

# Soil and Climate Change

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# Pataki Greenhouse Gas Report, April 2003

## CO<sub>2</sub> Emissions from Various Countries in 1998 in MMTCE - million metric tons of carbon equivalent

Region	CO <sub>2</sub> Emissions (MMTCE)	Share of World Total
<b>World</b>	<b>6,604</b>	<b>100.0%</b>
<b>United States</b>	<b>1,486</b>	<b>22.5%</b>
China	848	12.8%
Russian Federation	392	5.9%
Japan	309	4.7%
India	290	4.4%
Germany	225	3.4%
Texas	167	2.5%
United Kingdom	148	2.2%
Canada	127	1.9%
Italy	113	1.7%
Mexico	102	1.5%
France	101	1.5%
California	93	1.4%
Australia	90	1.4%
<b>Pennsylvania</b>	<b>68</b>	<b>1.0%</b>
<b>New York</b>	<b>62</b>	<b>0.9%</b>
Florida	61	0.9%
<b>New England*</b>	<b>46</b>	<b>0.7%</b>
Netherlands	45	0.7%
<b>New Jersey</b>	<b>31</b>	<b>0.5%</b>

# Why I Love Climate Change

- Climate change is changing the currency of global democracy.
- The Montreal Protocol, was a poster child for global democratic agreement to address the ozone hole (the ozone hole was due largely to 3 chemicals which were phased out).
- Unlike the ozone hole, climate change is caused by and will affect every single human being.
- Carbon is a global currency.
- Failure of Kyoto and the new beginnings of Copenhagen just point out the political enormity of a global accord that deals with such a pervasive issue. Climate change is changing the face of global policy.

# US and the Copenhagen Accord

- On January 28, 2010, the US informed Mr. Yvo de Boer, Executive Secretary of United Nations Framework Convention on Climate Change that the US set the following emission reduction targets:
  - 17% reduction of 2005 baseline by 2020
  - 30% by 2025
  - 42% by 2030
  - 82% by 2050
- Of course, the Senate has to pass these goals to make them meaningful.

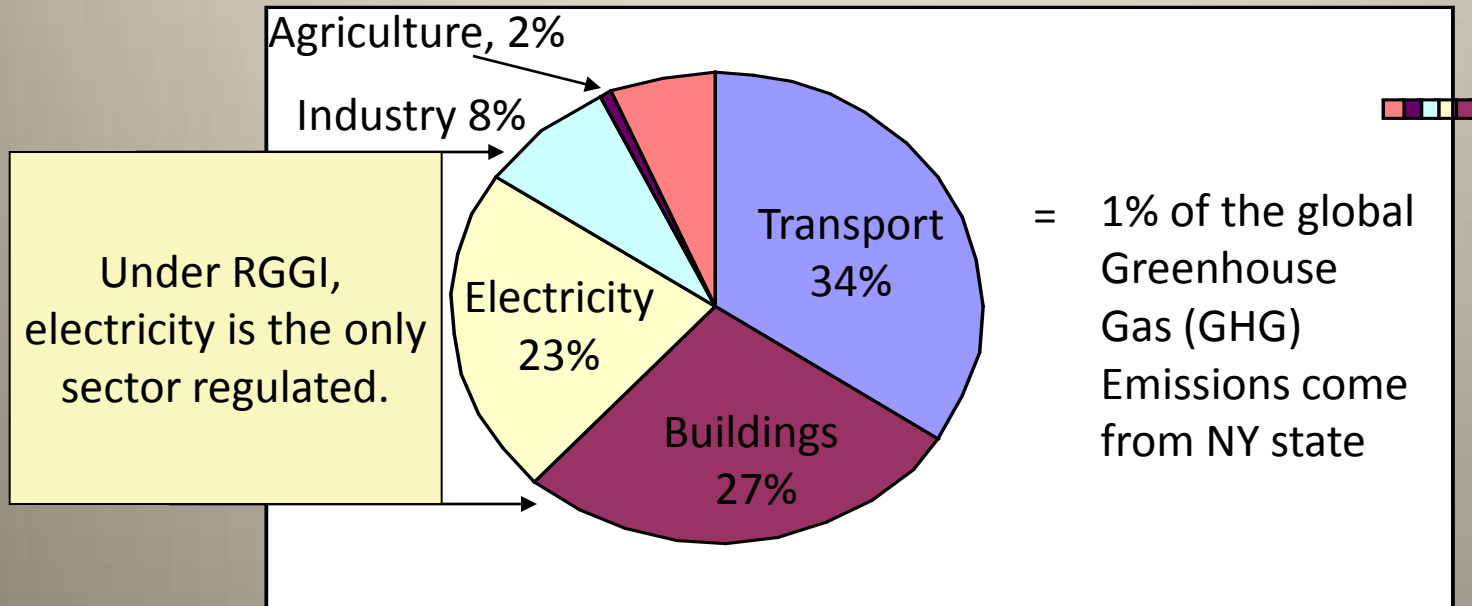
# Where do these Emissions come from?

