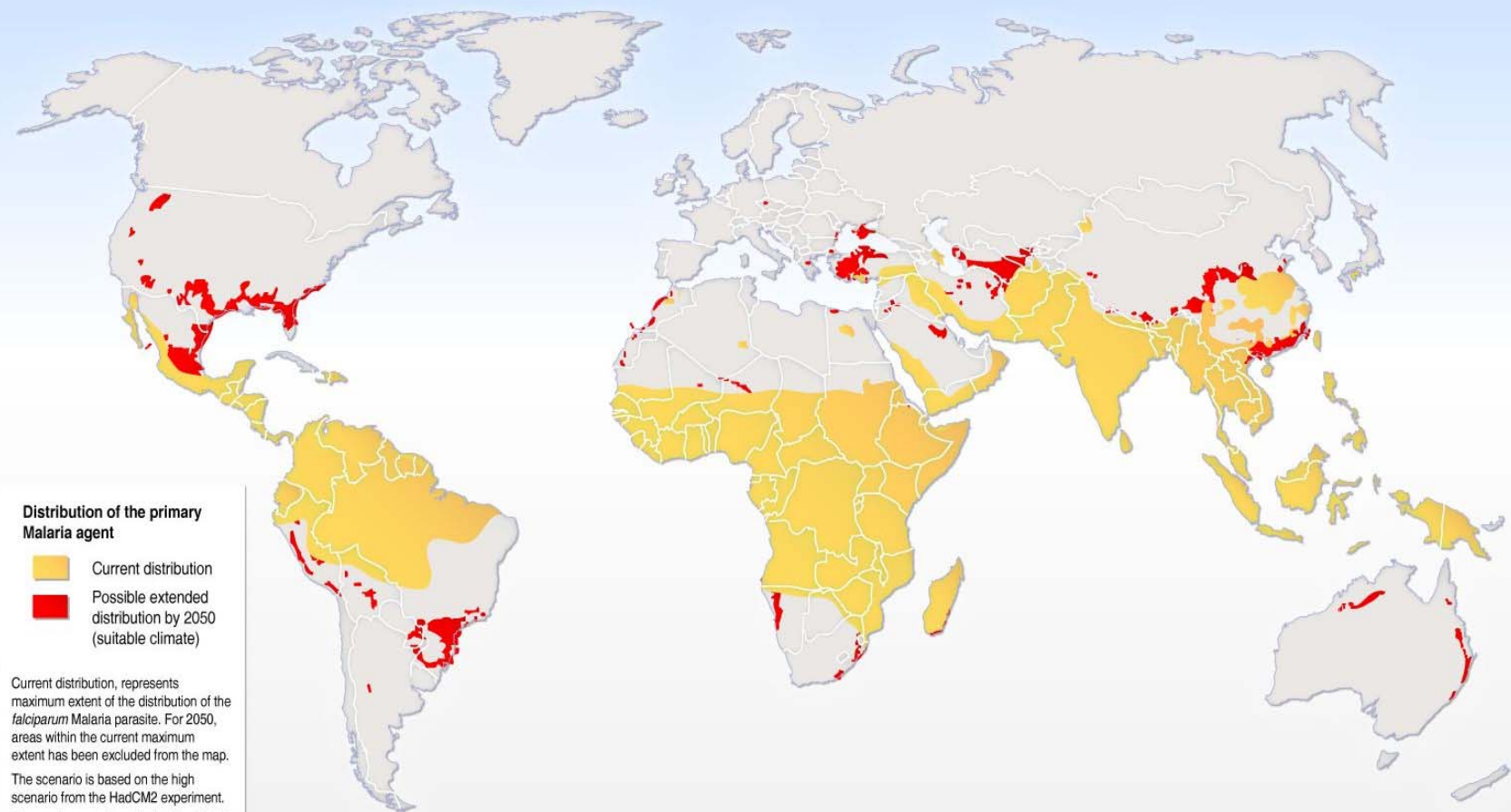
# Climate-Sensitive Infectious Diseases

- ◆ Globally, infectious diarrhea is the second-leading cause of death in young children.
- ◆ WHO estimates 1.62 million children younger than 5 years die of diarrhea annually, most from contaminated water.
- ◆ In developed countries diarrhea death is rare, but illnesses due to temperature increases are likely
- ◆ Vector-borne infections are affected by climate change, both the hosts and pathogens.



