

# Carbon Trading

an overview of financial instruments  
designed to combat climate change



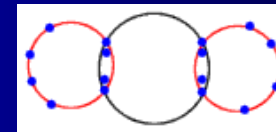
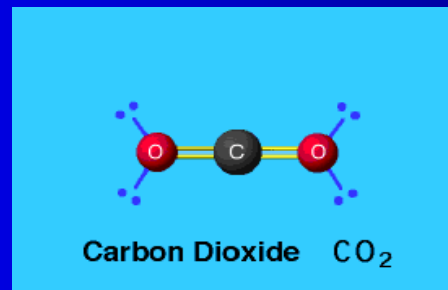
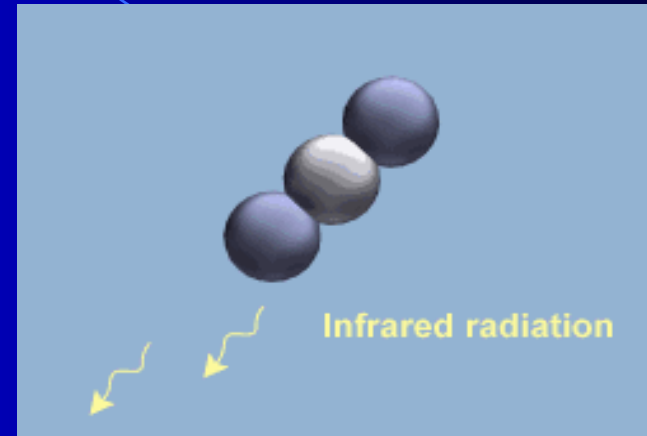
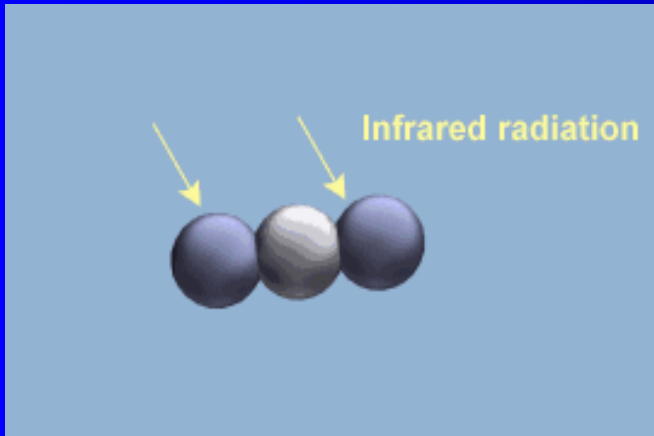
Image by: Stockli, Nelson, Heiler  
Laboratory for Atmospheres  
Goddard Space Flight Center  
<http://rsd.gsfc.nasa.gov/rsd>



Hurricane Linda west of Mexico  
September 9, 1997 17:45 UTC  
Data from: NASA, NOAA, USGS

