

OUR COMMON ATMOSPHERE

Global Sustainability – A Nobel Cause

POTSDAM

October 8, 2007

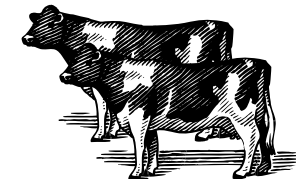
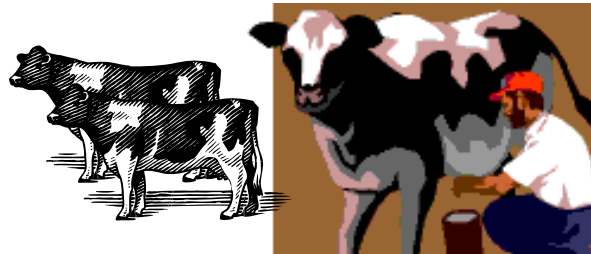
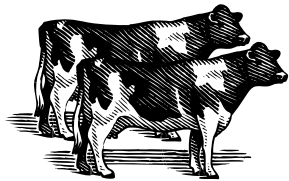
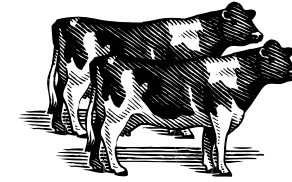
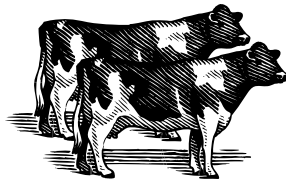
Mario J. Molina

University of California, San Diego

**Mario Molina Center for Strategic Studies in
Energy and the Environment, Mexico City**



The Tragedy of the Commons



William Forster Lloyd, 1833
Garret Hardin, 1968

Major Environmental Challenges for the 21st Century

- **Depletion of Natural Resources**
 - Degradation of Land
 - Loss of Biodiversity
 - Deforestation
 - Over-exploitation of Fisheries
- **Disposal of Solid and Hazardous Waste**
- **Water Pollution**
- **Air Pollution**
- **Global Changes in the Chemical Composition of the Atmosphere**
 - Greenhouse Effect
 - Stratospheric Ozone Depletion
 - Tropospheric Ozone and Particulate Matter

FISHERIES

- ~ 75% of major global fisheries are fully exploited, overexploited or depleted
- 50 years ago, was 5%



OUTLOOK FOR CHINA

Assuming China's economy continues to grow at 8%/year:

Income per person in 2031: same as USA's in 2004

	World Consumption in 2004	China's Consumption in 2031
Grains	1.74 billion tons	1.31 billion tons
Paper	161 million tons	305 million tons
Oil	84 million barrels / day	99 million barrels / day

Source: Lester R. Brown, PlanB 2.0, Norton & Co, 2006



September
2007



CLIMATE CHANGE 2007
THE PHYSICAL SCIENCE BASIS



Working Group I Contribution to the Fourth Assessment
Report of the Intergovernmental Panel on Climate Change





Avoiding the Unmanageable and Managing the Unavoidable

*The Report of the United Nations-Sigma Xi
Scientific Expert Group
on Climate Change and Sustainable Development*

Hans Joachim Schellnhuber (John)

Nebojsa Nakicenovic (Naki)

