

Carbon Trading

**an overview of financial instruments
designed to combat climate change**

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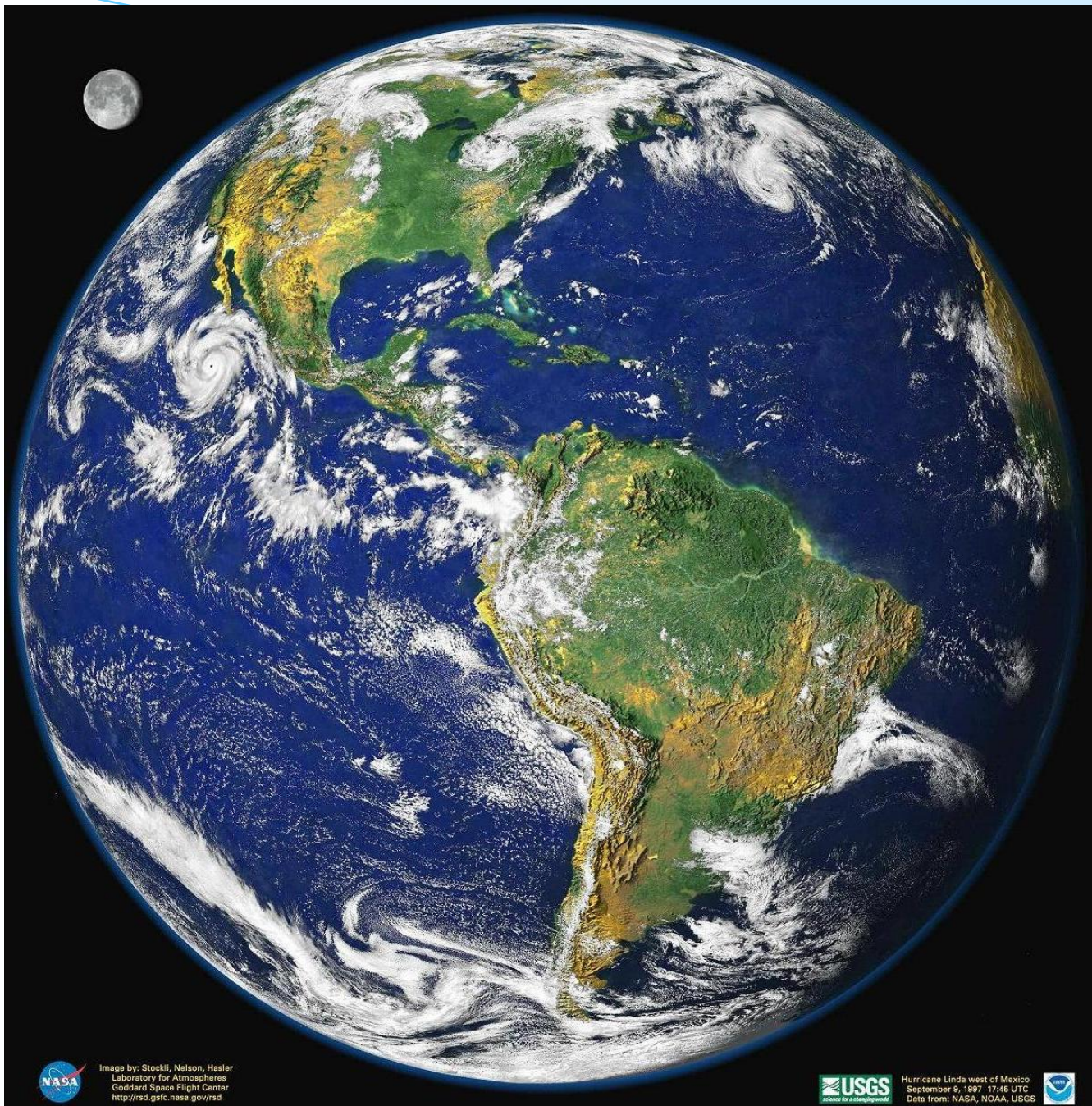


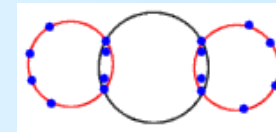
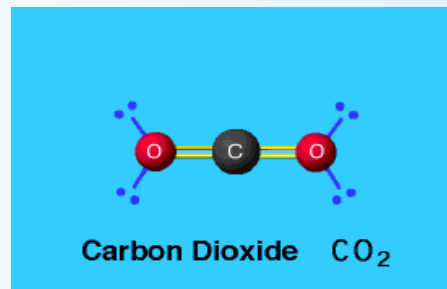
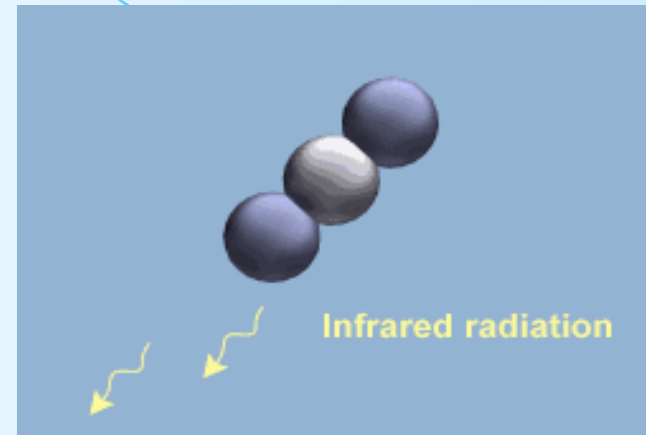
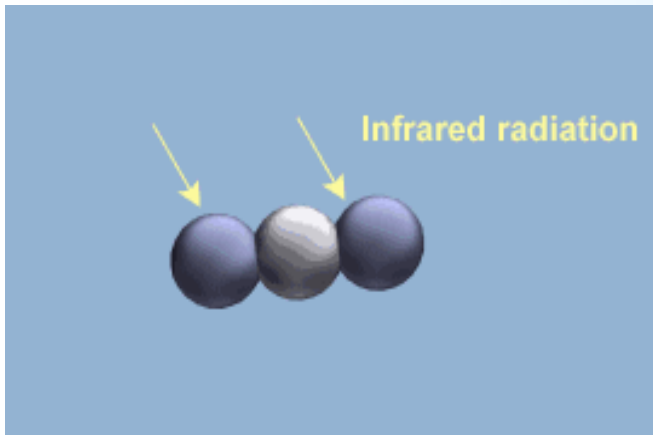
Image by: Stockli, Nelson, Heiler
Laboratory for Atmospheres
Goddard Space Flight Center
<http://rad.gsfc.nasa.gov/rad>