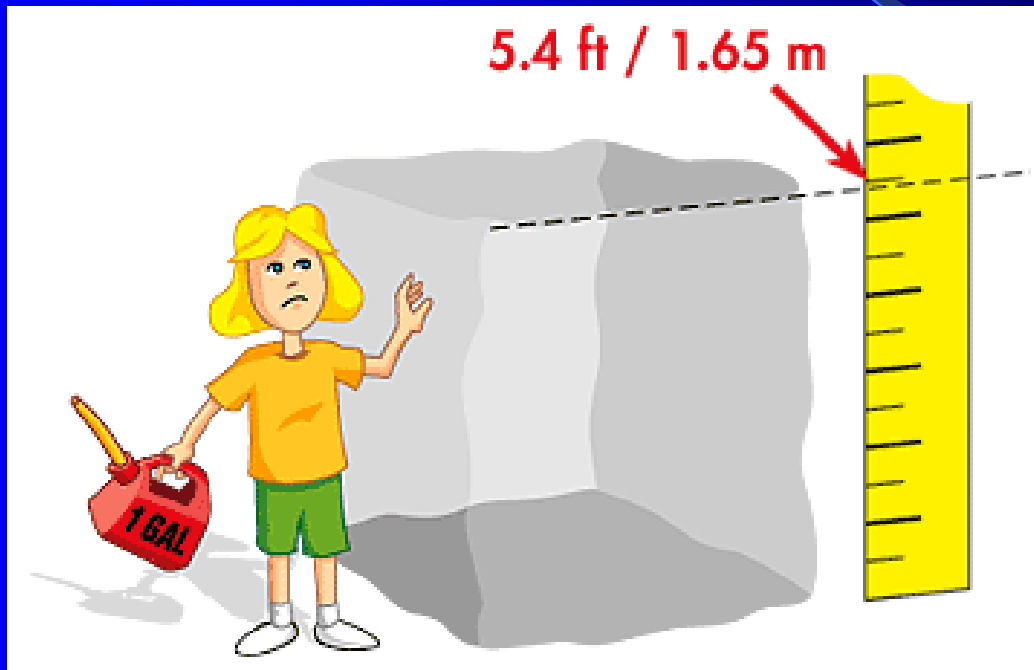


# Carbon Dioxide



Intercepts infrared waves going into space

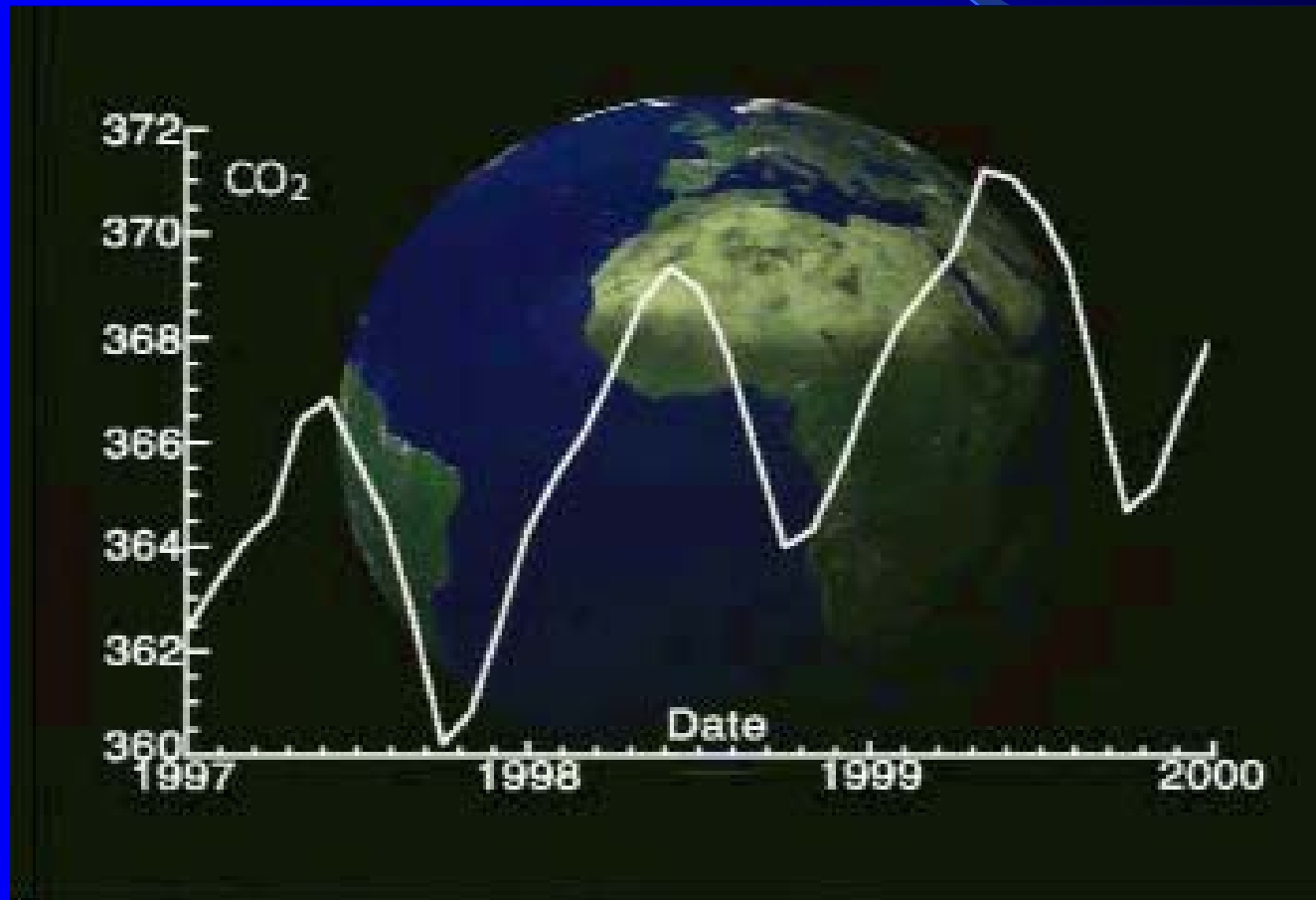
Gasoline is 85.5% carbon

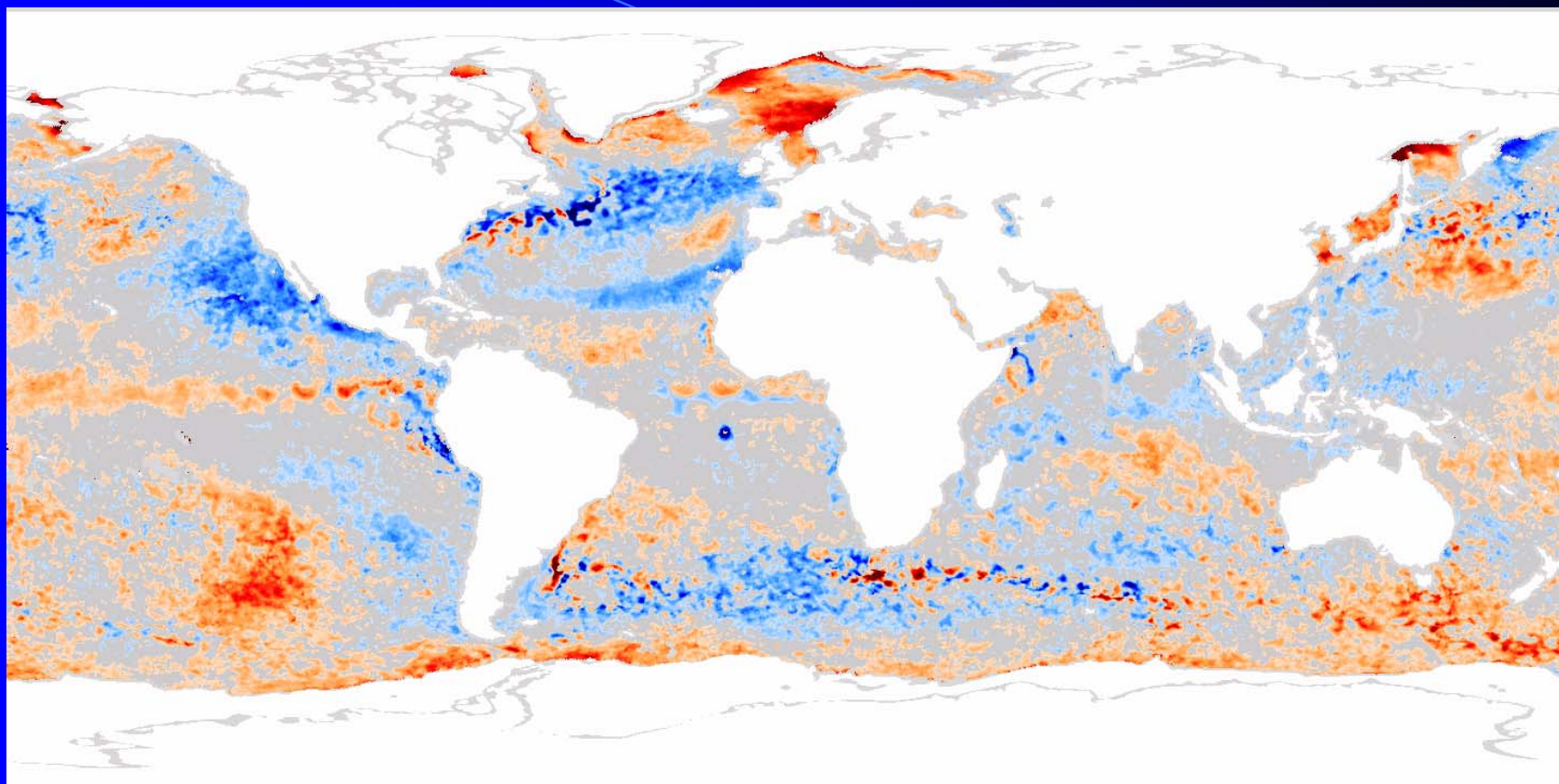


1 gallon of conventional gasoline becomes  
172 cubic feet / 4.87 cubic meters of CO<sub>2</sub>

