Carbon Footprinting

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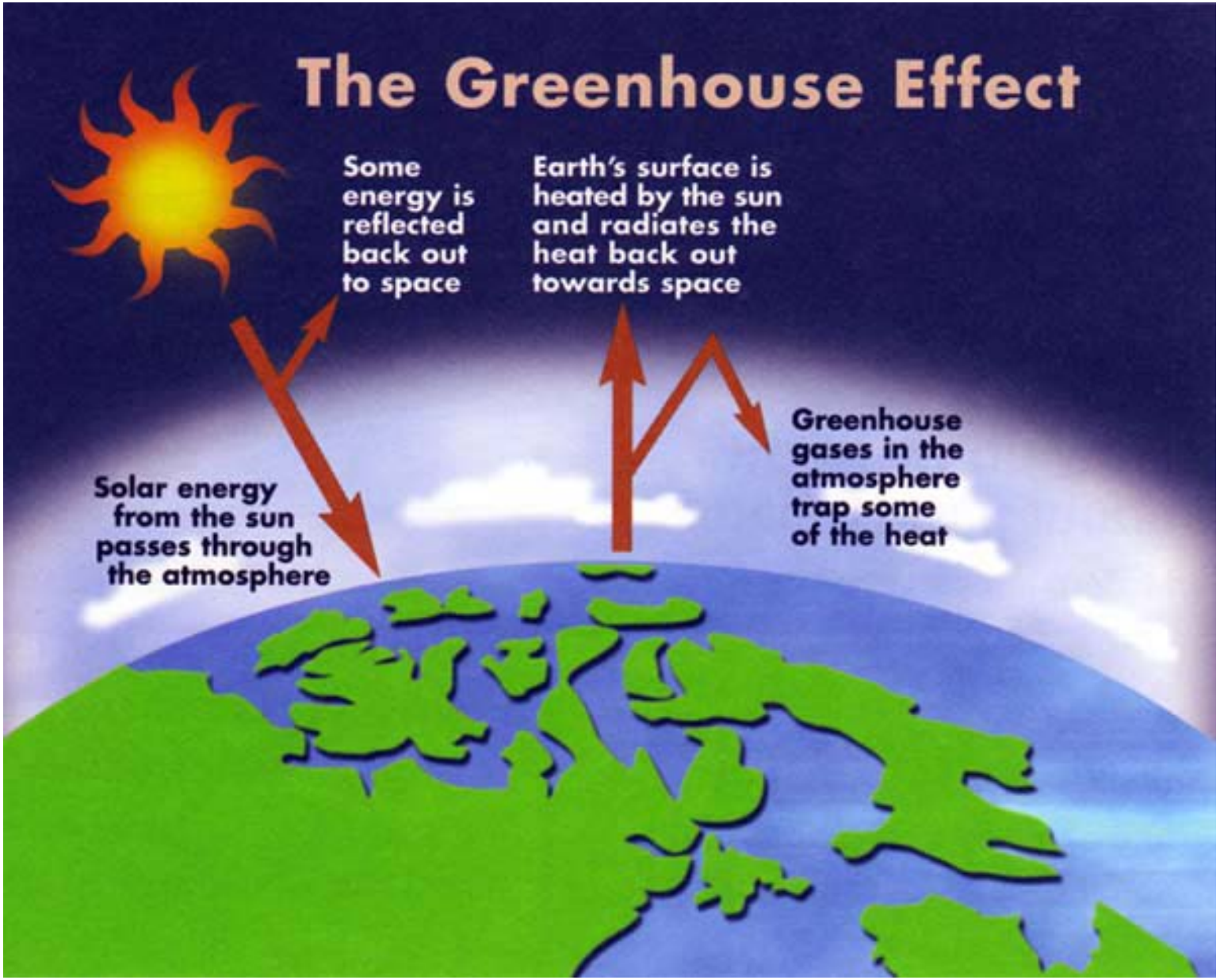
Overview