- Majority comes from Sequestered Carbon (Fossil Fuel) extracted from deep within the earth, combusted, and emitted to the atmosphere.
- Significant emissions come from deforestation
- ~20% comes from agriculture, globally.
  - In NY for example, ag accounts for only 2% of the State emissions portfolio.
  - It is proportionately small because our fossil fuel use is proportionately big.

# How to Address These Emissions

- Cap and Trade is ONE way to address CO<sub>2</sub> emissions

# Regional Greenhouse Gas Initiative (RGGI) Regulates Electric Sector



Source: Pataki greenhouse gas report, slightly modified

RGGI: Regional Greenhouse Gas Initiative, 10 NE states agreeing to cap and trade emissions from the electricity sector

# Electricity is Regulated First

- RGGI regulates only the electric sector
- Electricity contributes ~23% of State emissions
- For the quantity to be regulated, there are relatively few power plants
- Easy records to follow, relatively easy to regulate.

Anything farms or other sectors do at this time to reduce greenhouse gases is voluntary



# Cap & Trade for Electricity CO<sub>2</sub>

Plant A



Government sets Cap

**CAP: 800 Tons**

Plant B



**BEFORE:** 500 Tons  
**Allowance:** 400 Tons  
**Activity:** NONE, too cost prohibitive  
**Reductions:** 0 Tons

**BEFORE:** 500 Tons  
**Allowance:** 400 Tons  
**Activity:** \$spent on site exceeds requirements  
**Reductions:** 200 Tons

To meet its compliance requirements Plant A can purchase

Allowances from another plant or

Offsets (greenhouse gas reductions achieved by other non-regulated parties) from agriculture or forestry.

# Offsets: How Ag Trades Carbon

- Electric plants are the *\*first\** to be regulated.
- The power plants can
  - 1) reduce their own emissions or
  - 2) buy another plants allowances
  - 3) buy offsets from greenhouse gas emission reductions  
*\*outside\** of the electric sector

- **Offsets** are greenhouse gas reductions achieved by non-regulated market participants. Greenhouse gas mitigation achieved by non-regulated parties can be purchased as offsets by a regulated power plant to meet the required cap.

# Importance of RGGI

- Unlike the voluntary market CCX, RGGI is a regional regulated market
- RGGI legitimizes the demand for carbon credits
- Carbon credits will become more valuable
- Farms should think more seriously
  
- Unclear what is happening at a national or international levels at this time

# Eligible Offsets on 2 Registries

## Chicago Climate Exchange (CCX)

- Methane destruction  
(18.25 MT/T CH<sub>4</sub> destruction, 1999)
- Conservation Tillage  
(0.6 MT/ac/yr, 4 yr contract, 1999) in NJ, 0.4 in NY
- Grass Cover  
(1 MT/ac/yr, 4yr contract, 1999)
- Afforestation projects (1990)
- Displaced Fossil Fuel Electricity (0.4  
MT/MWH, 2005)
- Voluntary

## Regional Greenhouse Gas Initiative (RGGI)

- Methane Destruction
- Boiler Efficiency
- Afforestation Projects
- Electricity Regulated