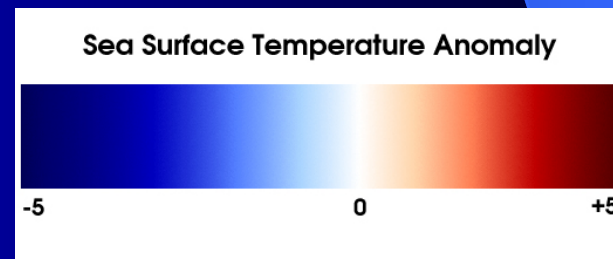


Humans add about 25 billion tonne  
carbon dioxide  
to the atmosphere each year

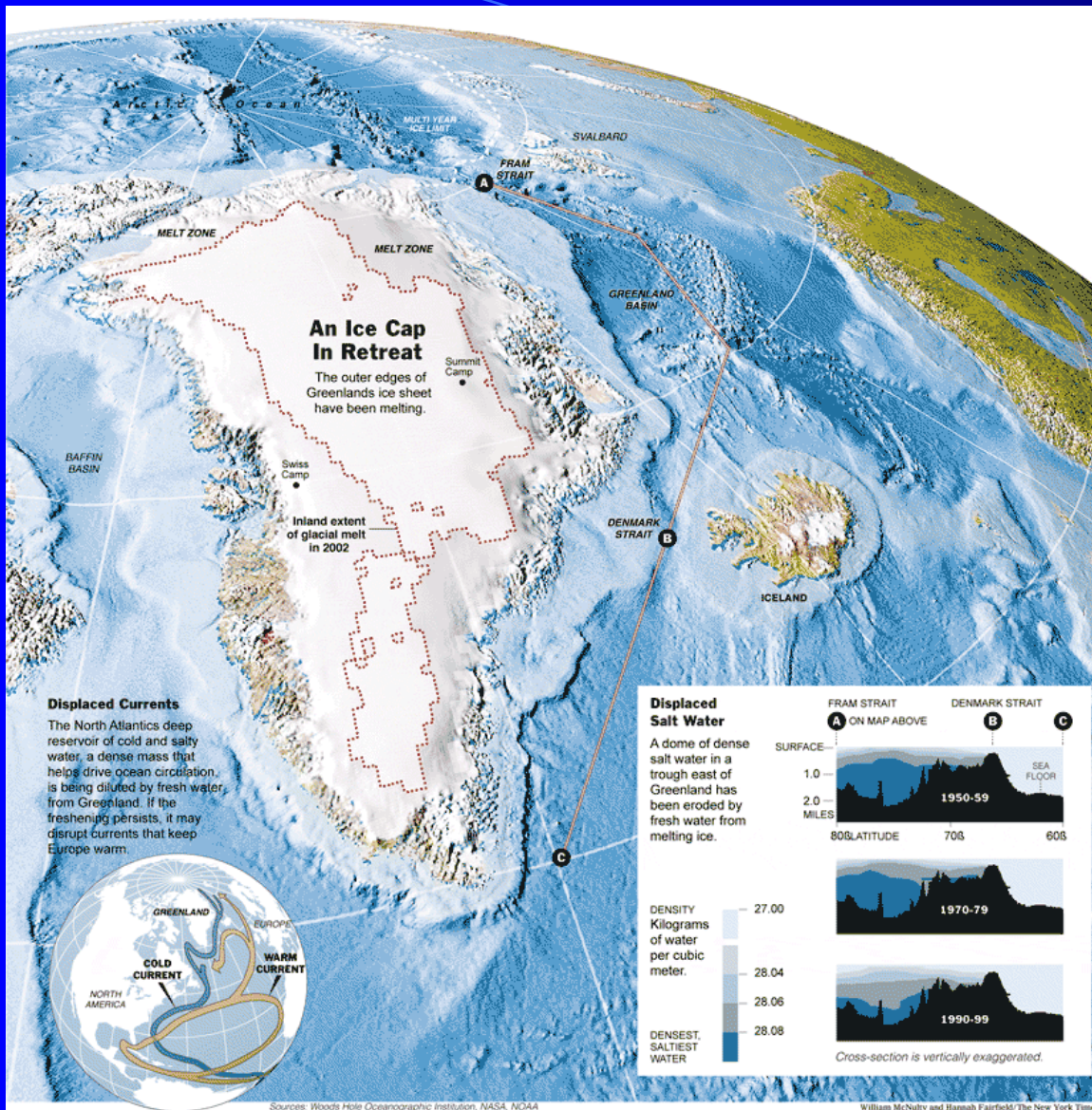




Sea Surface Temp Anomaly,  
Jun~Sep, 2003

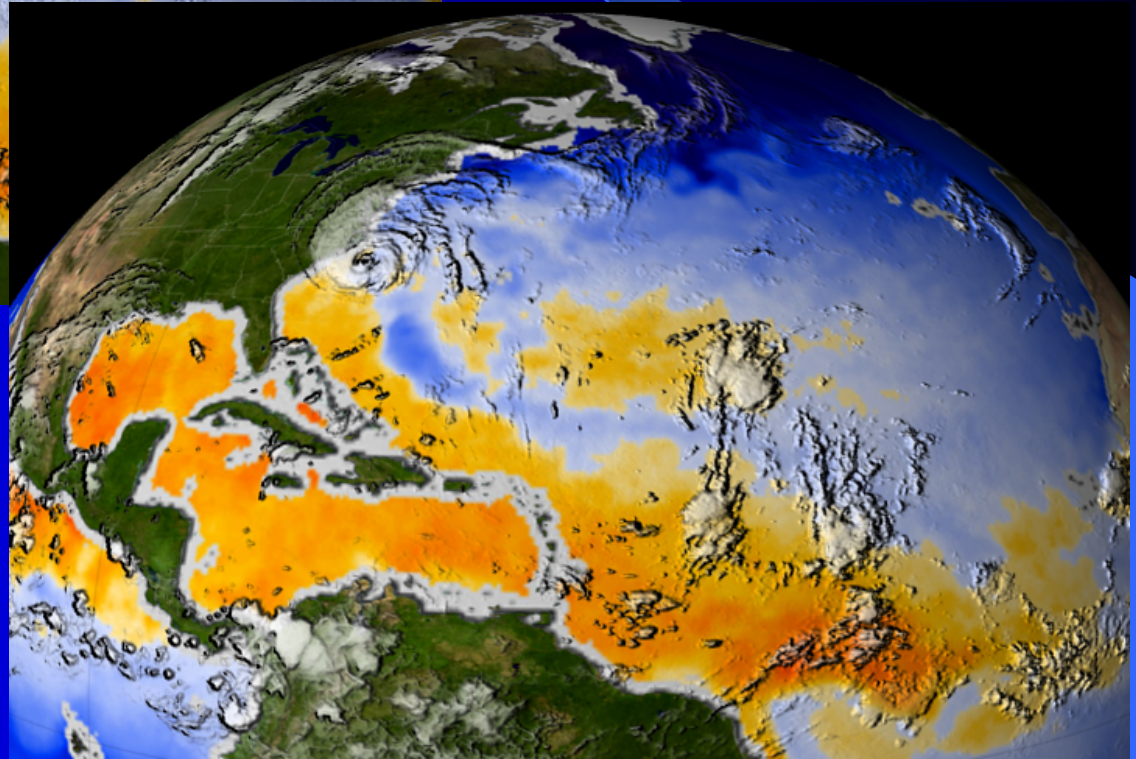
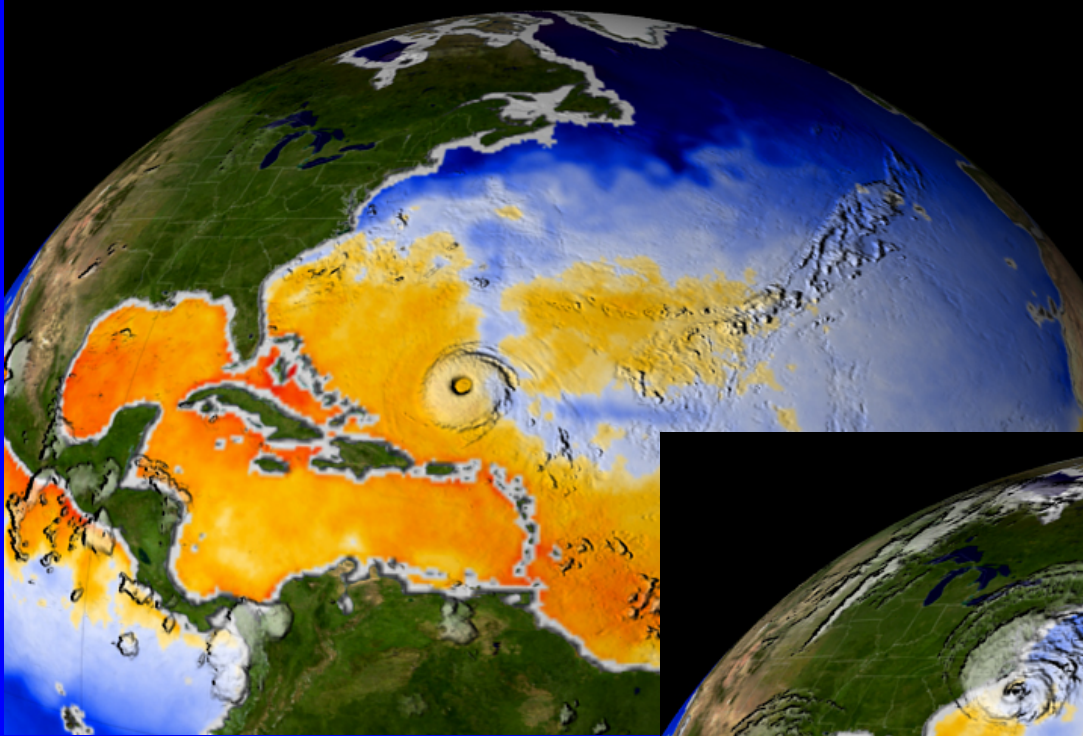