Mario Molina

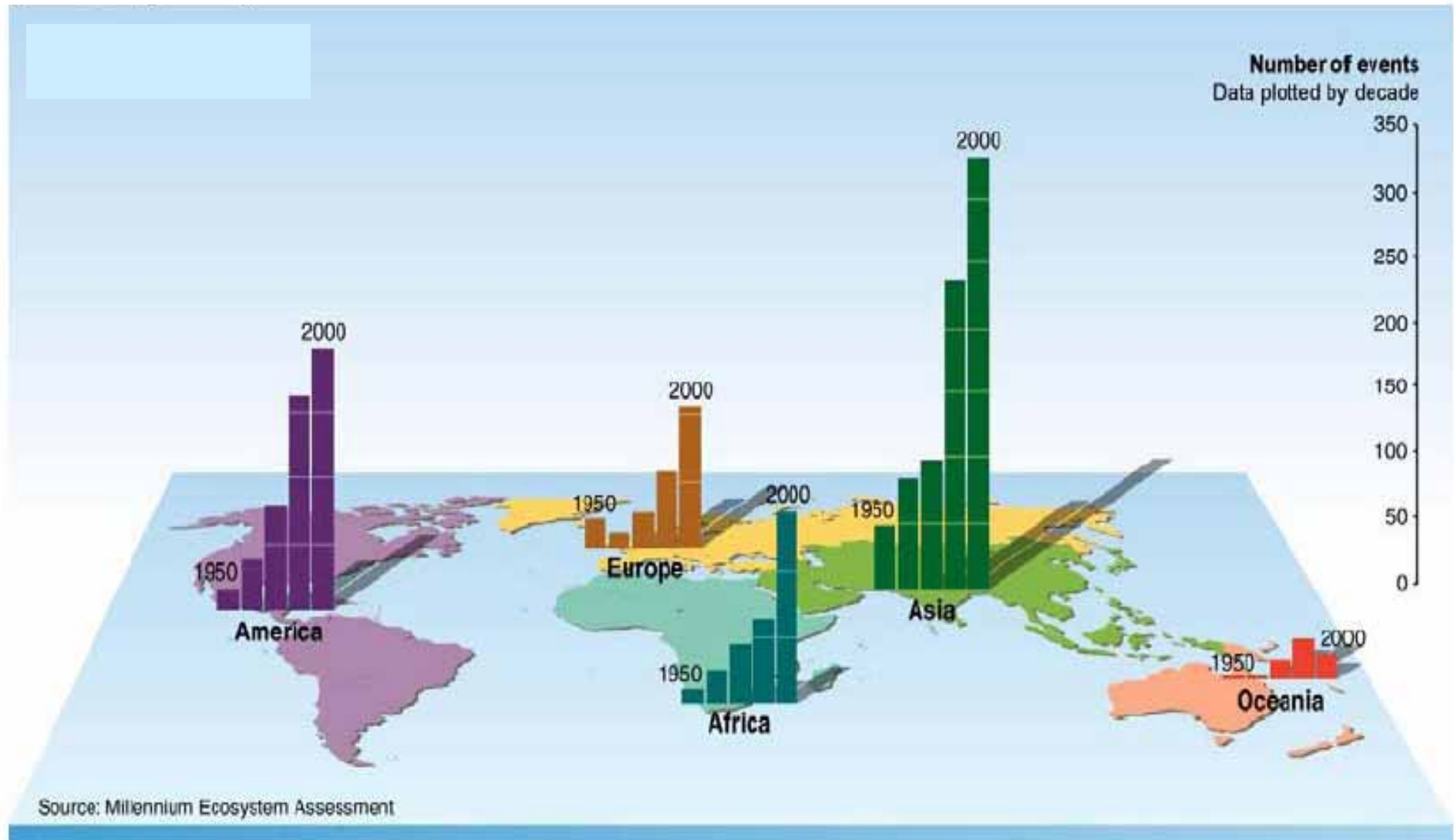
⋮

February 2007

The logo for Sigma Xi, The Scientific Research Society, featuring the text "SIGMA XI" in a large serif font above a horizontal line, with "THE SCIENTIFIC RESEARCH SOCIETY" in a smaller serif font below the line.