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

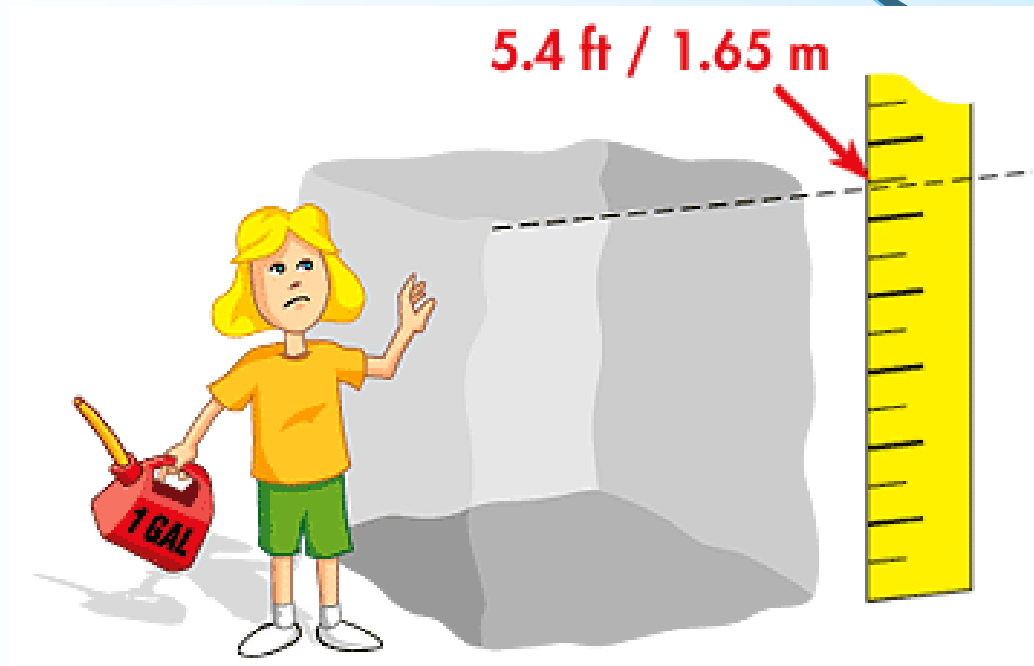


Carbon Dioxide



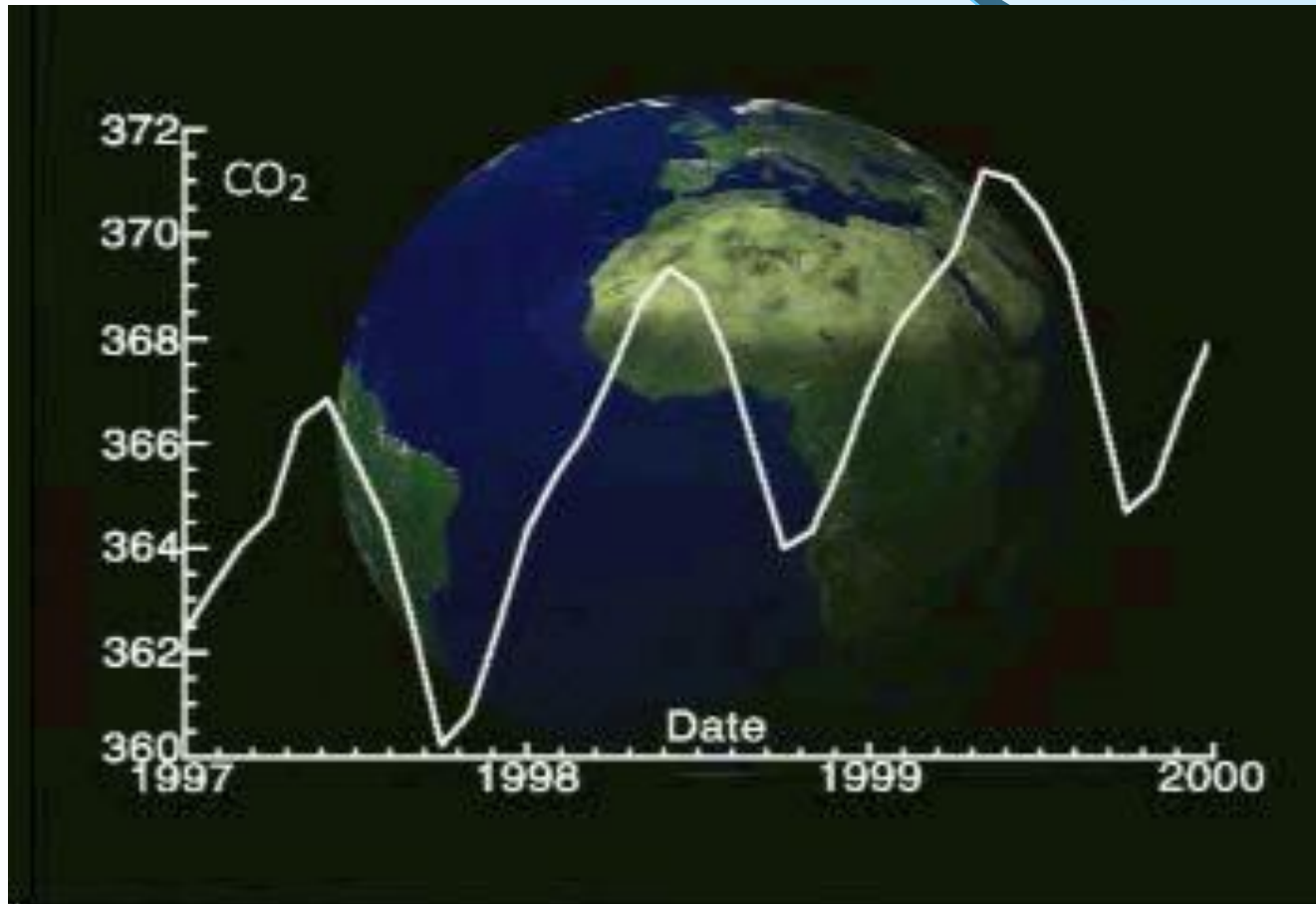
Intercepts infrared waves going into space