# Economic Realities of Trading Soil Carbon

- You can't trade soil carbon under RGGI (but so far, no offsets have been awarded under RGGI)
- You can trade soil carbon under CCX, but the current price per ton is \$0.10/ton CO<sub>2</sub>e.
  - 0.6 T/ac of conservation tillage = \$0.06/ac
  - 1 T/ac of permanent grass cover = \$0.10/ac

# Soil: Finite Opportunities to Mitigate

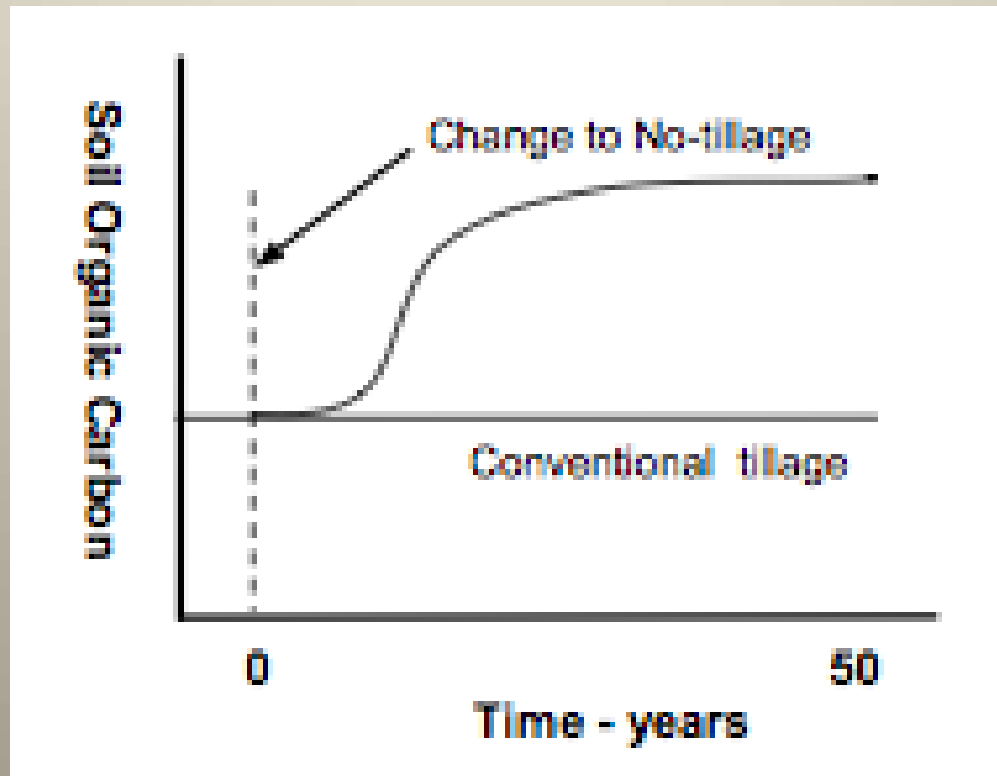


Figure by John Duxbury

# Complexities by Changes in Soil Chemistry

- Tillage aerates the soil. As the soil becomes slightly more anaerobic from conservation tillage or no-till activities, it may increase relevant amounts of Nitrous Oxide, a much more potent GHG than Carbon Dioxide.
- FOOT NOTE: Nitrous Oxide ( $N_2O$  is  $\sim 300$  times as potent of a GHG than  $CO_2$ ). Small changes in  $N_2O$  may negate all GHG accounting benefits of Carbon Sequestration in Soil.

# Soil Potential to Mitigate Climate

- Financial opportunities:
  - Providing agricultural offsets in cap and trade systems.
  - Niche Market products as no-till or maximal sequestration.
  - Improve soil fertility thus improving crop productivity and overall efficiency and cost-effectiveness of an acre.



# What we have to work with

- There is a finite supply of land
- There are competing uses (heat vs transportation fuel, feed vs electricity, food vs fiber, etc.)
- There are quality of life issues (more energy, more pollution, particulate matter, erosion, GHGs, NOx, nutrient loading, etc.)
- Regardless of your ultimate agenda, maintaining Soil Carbon helps sustain all societal decisions to grow food, feed, fiber or fuel.