SIGMA XI
THE SCIENTIFIC RESEARCH SOCIETY

FLOODS 1950-2000





DROUGHTS

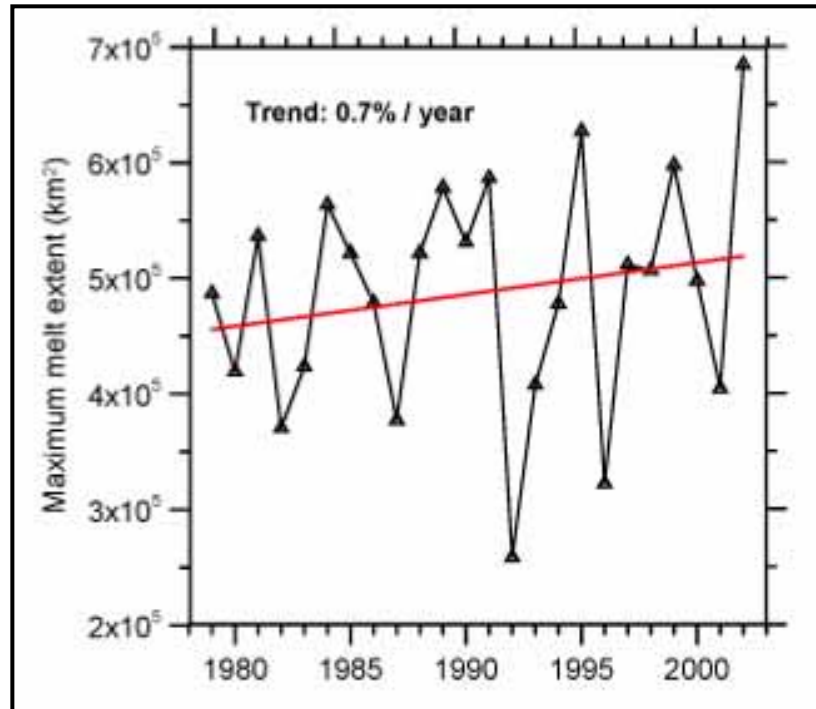
400,000,000 people are living under extreme drought conditions

“Very Dry” Land, Worldwide:

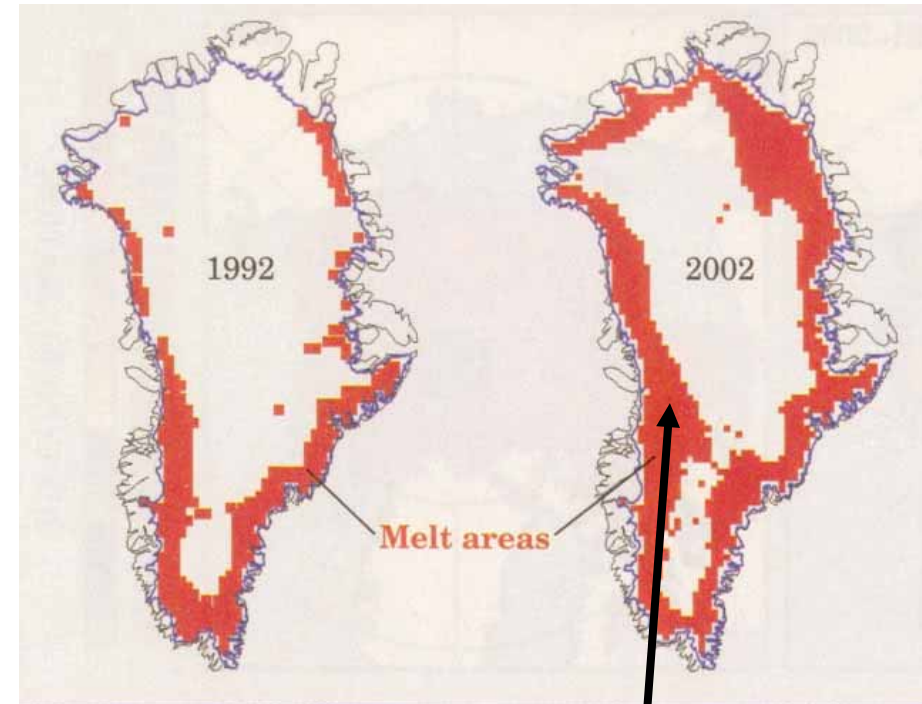
15% in 1970

30% in 2002

Increasing Melt Area on Greenland



- 2002 all-time record melt area
- Melting up to elevation of 2000 m
- 16% increase from 1979 to 2002

