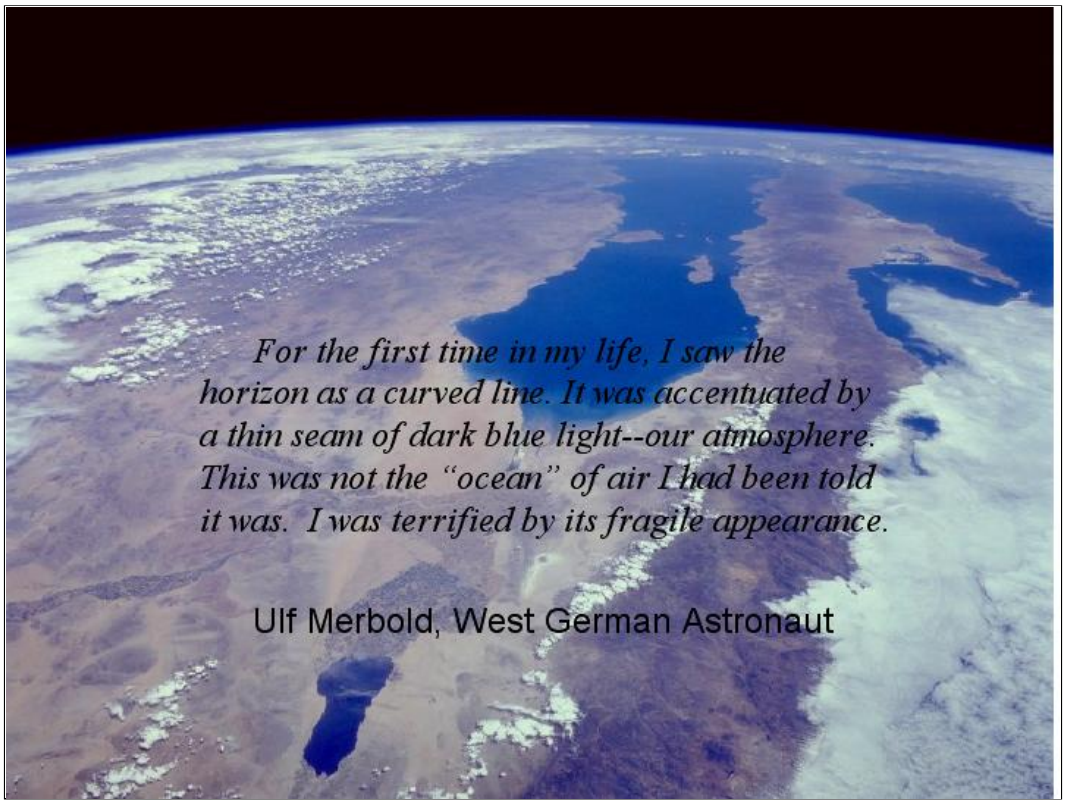
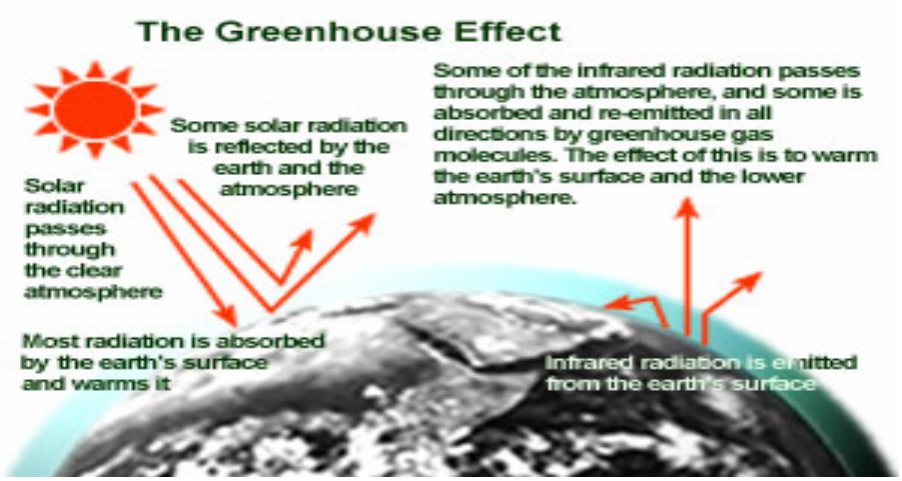

For the first time in my life, I saw the horizon as a curved line. It was accentuated by a thin seam of dark blue light--our atmosphere. This was not the "ocean" of air I had been told it was. I was terrified by its fragile appearance.
Ulf Merbold, West German Astronaut

