Climate Change
Water and Energy

A Presentation to:
The Dayton Council on World Affairs
By
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Part of this Presentation will be based in Science and Part will be Subjective.

Never-the-less the Argument is Compelling
WATER PLANET

70% of the Planet is Covered by Water
Where is Earth’s Water?

- Total global water: 96.5%
- Other saline water: 0.9%
- Freshwater: 2.5%
  - Other freshwater: 1.2%
  - Groundwater: 30.1%
  - Glaciers and ice caps: 68.7%
- Lakes: 20.9%
- Ground ice and permafrost: 69.0%
- Atmosphere: 3.0%
- Living things: 0.26%
  - Rivers: 0.49%
  - Swamps, marshes: 2.6%
  - Soil moisture: 3.8%
Great Lakes have 20% of Fresh Water in the World
Eight States formed the Great Lakes Compact (Dec 8 2008)
CLEAN, UNPOLLUTED WATER IS CRITICAL TO LIFE ON EARTH
BEFORE WE START OUR DISCUSSION ON CLIMATE CHANGE, THERE ARE FOUR CRITERIA WE MUST CONSIDER.
THE EARTH IS A VERY COMPLICATED SYSTEM AND WE HAVE YET TO DISCOVER ALL OF IT’S SECRETS
GOD HAS TAUGHT US EVERYTHING WE KNOW, BUT HE HASN’T TAUGHT US EVERYTHING HE KNOWS.
There is no such thing as 0% or 100% Certainties that anything will or not happen, until it happens.
Risk Assessments must Employ Collective and Subjective Judgements:

- Possible but not Probable
- Probable but not Certain
- Within Reasonable Certainty

Examples of Risky Decisions: Normandy Beach, John Glenn, Landing on Moon, Evel Knievel, Mt Everest
The Bottom Line is that Governments, Military, Businesses, Education all make Major Decisions on sketchy Data.

No matter how Sophisticated the Risk Assessments, the Probability of Occurrence and the Severity of the Action must be Estimated. If the Probability of Occurrence is Slight but the Severity of the Action is Severe, Contingencies must be Considered.
The Concept of Global Warming rests on the Transformation and Conservation of Mass and Energy, one of the basic Laws of Science. It all starts with the Sun.
The Earth’s Greenhouse Effect

About half the solar energy absorbed at the surface evaporates water, adding the most important greenhouse gas to the atmosphere. When this water condenses in the atmosphere, it releases the energy that powers storms and produces rain and snow.

About 30% of incoming solar energy is reflected by the surface and the atmosphere.

Only a small amount of the heat energy emitted from the surface passes through the atmosphere directly to space. Most is absorbed by greenhouse gas molecules and contributes to the energy radiated back down to warm the surface and lower atmosphere. Increasing the concentrations of greenhouse gases increases the warming of the surface and slows loss of energy to space.

The surface cools by radiating heat energy upward. The warmer the surface, the greater the amount of heat energy that is radiated upward.
Increase of CO₂ and Surface Temperatures

Global Temperature and Carbon Dioxide

- Temp. in degrees F
- Global Temperature
- Carbon Dioxide
- CO₂ in parts per million

1880 1900 1920 1940 1960 1980 2000
2015 Was the Warmest Year in History. 13 of the Warmest Years in History occurred over the past 15 years.
Assume we take a cube of Atmosphere in chemical equilibrium with Water of the Gulf of Mexico 5,280 ft Air and Water Vapor

Assume we take a cube of Atmosphere in chemical equilibrium with Water of the Gulf of Mexico
<table>
<thead>
<tr>
<th>Temp – deg F</th>
<th>lbs/Cubic Foot</th>
<th>lbs/Cubic Mile</th>
</tr>
</thead>
<tbody>
<tr>
<td>70</td>
<td>0.0011</td>
<td>162 MM</td>
</tr>
<tr>
<td>80</td>
<td>0.0015</td>
<td>220 MM</td>
</tr>
<tr>
<td>90</td>
<td>0.0021</td>
<td>280 MM</td>
</tr>
</tbody>
</table>