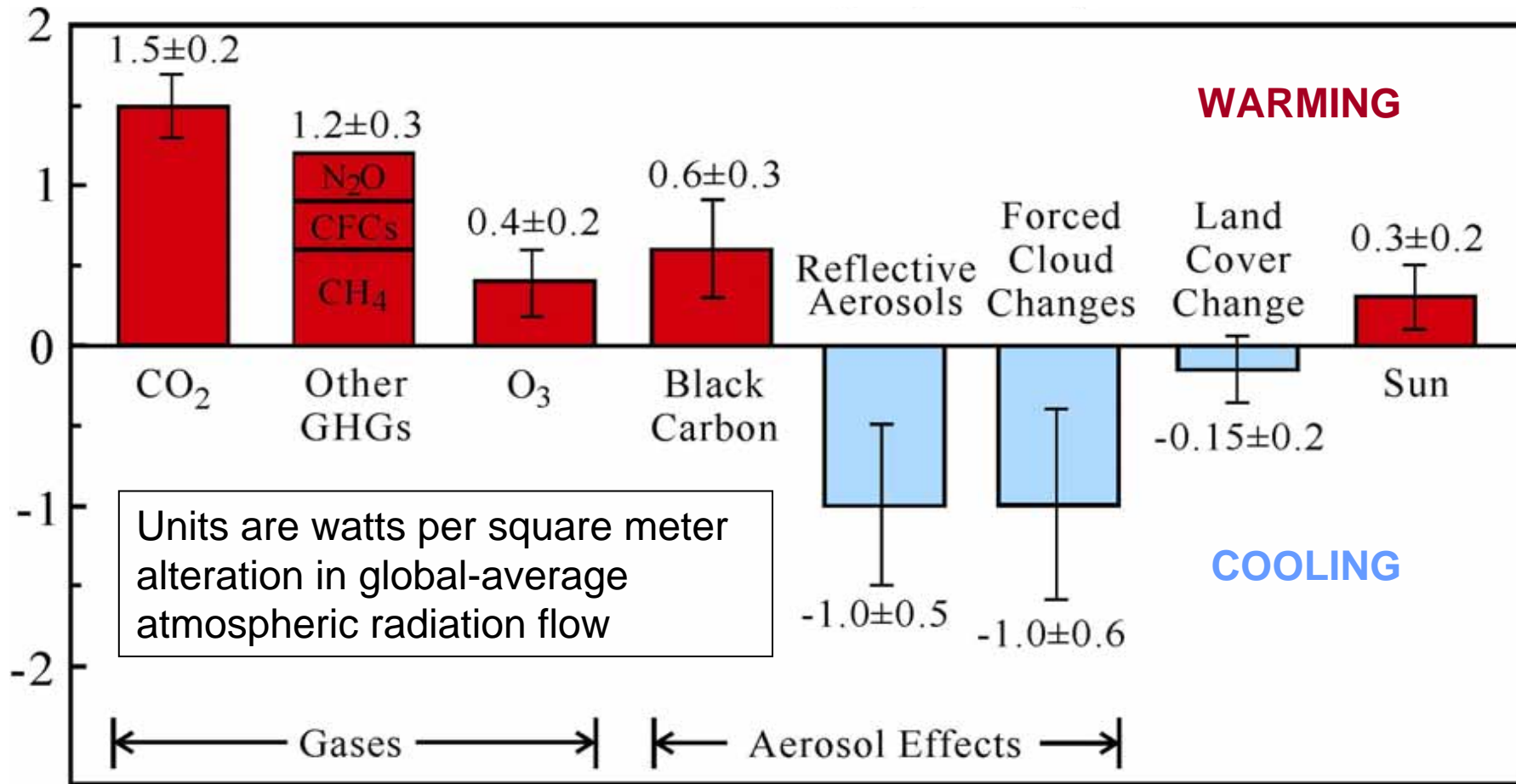


70 meters thinning in 5 years

Satellite-era record melt of 2002 was exceeded in 2005.