# Greenland is melting



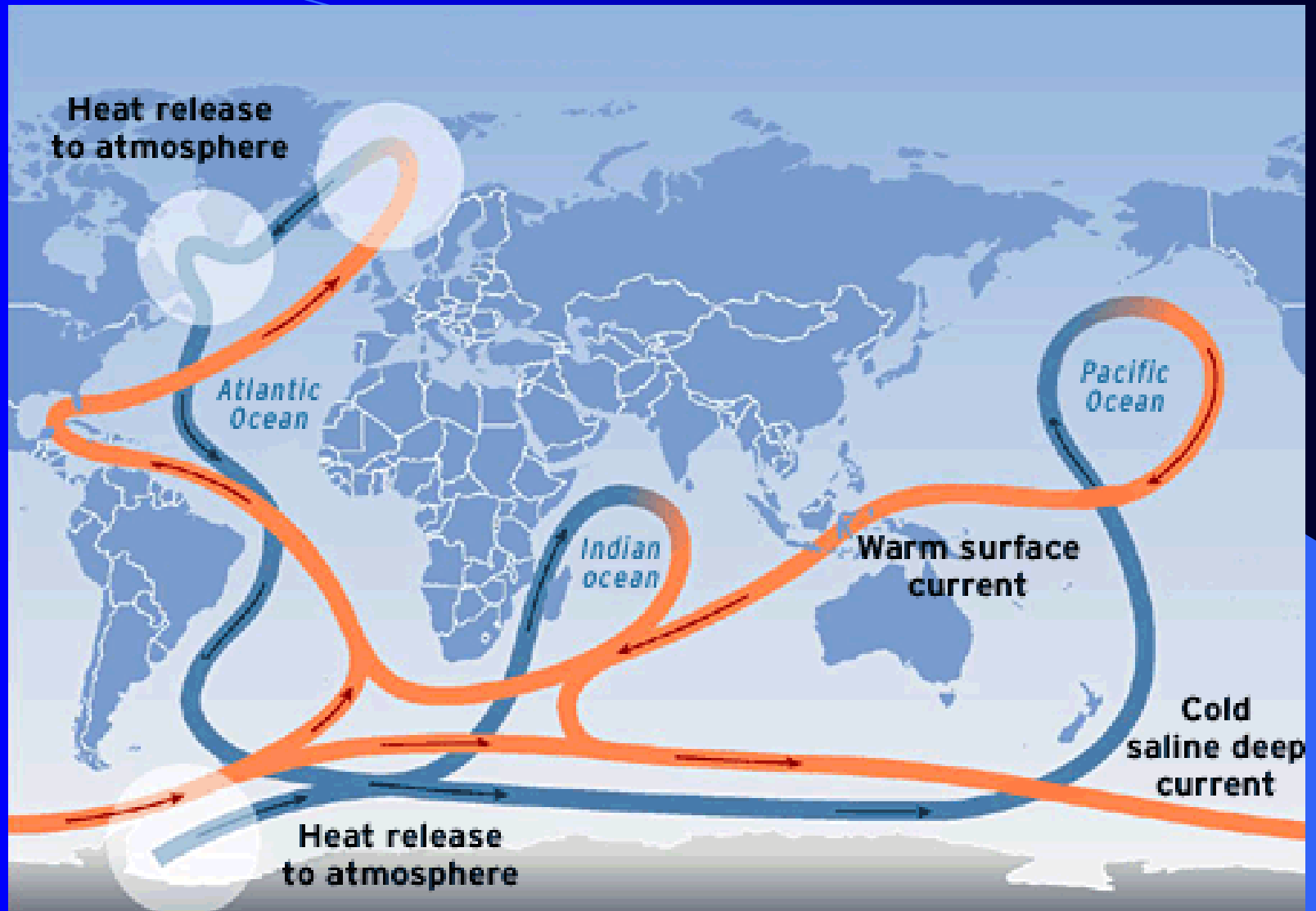
NY Times June 8, 2004





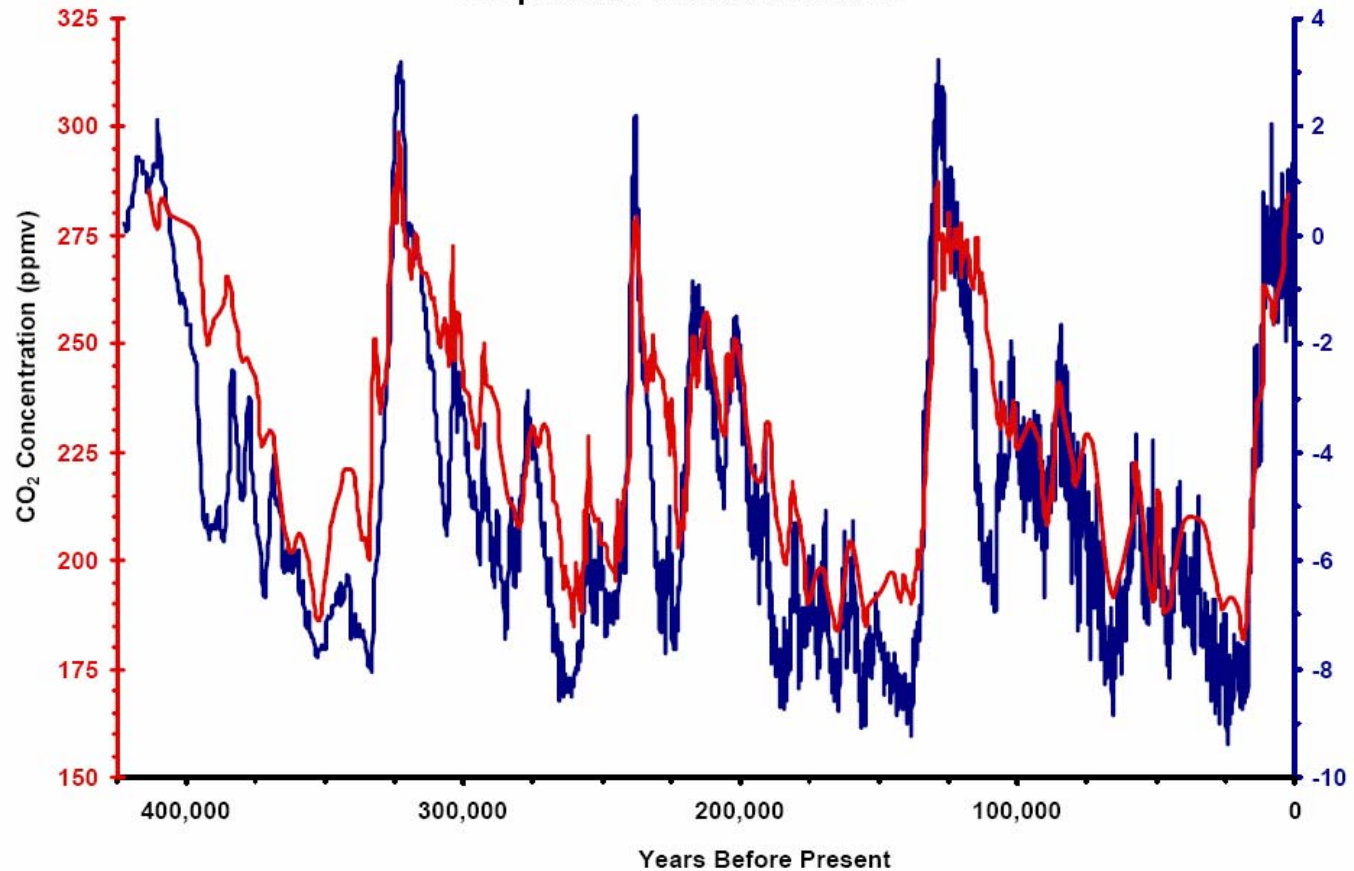
Fabian, Sep, 2003





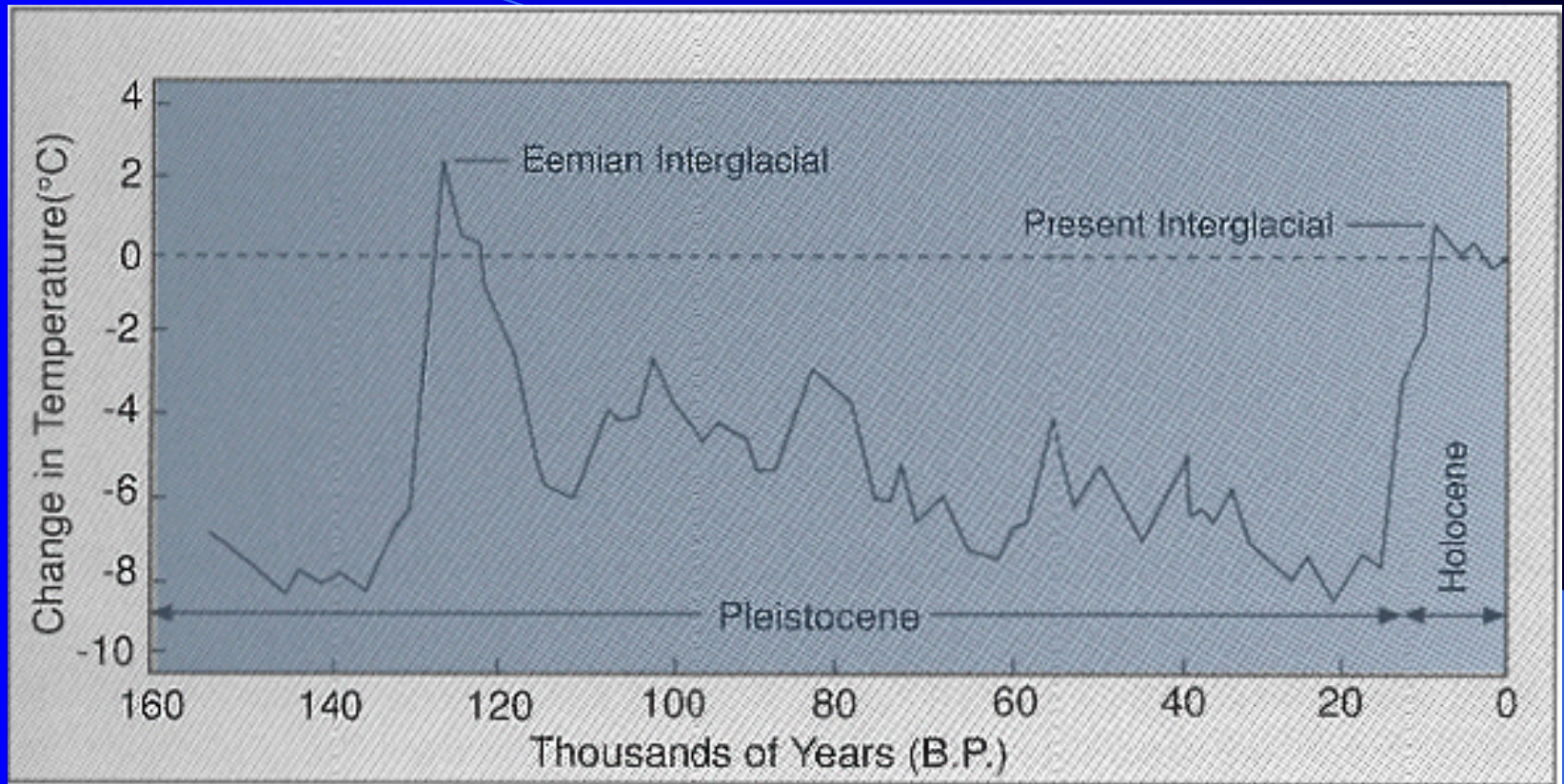
The oceans have absorbed about 30 times more heat than the atmosphere since 1955

### Vostok Ice Core CO<sub>2</sub> Concentration and Temperature Variation Record



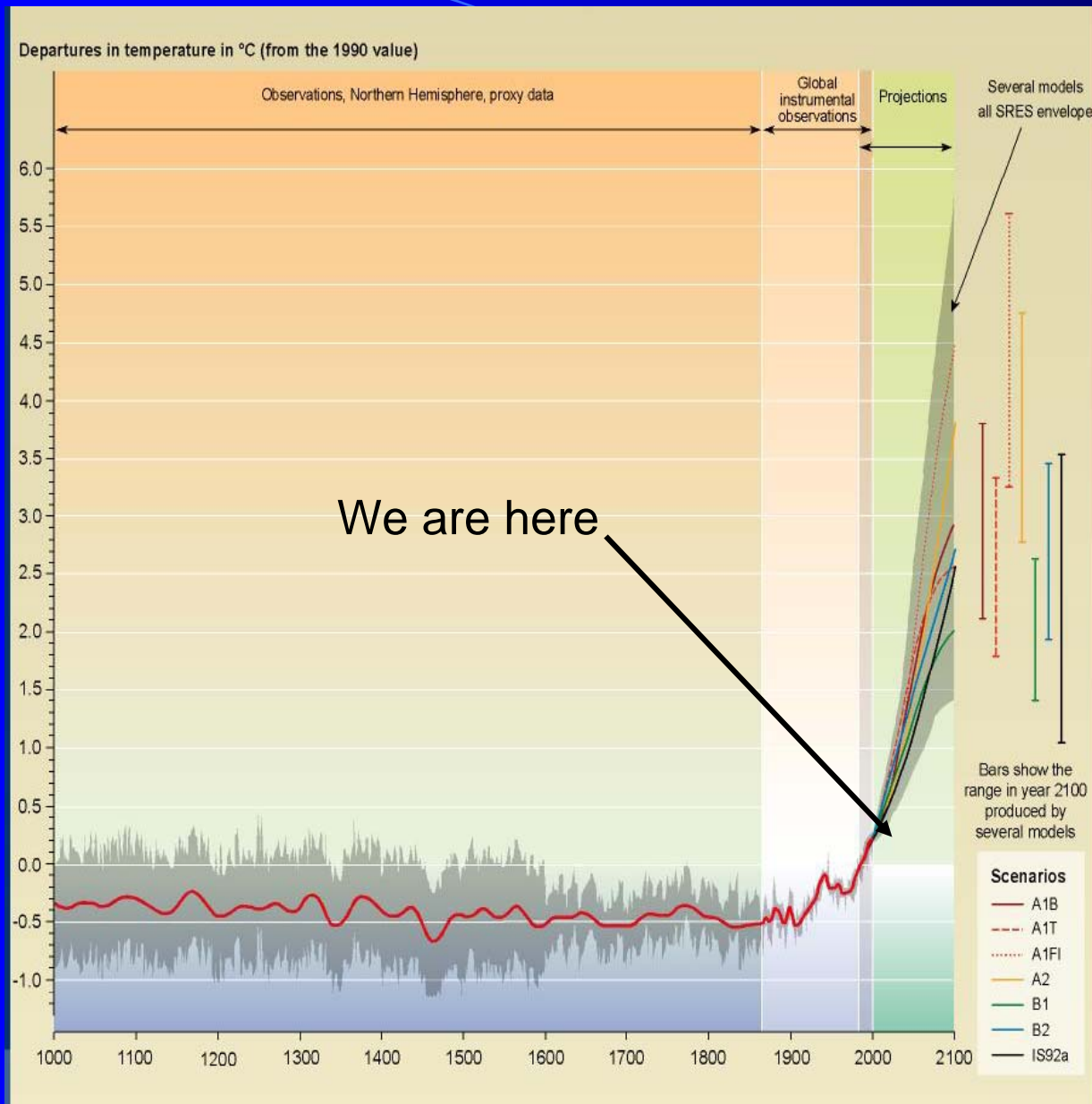
Source: Barnola, *et.al.*; Petit *et.al.* (PAGES / IGBP)