The Greenhouse Effect is Well-Established



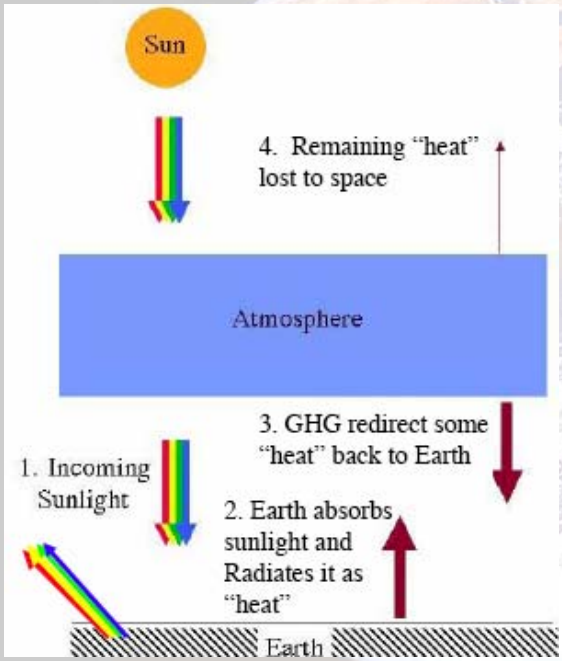
Graphic Source: US EPA

Greenhouse effect is well-established.

Greenhouse gases trap heat and without them, life would not be possible, as Earth would be 60º F. colder.

Heat trapping properties of GHGs (CO_2 and others) are well-understood. Adding GHGs to the atmosphere will tend to warm planet.

Greenhouse Gases Act Like a Blanket

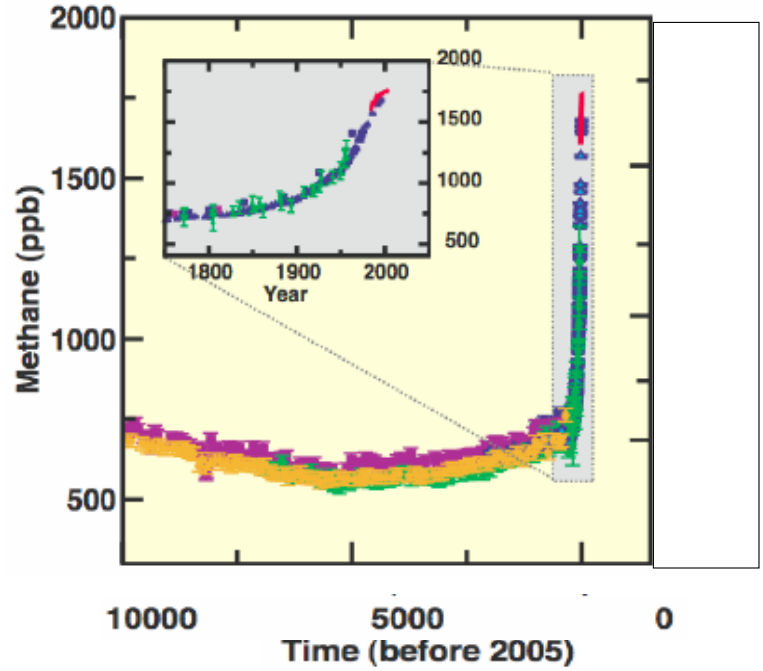


Greenhouse Gases:

CO_2 carbon dixoide
CH_4 methane
N_2O nitrous oxide
O_3 ozone
CFCs
H_2O water vapor

Carbon dioxide is the most abundant greenhouse gas and it is found in the parts per million range, methane is a very potent greenhouse gas, and is able to retain more gas.

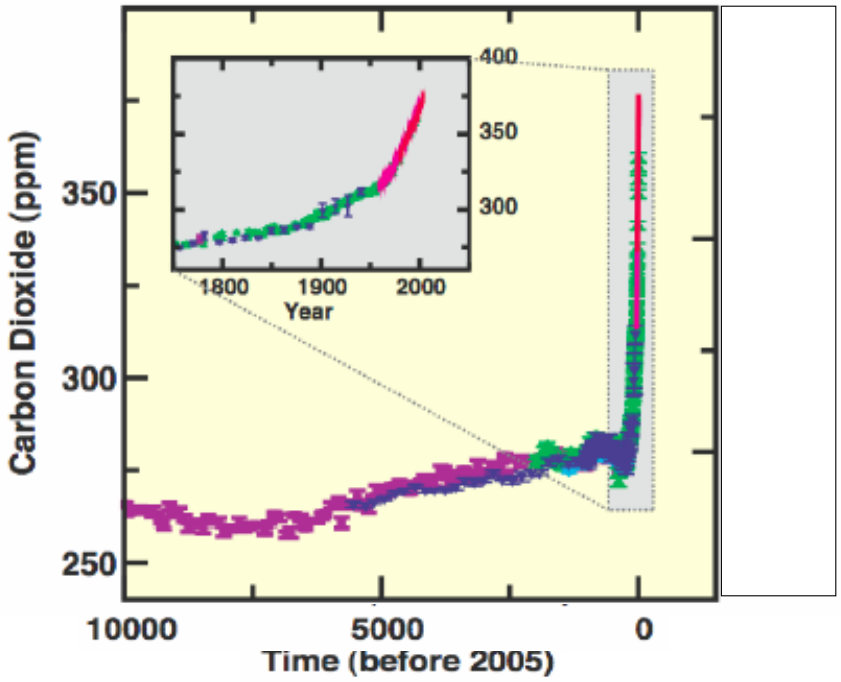
Changes in CH_4 from Ice-Core & Observational Data