Source: Waleed Abdalati, Goddard Space Flight Center

Effective climate forcings 1750-2000



Source: Hansen et al., JGR, **110**, D18104, 2005.

Estimated Health Benefits of a 10% Reduction of Pollution Levels in Mexico City

PM10	Background Rate (case-persons-yr)	Risk Coefficient (% per 10 μ g/m ³)	Risk Reduction (cases/yr)
Cohort Mortality	10/1000	3	2000
Time Series Mortality	5/1000	1	1000
Chronic Bronchitis	14/1000	10	10 000

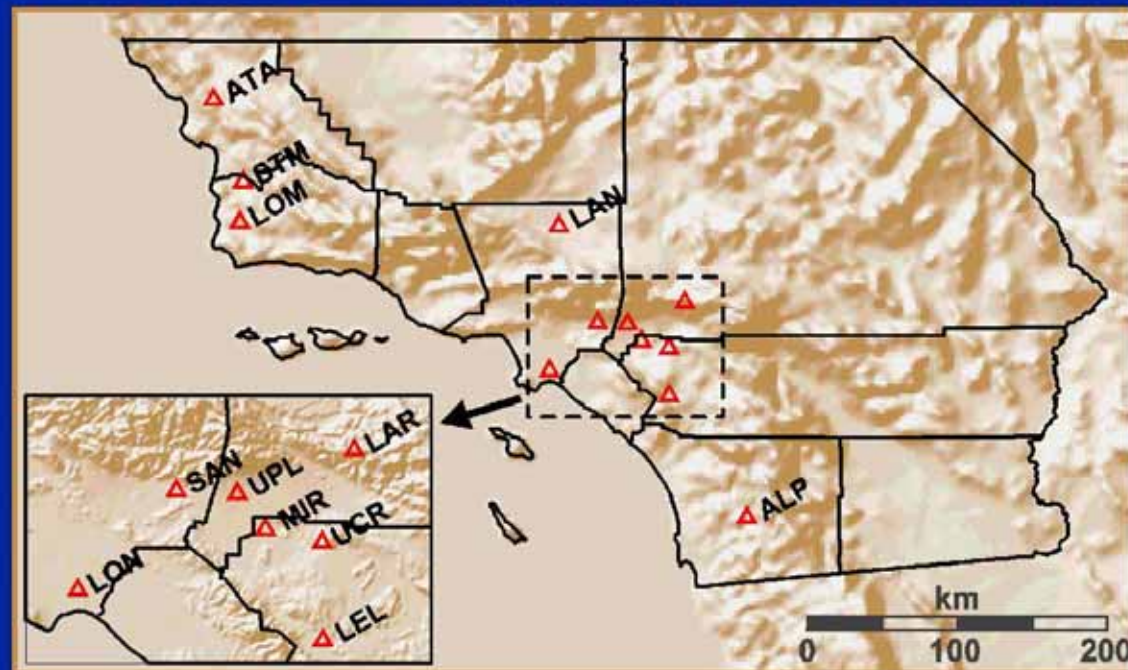
Ozone	Background Rate (case-persons-yr)	Risk Coefficient (% per 10 μ g/m ³)	Risk Reduction (cases/yr)
Time Series Mortality	5/1000	0.5	300
Minor Restricted Activity Days	8000/1000	1.0	2,000,000

Chapter 4. Health Benefits of Air Pollution Control: *John Evans, Jonathan Levy, (Molina et al., 2002) James Hammitt, Carlos Santos Burgoa, and Margarita Castillejos*

Air pollution harms children's lungs for life



Children's Health Study Study Region



Children exposed to higher levels of particulate matter and other air pollutants had significantly lower lung function