- Greenhouse Gases & Climate Change
- Carbon Footprinting

Greenhouse Gases

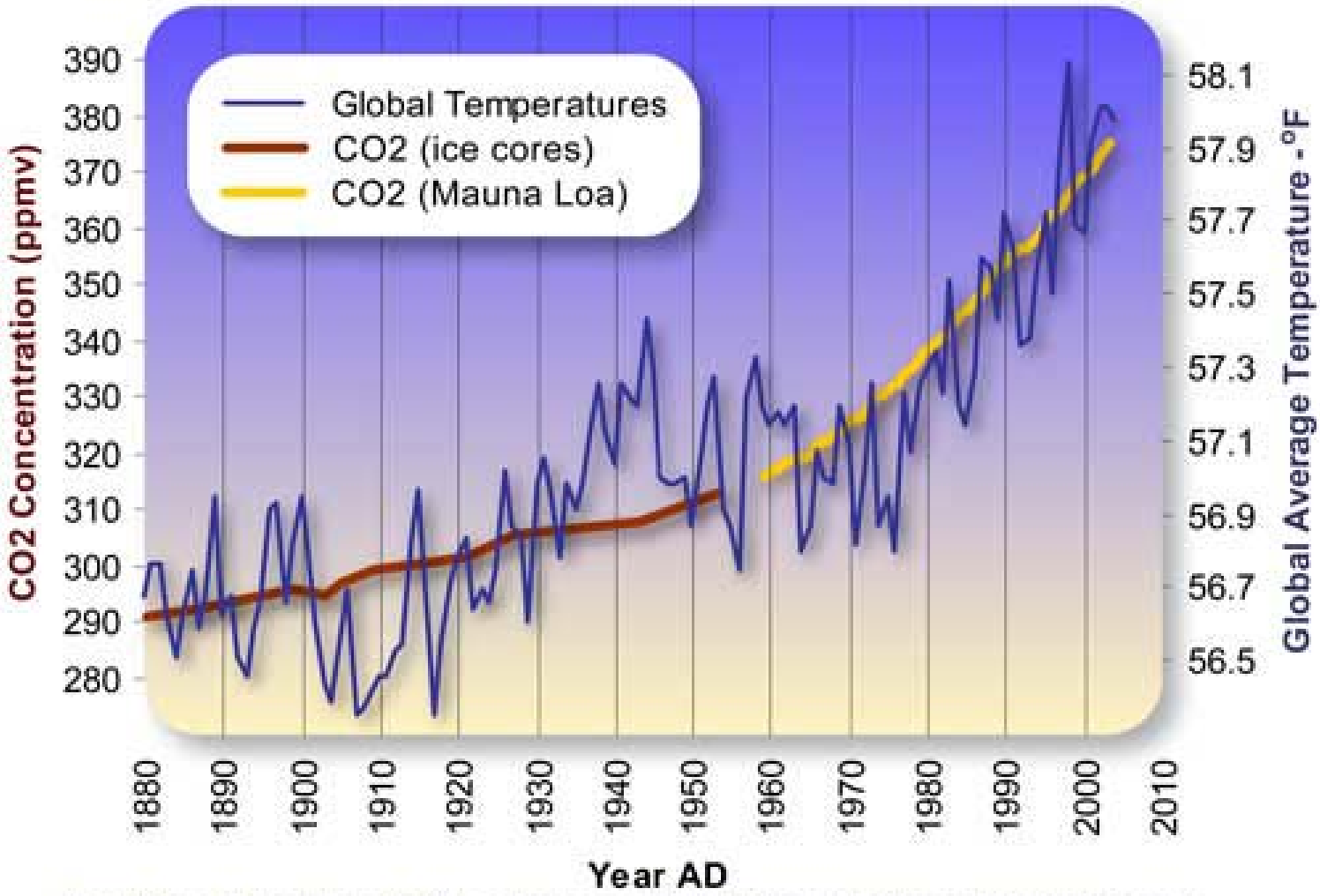


Source: http://triusenergy.com

Greenhouse Gases

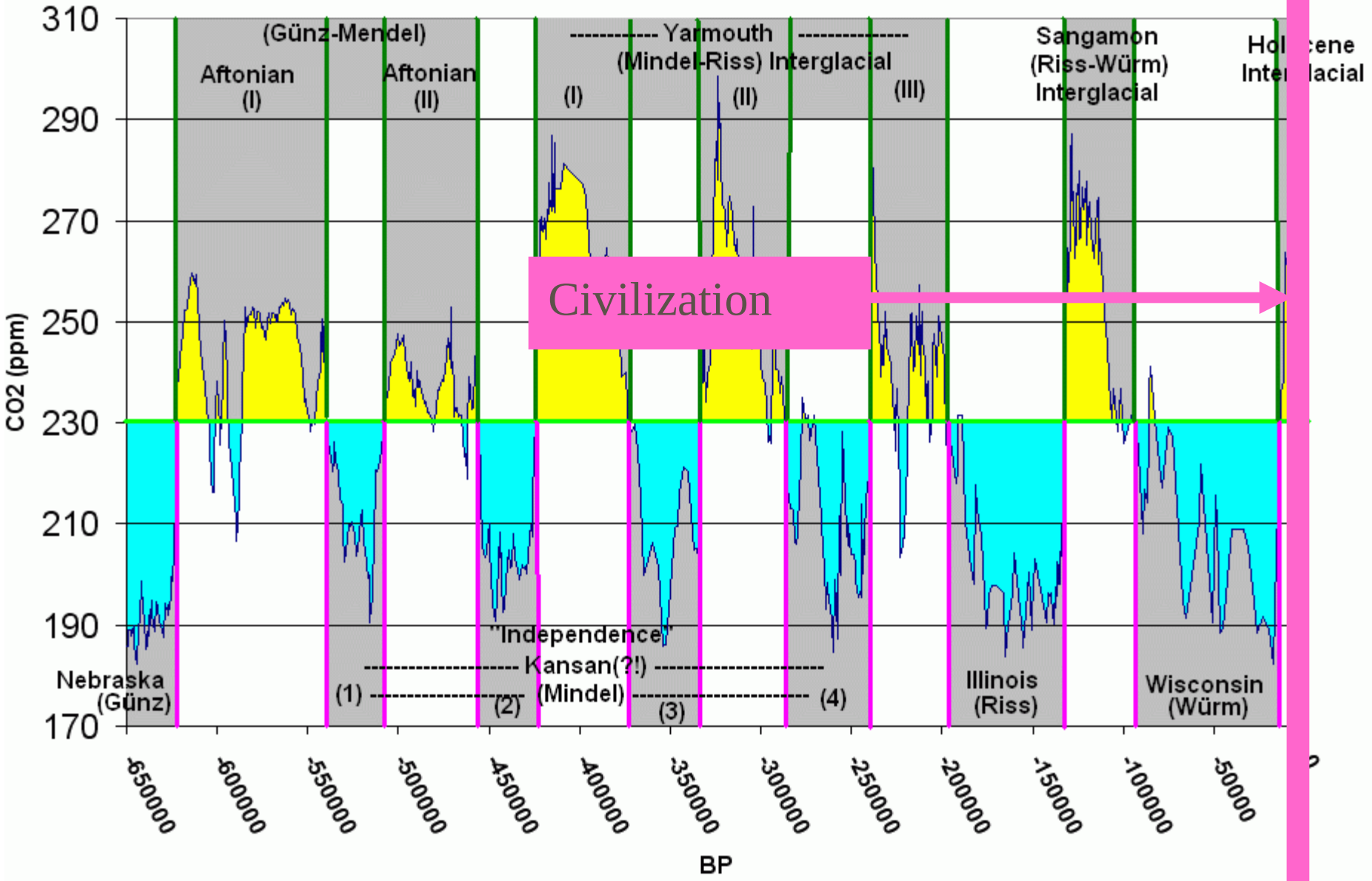
CO_2	Carbon dioxide	(Fossil Fuels)
CH_4	Methane	(Agricultural, waste, fuels)
N_2O	Nitrous oxide	(Agricultural, waste, fuels)
HFCs	Hydrofluorocarbons	(Refrigerants)
PFCs	Perflurocarbons	(Semiconductor, aluminum)
SF_6	Sulfur hexafluoride	(Electrical distribution)