Gasoline is 85.5% carbon

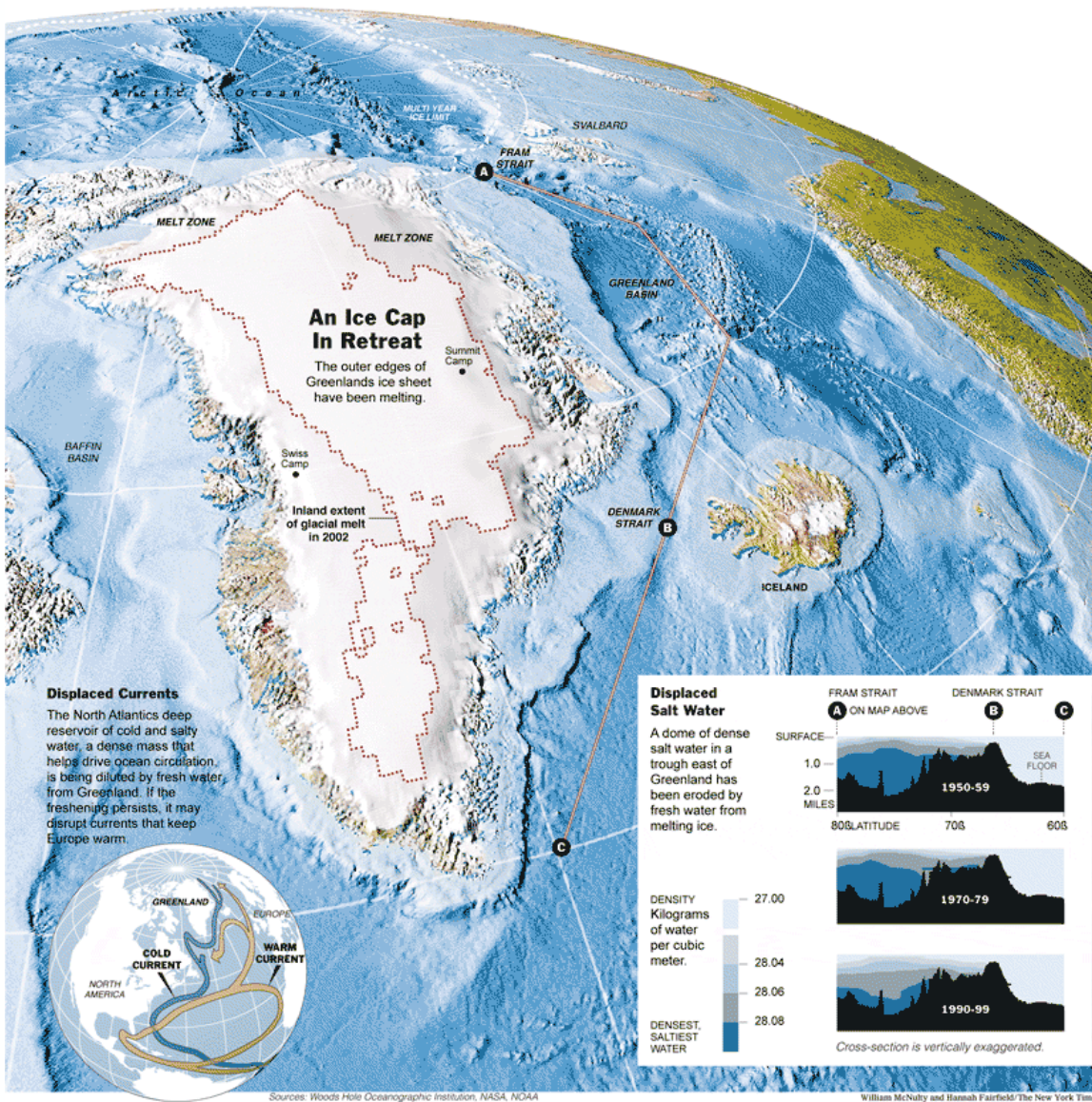


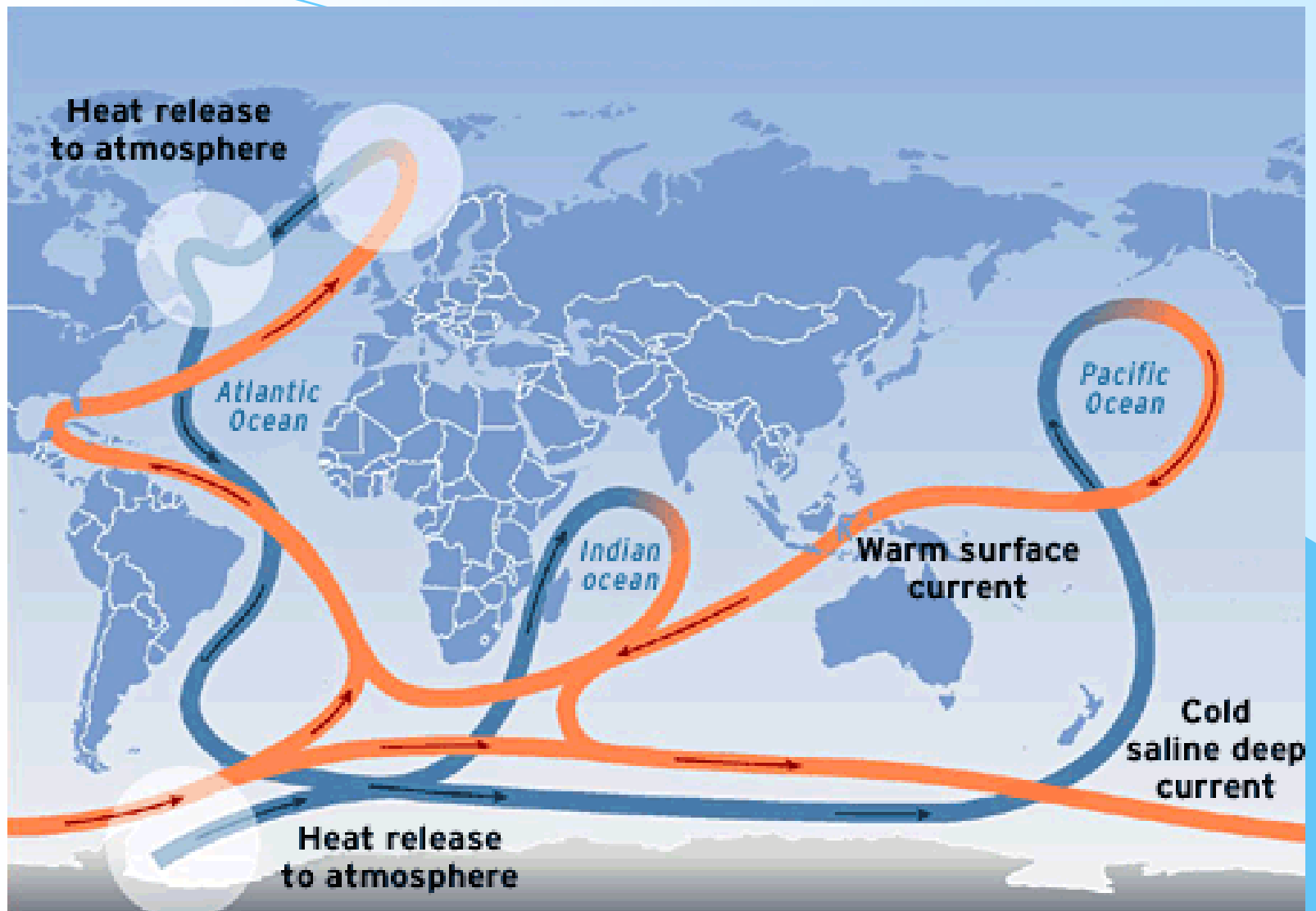
1 gallon of conventional gasoline becomes
172 cubic feet / 4.87 cubic meters of CO₂

