

Soil and Climate Change

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SJ RC&D Soil Conference, March 9, 2010

Pataki Greenhouse Gas Report, April 2003

CO₂ Emissions from Various Countries in 1998 in MMTCE - million metric tons of carbon equivalent

Region	CO ₂ Emissions (MMTCE)	Share of World Total
World	6,604	100.0%
United States	1,486	22.5%
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%
Pennsylvania	68	1.0%
New York	62	0.9%
Florida	61	0.9%
New England*	46	0.7%
Netherlands	45	0.7%
New Jersey	31	0.5%

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.

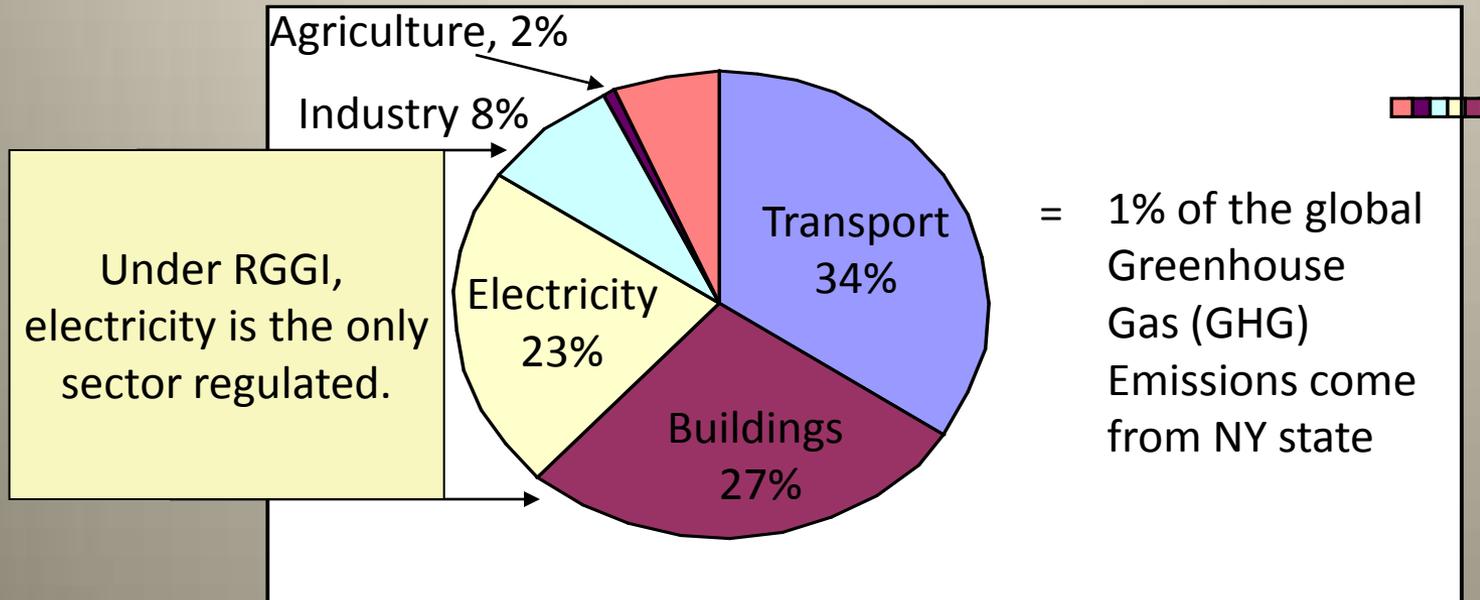
Where do these Emissions come from?

- 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 CO₂ 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 CO₂

Plant A



Plant B



Government sets Cap

CAP: 800 Tons

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 CH₄ 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 CO₂e.
 - 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