Global Average Temperature and Carbon Dioxide Concentrations, 1880 - 2004

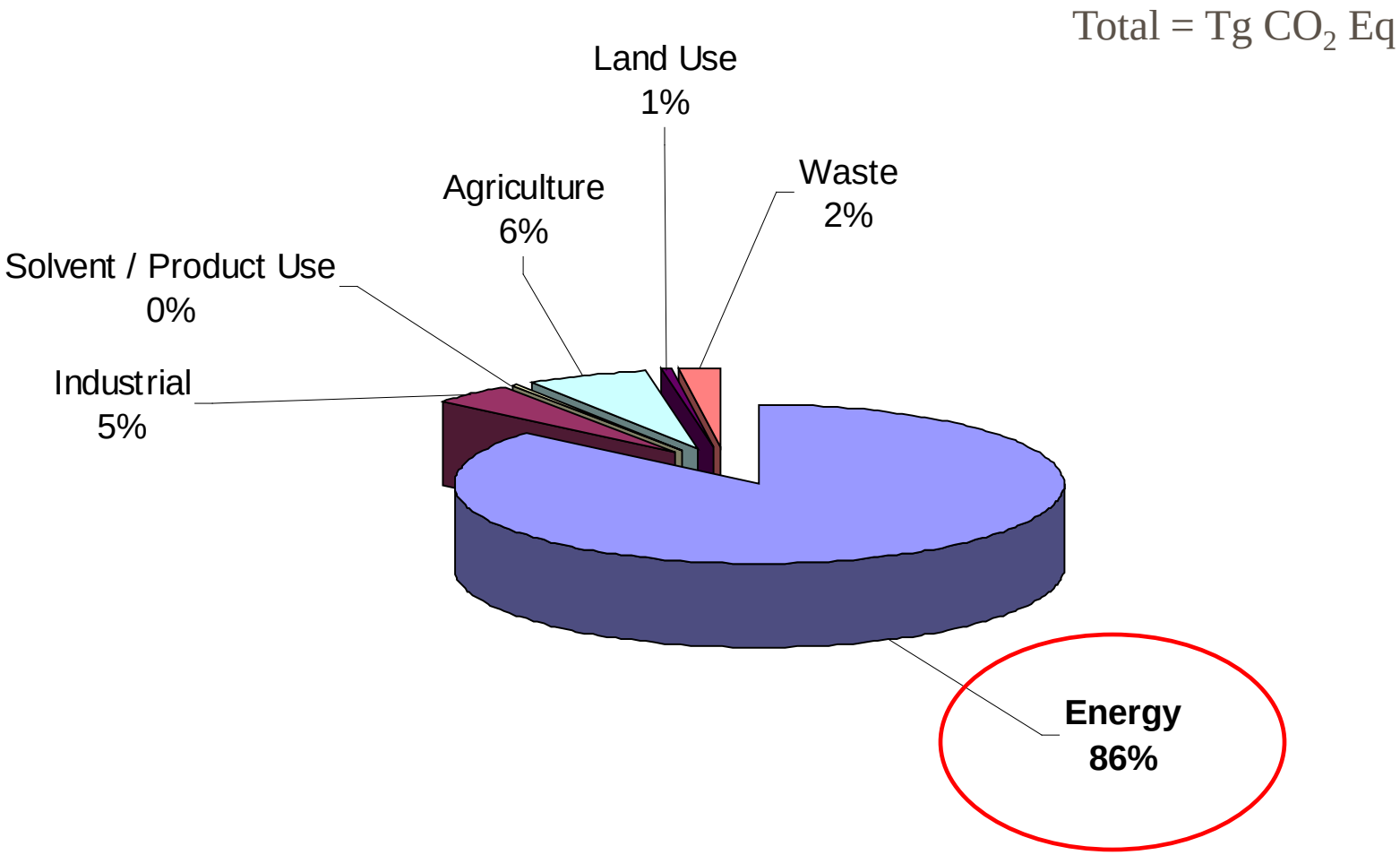


Data Source Temperature: ftp://ftp.ncdc.noaa.gov/pub/data/anomalies/annual_land.and.ocean.ts
Data Source CO2 (Siple Ice Cores): http://cdiac.esd.ornl.gov/ftp/trends/co2/siple2.013
Data Source CO2 (Mauna Loa): http://cdiac.esd.ornl.gov/ftp/trends/co2/maunaloa.co2

