Context and Goal-Setting: How Climate Change Could Affect Calvin

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Topics

Global

National

College

Nation

Kingdom

Context and Status

Application and Action
Global
Venus

- CO₂ atm
- 870 °F
- 92 atm
- 65 kg/m³

http://www.solarviews.com/cap/venus/venusmar.htm
Global Warming

- Fossil fuel combustion puts extra CO$_2$ (a greenhouse gas) into the atmosphere

- $\text{CH}_4 + 2\text{O}_2 \rightarrow \text{CO}_2 + 2\text{H}_2\text{O}$

http://www.physicalgeography.net/fundamentals/images/greenhouse.GIF
Earth’s Carbon Cycle

- Many emission sources
- Many sequestration sinks
- Total human emission 7.1 GtC/yr
- Net: 3.2 GtC/yr human emissions remain in the atmosphere

http://earthobservatory.nasa.gov/Library/CarbonCycle/carbon_cycle4.html
Keeling Curve

Fossil Fuel Emissions Reductions

Figure 1. The Impact of Fossil Fuel CO₂ Emissions Reductions of 2% per Year for 40 Years, with a 10 Year Delay in Implementation for Non-G8 Countries.

Note: The hatched segment in Figure 1 depicts the predicted incremental reduction in atmospheric CO₂ concentrations relative to the BAU scenario, due to emissions stabilization post-2030. Each colored segment shows additional reductions in atmospheric CO₂ due to emissions reductions in one or more countries.
Kyoto Protocol

Annex I nations reduce emissions to 5% below 1990 levels by 2010

National Issues
Cap and Trade Regimes

- Polluters buy the right to emit $\text{CO}_2$ from the government
- Government reduces number of credits available over time
- Carbon credits traded in markets
- European Climate Exchange: 1 t$\text{CO}_2e = €25.14$ (~$40$
- IPCC estimates cost of cap and trade regimes at 0.1 – 1.0% of GDP
Candidates Favor Cap-and-Trade for US

- Reduce US annual CO$_2$ emissions to 80% below 1990 levels by 2050
- Reduce US annual CO$_2$ emissions to 30% below 2000 levels by 2050

Pending Legislation

Comparison of Legislative Climate Change Targets in the 110th Congress, 1990-2050
December 7, 2007

World Resources Institute

Calvin College Carbon Neutrality Project

Biology 354 and Engineering 333 Students Fall 2007
Profs. Warners and Heun & VP Henry DeVries
What Would it Take to Make Calvin Carbon Neutral?

• Assessed Calvin’s carbon footprint
  • Emissions
  • Sequestration
• Assessed remediation strategies
• Simulated carbon trading market
Calvin College Carbon Emissions

- Building Energy Use: 22,781 tCO₂e/year
- Transport: 42,000 tCO₂e/year
- Land: 1,756 tCO₂e/year
- Construction: 1,134 tCO₂e/year
- Waste: 258 tCO₂e/year

(Data from CCCN Project)
Calvin College Emissions Details

Building Energy Use: 42,000 tCO₂e/year
Transport: 22,781 tCO₂e/year
Other: 14,839 tCO₂e/year

Commuting: 5,852 tCO₂e/year
Air: 2,090 tCO₂e/year
Service Vehicles: 1,090 tCO₂e/year

Electricity: 31,920 tCO₂e/year
Heating: 10,080 tCO₂e/year

(Data from CCCN Project)
Calvin College Sequestration

Metric Tons CO₂ Sequestered/year (Data from CCCN Project)

- Maintained Lawn: 21.7
- Shrub: 10.1
- Mature Forest: 9.4
- Edge: 8.2
- Prairie Grassland: 5.8

(Data from CCCN Project)
Calvin’s Carbon Footprint

Emission

- Transport: 22,781
- Building Energy: 42,000
- Other: 3,148

Sequestration

- Mature Forest: 9.4
- Edge: 8.2
- Prairie Grassland: 5.8
- Mature Forest: 9.4
- Shrub: 10.1
- Maintained Lawn: 21.7
- Other: 3,148

Total Emission: 67,929 tCO₂/year
Total Sequestration: 55 tCO₂/year

(Data from CCCN Project)
Calvin’s Energy Picture (2006-2007)

In the year 2006-2007, Calvin’s energy expenditures were as follows:

- **Electricity**
  - 2006-07: $1.6 million
  - 06-07 with CO2: $1.6 million

- **Natural Gas**
  - 2006-07: $1.4 million
  - 06-07 with CO2: $1.4 million

- **Carbon Credits**
  - 2006-07: $2.1 million
  - 06-07 with CO2: $2.1 million

Total expenditures for electricity and natural gas were $3.0 million, with carbon credits adding an additional $2.1 million for a total of $5.1 million.
Examples of Calvin Activities

http://solar.calvin.edu

http://www.calvin.edu/admin/housing/new-wing/layout.html

http://geothermal.calvin.edu

http://wind.calvin.edu
Possible Future Goals for Calvin

- National Wildlife Federation
  - Campus Climate Champions establish goals of 2–3% annual reductions in CO₂ emissions
  - Reach ~70% emissions cut by 2050

- Calvin
  - Goal of 1–2% annual reductions in CO₂ emissions
  - Develop a campus-wide action plan
  - Annual progress reports

http://www.nwf.org/campusEcology/champions/
The Nation
Predicted Effects of Lieberman-Warner Bill

- Conservation
- More nuclear
- Reliance upon Carbon Capture and Storage technology (CCS)
- Slight increase in renewables

http://www.nicholas.duke.edu/institute/econsummary.pdf
Government Spending of Allowances

The Kingdom
Evangelical Climate Initiative (2006)

- Human-induced climate change is real
- The consequences of climate change will be significant, and will hit the poor the hardest
- Christian moral convictions demand our response to the climate change problem
- The need to act now is urgent

Advocacy by ECI Signatories

- Mitigate carbon market effects on the poor
- Provide aid for developing nations
  - Mitigate effects of climate change caused by global warming
  - Transfer low-emissions technology as economies grow
Conclusions
Conclusions

- Global
  - Climate change is all about energy (and politics)
  - US started the ball rolling, China following in American footsteps unless US shows domestic leadership

- US
  - Carbon markets and trading are coming
  - Christians are playing an important policy role

- Calvin: Are we ready?