IPCC
2007

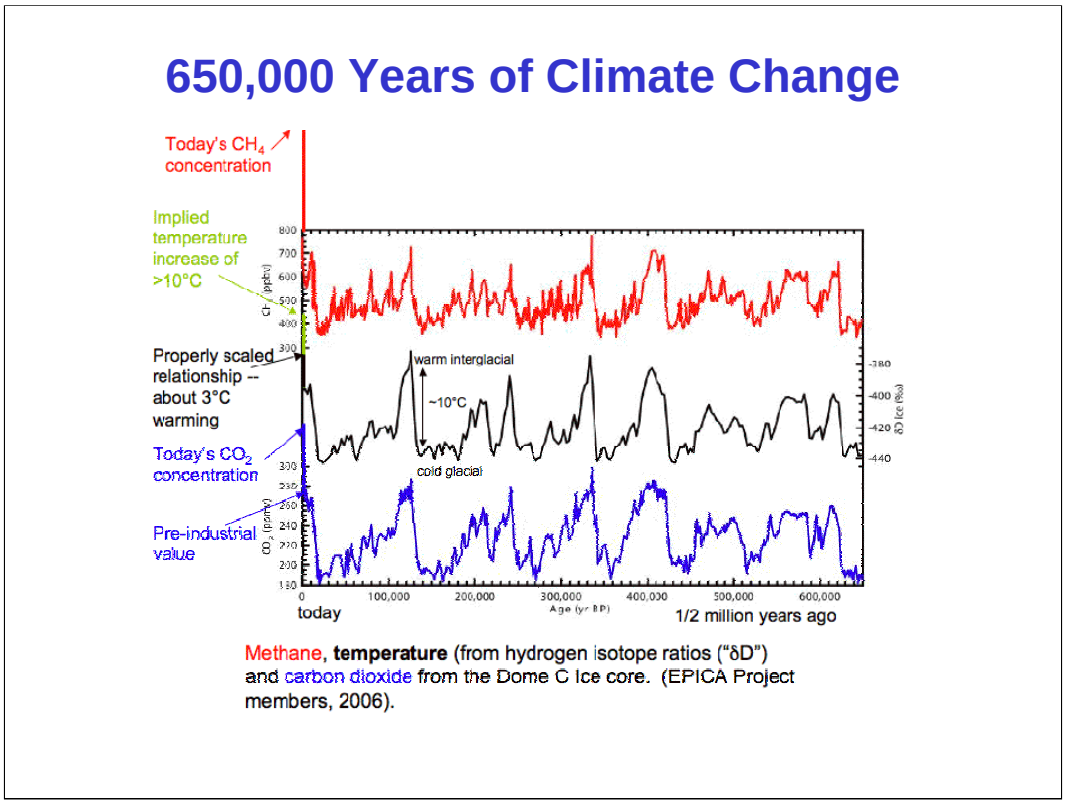
This is methane data gathered from ice core samples as well as measured values depicted in red. As you can see from the inset graph methane levels have risen dramatically over the past 200 years.