Outflow of Aerosol, Northern India

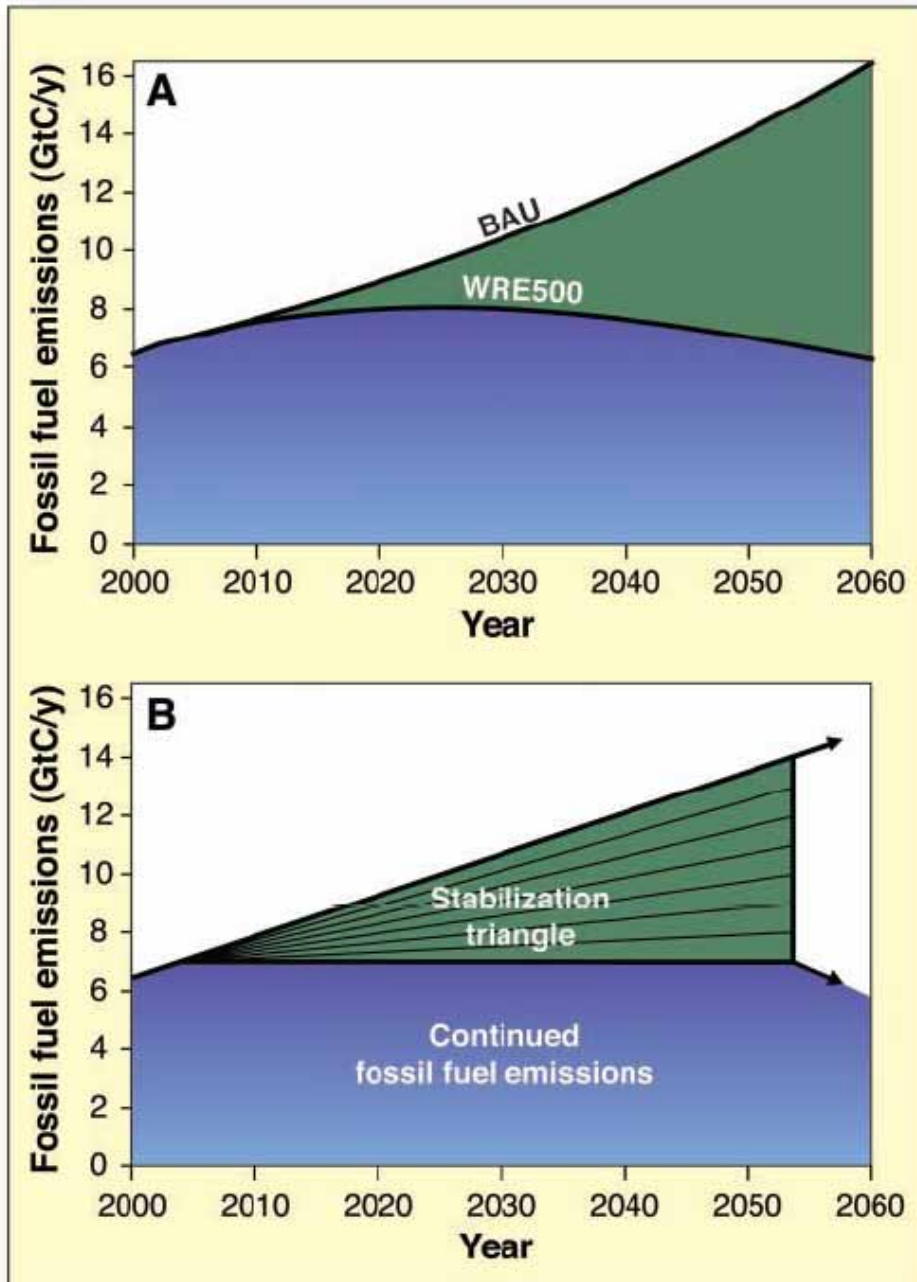


The skies over Northern India are filled with aerosol particles all along the southern edge of the Himalayan Mountains, and streaming southward over Bangladesh and the Bay of Bengal.