# Spreading Infectious Disease: Malaria

## Climate Change and Malaria



### Distribution of the primary Malaria agent

- Current distribution
- Possible extended distribution by 2050 (suitable climate)

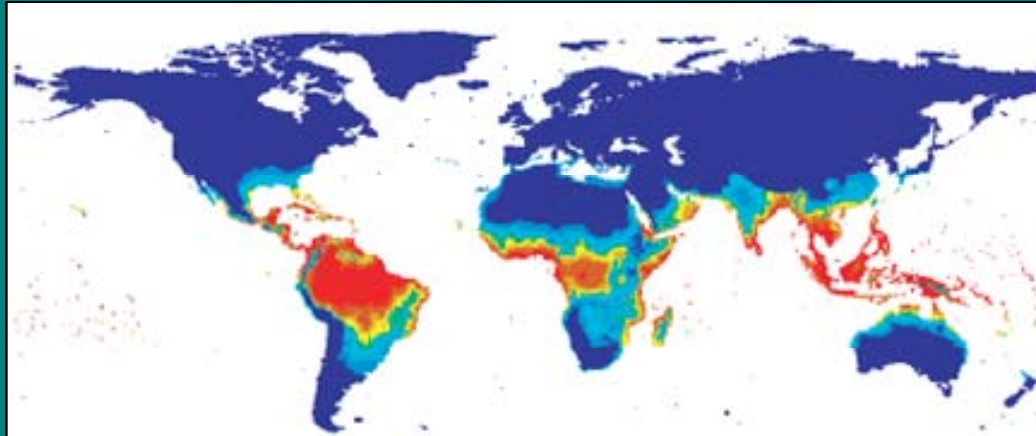
Current distribution, represents maximum extent of the distribution of the *falciparum* Malaria parasite. For 2050, areas within the current maximum extent has been excluded from the map.

The scenario is based on the high scenario from the HadCM2 experiment.

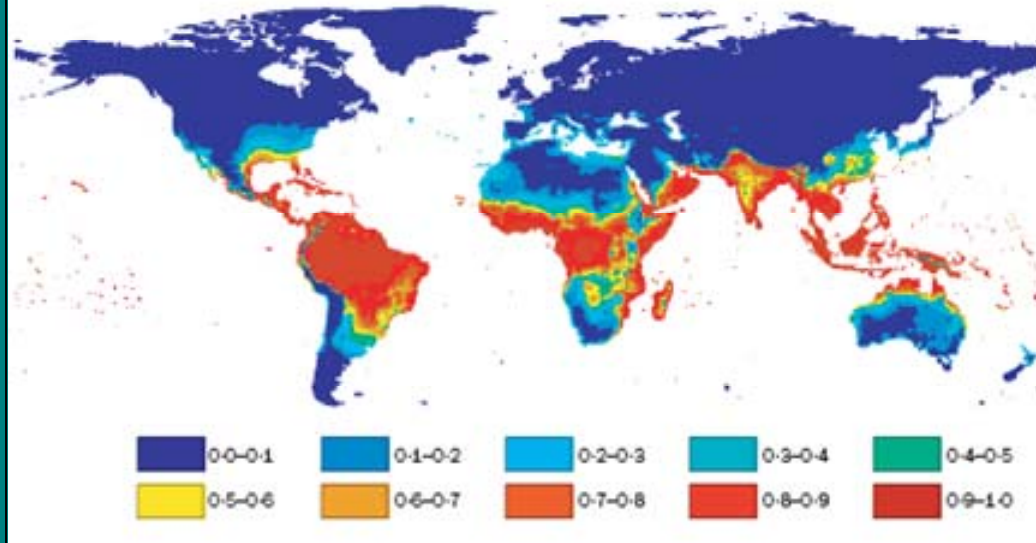
Source: Rogers, Randolph. *The Global Spread of Malaria in a Future, Warmer World*. Science (2000:1763-1766).

