THE POLITICS OF CLIMATE CHANGE

Fred Busche
Some Political Humor

1. Cartoon: "It's settled... we agree to sign a pledge to hold another meeting to consider changing course at a date yet to be determined."

2. Cartoon: "The ball must have been deflated... 2014 hottest year on record."

3. Cartoon: "This snowball proves global warming doesn't exist..."

4. Cartoon: "Oh, and one thing we forgot to mention: climate change."

"The President: WHAT?"
And My Favorite

CLIMATE SUMMIT

WHAT IF IT'S A BIG HOAX AND WE CREATE A BETTER WORLD FOR NOTHING?

- ENERGY INDEPENDENCE
- PRESERVE RAINFORESTS
- SUSTAINABILITY
- GREEN JOBS
- LIVABLE CITIES
- RENEWABLES
- CLEAN WATER, AIR
- HEALTHY CHILDREN
- ETC. ETC.
AGENDA

• Short Discussion of the Scientific Method
• Short Review of How Weather and Climate are Related
• Possible Impacts of Climate Change
  – Estimates of What Costs Might be Associated With Preparing for Climate Change
  – What Other Countries are Doing to Prepare for Climate Change
• Why US Politicians Seem to be at Odds with Scientific Evidence Supporting Climate Change
• What Can Citizens do to Promote Preparation for Climate Change
SCIENCE VS. EVERYTHING ELSE
Scientific Method
Science and Critical Thinking

- Is the Sun Hot
- Test with thermometer temp should be higher in the sun
- Measure temp in dark and light
  - Shows higher temperature in sun than in dark
- Measure temp in cloudy and sunny
  - Shows higher temp in sun than in cloud
- Et Cetera Et. Cetera
- Since the Sun is Hot then it should warm the Earth
  - Take measurements everywhere at all times of the year
- It is warmer on some parts of the Earth because the Sun is directly overhead
WEATHER AND CLIMATE REVIEW
Troposphere

• Where weather happens
• Location - surface to about 10 km.
• Composition - unpolluted air:
  • Nitrogen (78%) Oxygen (21%). Remaining 1% is CO2 (0.0365%), H, He, Ar
• Water vapor is an additional variable amount, 01% to 5%.
**Stratosphere**

- Where jets fly (at the bottom of it)
- Location - Above troposphere, about 10-50 km. Very thin air - virtually no weather, and no turbulence.
- Composition - Similar to troposphere, except
  - water vapor is 1000 x less
  - ozone is 1000 x greater
Energy Balance: Effect of Atmospheric Gases
Weather

- Weather = short-term atmospheric conditions
- Dynamic but Short Lived
- Dramatic events
- Some warning before they hit
- Severity associated with heat energy and its transfer between the Ocean, Land and Atmosphere
What is Climate

Climate is the aggregated pattern of weather, meaning averages, extremes, timing, spatial distribution of...

- hot & cold
- cloudy & clear
- humid & dry
- drizzles & downpours
- snowfall, snowpack, & snowmelt
- blizzards, tornadoes, & typhoons

Climate change means altered patterns.

- Global average temperature is just one measure of the state of the global climate as expressed in these patterns
- Small temperature changes $\rightarrow$ big changes in the patterns

(after Holdren NCES, 2008)
Overview

• Global Climate Change: Trends & Projections

• North America: Trends & Projections

• Parting Thoughts
What is an Extreme Event

(a) Temperature
- Cold temperature extremes
- Hot temperature extremes

(b) Precipitation
- Heavy precipitation extremes

Increase in Probability of Extremes in a Warmer Climate

(a) Temperature
- Previous climate
- New climate
- More hot weather
- More record hot weather

(b) Precipitation
- Less light precipitation
- Previous climate
- More heavy precipitation