■ Climate Change Post-2100: What are the Implications of Continued Greenhouse Gas Buildup? ■

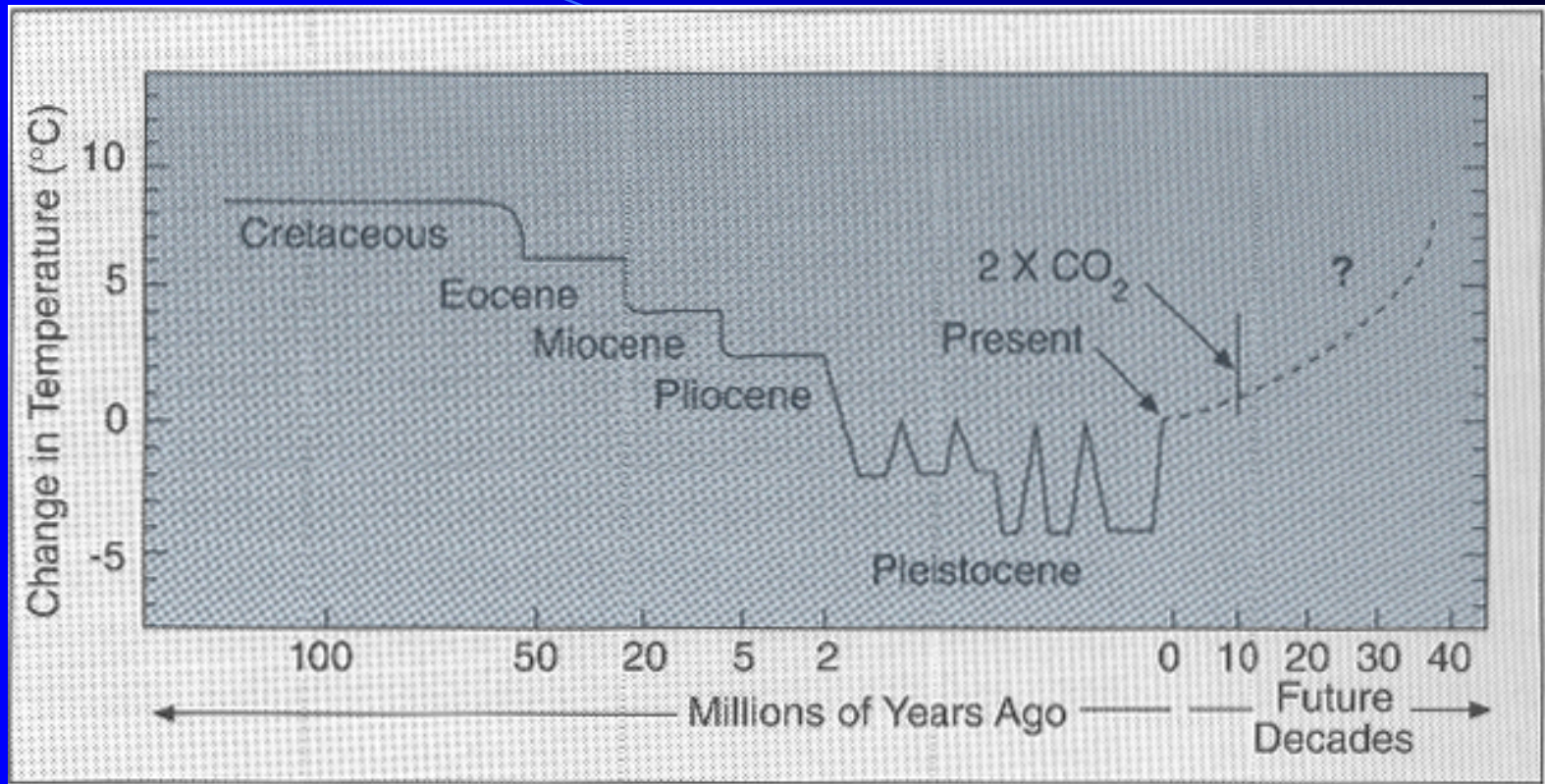


Man came out of his cave at the time earth entered the 'present interglacial' (Holocene) and flourished only after the 120,000 year winter was over.





Globally,  
temperatures  
are projected  
to rise an  
additional  
2 – 5°C in the  
21<sup>st</sup> Century



CO<sub>2</sub> is linked with geologic periods. In other words, if we travel to 4 x CO<sub>2</sub>, which some speculate we may later this century, we would travel across several geologic time zones.

# Yikes, Climate Change!

What to do?

- Nothing
- Adapt
- Engage



# Man invents the Kyoto Protocol!

The Kyoto Protocol (KP) sets legally binding emissions targets for a basket of six greenhouse gases (GHG) for Annex I countries<sup>2</sup>.

Together, they must reduce their emissions by 5.2% below 1990 levels over the commitment period 2008-2012.

The Protocol will become effective when it was ratified by 55 parties whose CO<sub>2</sub> emissions represent 55% of the total from Annex I Parties in the year 1990.

# Rich leads, poor follows

**Table 1: Regions<sup>9</sup>**

<b>Annex I countries and regions</b>	<b>Non-Annex I countries and regions</b>
USA: United States of America	EEX: Energy Exporting Countries
JPN: Japan	CHN: China
EEC: European Union (EC 15 members)	IND: India
OOE: Other OECD Countries	DAE: Dynamic Asian Economies
EET: Eastern Europe	BRA: Brazil
FSU: Former Soviet Union	ROW: Rest of the World

The Kyoto Protocol allows for project-based transactions in the form of Joint Implementation (JI) in Annex I countries, and for the Clean Development Mechanism (CDM) in non-Annex I countries. It also allows for direct emission trading between Annex I countries.

JI, CDM, IET

# IMCP Innovation Modelling Comparison Project

## - Complement to EMF

International Programme on the Economics of Atmospheric Stabilisation (IPEAS)

“To help international discourse on the economics of climate change to become more realistic and more useful to decision-makers, by embodying the central features of innovation, investment, inertia and learning under uncertainty concerning both mitigation and impacts.”

*Overseen by Steering Committee of leading European researchers*

Innovation modeling comparison project (IMCP)

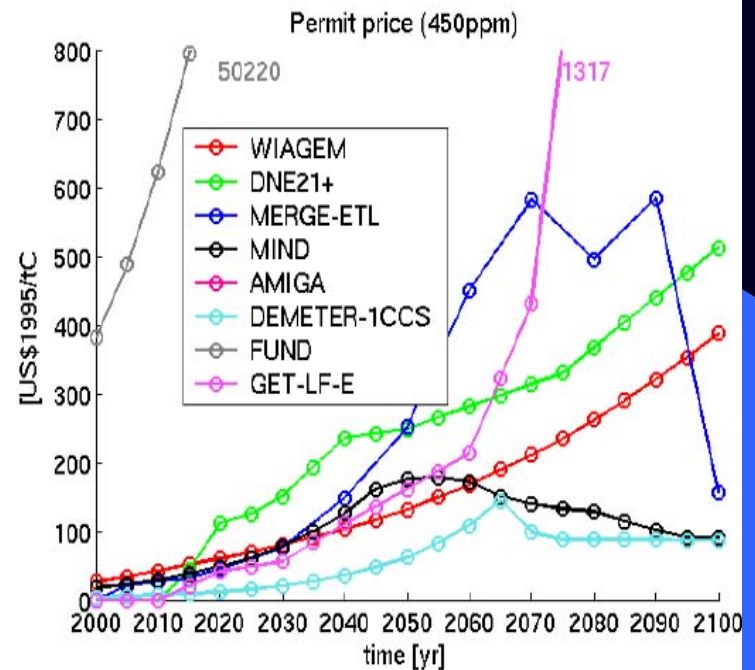
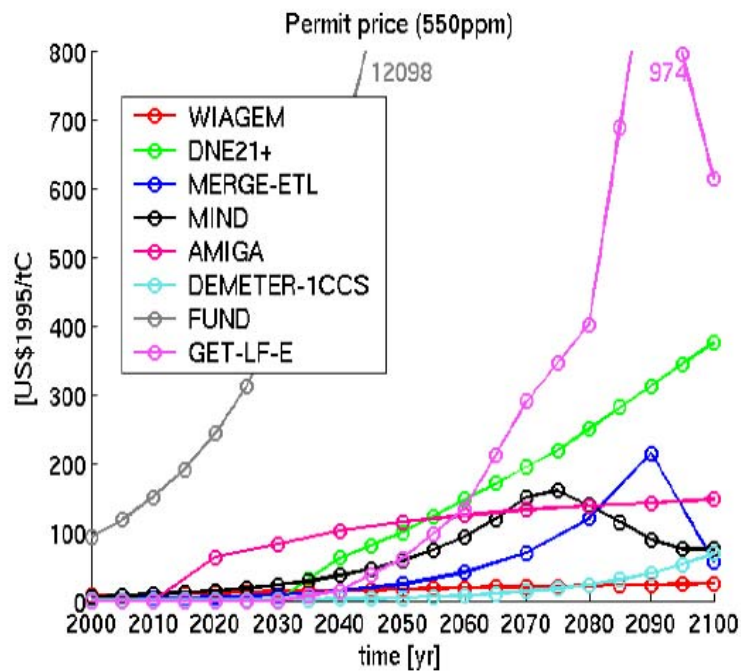
Explore insights from different innovation modeling approaches into implications of different stabilisation levels, with particular reference to: investment trajectories; mix of policy instruments; international technology spillovers; implications of uncertainty.