Stabilization Wedges: Solving the Climate Problem for the Next 50 Years with Current Technologies

S. Pacala & R. Socolow

*Improved fuel economy
Reduced reliance on cars
More efficient buildings
Improved power plant efficiency
Substituting natural gas for coal
Carbon capture and storage
Nuclear fission
Wind electricity
Biofuels
Forest management*



COAL-FIRED POWER PLANTS



**China is now building
the equivalent of two
500-megawatt coal
plants every week**

*Source: Design to Win –
Philanthropy's Role in the Fight
against Global Warming California
Environmental Associates*

Jinzhushan Power Plant in Hunan Province

(Photo courtesy Hunan Datang Xianyi Technology Co Ltd)

N₂O release from agro-biofuel production negates global warming reduction by replacing fossil fuels

P. J. Crutzen, A. R. Mosier, K. A. Smith, and W. Winiwarter

Received: 28 June 2007– Published: 1 August 2007

“...the production of commonly used biofuels, such as biodiesel from rapeseed and bioethanol from corn (maize), can contribute as much or more to global warming by N₂O emissions than cooling by fossil fuel savings.”

Atmos. Chem. Phys. Discuss., 7, 11191–11205, 2007

KYOTO PROTOCOL
to the
UNITED NATIONS FRAMEWORK CONVENTION
ON CLIMATE CHANGE

The Parties to this Protocol, Being Parties to the United Nations Framework Convention on Climate Change, ... have agreed as follows: ... (28 articles)

Developed countries that ratify this protocol commit to reduce their emissions of carbon dioxide and five other greenhouse gases, or engage in emissions trading.

International Agreement to Control CFC Emissions

UNITED NATIONS ENVIRONMENT PROGRAM (UNEP)



MONTREAL PROTOCOL ON SUBSTANCES THAT DEplete THE OZONE LAYER

FINAL ACT

1987

20th Anniversary of the Montreal Protocol

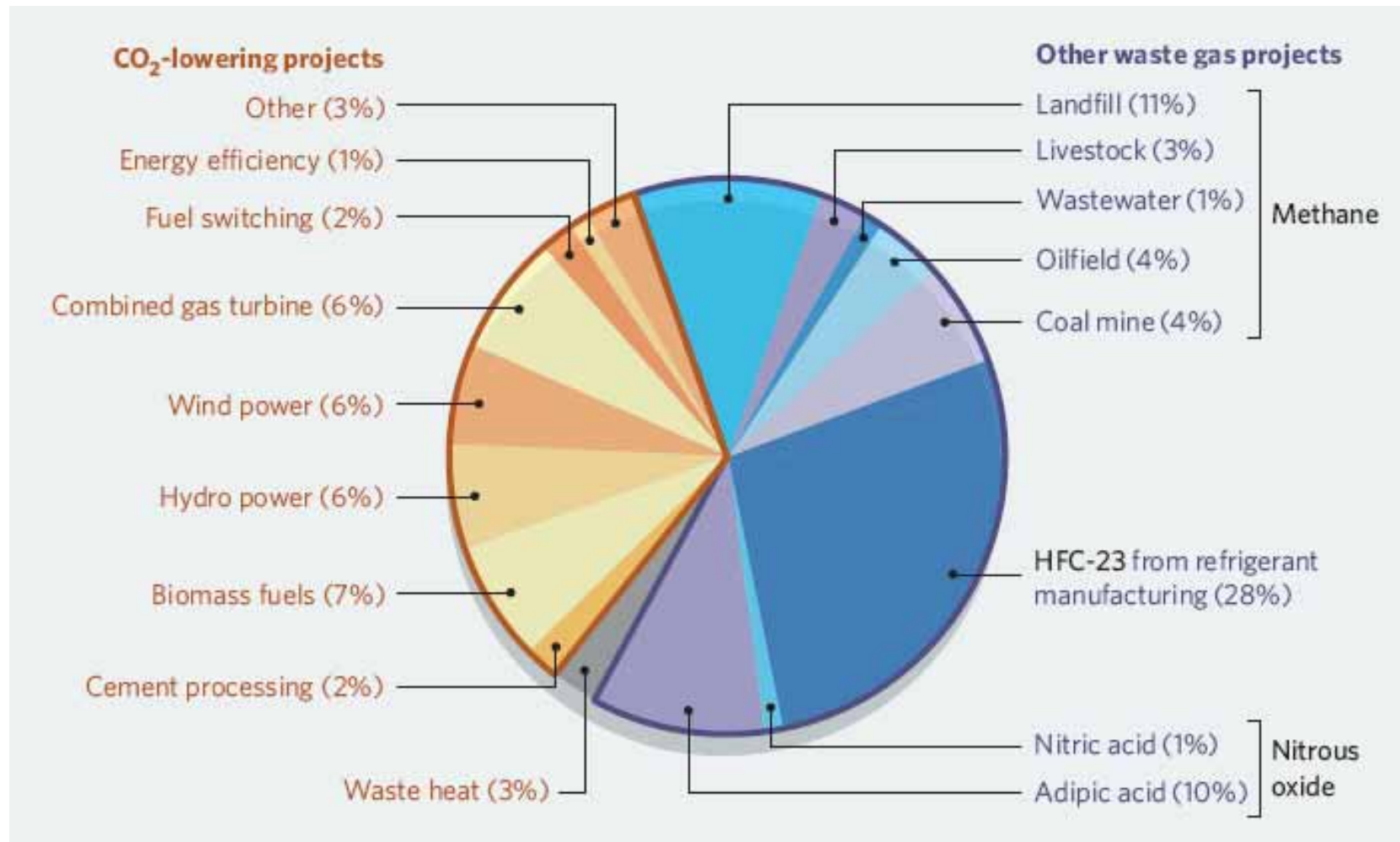
- ❑ **The 191 Parties to the Protocol agreed to speed up by ten years the phase-out of HCFCs**
- ❑ **Developed country Parties promised to continue paying into a technology fund to help developing country Parties meet their new phase-out obligations**
- ❑ **The agreement reduces greenhouse gas emissions by up to 25 billion tons of CO₂ equivalent —five times more than the Kyoto Protocol will do during its initial reduction period from 2008 to 2012.**