Changes in CO2 from Ice-Core & Observational Data

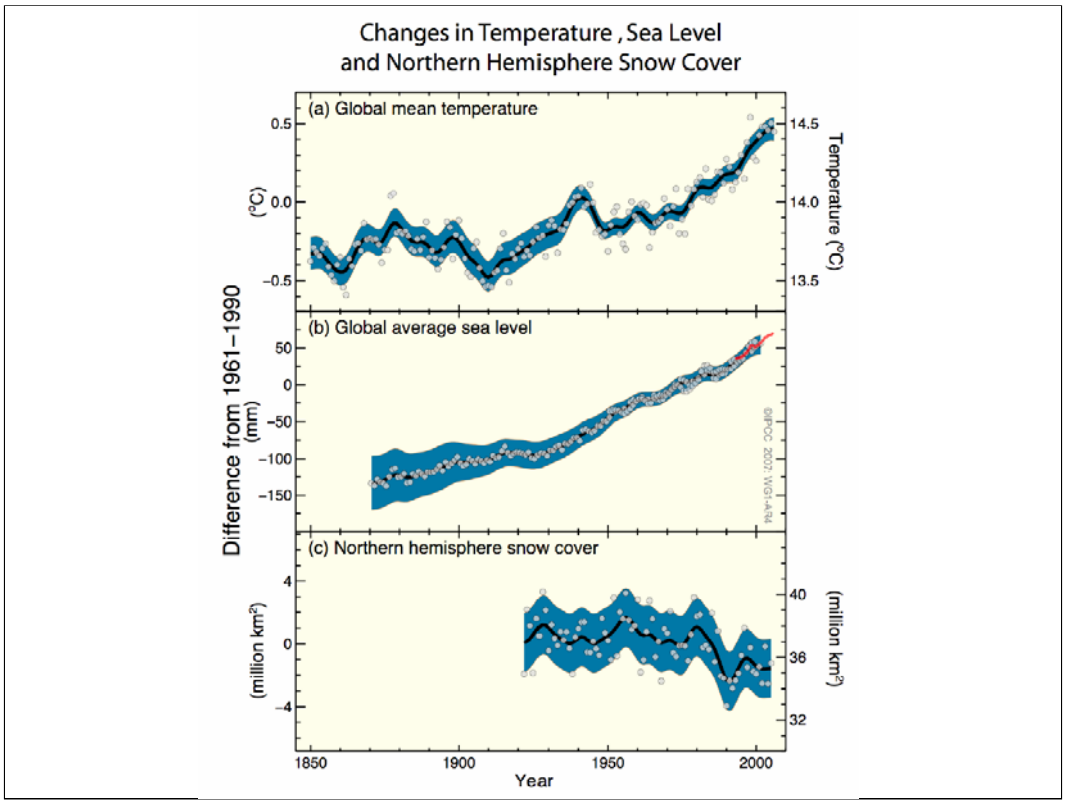


IPCC
2007

The same phenomenon of steeply rising values of carbon dioxide since the 1800s is depicted by the inset graph.



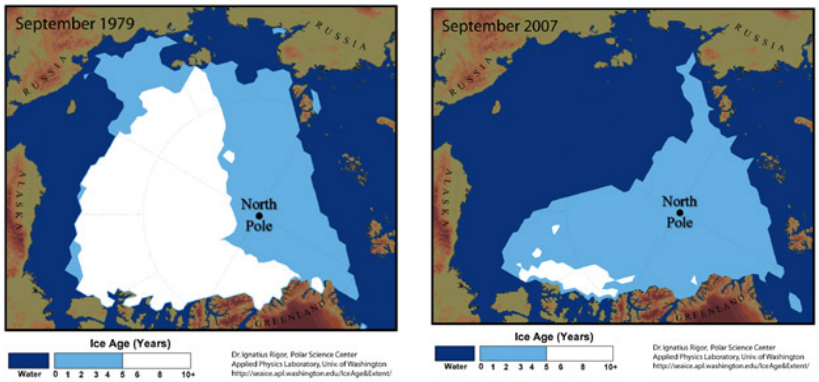
How to do natural climate cycles work. This graph depicts 650,000 years of information gathered from ice core samples from the artic. As you can see methane concentrations and carbon dioxide concentrations are directly related. As you look back from 650,000 years ago, significant cycles can be identified. As you can also see, the concentrations of methane and carbon monoxide are significant higher than the cycle. The temperature is also higher than it would be in the natural cycle, 3 degrees centigrade.



While the temperature is 3 degrees C higher at the poles, the global mean temperature is 1 degree higher overall. The overall sea level increase since 1870 is approximately 200 millimeters or 1/5 of a meter higher, and the northern hemisphere snow cover is decreasing.

Arctic sea ice has decreased over the last three decades.

September 1979 | **September 2007**



Source: University of Washington Polar Science Center, http://seaice.apl.washington.edu/

One visible sign of climate change is the reduction in extent, thickness, and age of Arctic sea ice. These images accompanied the announcement of polar bears being named an endangered species.

Intergovernmental Panel on Climate Change: We are warming the planet.

- Human activities have induced most of the warming over the past 50 years (over 90% certainty)
- Better modeling has enhanced confidence in impacts statements and future climate projections
- Greenhouse gases and temperatures are rising; warming of climate system is considered "unequivocal"
- A range of stabilization levels can be achieved by deploying a portfolio of current and future technologies

The Intergovernmental Panel on Climate Change (IPCC) was established by World Meteorological Organization (WMO) and the United Nations Environment Programme (UNEP) in 1988 to assess on a comprehensive, objective, and transparent basis the current state of knowledge on climate change, its potential impacts and options for adaptation and mitigation. Its Fourth Assessment Report was released last year.

