GLOBAL WARMING, THE GREENHOUSE EFFECT AND YOUR FAMILY’S CONTRIBUTION

Stephen E. Schwartz

SUMMER SUNDAYS

http://www.ecd.bnl.gov/steve
by far the most terrifying film you will ever see.

an inconvenient truth
A GLOBAL WARNING

now playing in select theaters
SPECIAL REPORT  GLOBAL WARMING

BE WORRIED.
BE VERY WORRIED.
Climate change isn’t some vague future problem—it’s already damaging the planet at an alarming pace. Here’s how it affects you, your kids and their kids as well.

EARTH AT THE TIPPING POINT
HOW IT THREATENS YOUR HEALTH
HOW CHINA & INDIA CAN HELP
SAVE THE WORLD—OR DESTROY IT
THE CLIMATE CRUSADERS
Ice, Wind and Fire

Global warming is happening, and the proof is all around us.

Greenland is Melting

Scientists say the ice is thinning and global warming is to blame; ocean levels are rising, due to a combination of thermal expansion of the water and melting of polar ice.
INDIA
INDIA
NEW ORLEANS
RETREAT OF MID-LATITUDE GLACIERS

South Cascade Glacier, Washington

1928 2000

PASTERZE GLACIER, AUSTRIA 1875 - 2004

About 2 km shorter.
Terminus replaced by artificial lake.
Decrease in length about 15 meters per year.
In 2003, decrease was 30 m in length and 6.5 m in thickness.

http://www.worldviewofglobalwarming.org/pages/glaciers.html
PORTAGE GLACIER, ALASKA 1914 - 2004

http://www.worldviewofglobalwarming.org/pages/glaciers.html
RHONE GLACIER, VALAIS, SWITZERLAND
1859 - 2001

Glacial retreat is 2.5 km.

Base is 450 meters higher.

http://www.worldviewofglobalwarming.org/pages/glaciers.html
GRINNELL GLACIER
GLACIER NATIONAL PARK 1911 - 2000

http://www.worldviewofglobalwarming.org/pages/glaciers.html
GLACIER AX010, NEPAL, 1978-2004

http://snowman.ihas.nagoya-u.ac.jp/download/photo/AX010.html
FUNAFUTI, TUVALU

The 11,000 Tuvaluans live on nine coral atolls with typical elevation 2 meters and not exceeding 5 meters.

“Our whole culture will have to be transplanted.”

- Paani Laupepa, Former Assistant Environmental Minister later Assistant Secretary for Foreign Affairs
The Greenhouse Effect

Solar radiation passes through the clear atmosphere.

Some solar radiation is reflected by the Earth and the atmosphere.

Some of the infrared radiation passes through the atmosphere, and some is absorbed and re-emitted in all directions by greenhouse gas molecules. The effect of this is to warm the Earth's surface and the lower atmosphere.

Most radiation is absorbed by the Earth's surface and warms it.

Infrared radiation is emitted from the Earth's surface.
Everybody talks about the weather —
But nobody does anything about it.

Now with the greenhouse effect,
we ARE doing something about it.
What are we doing?
ATMOSPHERIC CARBON DIOXIDE IS INCREASING

Global carbon dioxide concentration over the last thousand years
CHANGE IN GLOBAL MEAN SURFACE TEMPERATURE 1855-2004

Temperature Anomaly, K

Climate Research Unit, University of East Anglia, UK
Northern Hemisphere temperature trend (1000-1998), from tree-ring, coral, and ice-core proxy records as calibrated by instrumental measurements. 

Mann et al., Geophysical Research Letters, 1999
GREENHOUSE GASES AND TEMPERATURE OVER 450,000 YEARS

Vostok core, Antarctica

Modified from Petit et al., Nature, 1999
Looking to the Future . . .
Prediction is difficult, especially about the future.

– Niels Bohr
PROJECTED CO₂ EMISSIONS AND CONCENTRATIONS AND GLOBAL TEMPERATURE AND SEA LEVEL, 2000-2100

**CO₂ emissions**

- **Scenarios:** A1B, A1T, A1FI, A2, B1, B2, IS92a
- **CO₂ emissions (Gt CO₂ yr⁻¹)**
- **Year:** 2000-2100

**CO₂ concentrations**

- **Scenarios:** A1B, A1T, A1FI, A2, B1, B2, IS92a
- **CO₂ concentration (ppm)**
- **Year:** 2000-2100

**Temperature change**

- **Scenarios:** A1FI, A1B, A1T, A2, B1, B2, IS92a (TAR method)
- **Temperature change (°C)**
- **Year:** 2000-2100

**Sea level rise**

- **Scenarios:** A1B, A1T, A1FI, A2, B1, B2, IS92
- **Sea level rise (metres)**
- **Year:** 2000-2100

*IPCC, 2001*
“Gentlemen, it’s time we gave some serious thought to the effects of global warming.”
WHERE IS ALL THIS CO$_2$ COMING FROM?

WHO IS RESPONSIBLE?
HOW MUCH CARBON IS IN A GALLON OF GASOLINE?

1 lb?  2 lbs?  3 lbs!?  5 lbs!??

All of this carbon goes into the atmosphere as carbon dioxide when you burn the gasoline in your car.
THE MOST EFFECTIVE WAY TO DOUBLE THE FUEL ECONOMY OF A CAR . . . IS TO PUT TWO PEOPLE IN IT!
CARPOOLING CAN SAVE MORE THAN GAS
WHERE DOES YOUR ELECTRIC ENERGY COME FROM?

SOURCES OF ELECTRIC ENERGY IN THE UNITED STATES

Annual Total 3.71 Trillion KWH

On Long Island most electric energy derives from combustion of oil.
YOUR FAMILY’S CONTRIBUTION TO THE GREENHOUSE EFFECT

CARBON DIOXIDE EMISSIONS FROM ELECTRIC ENERGY PRODUCTION
(1990's Technology)

CO$_2$ emissions, Pounds (C) per KWH

Suffolk County 2001 Legislation

A typical household using 1000 kilowatt hours of electricity per month is responsible for emission of 3 tons of carbon a year in the form of carbon dioxide. How much does your household contribute?
At half a pound of carbon per KWH, the average household is responsible for emission of 500 pounds of carbon a month.
What country uses the most electric power?

No surprise. It's the United States.
WHAT COUNTRY USES THE MOST ELECTRIC POWER *PER CAPITA*?

No surprise. It's the United States again.
WHERE IS THIS CARBON DIOXIDE COMING FROM?
WE ARE ALL RESPONSIBLE.

Burning a gallon of gasoline in your car puts 5 pounds of carbon in the atmosphere as carbon dioxide (CO$_2$), and it will stay there for decades — maybe a century!

Other sources are home heating and electric power production.
Global Atmosphere, Global Warming

QUESTIONS ABOUT GLOBAL WARMING

• Is it real?
• Is it important?
• What is it due to?
• How much more can we expect?
• Are we seeing just the tip of the iceberg?

Research is helping to answer these questions.

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