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



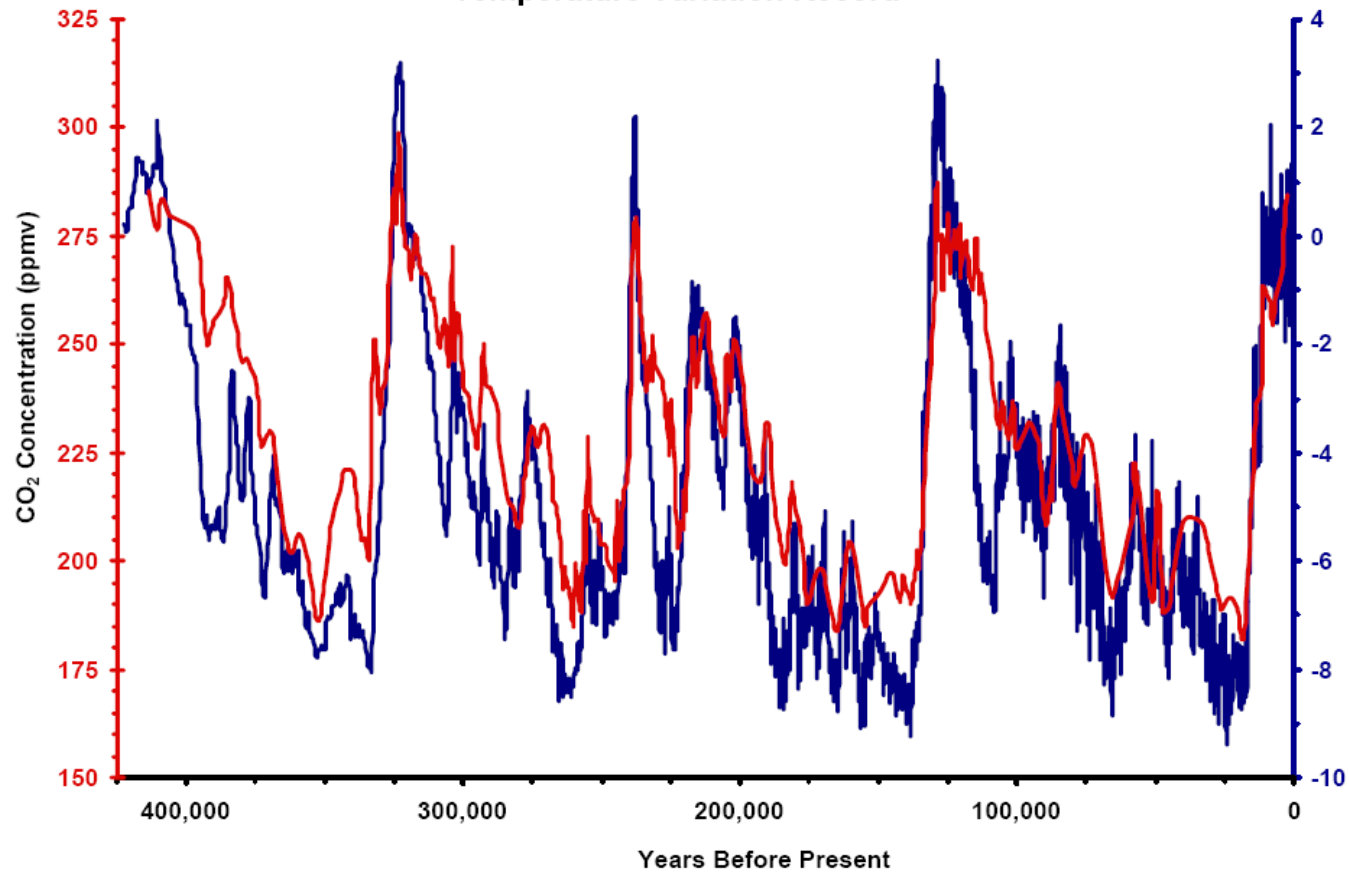
Greenland is melting





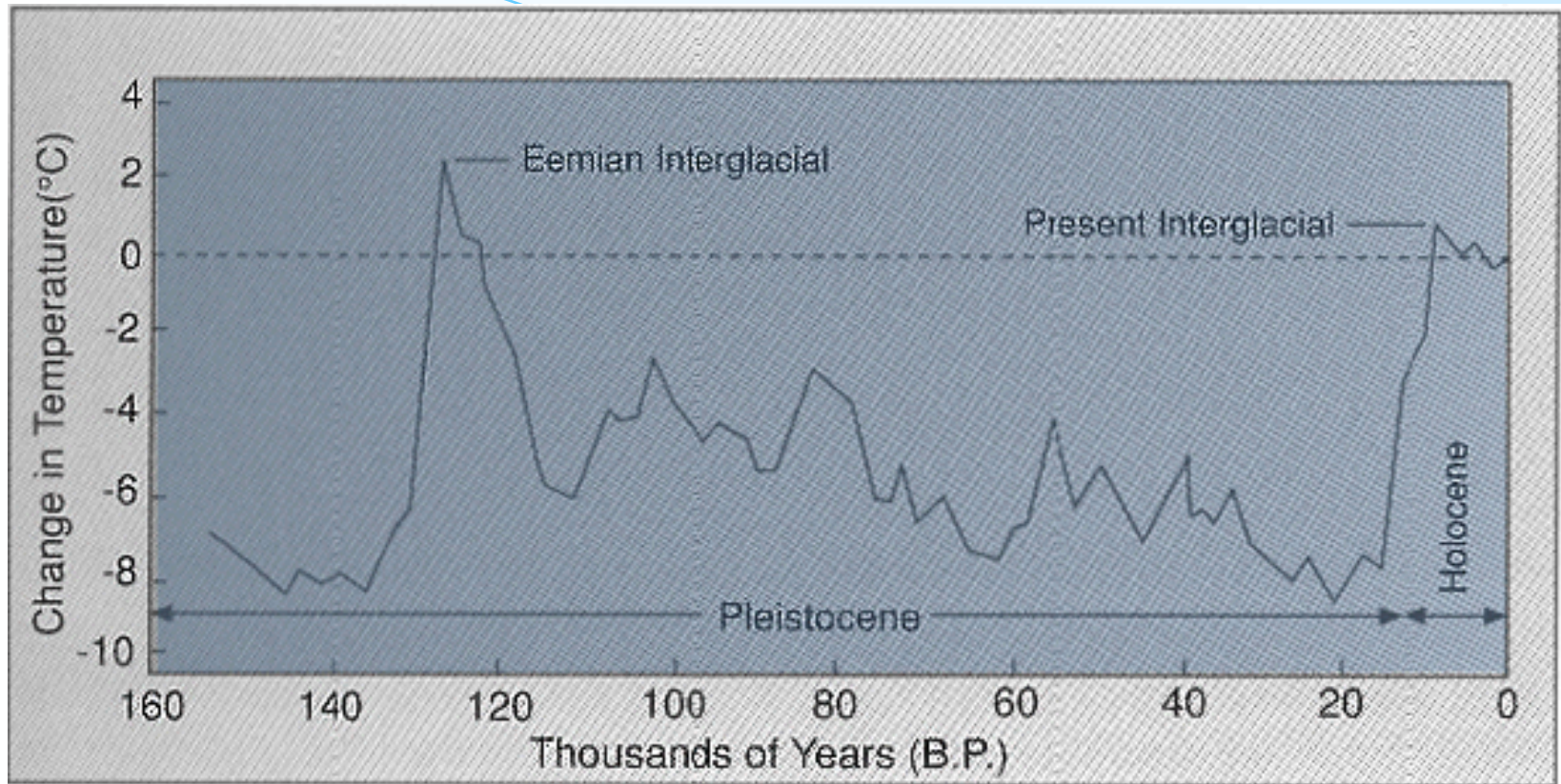
The oceans have absorbed about 30 times more heat than the atmosphere since 1955

Vostok Ice Core CO₂ Concentration and Temperature Variation Record

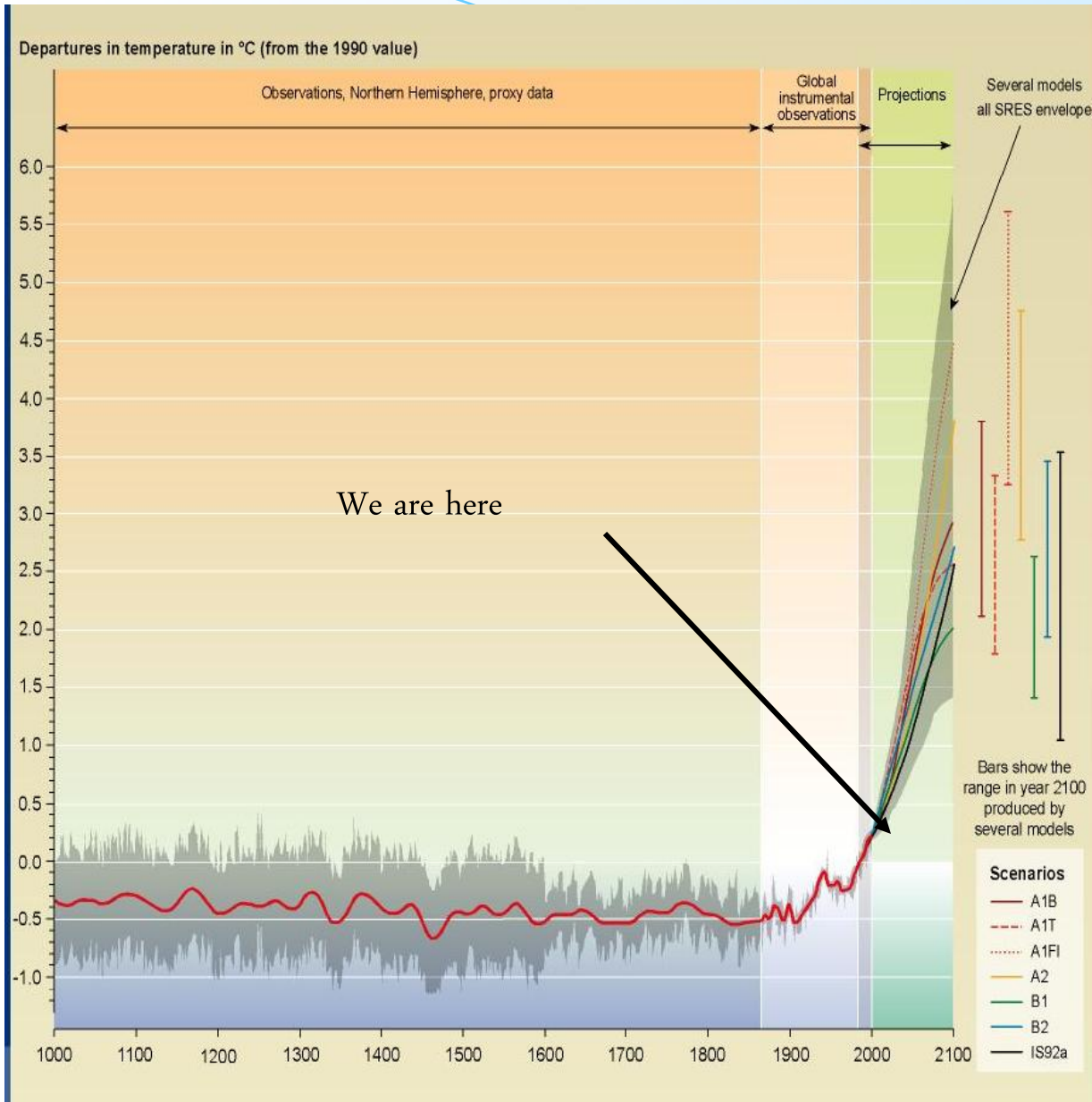


Source: Barnola, *et.al.*; Petit *et.al.* (PAGES / IGBP)