*Coordinated jointly between PIK/DIW and Cambridge Econ / Tyndall*

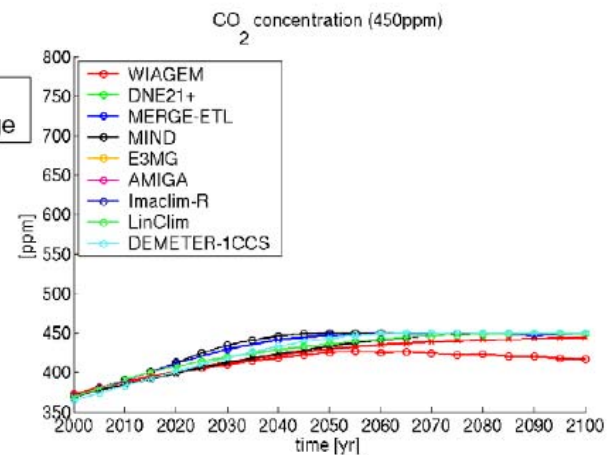
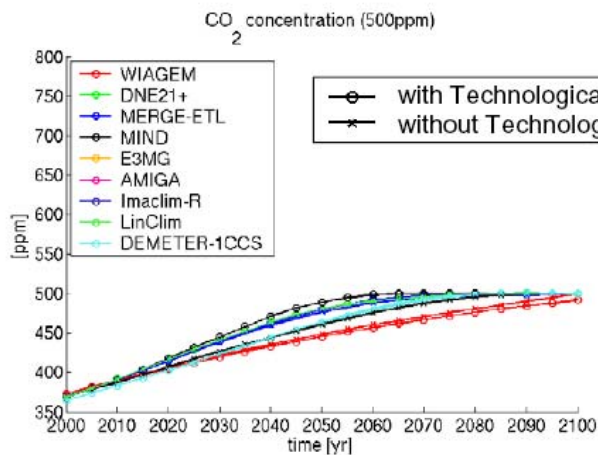
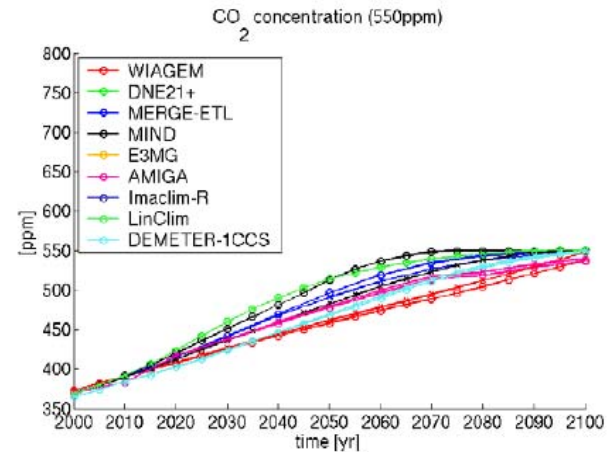
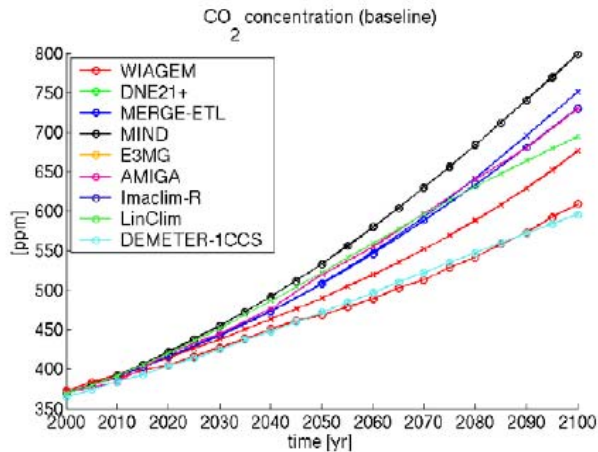


# Permit Prices

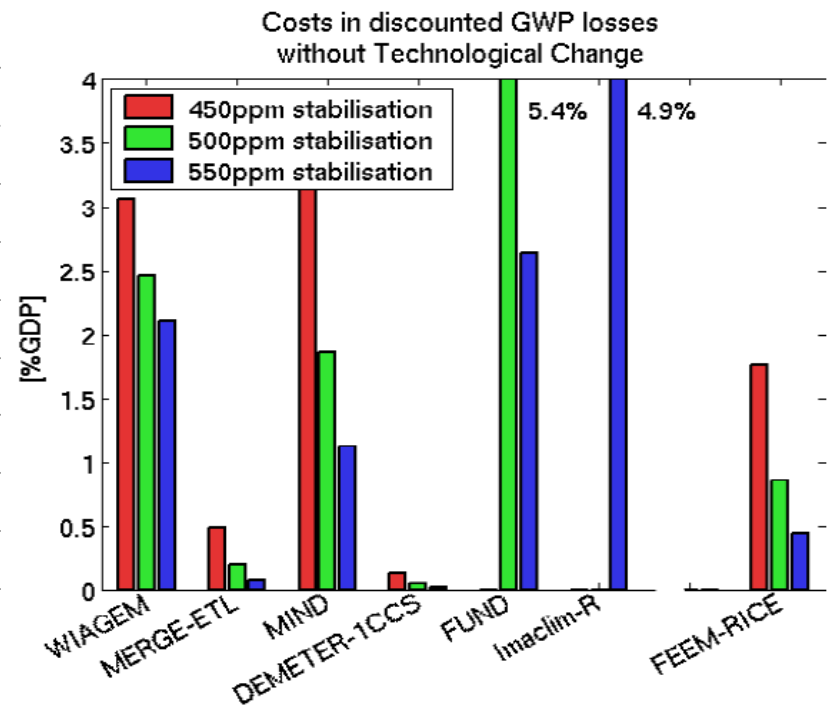
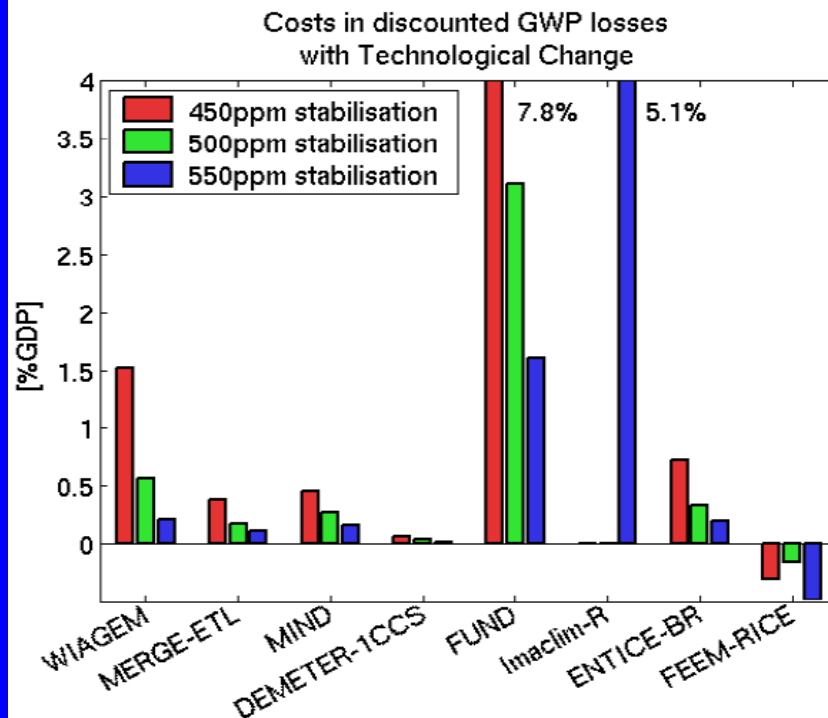
with technological change



