

Challenges and Opportunities of Speaking to the Public about Global Warming and Climate Change

- Remain cognizant to explain basic concepts, graphs, jargon that you normally take for granted will be understood.
- Plan carefully the flow and logic of your presentation. Try to keep it as straightforward as possible.
- · Balancing "concerns" with the need to provide "hope."
 - Strong-handed scare tactics can actually backfire.
 - Provide a sense of urgency without a sense of panic.

• Use the topic as an opportunity to educate the public on the "process" of science in general.

- Few scientific issues are black & white.
- Importance of building of consensus.

Importance of peer review.

My Assumptions for this Talk

- Global Warming/Climate Change are serious issues.
- Action needs to take place on many levels.
 Individually, locally, regionally, nationally, globally.
- Clear communication of the issues is required to make good decisions.
- There is a lot of (mis-)information in the public discussion;
 + some of it due to lack of understanding and some of it intentional.
- Scientists and technical experts can (collectively) have a positive impact on the framing of this discussion, but only if we speak in ways the public can understand.

Areas of Potential Confusion

"Not everybody agrees..."

· etc.

- "Isn't it just a natural variation?"
- "What difference can a degree or two make?"
- "Are these funky local weather events due to GW?"
- "How can GW cause both droughts and floods?"
- Climate models predict things all over the map. How can we believe anything from them?
- · Mercury in CFL bulbs-bad for the environment?
- Ethanol: not everything it's cracked up to be?
- Wind Energy: Environmental tug-of-war.



Bill Blair Johns Hopkins University Feb. 26, 2008 A Talk for the Public



Outline

- The Greenhouse Effect
- Global Warming
 - Is it real?
 - Is it natural or induced?
 - What are the impacts?
- What can/should be done?



The New Hork Cimes Tuesday, November 6, 2007 WORLD U.S. N.Y. / REGION BUSINESS THE

DOT EARTH

Is Burning Coal a Patriotic Duty in Kansas?

Coal companies and utilities have tried a <u>new approach</u> in defending black combustible rock as the fuel of the future, at least in Kansas.

Science

•

The New York Times

They helped pay for newspaper ads there on Monday criticizing the decision last month by the administration of Gov. Kathleen Sebelius to deny air-quality permits for two 900-negawart coal-burning plants. The denials were based on health and environmental risks from global warming.

Such ads are not unusual. But these particular ads were topped by three cheery images of heads of state with rather low approval numbers in the United States – Presidents <u>Mahmoud Amadinejad of Iran</u>, <u>Hugo Chavez</u> <u>Venezuela</u> and <u>Vladimir</u> Putin of <u>Russia</u>.



Why are these men smiling?

"Why are these men smiling?" asked the advertisement, which was paid for by Kansans for Affordable Energy, a group that has received financial backing from a local utility, <u>Smilonver Electric Power</u>, and the world's largest private coal company, <u>Feabody Energy</u>.

The answer: "Because the recent decision by the Sebelius Administration means Kansas will import more natural gas from countries like Russia, Venezuela, and Iran."

Politically Charged

Washington

WORLD U.S. N.Y. / REGION BUSINESS TECHNOLOGY SCIENCE HEALTH SPORTS OPINION

Gore Makes It to the Oval Office, if Only for a Chat



Al Gore made his first trip back to the White House since the Clinton administration for a ceremony in the Oval Office honoring the American Nobel isurestes.

Published: November 27, 2007	E E-MAIL
WASHINGTON, Nov. 26 — Al Gore has traveled the world to spread his message that climate change is creating a "planetary emergency."	
	REPRINTS

The Greenhouse Effect

- Sunlight comes through glass.
- Light is absorbed and re-radiated as heat (infrared light).
- Heat is trapped (warms interior of greenhouse).
- Need for "balance" to keep it from getting too hot/cold.







The Earth is so big...how can we affect things?





Greenhouse Gases

- Water Vapor H₂O
- Methane CH₄
- Carbon Dioxide CO₂
 - A trace constituent, but very effective at trapping heat.



Carbon Facts

- Coal is almost pure carbon and oil and gas (hydrocarbons) are mostly carbon.
- Burning fossil fuels currently releases about 2.6 Billion metric tons of carbon into the atmosphere per year.
- Over decades, we have put (and are putting) enough carbon (CO_2 , CH_4 , etc.) into the atmosphere to affect the delicate balance.
 - CO_2 fraction has increased ~30% since 1860.
- Since 1860, US has been responsible for 29%, western Europe for 27%.
- Current emissions: US and China about tied, but China, India, increasing rapidly.

The Earth is so big...how can we



Fact: Atmospheric CO₂ levels are increasing.