# Spreading Infectious Disease: Dengue

1990



2085



# Spreading Infectious Disease: West Nile Virus

States with cases of West Nile virus in humans



\* Year of extreme drought may have increased West Nile virus cases in the U.S. and Canada.

\*\* Preliminary count.

1999



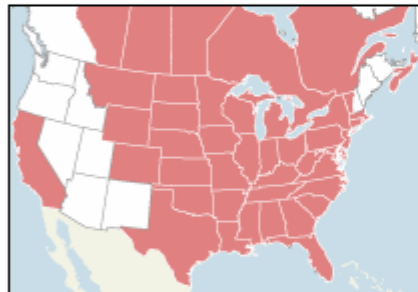
2000



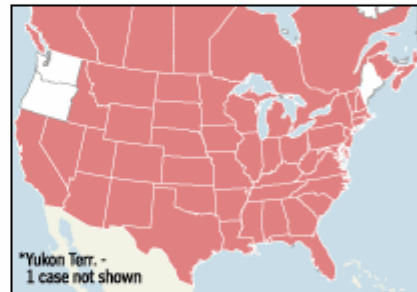
2001



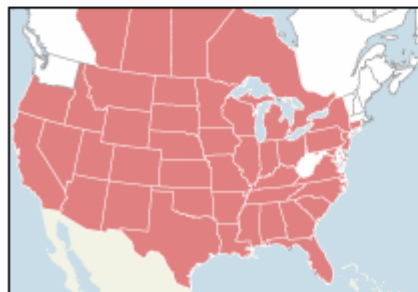
2002



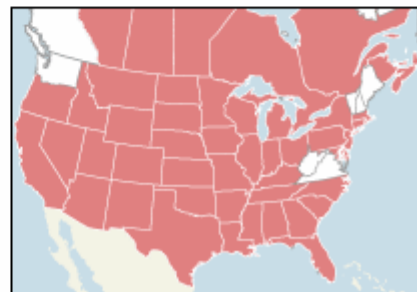
2003\*



2004



2005

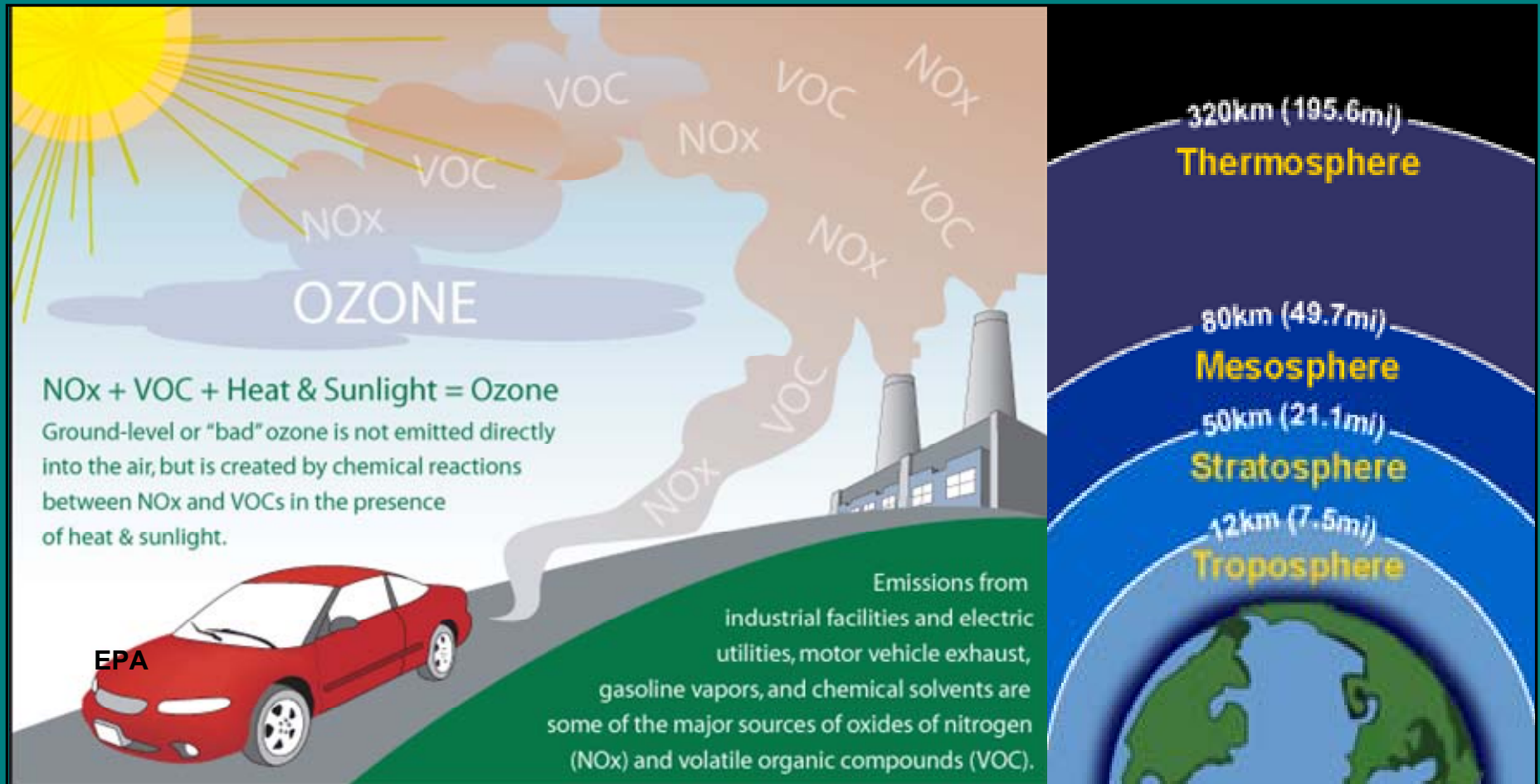


2006: One case in Mississippi so far

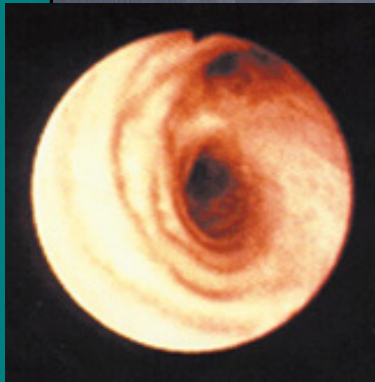
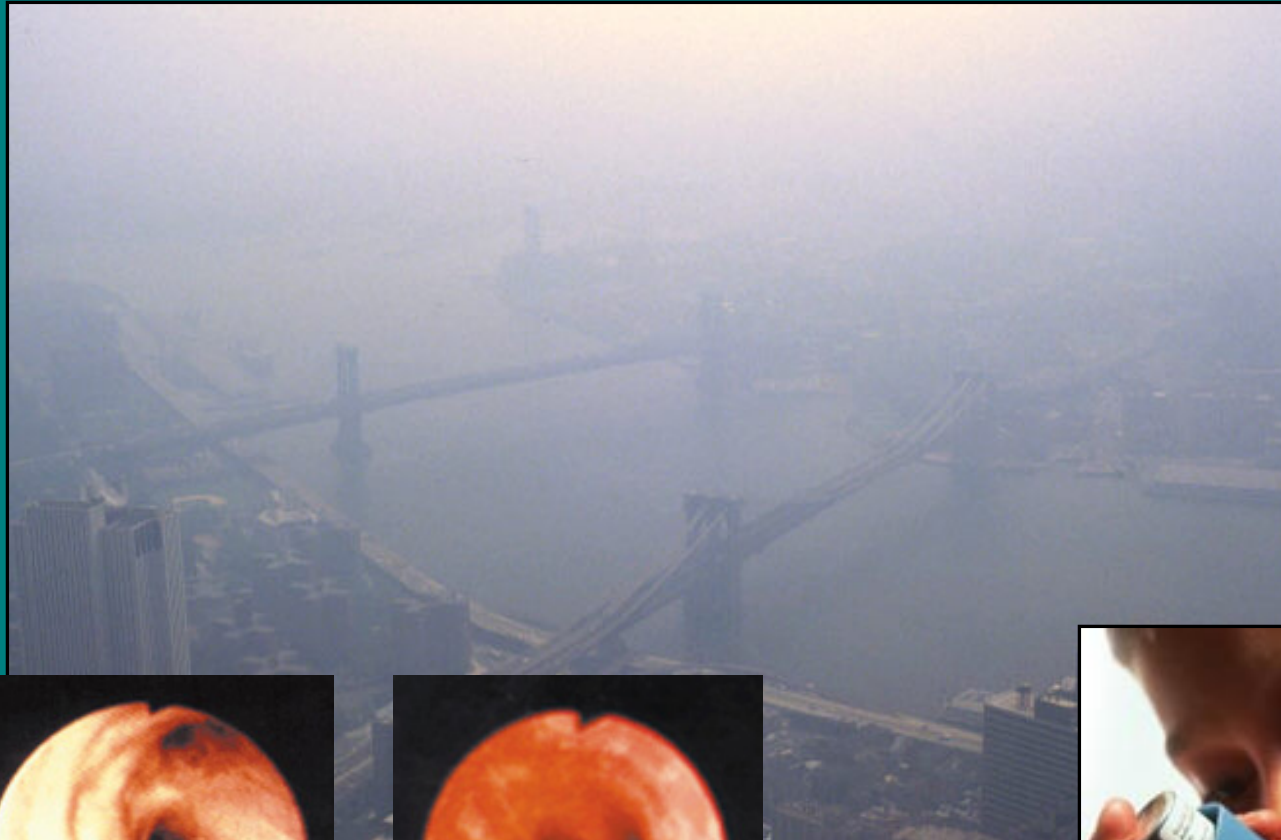
Number of West Nile virus cases and deaths in the U.S. and Canada

UNITED STATES			CANADA		
Year	Number of cases	Deaths	Year	Number of cases	Deaths
1999	62	7	1999	No cases	
2000	21	2	2000	No cases	
2001	66	9	2001	No cases	
2002	4,156	284	2002	426	20
2003*	9,862	264	2003*	1,478	12
2004	2,539	100	2004	25	2
2005	2,949 **	116	2005	224	12
<b>TOTAL</b>	<b>19,655</b>	<b>782</b>	<b>TOTAL</b>	<b>2,153</b>	<b>46</b>

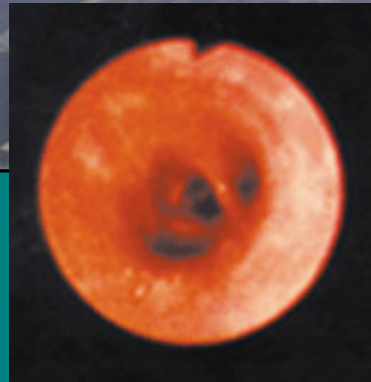
# Deteriorating Air Quality: Ozone Pollution