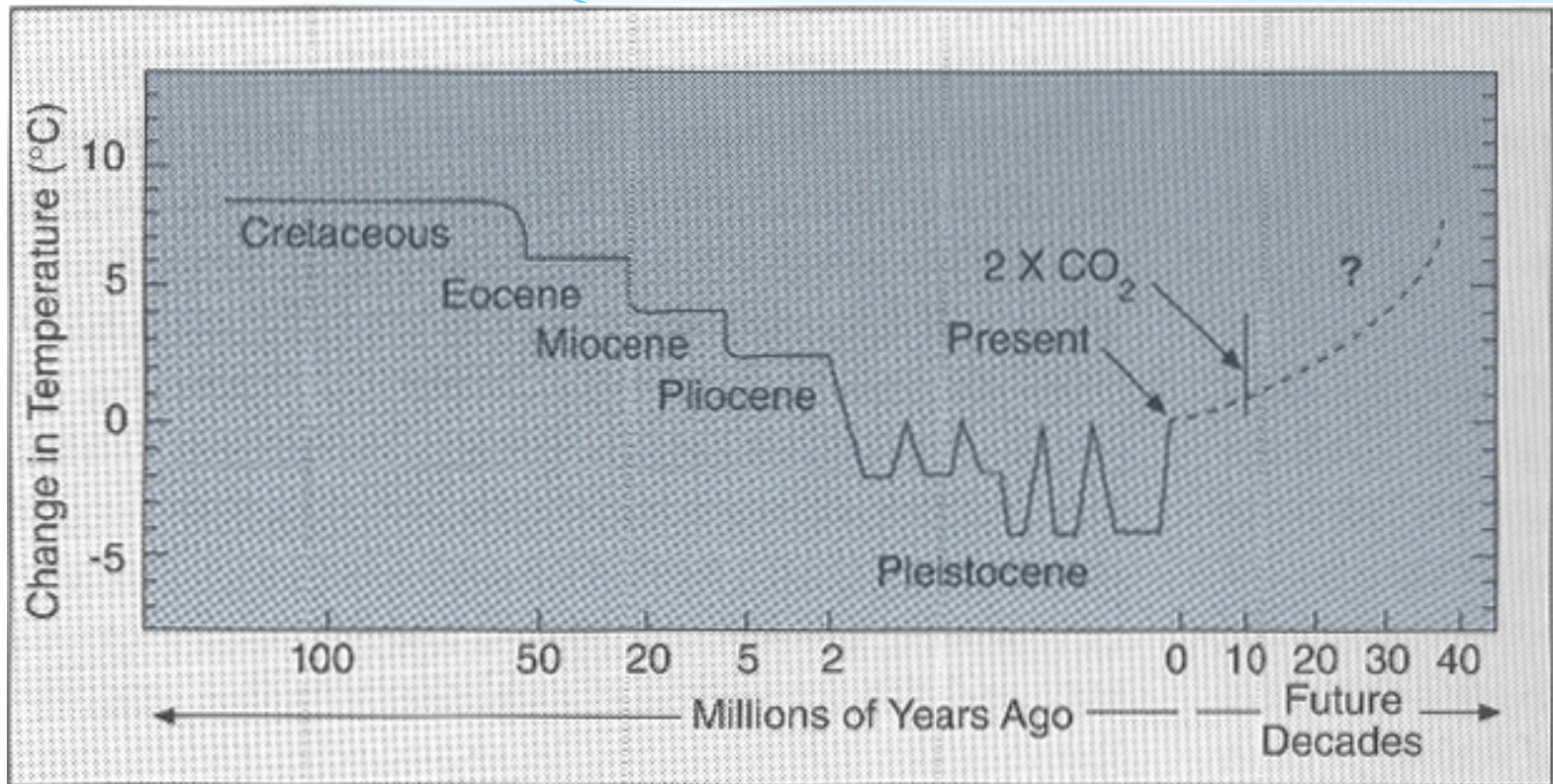
Climate Change Post-2100: What are the Implications of Continued Greenhouse Gas Buildup?



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
21st Century



CO₂ is linked with geologic periods. In other words, if we travel to 4 x CO₂, 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 countries².

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 CO₂ emissions represent 55% of the total from Annex I Parties in the year 1990.

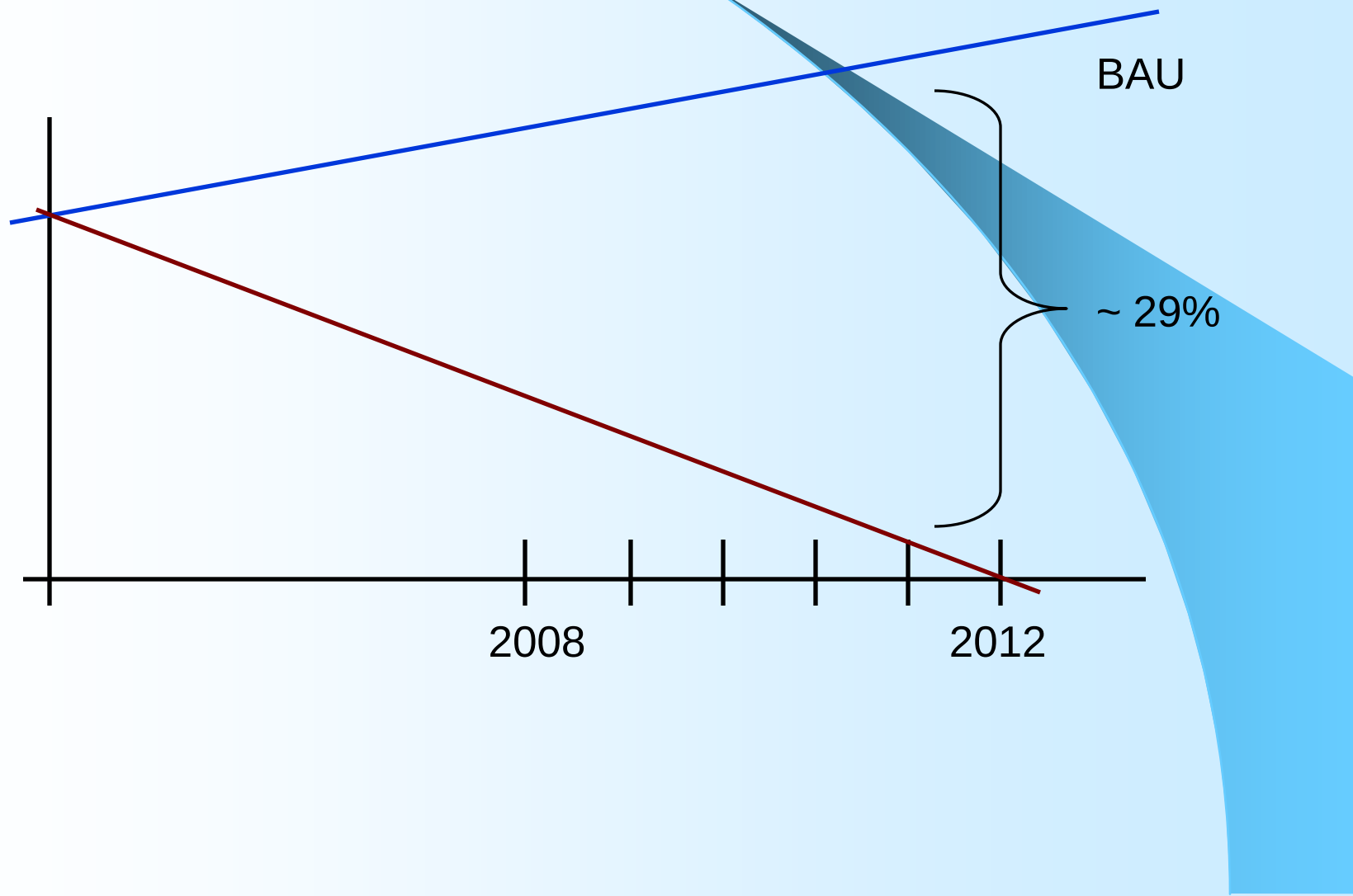
Table 4.3 Key information on approved JI projects

Host Country	Program	Project Type	Project Description	Greenhouse gas reduction [tCO ₂ -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		
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 ₂ -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

Result: Glide Trajectory



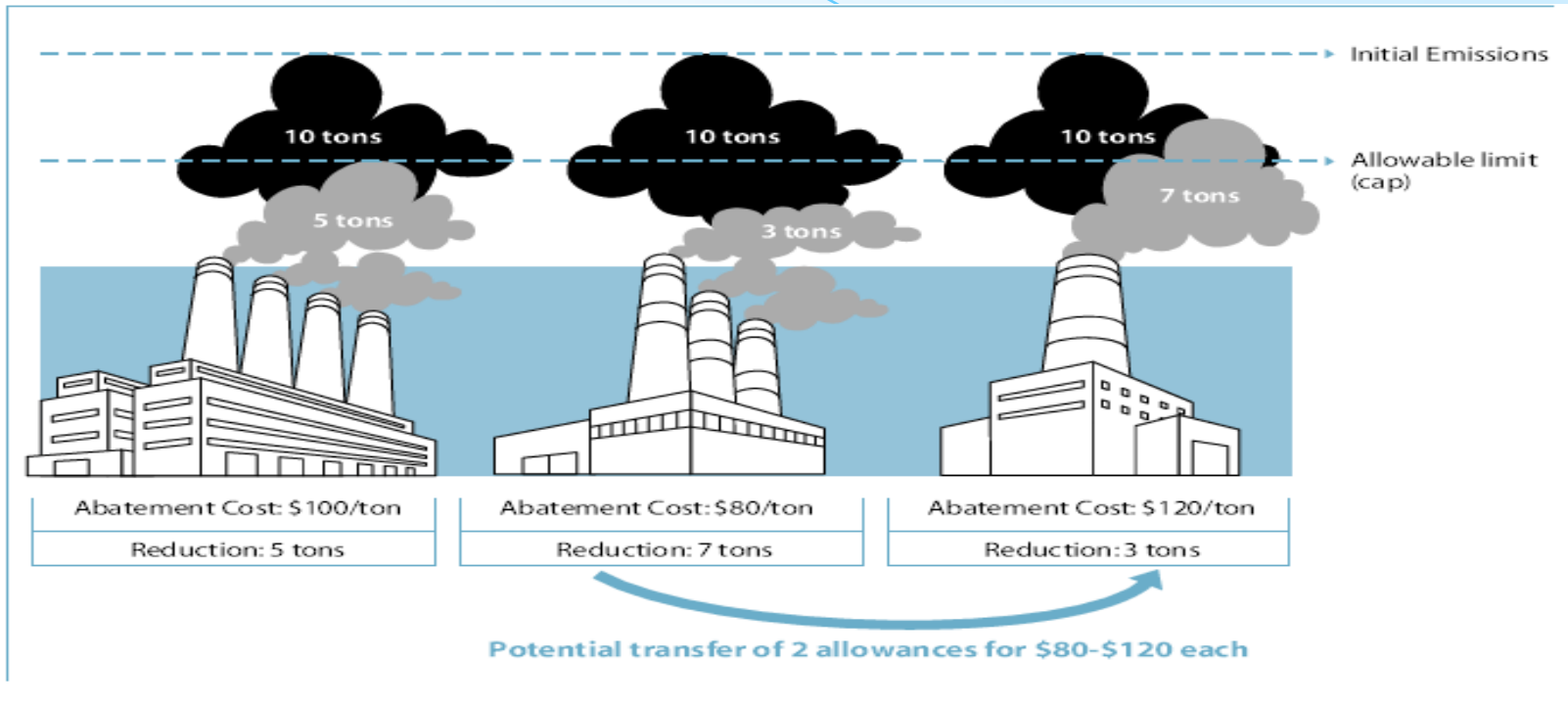
Project 0032 : Methane capture and combustion from swine manure treatment for Peralillo