The conclusions of the IPCC, simply put, are:

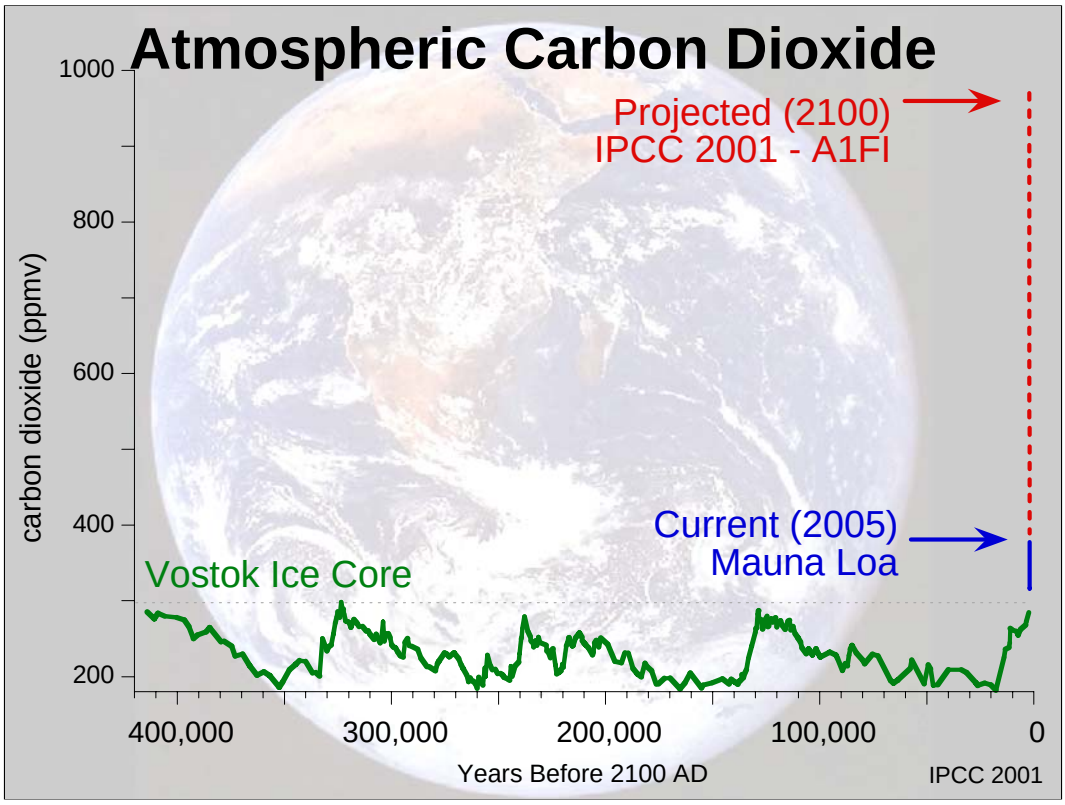
We are certain that the global climate is getting warmer.

Humans are definitely contributing to that warming.

Science has improved so we have better confidence in our projections about the impacts of climate change.

We can do something about it by using available technology and developing new technology. We have done this before (cars, planes, computers, cell phones, internet) and we can do it again.

Data from Antarctic ice cores show that carbon dioxide concentrations are unprecedented in the last 650,000 years.



The IPCC A1F1 model predicts that the levels of carbon dioxide could be over 3 times the normal level by 2100 if steps to reduce greenhouse gas emissions are not taken.

Slowing the growth of GHG emissions

EPA Voluntary Programs: Partnering with companies, governments, communities, and organizations to achieve cost-effective emissions reductions through technologies and best management practices

As I mentioned at the beginning of this presentation, EPA has multiple programs that aim to reduce GHG emissions.

We can provide a lot of tools, information, and assistance.

Many of these programs have Regional contacts in the Chicago office you can help you.

Climate Change and Waste

The Climate and Waste Connection

Reducing and Recycling waste decreases greenhouse gas emissions by:

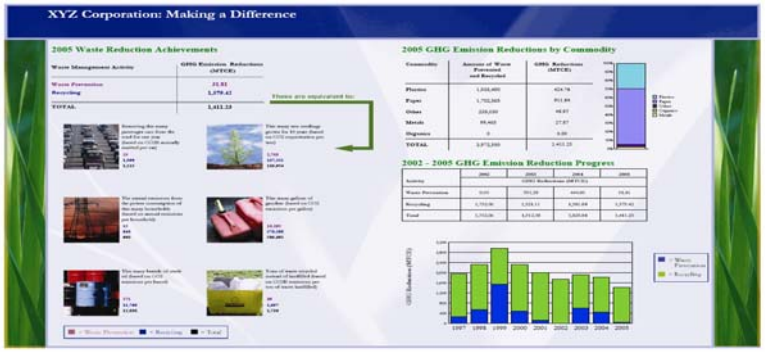
- Saving energy by manufacturing with recycled material
- Reducing methane emissions from landfills
- Increasing carbon storage in forest and soil