(CCSP SAP 3.3)
Global Temperatures are Increasing

Green bars show 95% confidence intervals

the 15 hottest years all occurred since 1990

http://data.giss.nasa.gov/gistemp/graphs/
<table>
<thead>
<tr>
<th>Phenomenon and direction of trend</th>
<th>Likelihood of future trends based on projections for 21st century using SRES scenarios</th>
<th>Agriculture, forestry and ecosystems (WGII 4.4, 5.4)</th>
<th>Water resources (WGII 3.4)</th>
<th>Human health (WGII 8.2, 8.4)</th>
<th>Industry, settlement and society (WGII 7.4)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Over most land areas, warmer and fewer cold days and nights</td>
<td>Virtually certain*</td>
<td>Increased yields in colder environments; decreased yields in warmer environments; increased insect outbreaks</td>
<td>Effects on water resources relying on snowmelt; effects on some water supplies</td>
<td>Reduced human mortality from decreased cold exposure</td>
<td>Reduced energy demand for heating; increased demand for cooling; declining air quality in cities; reduced disruption to transport due to snow, ice; effects on winter tourism</td>
</tr>
<tr>
<td>Warm spells/heat waves. Frequency increased over most land areas</td>
<td>Very likely</td>
<td>Reduced yields in warmer regions due to heat stress; increased danger of wildfire</td>
<td>Increased water demand; water quality problems, e.g. algal blooms</td>
<td>Increased risk of heat-related mortality, especially for the elderly, chronically sick, very young and socially isolated</td>
<td>Reduction in quality of life for people in warm areas without appropriate housing; impacts on the elderly, very young and poor</td>
</tr>
<tr>
<td>Heavy precipitation events. Frequency increases over most areas</td>
<td>Very likely</td>
<td>Damage to crops; soil erosion, inability to cultivate land due to waterlogging of soils</td>
<td>Adverse effects on quality of surface and groundwater; contamination of water supply; water scarcity may be relieved</td>
<td>Increased risk of deaths, injuries and infectious, respiratory and skin diseases</td>
<td>Disruption of settlements, commerce, transport and societies due to flooding: pressures on urban and rural infrastructures; loss of property</td>
</tr>
<tr>
<td>Area affected by drought increases</td>
<td>Likely</td>
<td>Land degradation; lower yields/crop damage and failure; increased livestock deaths; increased risk of wildfire</td>
<td>More widespread water stress</td>
<td>Increased risk of food and water shortage; increased risk of malnutrition; increased risk of water- and food-borne diseases</td>
<td>Water shortage for settlements, industry and societies; reduced hydropower generation potentials; potential for population migration</td>
</tr>
<tr>
<td>Intense tropical cyclone activity increases</td>
<td>Likely</td>
<td>Damage to crops; windthrow (uprooting) of trees; damage to coral reefs</td>
<td>Power outages causing disruption of public water supply</td>
<td>Increased risk of deaths, injuries, water- and food-borne diseases; post-traumatic stress disorders</td>
<td>Disruption by flood and high winds; withdrawal of risk coverage in vulnerable areas by private insurers, potential for population migrations, loss of property</td>
</tr>
<tr>
<td>Increased incidence of extreme high sea level (excludes tsunamis)*</td>
<td>Likely*</td>
<td>Salinisation of irrigation water, estuaries and freshwater systems</td>
<td>Decreased freshwater availability due to saltwater intrusion</td>
<td>Increased risk of deaths and injuries by drowning in floods; migration-related health effects</td>
<td>Costs of coastal protection versus costs of land-use relocation; potential for movement of populations and infrastructure; also see tropical cyclones above</td>
</tr>
</tbody>
</table>

*Values are based on the SRES A2, B1, and B2 scenarios.
Climate Change in a "Nutshell"
POSSIBLE IMPACTS OF CLIMATE CHANGE TO NAME A FEW
Effect of Rising Sea Level

- Threats to coastal communities
  - High tides and storm surges riding on ever-higher seas are more dangerous to people and coastal infrastructure
  - Barrier islands, beaches, sand dunes, salt marshes, mangrove stands, and mud and sand flats retreat inland as sea level rises, unless there are obstructions along the retreat path
  - Many shorelines have sea walls, jetties, and other artificial defenses to protect roads, buildings, and other vital coastal resources

- Saltwater intrusion
  - Sea-level rise can mean that saltwater intrudes into groundwater drinking supplies, contaminates irrigation supplies, or overruns agricultural fields
Lifetime Daily Temperatures Above 95°F

Current Look

Future Look

Average Days a Year Over 95°F
Humid Heat Stroke Index

Days per year when the heat and humidity could be so high that it will be unsafe for humans to remain outdoors (HHSI > 92°F)

By 2100 (2000-2099)

By 2200 (2100-2199)

Data Source: Rhodium Group
# Summary of Relative Direction, Magnitude and Certainty of Health Impacts

<table>
<thead>
<tr>
<th>Negative Impact</th>
<th>Positive Impact</th>
<th>Key Adaptations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Very High to High Confidence</td>
<td></td>
<td>Early warning systems, behavioral change</td>
</tr>
<tr>
<td>- Heatwaves</td>
<td></td>
<td></td>
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<tr>
<td>- Cold-related mortality</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Restricted distribution of some VBD</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Increased range of some VBD</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Waterborne disease outbreaks</td>
<td></td>
<td></td>
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<tr>
<td>- Air pollution-related health outcomes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Medium Confidence</td>
<td></td>
<td>Early surgeillance, enhance surgeillance</td>
</tr>
<tr>
<td>- Floods and other extreme events</td>
<td></td>
<td>Regulations, early warning systems</td>
</tr>
</tbody>
</table>

**CCSP SAP 4.6**
Severe Events Change

“Normal” weather distribution over time

Distribution range shifted by climate change

Frequency of occurrence

Extreme events  Likely events  Extreme events

The new normal
Projected Increase in Occurrence of Extremely High Rainfall Days (1 in 20 Year Events)

(from Wehner 2005)
WHAT OTHER COUNTRIES ARE DOING TO HELP THE SITUATION
Holland
Current Impact Upon the US

• On Miami Beach, rising sea levels have interesting consequences. The ocean periodically starts bubbling up through local drainpipes and you’ve got saltwater coming up through the drains, into the garages and sidewalks and so on, damaging the Ferraris and the Lexuses.
Viet Nam
China?
Brazil
HOUSTON WE APPEAR TO HAVE A PROBLEM
US POLITICS AND CLIMATE CHANGE
Political Issues in the US

• Last year polling data found that climate change has emerged as America's most polarizing political issue.