Project title	Methane capture and combustion from swine manure treatment for Peralillo -  project design document (643 KB) -  registration request form (166 KB)
Host Parties	Chile  approval (371 KB)  authorization (371 KB) Authorized Participants: Agrícola Super Limitada
Other Parties Involved	Japan  approval (250 KB)  authorization (250 KB) Authorized Participants: The Tokyo Electric Power Company, Incorporated Canada  approval (167 KB)  authorization (167 KB) Authorized Participants: TransAlta Corporation
Activity Sector	Waste handling and disposal / Agriculture
Activity Scale	LARGE
Methodologies Used	AM0006 - GHG emission reductions from manure management systems
Amount of Reductions	78 867 metric tonnes CO2 equivalent per annum
Fee level	USD 15000
Validation Report	 Explanation of taking due account of comments (69 KB)  List of documents (88 KB)  List of interviewed persons (69 KB)  Modalities of communication (340 KB) Other documents (descriptions provided by the DOE)  Validation Report and Protocol (1342 KB) Public availability information The validation report will be published on the CDM website with the request for registration.  Compilation of all comments received (69 KB)
Requests for Issuance and related documentation	

What is a Cap-and-Trade Program?

- A “cap” is placed on emissions from “covered sources”
- Covered sources must surrender “credits” equal to emissions in the compliance period
 - A “credit” can either be an “allowance” or an “offset”
 - Allowances – allocated to covered sources
 - Offsets – come from projects in uncovered sectors (i.e. outside the “cap”)
- Covered sources can design their own compliance strategy:
 - Reduce emissions to the cap
 - Reduce below cap and sell unused allowances to others
 - Purchase allowances and/or offsets and emit above the cap
- Emitters and other project developers can create offset credits to be used, banked or traded on an exchange

Cost Minimization With Trading



Cost: \$500

**Cost: \$560 minus
\$160 - \$240 = \$320 -
\$400**

(vs. \$400 fixed)

**Cost: \$360 plus
\$160 - \$240 = \$520 -
\$600**

(vs. \$600 fixed)

**BOTH
PARTI
ES
BENEF
IT**

What Is A “Carbon Credit”?

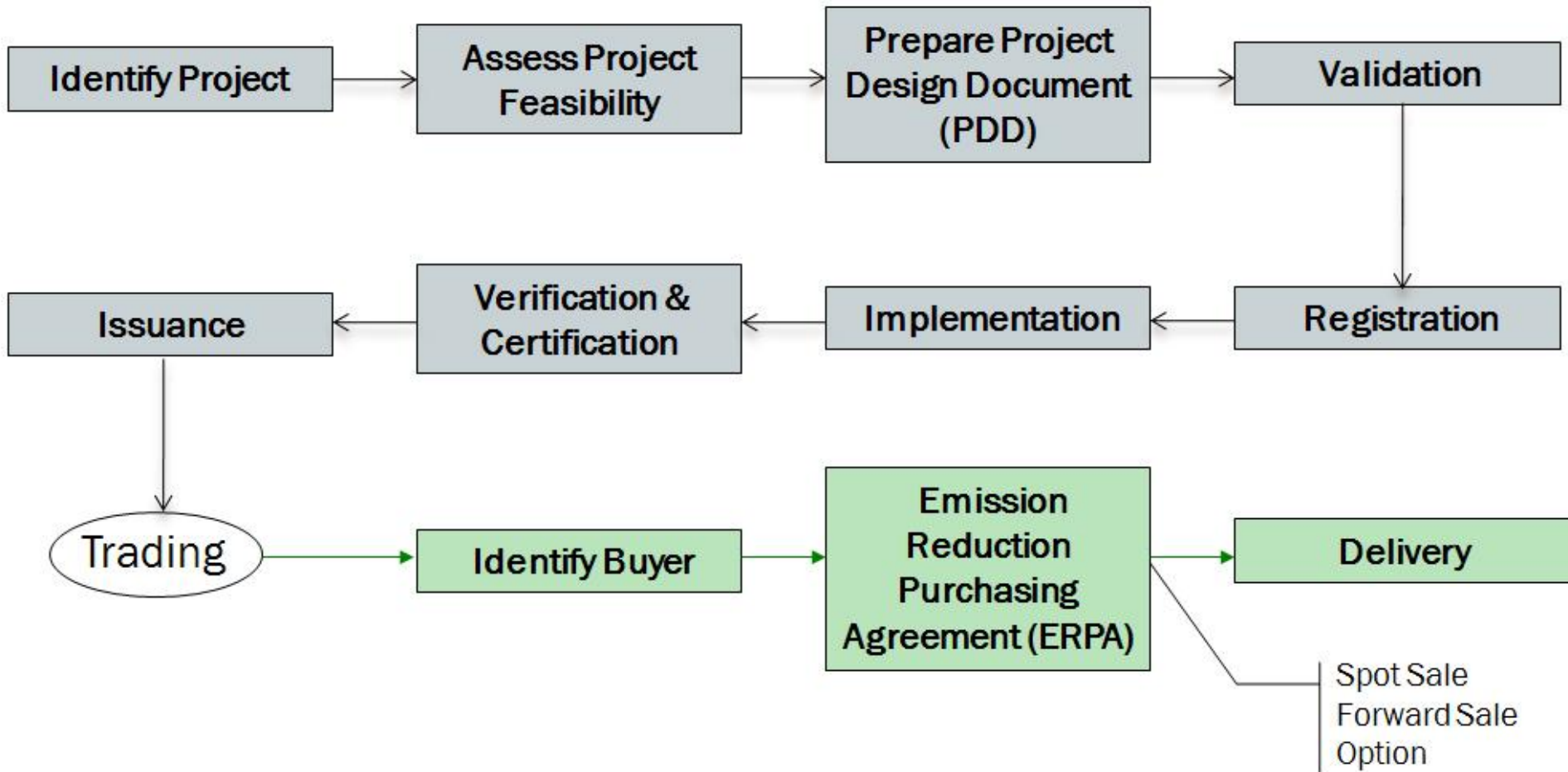
A carbon credit is:

- A tradable commodity
- With an independent market value
- Created pursuant to legal requirements
- In a voluntary or mandatory market
- From projects in non-covered sectors
- That represents a reduction, avoidance or sequestration of 1 ton of CO₂ or equivalent greenhouse gas (GHG)

Legal Components

- ✓ Real (represents actual emissions reductions)
- ✓ Measurable (capable of accurate measuring & monitoring)
- ✓ **Additional (based on a realistic baseline)**
- ✓ Permanent (account for reversals during commitment period)
- ✓ Verified (by independent, registry-approved verifier)
- ✓ Enforceable (clear, unambiguous ownership)
- ✓ Unique (no double counting)
- ✓ Transparent & Address Leakage (does not lead to an increase in emissions outside of the project's boundary)

Carbon Offset Projects: Typical Project Cycle



Carbon Offset Standards/Registries

- Climate Action Reserve (CAR)
 - <http://www.climateactionreserve.org>
- Clean Development Mechanism (CDM)
 - <http://cdm.unfccc.int/index.html>
- Voluntary Carbon Standard (VCS)
 - <http://www.v-c-s.org/>
- American Carbon Registry (ACR)
 - <http://www.americancarbonregistry.org/>
- Chicago Climate Exchange (CCX)
 - <http://www.chicagoclimatex.com/>

Trading and Sourcing Basics

- Credits can be purchased/sold through an exchange such as the Chicago Climate Exchange, or “over-the-counter”.
 - Over-the-Counter Transactions (2009) – 63% of Volume
 - Exchange Transactions (2009) – 37% of Volume
 - CAR Credits (aka Climate Reserve Tonnes, or CRTs)
 - 37% of volume in 2009
 - 65% of market value in 2009
- Trading vs. Retirement
 - Credits can be traded without being “retired”. Only the retirement of credits allows the holder to claim the carbon reduction.