WasteWise -Voluntary program that works with companies to develop a solid waste reduction plan

Waste sector activities have great greenhouse gas reduction potential. There are upstream benefits such as reduced CO2 emissions due to energy savings when products are manufactured from recycled material. For example, manufacturing an aluminum can from recycled aluminum uses 95% less energy than manufacturing the can from bauxite. There are also downstream benefits by reducing methane emissions from landfills (landfills are the largest single man-made source of methane).

WasteWise Helps make the Climate/Waste Connection

- WasteWise Partners set waste prevention and recycling goals www.epa.gov/wastewise
- Climate Profile: Reporting partners receive a profile which quantifies the climate benefits of their waste reduction efforts



WasteWise is a voluntary partnership program focused on waste prevention, recycling, and procurement of recycled products. WasteWise has many community partners. Reporting partners receive a customized climate profile that describes the climate benefits of their waste reduction efforts. These can be used to share with residents to increase understanding of why recycling and reuse programs are important.

Climate Benefits of Reduction and Recycling Programs

- EPA has developed emission factors for many components of the waste stream (i.e. corrugated cardboard, aluminum cans, etc.)
- The Waste Reduction Model (WARM) calculates greenhouse gas (GHG) emissions for each waste component under various waste management scenarios (landfilling, combustion, source reduction and recycling)
- Model compares emissions for baseline waste generation vs. alternative waste management scenario
- WARM is free and easy to use at: http://www.epa.gov/climatechange/wycd/waste/calculators/Warm_home.html
- Five new Region 5 WasteWise partners last year recycled over 17 million pounds of solid waste and the WARM model calculated reduced greenhouse gas emissions of 9,500 Metric Tons of Carbon Equivalents (MTCE), which is equivalent to removing 7532 cars from the road.

EPA conducted a life cycle assessment to determine the overall greenhouse gas impacts from the major waste management options (e.g., landfill, combustor, recycling, source reduction). The study (available on the EPA's web site) resulted in the development of emission factors for various components of the waste stream (e.g., newspaper, various plastics, aluminum, steel, etc.). To make it easier to use these emission factors, EPA developed WARM, a model that can provide greenhouse gas emissions for each waste management option. Communities can compare results for landfilling vs. recycling vs. incineration. It is very user friendly and can be accessed from the website above.

Analysis of Metro Health Waste Management Impacts on GHG Emissions Using EPA's WARM Model

Prepared by: Ajit Vaidya

Grand Rapids, MI, September 25, 2008

Metro Health Hospital: Overview of Waste Reduction & Recycling Initiatives

- Joined Hospitals for a Healthy Environment program in 2004.
- Moved into new LEED rated hospital in 2007.
- Joined EPA's WasteWise Program in 2007
- FY 2005 designated Baseline Year for Waste Reduction efforts.
  - Goal of 33% Waste Reduction by 2008
  - Goal of 50% Waste Reduction by 2010
  - Goal of 80% Waste Reduction by 2015
- Waste Reduction and Recycling Initiatives
  - Source Reduction and Solid Waste Recycling
  - Construction and Demolition Debris Recycling

Application of WARM model to Metro Health: Solid Waste Profile

- Solid Waste Stream (FY05-FY08)
- WARM model assumptions
  - Assumes a combined stream of Municipal Solid Waste and Regulated Medical Waste
  - Model does not consider hazardous waste recycling (except personal computers)
  - Reusable sharps containers and shrink wrap elimination considered source reduction
  - Recycling includes cardboard, office paper, X-Ray film (plastic), mixed recyclables, and computers.
- Under baseline scenario, all solid waste and regulated medical waste taken to incinerator.
- Alternative waste management scenario includes source reduction and recycling.