# Agriculture is Affected

- Changes in Climate affecting growing season predictability
- Pressures to address air and water quality associated with production
- Pressures to increase productivity/intensification
- Demand driving what crops are grown
- Raw material supplier or Reaping benefits from processing
- Rising energy costs = rising input costs = rising overhead costs

# Contact

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# Efficiency and Conservation

- Efficiency and Conservation in society is the number one Best Management Practice for protecting our land, our communities, and our selves.
- The average gas mileage I used to go to another conference last November was almost the same as the Model T.

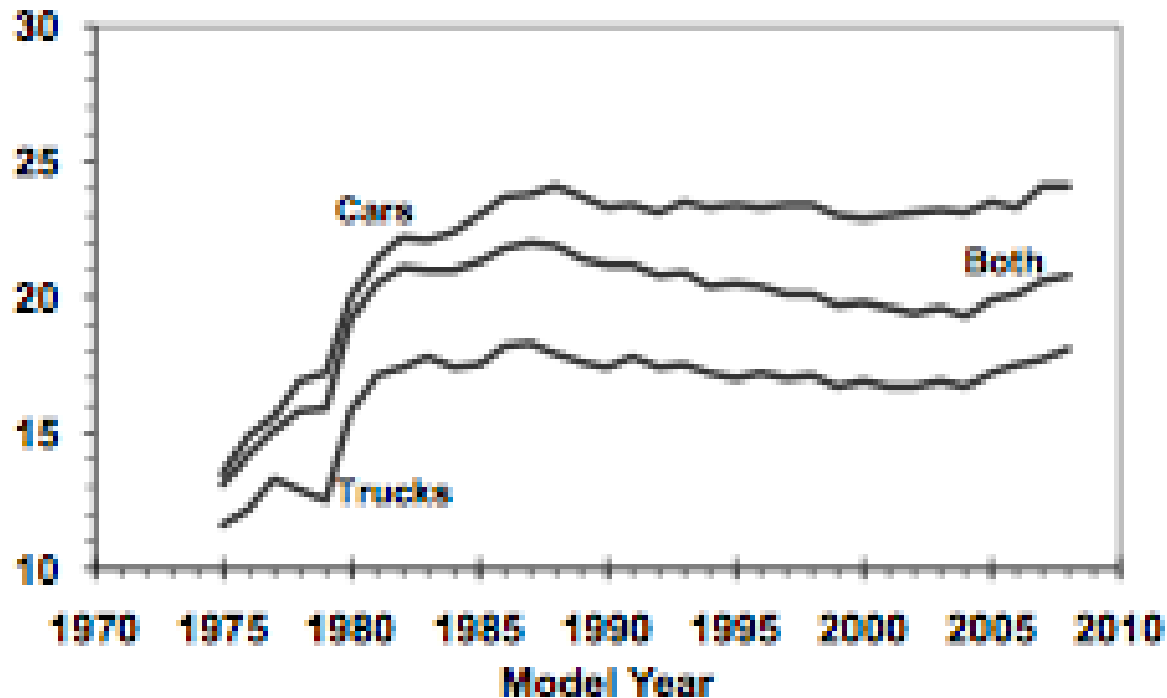
# Trends in US Vehicles

EPA 2008 report, 20.8mpg, 1987 peak at 22.0mpg

## Adjusted Fuel Economy by Model Year (Annual Data)

<http://www.epa.gov/otaq/fetrends.htm>

Adjusted MPG



# Ford Facts

[http://media.ford.com/article\\_display.cfm?article\\_id=858](http://media.ford.com/article_display.cfm?article_id=858)

- The Model T was introduced on Oct. 1, 1908.
- It had a 20-horsepower, four-cylinder engine
- It reached a top speed of about 45 miles per hour
- It got 13 to 21 miles per gallon of gasoline
- It weighed 1,200 pounds.
- It was the ninth of Henry Ford's production cars.
  
- The Ford Fusion I drove Nov. 11, 2009, 101 years later gets 16.4mpg and emits 8 tons of CO<sub>2</sub>/yr

# Policy for Agriculture- could it be with car fuel standards?

- A doubling of gas mileage would increase the biomass energy use value of our land by 2.
- That is 1 acre would fuel a car to go 2x as many miles, or 1 acre would help 2 cars go the same mileage.