Mandatory, Voluntary & Pre-Compliance Markets

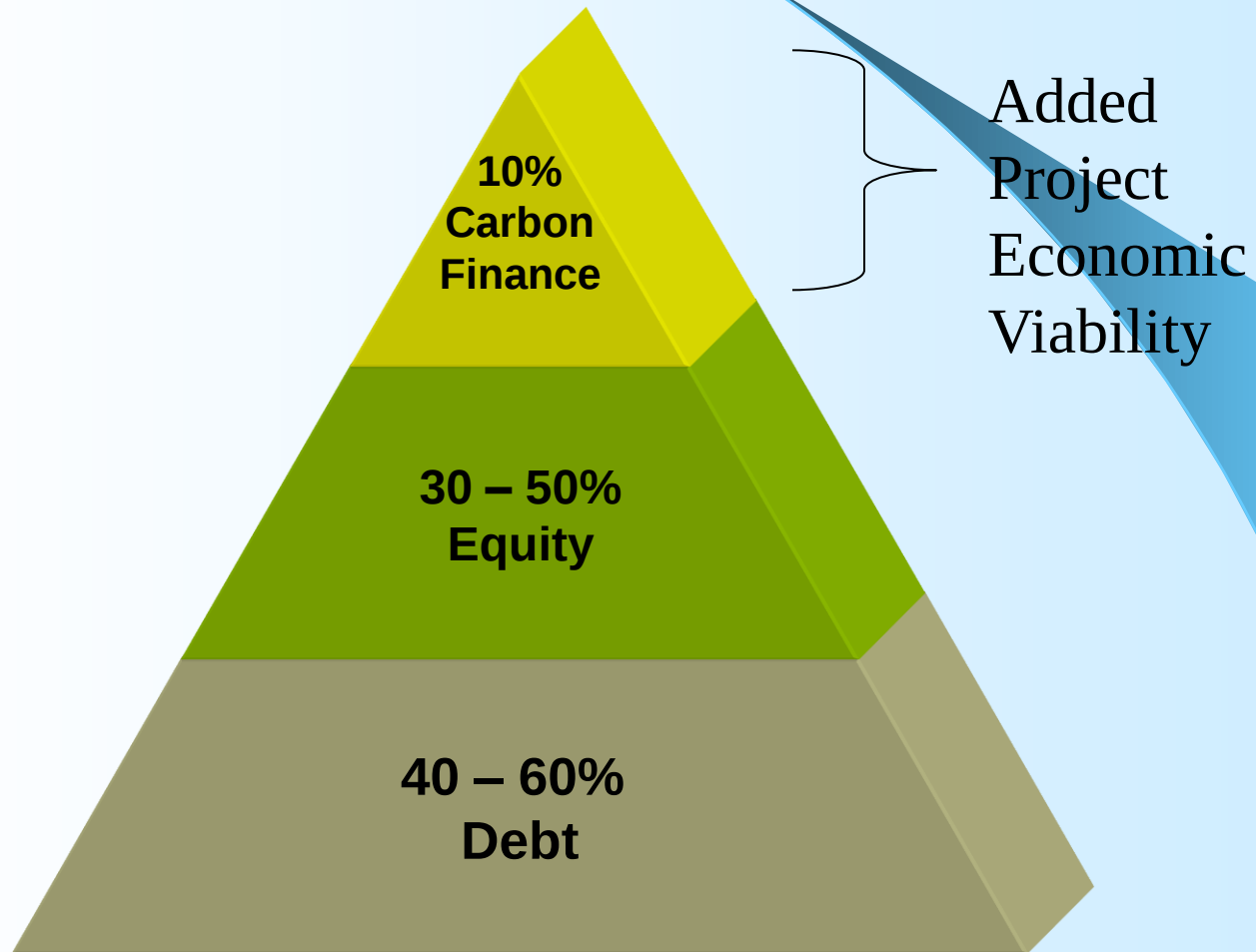
- Voluntary Markets – 35% in 2009
 - Companies purchase carbon offsets to reduce or neutralize their greenhouse gas emissions for various reasons.
- Pre-Compliance Markets – 65% in 2009
 - Buyers purchase credits with the hopes that they can be used for compliance purposes in a future cap-and-trade program.
- Mandatory Markets – 0% in 2009
 - Regulated entities purchase offsets credits to meet their compliance obligations.
 - Distinction between “offsets” and “allowances”

Size and Value of US Offset Market in 2009

		Volumes (Mt CO ₂ e)	Value (\$M)	Price/Credit
Exchange Based Transactions	CCX CFIs	6.4	\$5.8	\$.90
	CAR	0.8	\$4.0	\$5
	Subtotal	7.2	\$9.8	\$1.36
OTC Transactions	CAR	7.2	\$48.2	\$6.70
	VCS	2.1	\$9.7	\$4.60
	ACR	1.8	\$3.5	\$1.95
	Other	1.1	\$2.4	\$2.20
	Subtotal	12.2	\$63.8	\$5.20
Total		19.4	\$73.6	\$3.80

Source: Point Carbon Research – US Offset Markets in 2010: The Road Not Yet Taken. March 1, 2010

Carbon Finance



Where Does Bioenergy Fit In?

- **Methane Reductions – 49% of supply in 2009**
 - Livestock (manure management)
 - Landfills (landfill gas collection)
 - Organic waste digestion
- **Energy Production**
 - Biomass/biogas combustion
- **Transportation**
 - Fuel switching (biofuels)

Hedging: Carbon Credits vs. RECs

- A carbon credit represents the reduction, avoidance, or sequestration of 1 ton of CO₂e of GHG
- A Renewable Energy Credit (REC) represents proof that 1 MWh of electricity was generated from an eligible renewable energy resource.
- Both are tradable commodities
- A REC *may* be considered convertible...
 - Represents the amount of GHG displaced from using 1 MWh of energy
 - Greater GHG reductions when grid is supplied by high-carbon fossil fuels
 - Elements like additionality must still be met

Current Regulatory Environment

- **International**

- Kyoto / EU ETS

- **Federal**

- EPA Reporting Rule
- SEC Guidance
- House/Senate Bills

- **State**

- Assembly Bill 32 (California)

- **Regional**

- Regional Greenhouse Gas Initiative
- Western Climate Initiative

Int. Mechanisms for Reducing GHGs

● Kyoto Mechanisms

- Emissions Trading Scheme (ETS)
- Clean Development Mechanism (CDM)
 - Allows industrialized countries with reduction commitments to invest in projects that reduce emissions in developing countries.
- Joint Implementation (JI)
 - Allows annex I countries with reduction commitments to invest in projects that reduce emissions in other annex I countries.
- Current Prices
 - Allowances (EAUs) - \$15.24
 - Offsets (CERs) - \$ 13.03

Federal Legislation & Regulations

- **Environmental Protection Agency (EPA)**

- Facilities emitting > 25,000 tons CO₂e must submit annual reports to the EPA
- Covers 85% of U.S. GHG emissions
- Emissions data will inform future policy decisions
- Utilities to be regulated in 2011 if comprehensive legislation is not passed by congress

Federal Legislation & Regulations

- **Securities and Exchange Commission (SEC)**

- All publicly traded companies must disclose “material” risks resulting from climate change, including:

- Impact of legislation and regulation
- Impact of international accords
- Indirect consequences of regulation or business trends
- Physical impacts of climate change

Federal Legislation & Regulations

- **House Bill: Waxman-Markey – Passed 06/26/2009**
 - Overlays EPA's jurisdiction under Clean Air Act
 - Covered Sources - > **25,000 tons CO₂e/year**
 - Caps gradually escalate:
 - **2012: 3% below 2005 level**
 - 2020: 17% below 2005 level
 - 2030: 42% below 2005 level in 2020
 - 2050: 83% below 2005 level in 2050
 - Offsets
 - 2 billion offsets useable per year
 - Domestic and International Project Types
 - Methodologies to be developed by EPA & USDA