Graphic Design: Michael Ernst, The Woods Hole Research Center

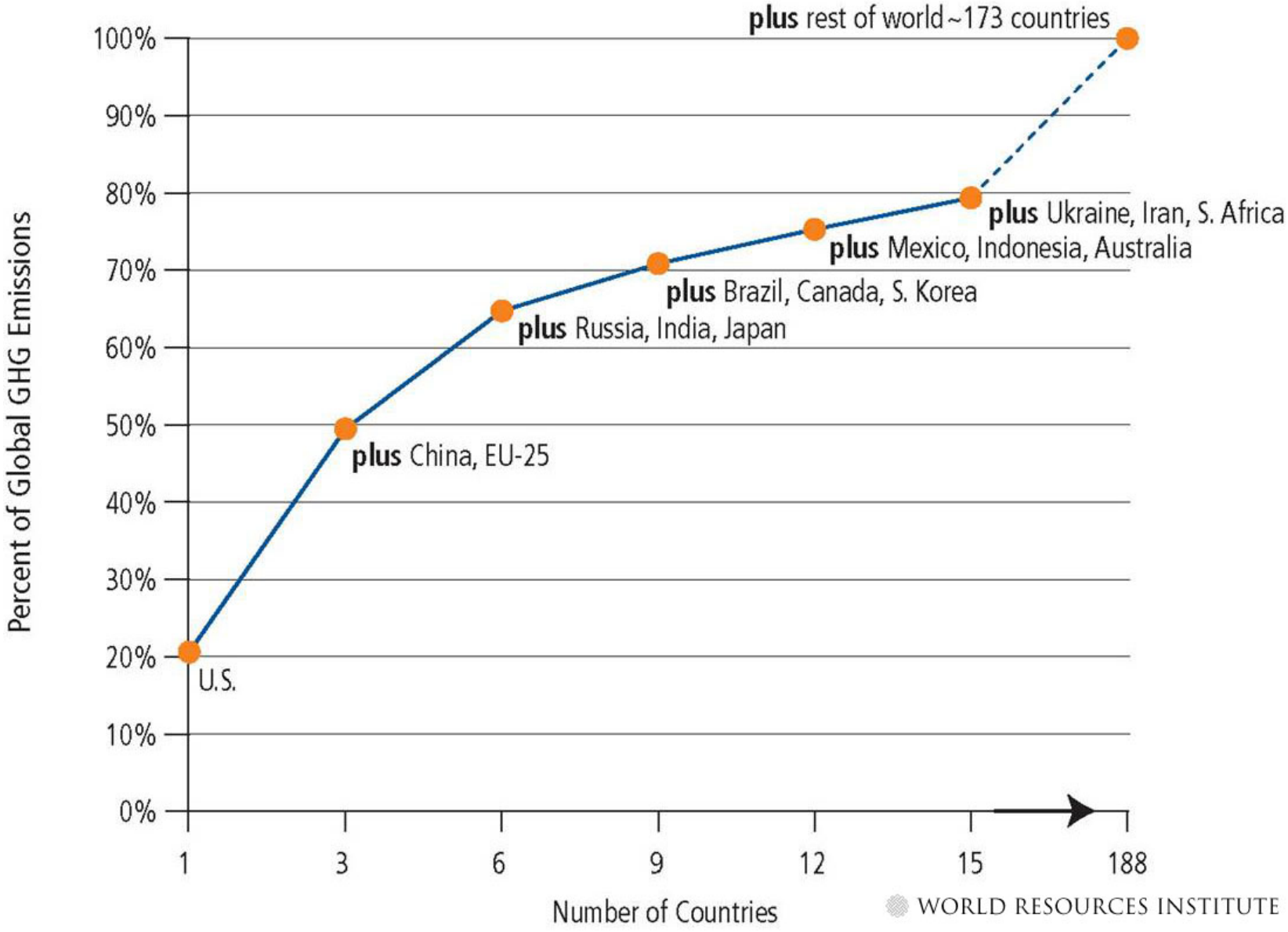

Late Pleistocene: Atmospheric CO2 and the Glacial cycles
(650,000 - 0 years BP)
(ppm)
N.American & (Alpine) names
310
290
270
250
230
210
190
170
CO2 (ppm)
(Günz-Mendel)
Aftonian
(I)
Aftonian
(II)
(I)
Yarmouth
(Mindel-Riss) Interglacial
(II)
(III)
Sangamon
(Riss-Würm)
Interglacial
Civilization
"Independence"
Kansan(?!)
(Mindel)
Nebraska
(Günz)
(1)
(2)
(3)
(4)
Illinois
(Riss)
Wisconsin
(Würm)
650000
600000
550000
500000
450000
400000
350000
300000
250000
200000
150000
100000
50000
BP

U.S. Greenhouse Gas Emissions for 2006

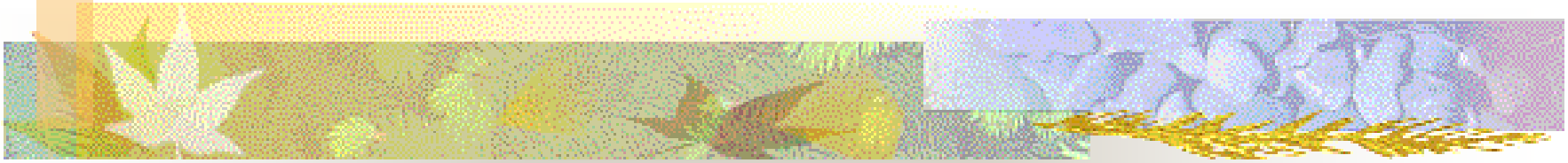


Source: U.S. EPA. *Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2006*

Aggregate Contributions of Major GHG Emitting Countries



Climate Change



Impacts of Climate Change

- Economic loss from extreme weather
- Depletion of natural resources
- Flooding
- Disease
- Water shortages
- Heat waves

Source: World Resources Institute. *Working 9 to 5 on Climate Change: An Office Guide*

What should we do?

1. Continue on same energy path. Learn to adapt to climate change.
   - Flooding, disease, lower food production, water shortages, etc.