Metro Health Solid Waste Profile

Annual Weights (tons)	FY 2005	FY 2006	FY 2007	FY 2008
Mixed MSW				
Solid Waste	579	544	549	619
Regulated Medical Waste	46	45	40	50
Total Mixed MSW:	626	589	589	669
Recycling				
Cardboard	62	59	56	72
Paper	0	38	52	58
X-Ray Film	6	3	4	0
Mixed Recyclables	0	0	0	9
Computers / Electronics	0	2	13	13
Source Reduction				
Reusable Sharps Containers		5	5	5
Elimination of Shrink Wrap	4	4	4	4

GHG Emissions Reductions from Metro Health Solid Waste Management Practices

	FY 2005	FY 2006	FY 2007	FY 2008
GHG Emissions (MTCE) - Baseline Scenario	-29	-33	-36	-45
GHG Emissions (MTCE) - Alternative Scenario	-78	-106	-122	-148
Total Change in GHG Emissions (MTCE)	**-49**	**-73**	**-86**	**-104**
GHG Emissions Equivalent to Removing # Passenger Cars from Roadway Each Year	**39 cars**	**58 cars**	**69 cars**	**82 cars**
Energy Equivalent to Reducing # Households Annual Energy Consumption	**7 homes**	**10 homes**	**13 homes**	**14 homes**
Energy Equivalent to Reducing # Gallons of Gasoline	**11,000 gal.**	**14,900 gal.**	**19,200 gal.**	**20,800 gal.**

Application of WARM model to Metro Health: Construction & Demolition Waste

- Construction & Demolition Waste Stream (CY05-CY06)
- Associated with demolition of old hospital
- WARM model assumptions
  - Wood waste a combination of dimensional lumber and medium density fiberboard.
  - Metal waste assumed to be a combination of steel and copper.
  - Other diverted waste is primarily drywall – assumed to be a combination of fiberboard and concrete.
- Under baseline scenario, all construction waste taken to local landfill with landfill gas capture.
- Under alternative waste management scenario, 70% of C&D Waste is recycled.

Metro Health Construction and Demolition Debris Profile

Annual Weights (tons)	CY 2005	CY 2006
Solid Waste	**254**	**488**
Recycling		
Concrete	394	342
Metal	23	128
Wood	72	143
Paper / Cardboard	3	44
Other Diverted	13	632
Subtotal Recycling	***505***	***1288***

GHG Emissions Reductions from Metro Health Construction Waste Management Practices

	CY 2005	CY 2006
GHG Emissions (MTCE) - Baseline Scenario (100% Waste Incineration)	-21	-126
GHG Emissions (MTCE) - Alternative Scenario (Incl. Recycling & Source Reduction)	-78	-475
Total Change in GHG Emissions (MTCE)	**-56**	**-349**
Equivalent to Removing # Passenger Cars from Roadway Each Year	**45 cars**	**277 cars**
Energy Equivalent to Reducing # Households Annual Energy Consumption	**7 homes**	**39 homes**
Energy Equivalent to Reducing # Gallons of Gasoline	**10,000 gal.**	**58,800 gal.**

GreenScapes is:

A Multi-media EPA Partnership Program designed to:

- Promote a wide variety of environmentally beneficial landscaping and land management practices;
- Preserve natural resources and prevent waste and pollution and to provide cost-efficient and environmentally friendly **solutions;**
- Improve both an organization's bottom-line and the environment.

GreenScapes
Environmentally-Beneficial Landscaping

Reduce:

- **Waste** generation by utilizing slow-growing, low maintenance plant materials.
- **Water** use - Incorporate compost into the soil to help improve water absorption and retention.
- **Pesticide** use - Implement an Integrated Pest Management (IPM) program.
- **Energy** - Strategically plant vegetation outside and around buildings to reduce indoor heating and cooling needs Reduce nonpermeable hardscape to minimize rainwater runoff & erosion.

Examples

- Switch from benches, boardwalks & bridges made from wood to long-lived plastic lumber.
- Conserve water and reduce maintenance by planting native plants
- Reduce chemical use by using native plants and organic biobased fertilizers.

Example

- Reduce or eliminate plastic silt fencing.
  - Substitute with blankets, berms, and filter-socks made of compost.

Compost provides:

- Superior filtration & erosion prevention/control
- Easier installation & maintenance
- Control & reduction of non-point source pollution
- Require less removal or disposal from site once job is complete

Healthcare Sector

Huge potential for waste reduction and energy conservation in the Healthcare Sector

- Represents 15% of Gross National Product
- Construction/Renovation investments over next 10 years estimated at $200,000,000
- Consumes 6% of all energy in US
- Facilities are interested in conserving resources, protecting health and saving money

GreenScapes
Environmentally Beneficial Landscaping

Climate Change and Energy

Buy Renewable Energy: Green Power Partnership

- Voluntary program in which partners use green power to meet a portion of their electricity needs
- More than 900 partners purchase more than 14.3 billion KWh of green power annually
- The Green Power Partnership helps through:
  - Green Power Locator: List of providers
  - Step-by-Step Guide to Purchasing Green Power
  - Media/outreach tools

Green Power is an "environmentally-differentiated" electricity product from solar, wind, geothermal, biomass, biogas, small hydro

Product options:

Green Power Electricity Products– purchased from utility green pricing programs or green power retail marketers

Renewable Energy Certificates (REC): Buy only the "attributes" associated with the electricity generated (1 REC = 1MWh)

On Site Generation: Install renewable energy system on site, e.g. Solar panels

900 Partners, 80 local government partners

14.3 billion KWh is enough to power 1.5 million homes

GPP has 80+ local government Partners, including Ann Arbor, Grand Rapids, Madison, Milwaukee, Northbrook

How Does the EPA GREEN POWER PARTNERSHIP Help?