Climate Impacts





A grim outlook on world climate Drought, famine are projected as planet warms

BY ALAN ZAREMBO AND THOMAS H. MAUGH II

Warmer sea temperatures...

- cause stronger storms and affect atmospheric and sea circulation patterns.
- Can cause droughts in some areas and excessive rainfall in others.
- Add to the rise in sea level. - Warm water has a larger volume.

Past Climate: How do we know?

- Ice core samples: Greenland, Antarctica, etc.
- Ice traps gas bubbles, dust particles, biological material, and other materials.
- Chemical isotope ratios are proxies for Temp, CO₂ levels, etc., at various times in the past.



19 cm long section of GISP 2 ice core from 1855 m

showing annual layer structure illuminated from below by a fiber optic source. Section contains 11 annual layers with summer layers (arrowed) sandwiched between darker winter layers.

Layers in ice core are similar to "tree rings" - showing annual cycles.



Consistent Results from two deepest Ice Core Samples Available, covering past 450,000 years!





Are we responsible?



Where does it go from here? Climate Models Provide Clues



Warming will not be uniform...



Figure 10.8. Multi-model mean of annual mean surface warming (surface air temperature change, "C) for the scenarios B1 (top), A18 (middle) and A2 (bottom), and three time periods, 2011 to 2030 (inth, 2046 to 2056 (middle) and 2090 to 2099 (right). Stipping is omitted for clarity (see text). Anomalies are relative to the average of the period 1990 to 1999. Results for individual models can be seen in the Supplementary Material for this incluter.

Venus - Earth's "Twin"?*



- Closest planet to earth.
- Nearly the same size as earth, but
- CO₂ atmosphere 100x denser than earth's.
- Surface temp 900 degrees F.
- Example of "Runaway" Greenhouse effect.

Like adding two "Chinas" between now and 2050.)

Venus - Earth's "Twin"?*

BA



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- denser than earth's.
- Surface temp 900 degrees F.
- Example of "Runaway" Greenhouse effect.

*(Let's hope not!)





Global Sustainability:

- US per capita energy consumption [hence, CO₂ production] is roughly 30x that of the developing world.
- If the developing world rises to our level of consumption, the energy needs are immense.
 - If they do it with fossil fuels, we are toast!
- This indicates that our level of energy consumption *is not sustainable.*

>> We must reduce our consumption and let the rest of the world meet us in the middle.

What Needs to Happen?

- We need to act...individually, collectively, globally.
 - "Procrastination is Decision."
- GOAL: Keep CO_2 levels below 2x preindustrial levels (<560 ppm) by 2050 and continue to reduce thereafter.
- No new technology is needed to do this! (Only the collective will to do it is missing.)

What has to happen, con't.

- The United States has to take a LEADERSHIP role in reducing greenhouse gas emissions.
 - Nothing will happen globally if we do not act.
 - It is in our country's best interest to do so.
 - Economically
 - Socio-politically

The U.S. is responsible for 23% of the world's CO₂ emissions, yet has only 5% of the world's population.

BUSINESS AS USUAL

Heavy dependence on fossil fuels.
 More carbon dioxide emissions.
 Higher global temperature.





What can we do to motivate ourselves?

- Consider Global Warming as a social justice issue.
- Consider Global Warming as a stewardship issue.
- Consider Global Warming as a survival issue.
- Greed. (e.g. capitalism!)



These applesauce cups are made out of cornstarch, which means they can biodegrade in soil, compost or wastetreatment facilities within a few months. Metabolix is partnering with agricultural giant ADM to produce the corn-based plastics, called Mirel, in the second half of next vear

Green homes going mainstream

placed windows, for one thing, says Michelle Many energy-consumption problems can be addressed with simple tweaks to conventional house

able energy as part of efforts to

ower will install its solar panels and sell the electricity he panels generate to HP at fixed rates under a power ase agreement. The system will save HP \$750,000 ver 15 years and offset 1 million pounds of carbon dioxic

er year, the equivalent of taking 100 cars off the road eac

The San Diego installation will be made up of 5,000 panels on seven buildings. It's a relatively large solar array, but solar array, which is the largest corporate installation to

Actions at the individual level can have an immediate and significant positive impact.

- Conserve!
- Recycle!
- Change a light bulb!
- Walk or bike.
- Carpool or public transportation.
- Buy a car that gets better gas mileage.
- Be aware, spread the word, change the culture.

Support Green Technologies and Alternative Energy Sources





Raising fuel economy to 40 miles per gallon can save **3 million barrels of oil** *a day*.

Let's take care of the Earth...



...it's the only one we've got!