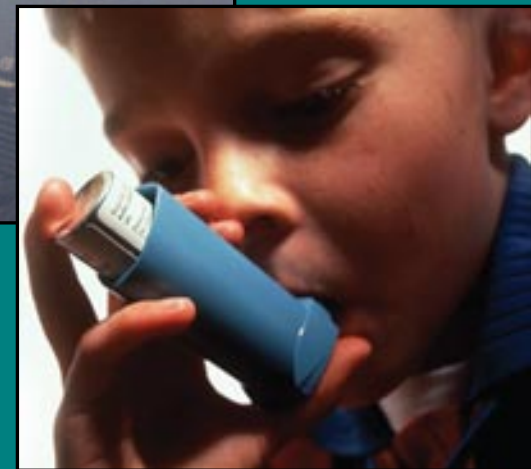
# Health Effects of Ground Level Ozone



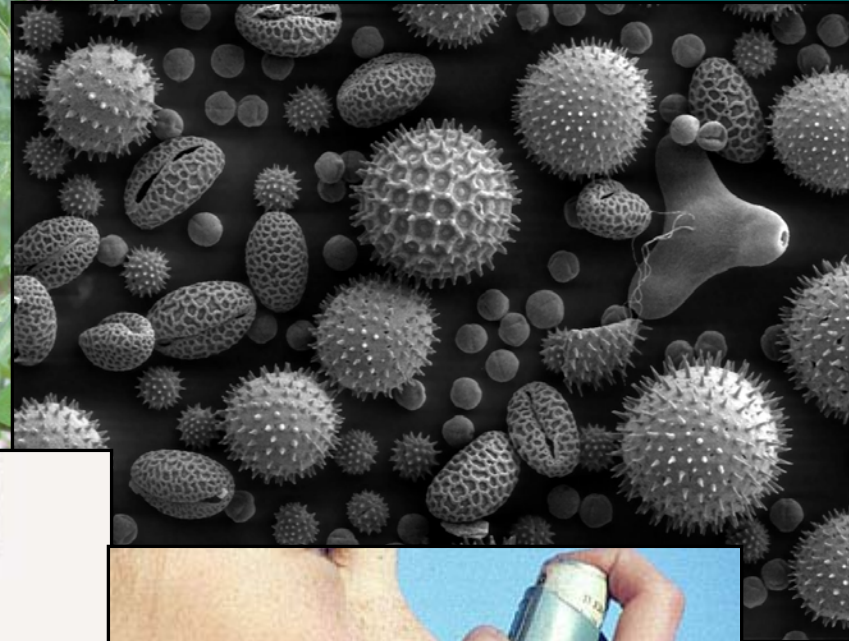
Healthy Airway



Inflamed Airway



# Natural Air Pollutants



# Summary



- ◆ Climate change is already causing devastating human impacts, and it is accelerating.
- ◆ CO<sub>2</sub>, temperature, ice, and sea levels are linked. High CO<sub>2</sub> is melting ice sheets worldwide, posing risks of catastrophic sea level rise if allowed to persist.
- ◆ Over 300,000 lives per year are lost from extreme weather, famine, floods, declining air quality, and spreading tropical diseases. Greatest impacts are in poor countries.
- ◆ To reverse these impacts and prevent far worse ones already in the pipeline, CO<sub>2</sub> must be brought to a safe level – below 350 ppm – urgently.

## Module 2: Environmental Drivers of Chronic Disease

- ◆ How environmental factors are key drivers of many common chronic diseases
- ◆ How environmental factors alter key biological pathways leading to chronic disease





**For more information contact:  
Greater Boston  
Physicians for Social Responsibility  
[www.psr.org/boston](http://www.psr.org/boston)**

**For additional resources on  
environmental health and nursing contact:  
The Environmental Health Nursing  
Education Collaborative  
[www.ehnursing.org](http://www.ehnursing.org)**