Federal Legislation & Regulations

- **Senate Bill: Kerry-Lieberman – Released 05/12/2010**
 - Also overlays EPA's jurisdiction under Clean Air Act
 - Covered Sources - > **25,000 tons CO₂e/year**
 - Caps gradually escalate:
 - **2013: 4.75% below 2005 level**
 - 2020: 17% below 2005 level
 - 2030: 42% below 2005 level in 2020
 - 2050: 83% below 2005 level in 2050
 - Similar cost containment provisions
 - Price Forecasts???
 - PointCarbon projects carbon would avg. \$31/ton btwn. 2013 - 2020

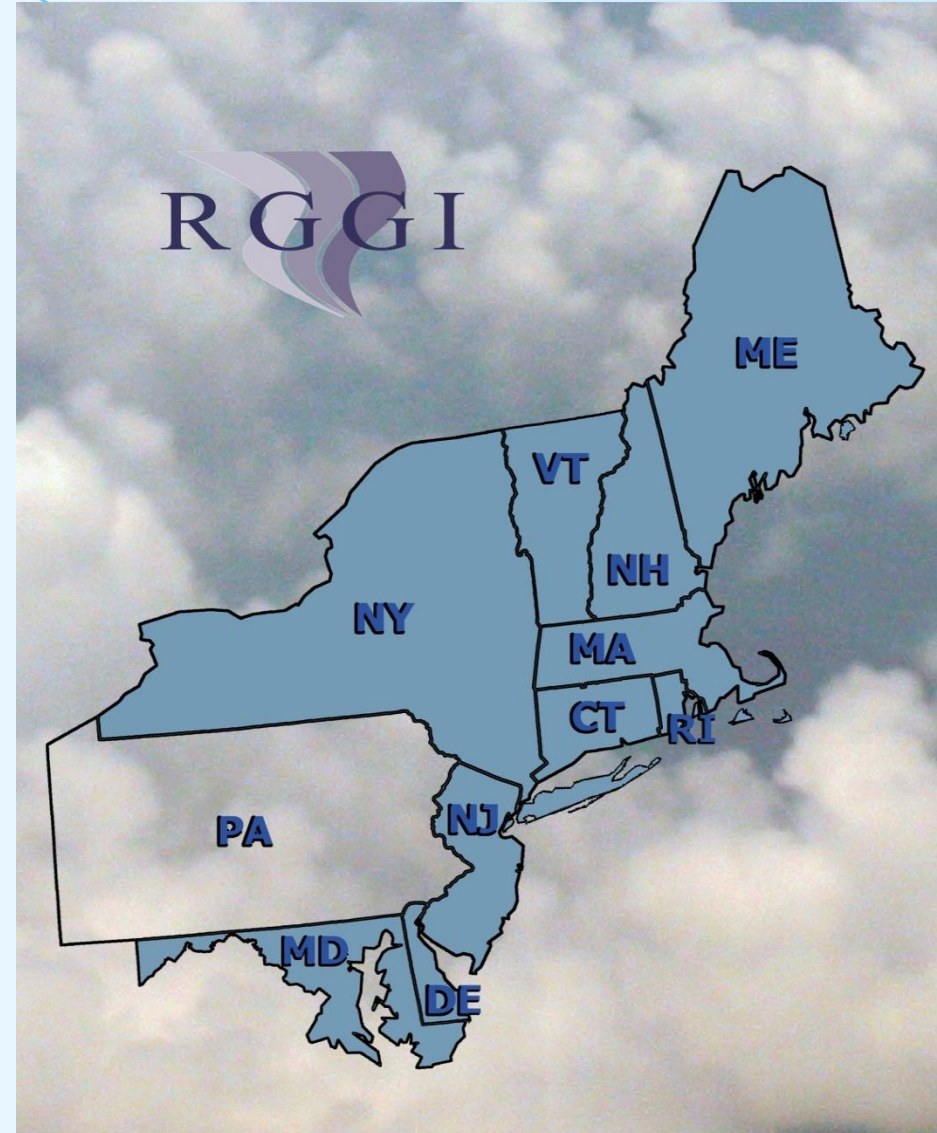
State Legislation

- **Assembly Bill 32 (California)**

- Broad-based cap-and-trade program
 - Electricity, Industry, Transportation Fuels, Natural Gas
- Rulemaking currently in progress
- Caps gradually escalate:
 - 2020: Reduce to 1990 levels (28% below BAU)
 - 2050: Reduce 80% below 1990 levels
- Offsets are being considered on a sector-by-sector basis
 - Climate Action Reserve is a state-sanctioned offset program

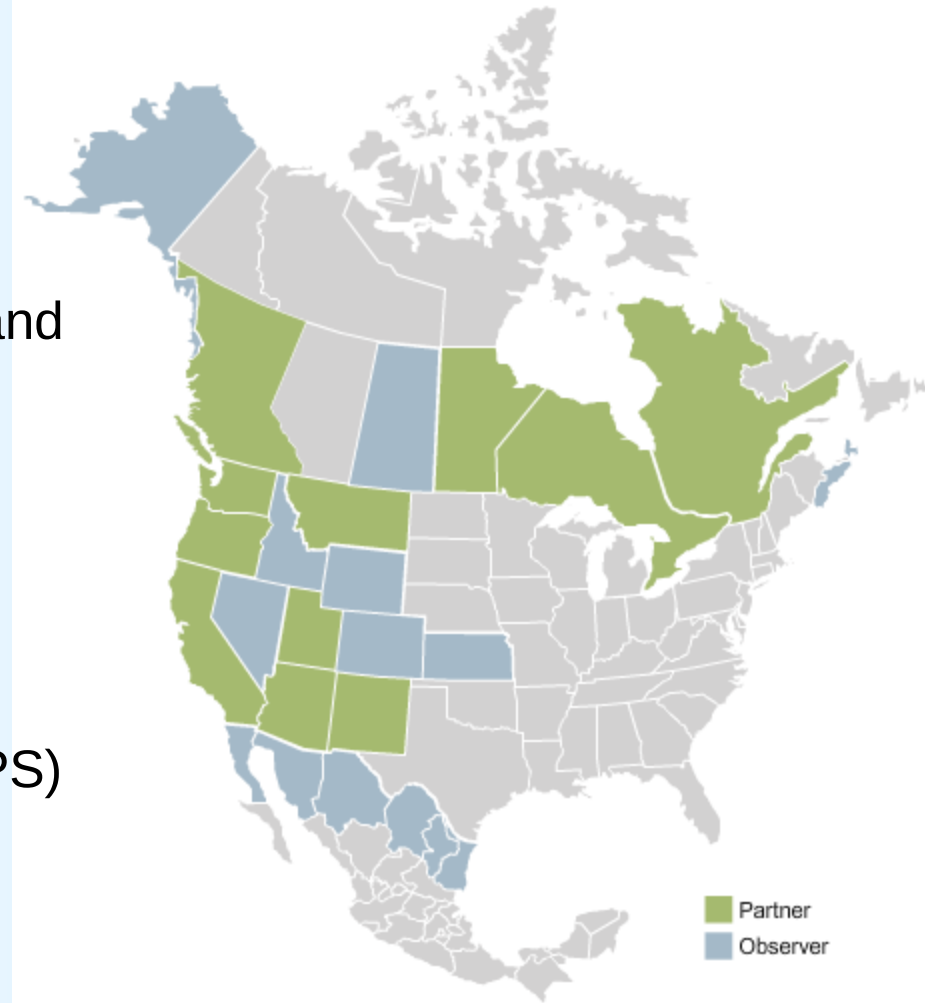
Regional Greenhouse Gas Initiative (RGGI)

- 10 states & 53 million people
- 8th largest emitter in the world
- Caps gradually escalate
 - Stabilize thru 2015
 - Reduce 10% by 2018
- Allowance Price - \$1.90
- Offsets:
 - 5 Project types accepted
 - Allowance price too low for offsets



Western Climate Initiative (WCI)

- 11 participants plus 13 “observers”
 - Participants – 7 states and 4 Canadian provinces
 - Observers – 6 states, 1 province and 6 Mexican states
- Multi-dimensional approach, including
 - Cap and Trade
 - Low carbon fuel standards
 - Renewable Portfolio Standard (RPS)
- Expects mandatory programs to start 2012



-Nice meeting all of you!

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Toward Climate Stability™