- Green Power Locator
  - Comprehensive list of local, regional & national green power providers
- Guide to Purchasing Green Power
  - Step-by-step instructions, issues, details
- Green Power Partner logo and guidelines
- Environmental claims calculators
- Partner recognition; captures favorable media attention
  - Clean technology
  - Domestic energy supply/energy security
  - New U.S. jobs

-The Partnership offers metrics for “How much is enough?” – Our minimum standard for membership tells customers the percent green needed to be doing something meaningful.

-The Power Profiler tool on our website helps all customers with their understanding and marketing of the impact of their purchase.

-We can’t endorse a specific product, but we can help you find what fits your needs.

Combined Heat and Power Partnership (CHP)

- Promotes cogeneration of electricity and thermal energy
- Most fossil fuel use in the United States is for either:
  - Heat/steam to drive industrial processes or provide space heating/cooling
  - Electricity production
- Separate heat and electricity production is highly inefficient; average efficiency of fossil fuel power plants is 33%
- Combined heat and power systems are highly efficient: 60-80% efficient

Opportunities for Hospitals

- Hospitals are excellent candidates for CHP
  - High thermal and electric loads
  - Thermal and electric loads rise and fall together
  - Long operating hours
  - Power reliability very important
- Benefits:
  - Reduced pollution and carbon emissions
  - Improved reliability, for the user and the electrical grid as a whole
  - Economic benefits: many projects have short payback periods; all provide hedge against electricity price increases
- The CHP Partnership can help you determine whether your facility is a good candidate for CHP

Potential for Hospitals

- Report by Midwest CHP Application Center
  - 200+ Hospitals Already use CHP nationwide
  - CHP potential in Michigan hospitals estimated at 629 MW, compared with actual 1.35 MW
- Many examples of successful projects

Additional Programs and Resources

Water Conservation

Consider as you build or renovate:

Use consultants paid from "Shared Savings"

Use EPA's WaterSense Products

http://epa.gov/watersense/

Check out Healthcare Environmental Resource Center water conservation resources

www.hercenter.org/facilitiesandgrounds/waterconserve.cfm

New! Use Energy Star Benchmarking tool to track water consumption

http://www.energystar.gov/index.cfm?c=business.bus_water

One hospital saved $280 per sink per year by installing $12 flow reduction device

Another facility saved $20,000 per year by recirculating heating/AC water

One hospital saved $42,000 per year by installing ultra low flush toilets

Healthcare Environmental Resource Center (HERC)

- USEPA sponsored comprehensive website
- Specific to the healthcare sector
- Federal regulatory information
- State regulatory contacts
- Technical Assistance information (P2)
- Handout on back of the agenda
- www.hercenter.org

Build Healthy Hospitals: Top 5 Green Strategies for Decisionmakers

#1 Energy Efficiency – Integrated Design & HVAC System Enhancements

#2 Process Water Efficiency

#3 Sustainable Flooring Material Selection

#4 Material Selection To Improve Air Quality

#5 Lighting Efficiency – Optimizing Use of Natural and Artificial Lighting

EPA publication, 2007
http://www.epa.gov/region09/waste/p2/greenbldg.html

Green Electronics Procurement with EPEAT©

www.epeat.net

Why purchase environmentally responsible electronics?

- Electronics represent serious environmental costs and opportunities
  - Energy use/costs
  - Potential harm to public health and the environment if disposed of improperly
  - Potential environmental liabilities and costs
  - Storage and disposal costs

Why use EPEAT

Because it makes it simple to procure 'greener' computers:

- **Rating system which addresses dozens of individual environmental criteria, such as energy consumption and toxic components and waste**
- **Includes all phases of the life cycle – design, corporate performance, packaging, use, refurbishment, end of life**
- **No cost**
- **Allows calculations of GHG emission reductions – Environmental Benefits Calculator**

EPEAT© Registered Products

	BRONZE	SILVER	GOLD
Desktops	23	100	17
Notebooks/Laptops	31	224	11
Integrated Systems	6	5	0
Monitors	10	250	1
Total	70	579	29

As of 9/6/2007

Additional Resources

- Donna Twickler, USEPA Region 5, Chicago twickler.donna@epa.gov
- US Department of Energy Program
  www1.eere.energy.gov/buildings/energysmarthospitals
- Energy Star