# CO<sub>2</sub> concentrations

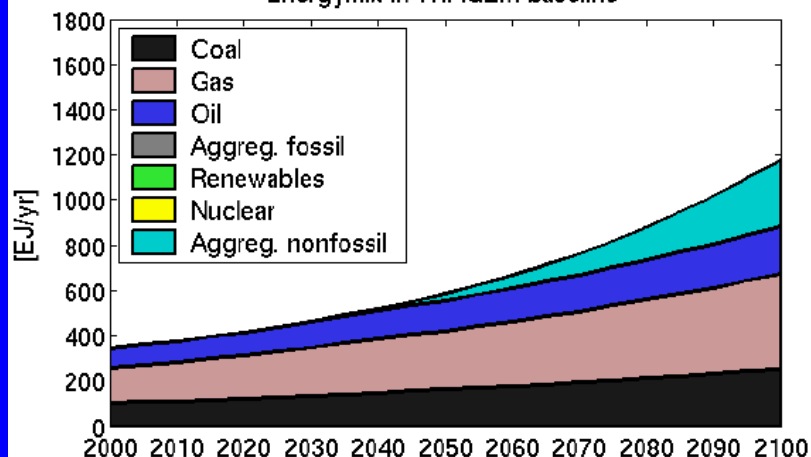


# Macro-economic costs

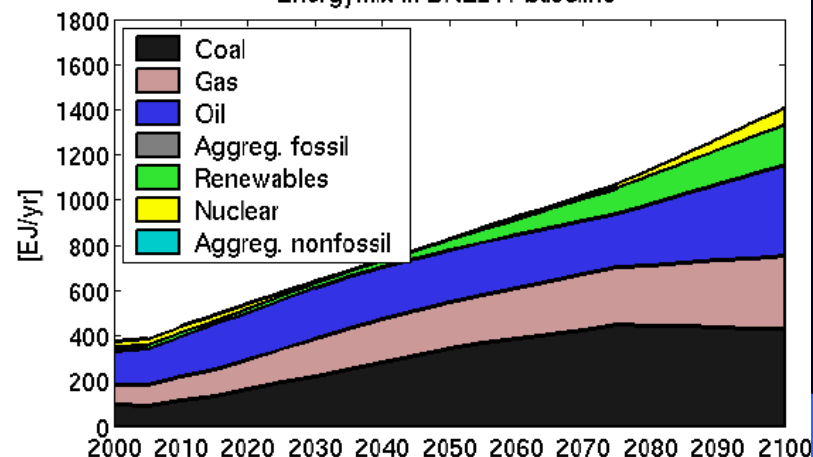


# Transformation of the energy system

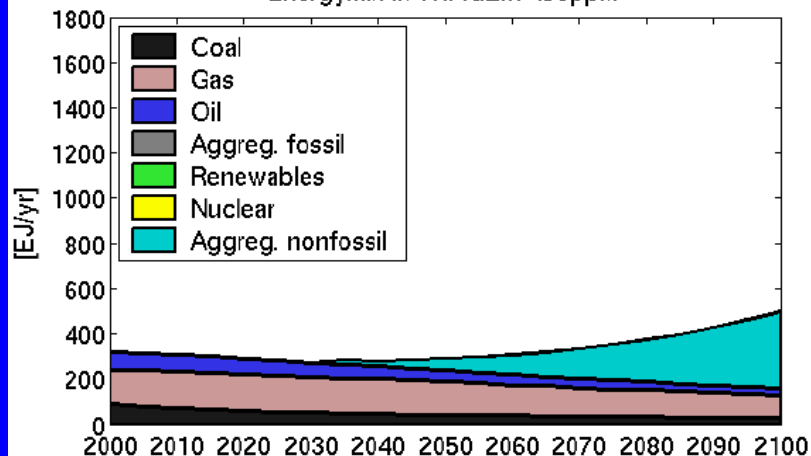
Energymix in WIAGEM baseline



Energymix in DNE21+ baseline



Energymix in WIAGEM 450ppm



Energymix in DNE21+ 450ppm

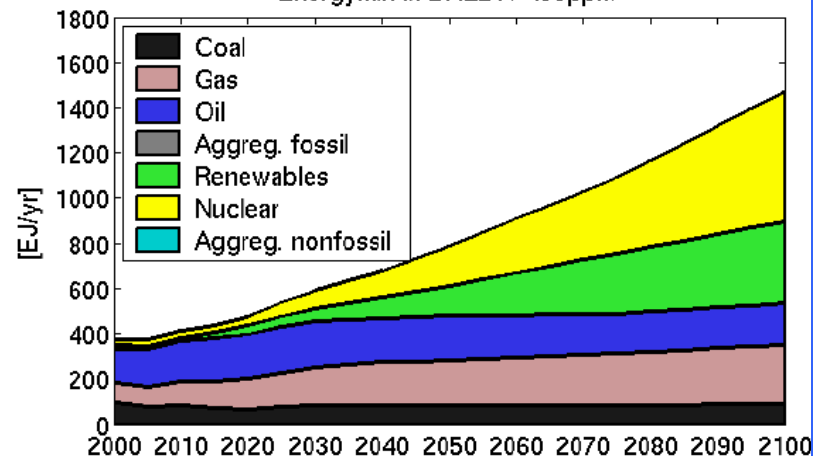




Table 4.3 Key information on approved JI projects

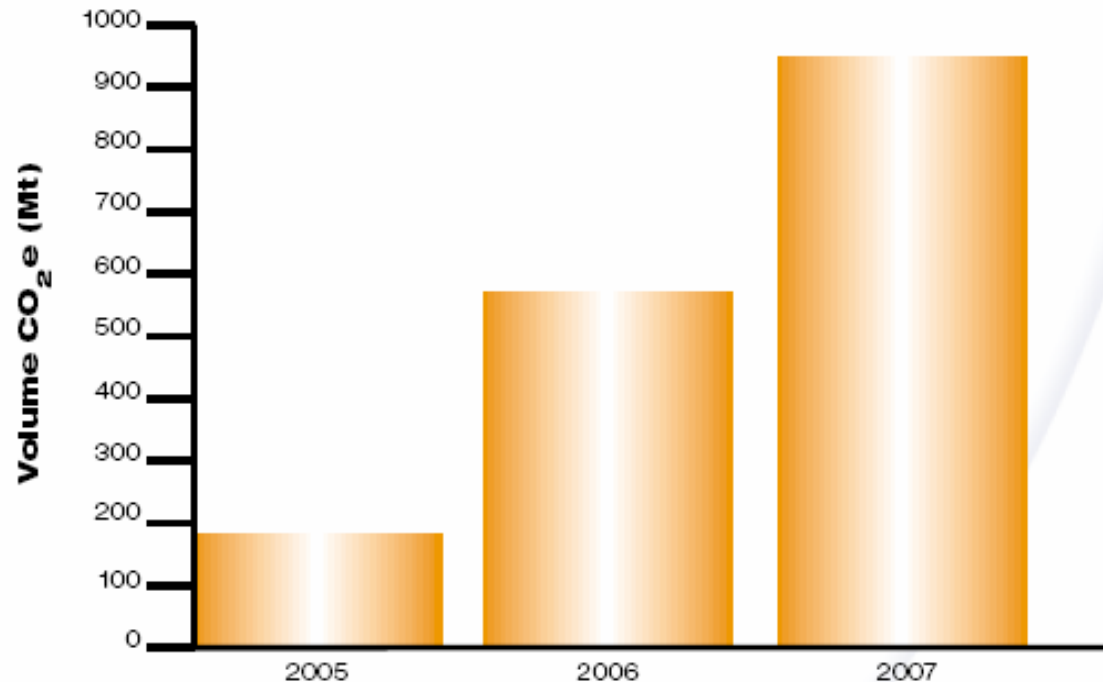
Host Country	Program	Project Type	Project Description	Greenhouse gas reduction [tCO <sub>2</sub> -eq]
Czech Republic	ERUPT	Biomass portfolio	28 biomass projects.	1.200.000
Hungary	ERUPT	Biomass	90 MW fuel switch coal to biomass.	710.000
Latvia	PCF	waste management	Methane capture.	368.101
Poland	PCF	Geothermal	Replace coal for district heating.	364.553
Poland	PCF	Biomass	Use of biomass waste.	190.630
Poland	ERUPT	Wind energy	60MW new capacity.	583.500
Romania	PCF	Afforestation	6.728 ha of public land.	1.018.000
Romania	ERUPT	Hydro	55MW.	612.631
Romania	ERUPT	Co-generation	26 MWe CHP.	1.536.140
Romania	ERUPT	Energy efficiency	Table 4.2 Key information on approved CDM projects	
Romania	ERUPT	Hydro		
Slovakia	ERUPT	Waste management		
Total				

Table 4.2 Key information on approved CDM projects

Country	Program	Type	Description	Greenhouse gas reduction [tCO <sub>2</sub> -eq]
Bolivia*	CERUPT	Energy efficiency	Efficient gas plant.	319.392
Brazil	PCF	Sinks & fuel switch	Charcoal from mono-culture plantation used in stead of coal.	12.041.356
Brazil*	CERUPT	Biomass	Retrofit CHP bagasse sugar mill; 15 MW.	259.506
Brazil*	CERUPT	Gas capture	Landfill gas recovery.	700.000
Brazil	NCDF, Japan	Fuel switch	Charcoal based steel production.	21.000.000
Brazil	NCDF	Gas capture	Combustion and flaring credits.	11.800.000
Brazil	VEGA	Gas capture	8MW power from landfill gas.	5.208.344
Chile	PCF	Hydro	26 MW run-of-river.	2.812.000
China*	CERUPT	Wind energy	30.6 MW new capacity.	600.248
Colombia	PCF	Wind energy	19.5 MW new capacity.	1.168.000
Costa Rica	PCF	Wind energy	9.6 MW new capacity.	327.000
Costa Rica	PCF	Wind energy	8.4 MW new capacity.	300.000
Costa Rica	PCF	Wind energy	25 MW new capacity.	204.000
Costa Rica	CERUPT	Hydro	7.5 MW new capacity.	184.360

## The EU Allowances Market - Estimations concerning volume

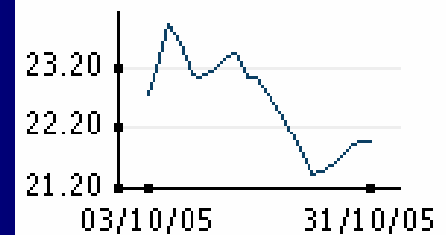
Source: PointCarbon



31 October 2005

EUA 2005 (€/tCO<sub>2</sub>)