• There is little sign that the climate gap separating the nation's two major parties will be bridged any time soon.

• When it comes to the general election, the climate issue poses an electoral problem for the Republicans.
  – New York Times poll found that a majority of Americans say they are more likely to support political candidates who promise to tackle climate change.
  – The poll also found that a solid majority of U.S. voters, 83 percent, believe global warming poses a serious threat to the world.

• 2010 Pew Global Attitudes Project found that in America, a mere 38 percent of consumers would be willing to pay higher prices to address Climate Change.

• Only 3 percent of current Republican members of Congress have been willing to go on record as accepting the fact that people are causing global warming.
Politics Elsewhere

• 2010 Pew Global Attitudes Project poll found that the majority of consumers in China (91 percent), India (73 percent) and South Korea (71 percent) are willing to pay higher prices to address climate change.

• The European Union's 28 member states committed to reducing all greenhouse gas emissions by 40 percent below 1990 levels by 2030.

• 135 Countries committed to a world wide International agreement to curb global warming that would overshoot the 2°C target by almost a degree.
SO WHAT IF ANYTHING SHOULD WE DO TO CHANGE THE CURRENT TREND
PDF OF AMERICAN METEORLOGICAL REPORT
A Model That Addresses Behavior

Figure 1. A Model of the Determinants of Behavior Relevant to Climate Change

Dr. Martin Patchen, Professor Emeritus of Sociology at Purdue University
This May Be the Course to Take

- **Policy Implication 1.** Show people that they and their society will benefit more (rewards minus costs) from effective actions to counter climate change than from actions that contribute to climate change
  - Behavior is influenced not only by calculation of the benefits and costs of alternatives, but also by emotions. Emotions – including, fear, anger, sadness, guilt and shame – affect behavior relevant to the environment

- **Policy Implication 2.** Provide information about climate change in a form that is concrete enough, graphic enough, and personal enough to arouse people’s emotions about the issue
  - People’s views about the benefits and costs of actions to counter climate change, as well as their emotions about climate change, depend in large part on their appraisals of the situation: How serious is the problem? What are the possible solutions? Who is responsible for action? What is my own personal role?

- **Policy Implication 3.** Convince people of the great seriousness of the problem of climate change by making clear the magnitude of the possible losses involved (including those that are immediate and personal) and the high probability of these losses occurring (including making clear the connections between recent memorable events and likely future events)

- **Policy Implication 4.** Let people know what the most effective ways to counter climate change are. Make clear the specific types of social policies and specific kinds of personal actions that will help reduce burning of fossil fuels, thus reducing CO2 emissions and countering climate change.
This May Be the Course to Take (Cont.)

• Policy Implication 5. Let people know what the most effective ways to counter climate change are. Make clear the specific types of social policies and specific kinds of personal actions that will help reduce burning of fossil fuels, thus reducing CO2 emissions and countering climate change.

• Policy Implication 6. Public officials and others need to activate the public’s latent support for government action to combat climate change by demonstrating and publicizing public actions that have been effective.

• Policy Implication 7. Greater prominence and publicity should be given to the funding and recommendations of independent authoritative scientific groups in which the public can have confidence.

• Policy Implication 8. Make clear how changes in the individual’s own actions and those of his community can help combat climate change.

• Policy Implication 9. Point out reasons why avoiding the bad effects of climate change may be considered a moral obligation (to one’s children and grandchildren, to community and to society, to one’s religious or other beliefs).

• Policy Implication 10. Attempts to change attitudes and behavior concerning global climate should not only provide people with relevant information but also put such information in the context of the values and social norms that are important to them.
• **Policy Implication 11.** Messages intended to gain support for actions to combat global warming should be tailored to the demographic characteristics of the audience – including its mix of genders, ages, education level, and regions. Messages need to be appropriate to the differing knowledge levels, values, self-images, emotional sensitivities and relevant benefits and costs of the different groups.

• **Policy Implication 12.** Promote the availability of affordable, convenient alternatives that can help combat climate change – for example, “green” electricity programs, public transportation, and making alternative fuels for cars widely available.

• **Policy Implication 13.** Programs to combat climate change should be structured so that the individual sees his actions as part of a shared social effort that involves shared goals as well as feedback and rewards for progress toward the goals.

• **OR WE CAN PUNT AND HOPE FOR THE BEST!**
QUESTIONS?