How Green are You?

Navigating a Carbon Constrained World

August 25, 2008
OK, so we’re all Scared

an inconvenient truth
A GLOBAL WARNING

An Inconvenient Truth on DVD
November 21

www.recycle.com
What is Carbon?
How does Carbon make it to the Atmosphere?
# Green House Gas Primer

<table>
<thead>
<tr>
<th>Gas</th>
<th>Heat Trapping Ability</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carbon Dioxide (CO₂)</td>
<td>1</td>
</tr>
<tr>
<td>Methane (CH₄)</td>
<td>23</td>
</tr>
<tr>
<td>Nitrous Oxide (N₂O)</td>
<td>296</td>
</tr>
<tr>
<td>Refrigerants</td>
<td>&gt;2000</td>
</tr>
</tbody>
</table>
Natural vs Man Made

- Swamps
- Forest fires
- Uptake by plants
- Power plants
- Cars
- Landfills
Positive proof of global warming.
Your plastic bottle
Your plastic bottle
Two Phenomena

- Resource Scarcity
- Global Warming
- A little overwhelming?
What are we going to DO??

- No Magic Bullet
- Need incentives to promote ideas
- Each “solution” is only a couple of percent reduction
Market for Trading Carbon

- Chicago Climate Exchange (CCX)
  - Market-based system
  - Gives economic value to carbon
  - Gives financial incentive for environmental innovation
  - Additionality – won’t get credit if you would have done it anyway

- More efficient than regulation

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What I am Paying For?

• Paying someone else to reduce their emissions by amount being used

• Cap & Trade
  – Regulates certain industries
  – Creates overall carbon emissions goals
  – Companies that perform better than their amount can sell
  – Caps shrink over time

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How much is Carbon?

- Carbon is traded in MTCO$_2$e
  - Metric Tons of CO$_2$ equivalent
- Traded on CCX in 100 ton units
  - Carbon Financial Instruments (CFIs)
- Current price for 1 ton is $3.75
- Current price in Europe for 1 ton is $37

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Types of Offsets

- Renewable Energy
- Landfill & Agricultural Methane
- Soil, Forestry & Rangeland Carbon
- Destruction of Ozone Depleting Substance
- Others by negotiation

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Still not convinced?
Again, What should I do?

- **Audit**
  - Determine baseline carbon emissions
  - Collect documentation
- **Benchmark**
  - How do I compare with others?
- **Develop a plan**
  - Specific targets for reduction
  - Can I invest in offsets?
- **Publicize**

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City Government Footprint

- ICLEI – Local Governments for Sustainability
  - International organization
    - Over 900 members worldwide
    - Very inexpensive
  - Computer program to determine City carbon footprint
    - Includes waste
    - Launched program for 30 large cities in the US to voluntarily report
What are cities doing?

- Albuquerque, NM – Landfill Gas
- Boulder, CO – Carbon Tax
- Ann Arbor, MI – Energy Efficiency
- Toronto, Canada – Innovative MSW
- Atlanta, GA – LEED buildings
Conference Footprint

Total Footprint: 18.75 MTCO2e

- Driving: 71%
- Waste: 16%
- Flying: 9%
- Electricity: 3%
- Natural Gas: 1%
Contribution of Waste

- **Total GHG Emissions for US**
  - 7,076 Million Metric Tons of CO$_2$e

- **Landfill Methane**
  - 147 Million MTCO$_2$e (2%)
  - Other estimates – 8-9%

- **Collection of Waste & Recyclables**
  - 8.4 Million MTCO$_2$e

Data courtesy of EPA, NSWMA, Peter Anderson
Landfill Gas

- Total methane generation not well understood
- Inefficient method of capturing methane
  - May be as low as 20% capture rate
  - Much of methane lost before/after gas system
- Bioreactor landfills release significantly more than they capture

<table>
<thead>
<tr>
<th>Material</th>
<th>Methane Generation Potential*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Food Waste</td>
<td>12.0 Mg CO$_{2equiv}$ per Mg</td>
</tr>
<tr>
<td>Grass Clippings</td>
<td>5.5 Mg CO$_{2equiv}$ per Mg</td>
</tr>
<tr>
<td>Old Newspaper</td>
<td>3.0 Mg CO$_{2equiv}$ per Mg</td>
</tr>
<tr>
<td>Leaves</td>
<td>1.2 Mg CO$_{2equiv}$ per Mg</td>
</tr>
</tbody>
</table>

Data courtesy of Peter Anderson & Sally Brown
Contribution of Waste

- Landfill methane itself is a significant issue
- Landfill methane not only effect
  - New products must be produced to replace items thrown away
- Zero-waste goals have potential to reduce US carbon output by 7%
  - Equivalent to shutting down 1/5 of US coal fired power plants

Data courtesy of Institute for Local Self Reliance
How does Recycling Fit In?

- **Significant GHG savings**
  - 1 ton Aluminum saves 14 MTCO$_2$e
  - 1 ton Office Paper saves 5 MTCO$_2$e
  - 1 ton PET saves 2 MTCO$_2$e
  - American households can save .75 MTCO2e each year by recycling

- **Issue of Additionality**
Waste & Carbon

• How will a carbon market affect the waste industry?
  – Increase focus on waste as a commodity
  – Increase focus on organics
  – Increase interest in waste wood for biomass power
  – Improve economics of processing technologies

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Organics Offsets

• CCX protocols under development
  – Composting
    • Credit for avoiding landfill
    • Credit for carbon sequestration
    • Credit for reduced fertilizer use
  – Food waste diversion
    • Likely will be 1-3 MTCO2e for each ton diverted from the landfill
    • Will subsidize new and expanding programs
Anaerobic Digestion

- Four types of carbon credits possible
  - Existing: Destruction of methane
  - Existing: Biogas electricity generation
  - Potential: Offset for saved methane generation from landfiling
  - Potential: Carbon sequestration in compost
What else is happening?

- Dhaka, Bangladesh – Organics
- Rural India – Anaerobic Digesters
Questions/Comments

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