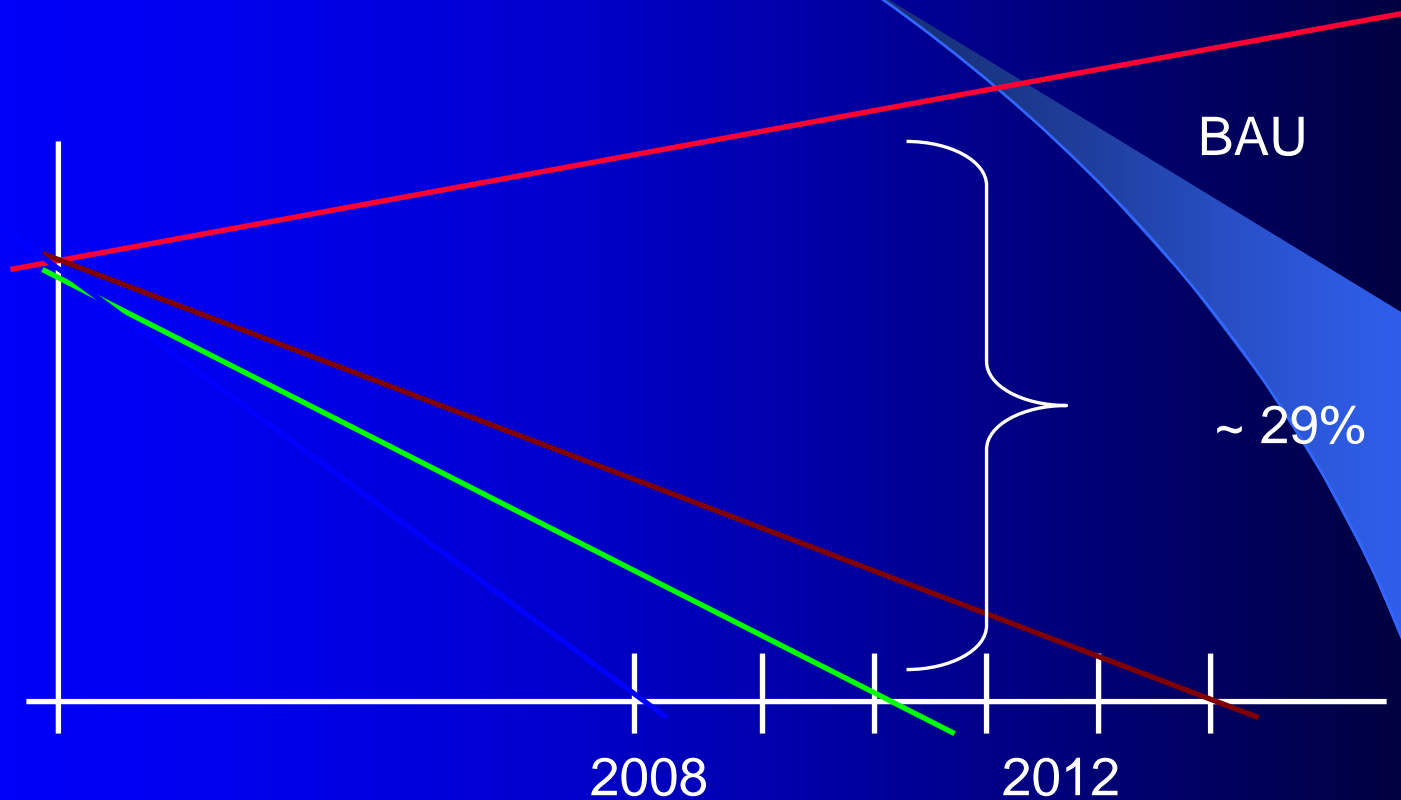
€21.95 ▼0.03



EUA = European Allowances

Traded on multiple exchanges, various styles; spot, forwards, swaps..

# Result: Glide Trajectory





Kingdom of Morocco



Ministry of Land-Use Management, Water and the Environment

The First Carbon Exhibition  
in North Africa and Middle East Region  
Djerba, 22-24 September 2004

# Moroccan CDM projects

## *Energy Efficiency projects*

faouzi senhaji

**GERERE**

[f.senhaji@iav.ac.ma](mailto:f.senhaji@iav.ac.ma)



CD4CDM Project





# ONE-Street lighting project

## *Project description*

- **Technical features :**
  - Installed capacity : 3 MW (15,000 x 200 W)
  - Expected saving : 3 GWh / yr (200 W bulbs to replace 250 W bulbs)
  - Components : 15,000 LCB of 200 W & PM
- **Financial issues :**
  - Total cost of the project : US \$ 0.5 million  
(Cost per bulb: US \$ 27.3)
  - **Timing :**
    - Starting date : 2005
    - Crediting period : 2006-2015



# ONE-Street lighting project

## *Baseline methodology*

- **Methodology :**

Described in paragraph 49 of Appendix B of the simplified M&P.

- **Approach :**

Displacing Electricity : BAU emissions – project emissions

Emissions: Number of devices \* power of device \* average annual operating hours \* emission coefficient (as for 1.D.) / grid loss

- **Calculations :**

- Over the crediting period, the expected CER are about 150,000

# ONE-Street lighting project

## *Sustainable development*

- **Environmental benefits :**
  - GHG emission reduction
- **Socio-economic benefits :**
  - Fossil fuel used in power generation reduced
  - Promotion of socio-economic activities

**For more informations :**



**Permanent Secretariat of CDM National Council**

**Climate Change Unit**

**Directorate of Partnership, Communication and Cooperation**

**Ministry of Land-Use Management, Water and the Environment**

**36 Avenue Al Abtal –Rabat –Morocco**

**Tel/Fax : +212 37 68 17 59**

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## Project 0032 : Methane capture and combustion from swine manure treatment for Peralillo

<b>Project title</b>	<p>Methane capture and combustion from swine manure treatment for Peralillo</p> <ul style="list-style-type: none"> <li> <a href="#">project design document</a> (643 KB)</li> <li> <a href="#">registration request form</a> (166 KB)</li> </ul>
<b>Host Parties</b>	<p><b>Chile</b>  <a href="#">approval</a> (371 KB)  <a href="#">authorization</a> (371 KB)</p> <p>Authorized Participants: Agrícola Super Limitada</p>
<b>Other Parties Involved</b>	<p><b>Japan</b>  <a href="#">approval</a> (250 KB)  <a href="#">authorization</a> (250 KB)</p> <p>Authorized Participants: The Tokyo Electric Power Company, Incorporated</p> <hr/> <p><b>Canada</b>  <a href="#">approval</a> (167 KB)  <a href="#">authorization</a> (167 KB)</p> <p>Authorized Participants: TransAlta Corporation</p>
<b>Activity Sector</b>	Waste handling and disposal / Agriculture
<b>Activity Scale</b>	LARGE
<b>Methodologies Used</b>	<a href="#">AM0006</a> - GHG emission reductions from manure management systems
<b>Amount of Reductions</b>	78 867 metric tonnes CO2 equivalent per annum
<b>Fee level</b>	USD 15000
<b>Validation Report</b>	<p> <a href="#">Explanation of taking due account of comments</a> (69 KB)</p> <p> <a href="#">List of documents</a> (88 KB)</p> <p> <a href="#">List of interviewed persons</a> (69 KB)</p> <p> <a href="#">Modalities of communication</a> (340 KB)</p> <hr/> <p><b>Other documents</b> (descriptions provided by the DOE)</p> <p> <a href="#">Validation Report and Protocol</a> (1342 KB)</p> <hr/> <p><b>Public availability information</b></p> <p>The validation report will be published on the CDM website with the request for registration.</p> <p> <a href="#">Compilation of all comments received</a> (69 KB)</p>
<b>Requests for Issuance and related documentation</b>	

*The atmosphere now holds 30% more carbon than a century ago.*

Human  
emission rate  
in billion  
tC/yr

Earth  
absorption rate  
in billion  
tC/yr

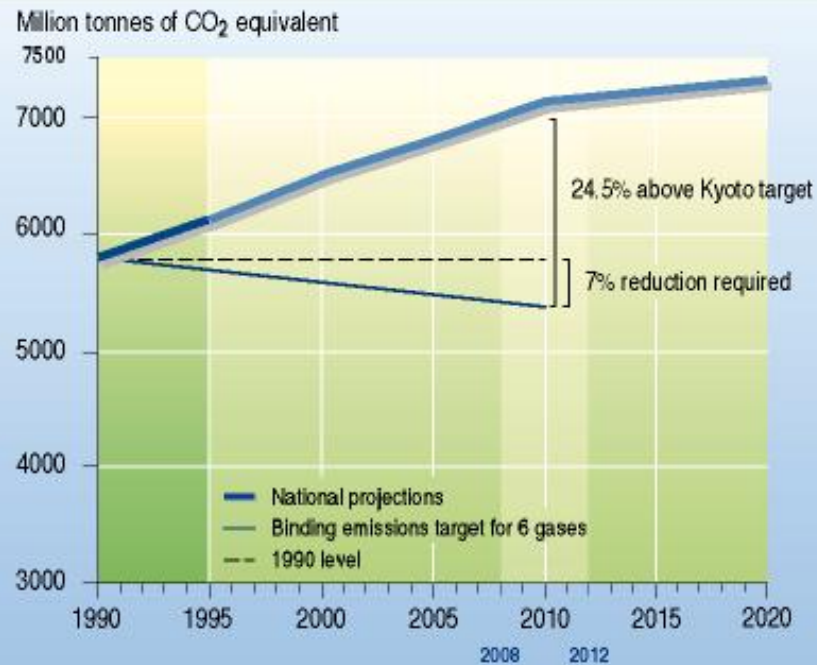


Latent atmospheric Carbon is  
about 188 billion ton



# U.S. commitment under Kyoto

**Emissions of greenhouse gases in the United States**  
(CO<sub>2</sub>, CH<sub>4</sub>, N<sub>2</sub>O, SF<sub>6</sub>, HFC's and PFC's)



**The United States must introduce additional measures to reduce greenhouse gas emissions by 24.5% to fulfill the Kyoto Protocol between 2008 and 2012.**

*Source:* Second national communications to UNFCCC, 1998.

-Nice meeting all of you!

this presentation can be downloaded from:

[www.icbe.com/about/uf/lectures/index.htm](http://www.icbe.com/about/uf/lectures/index.htm)

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**Toward Climate Stability™**