MM = Million
### Amount of Energy in the Air – 1 CM

<table>
<thead>
<tr>
<th>Temp – deg F</th>
<th>Total Btu’s</th>
<th>Kilotons TNT</th>
</tr>
</thead>
<tbody>
<tr>
<td>70</td>
<td>162 B</td>
<td>40.5 (0)</td>
</tr>
<tr>
<td>80</td>
<td>220 B</td>
<td>55.0 (14.5)</td>
</tr>
<tr>
<td>90</td>
<td>280 B</td>
<td>70.0 (29.5)</td>
</tr>
</tbody>
</table>

- **Little Boy (Hiroshima)** = 15 Kilotons TNT
- **Fat Man (Nagasaki)** = 20 Kilotons TNT

B = Million
Assume we have a weather system that is 50 miles wide and traveling at 20 mph,

Then Assume the line is 6 miles high and 100 miles deep.

The Result is 30,000 CM of Weather System with 900 Megatons of Energy
Impacts of Global Warming

Severity of Weather Events are More Severe
California Produces 50% of Nation’s Fruits and Vegetables
OGALLALA Aquifer Produces 20-30% of Nation’s Food Supply And is going dry.
Our Most Precious Resource, GROUNDWATER, is being depleted at an alarming rate

- California Imperial Valley
- Western Kansas, Oklahoma, Texas, Nebraska and Colorado

International:
- Beijing; 
- Brazil; 
- Jordan; 
- Australia; 
- India; 
- Middle East; 
- North Africa;
95+ Scientists in the World believe in Global Warming

- Theory of Global Warming is Sound;
- Temperatures are Increasing;
- Temperature Increase mirrors CO2 Increase;
- Glaciers are Melting;
- Weather Events are more Energy Intensive; and
- World-Wide Droughts are Increasing.
What are the Impacts on Ohio?
Impact on Ohio?
- Climate will most likely be similar to North and South Carolinas;
- State will experience a population increase;
- Storms will not be as violent as further south and west;
- Corn and Soybean production will decrease, Fruits and Vegetables will increase;
- Animal Farms will become Animal Factories or become extinct;
- Aquaculture will increase; but
- A Big Problem is Lake Erie
Lake Erie - A 2-Billion Dollar Industry is at Risk

Cold Water Fish to Decline
Walleye, Lake Trout

Asian Carp
Miami Valley Buried Aquifer

Our Most Valuable Resource
DAYTON IS READY FOR BUSINESS.

1.5 TRILLION
GALLONS OF FRESH WATER FOR BUSINESS AND INDUSTRY.

DAYTON, OHIO. WHERE OPPORTUNITY FLOWS.
DAYTONWATER.ORG
Where will Dayton stand in the Future?

We must protect our Groundwater!
How do we mitigate Global Warming?

Create Sustainable Organizations that create a Sustainable Planet
Definition of Sustainable.

Do not Consume Resources at a rate they cannot be Replaced.

Improve Quality, Improve Productivity and Reduce Waste through Continuous Improvement
Examples of Sustainable 21st Century Bio-Technologies

- AquaBounty Technologies, Inc
  Genetically Engineered Salmon that will Grow More Rapidly and Larger
- Enviroflight, LLC
  Developed Technology To Grow Black Soldier Fly Larvae to Replace Sardines, Anchovies and Menhaden, which are processed as Fishmeal

NOTE: WE ARE FISHING OUT OCEANS
Innovative Bio-Technologies - GMO

AquaBounty Technologies, Inc.

GM Salmon
24 in, 6.6 lb

Farm Salmon
13 in, 2.8 lb

Both Fish
18 months

AquaBounty Technologies, Inc.
Enviroflight (Yellow Springs) BSF Larvae replaces Fish Meal as Protein Source
“When the well is dry, we learn the value of water”

Benjamin Franklin
Pour Richard’s Almanac (1746)