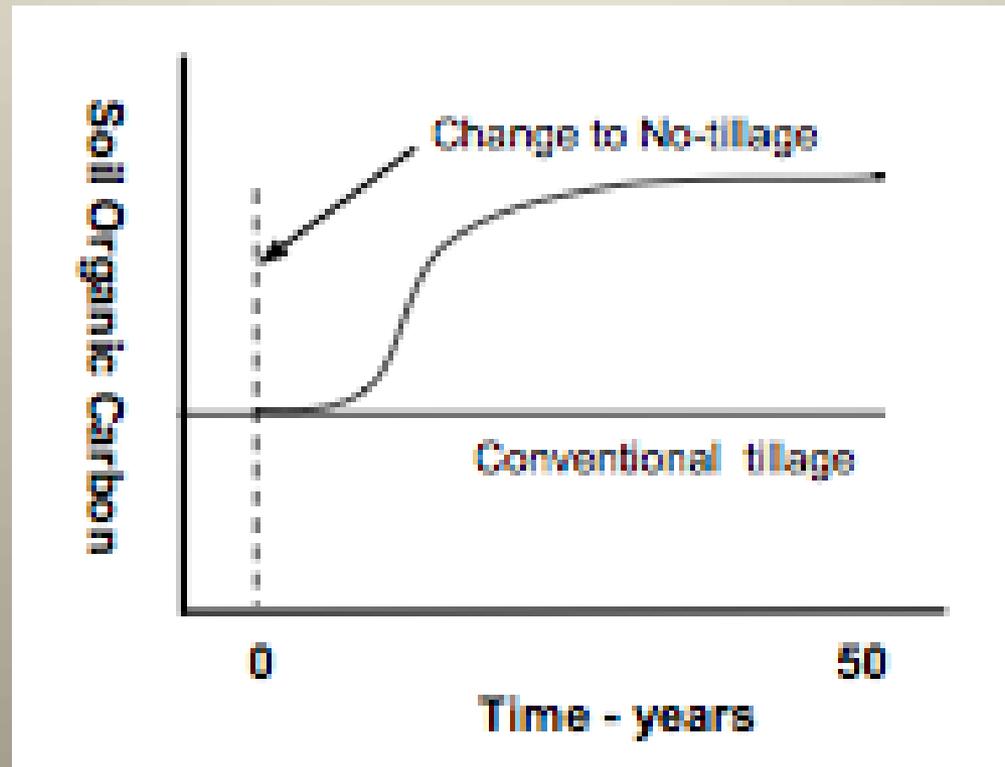


Figure by John Duxbury

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 ~ 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.

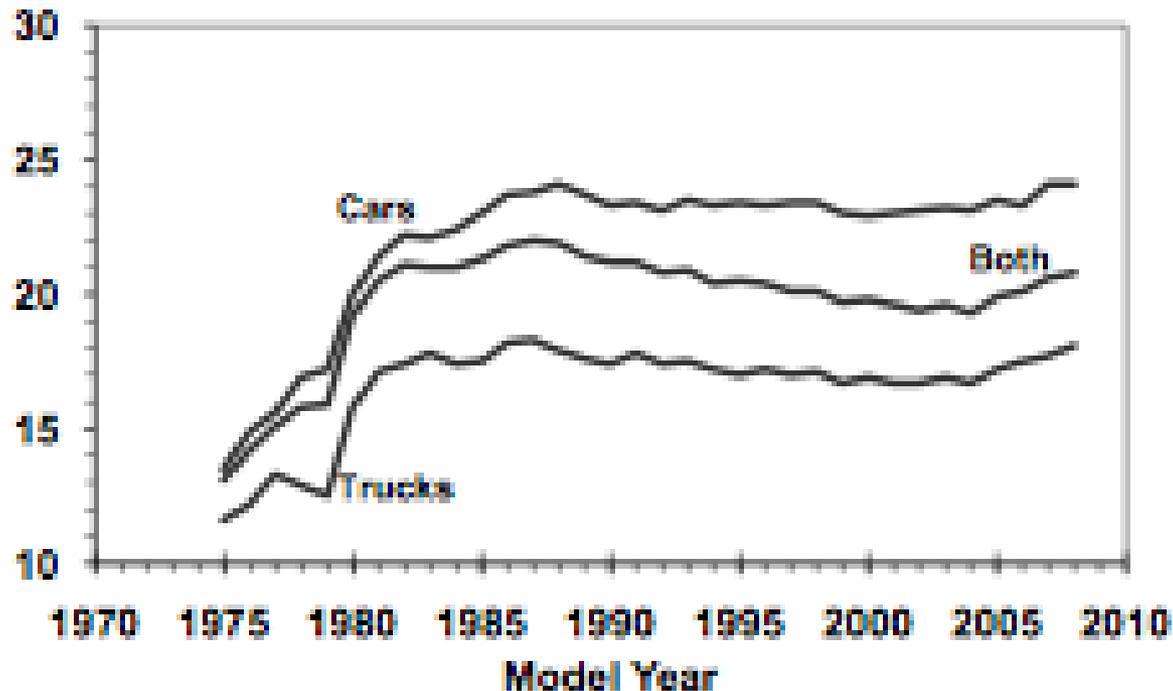
Trends in US Vehicles

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

- 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 CO₂/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.