Lessons from the Montreal Protocol

- **Collaboration among industry, academia, NGOs and governmental institutions**
- **Development of save alternatives**
- **Availability of financial resources to assist developing countries**
- **Monitoring results and follow up of control measures**

EXISTING PROJECTS IN THE GLOBAL CARBON MARKET

Breakdown of 1,534 CDM projects



Source: Michael Wara – Nature, Vol 445, 8 February 2007



Reducing poverty
through sustainable industrial growth

40 YEARS OF SERVICE TO MANKIND



Policies for Promoting Industrial Energy Efficiency in Developing Countries and Transition Economies

Prepared by:

**Aimee McKane, Lynn Price, Stephane de la Rue du Can
Lawrence Berkeley National Laboratory**

INTERNATIONAL

DEVELOPING COUNTRY ANALYSIS AND DIALOGUE

**Greenhouse Gas Mitigation in
Brazil, China and India:
Scenarios and Opportunities through 2025**

CENTER FOR CLEAN AIR POLICY

November 2006



Written by:

Matthew Ogonowski

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Jin Lee

Ned Helme

**Center for Clean Air
Policy (CCAP)**

Proyecto de Asistencia sobre el Financiamiento de Carbono (Banco Mundial)

Sector petrolero:

- Se han identificado 60 proyectos, relacionados con la eficiencia energética y la reducción de fugas de metano. Destacan:
 - Cogeneración
 - Instalación de Sellos Secos en las compresoras de gas



Actions Needed To Address Climate Change

- **Pursue a new international agreement in the post-Kyoto period, putting a price on carbon emissions so marketplace can work to find cheapest reductions**
- **Increase investments in energy-technology research, development and demonstration**
- **Expand international cooperation on deploying advanced energy technologies**
- **Accelerate “win-win” measures**

AB 32: Global Warming Solutions Act

**As Passed by the California Legislature
on August 31, 2006**

- **AB 32 requires California's global warming emissions to be reduced to 1990 levels by 2020**
- **This reduction will be accomplished through an enforceable statewide cap on global warming emissions that will be phased in starting in 2012.**

Human Population Growth