2. Curb emissions
   - Carbon tax
   - Cap and Trade
   - Regulations

Bottom Line

1. Currently, you can emit greenhouse gases for "free" in the U.S.
2. It is likely that there will be restrictions or a cost on greenhouse gas emissions
3. It may become costly to emit carbon
   - Prices for fossil fuels, steel, cement & water could up

Bottom Line

4. Sell more products / services by lowering your customer's carbon footprint.

5. Carbon Footprints can help reduce operating and transportation costs

Carbon Foot Printing

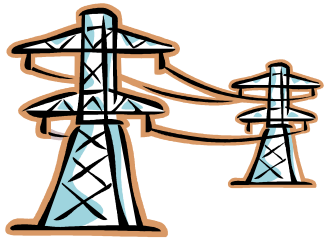
Carbon Footprint Steps

1. Determined sources to include
2. Gather activity data
3. Find emission factors
4. Complete calculations
5. Reduced and reported emissions

Sources that Must be Included

- All Direct Sources
  - Emissions from company owned sources
  - Ex: natural gas usage in boilers
  - Ex: fuel usage usage in fleet vehicles

- Indirect Sources
  - Emissions from sources owned by others, but as a consequence of company activities
  - Ex: electricity usage



Optional Indirect Sources

- Business travel by air, rail, or taxi
- Employee commuting
- Consumables (i.e. paper, raw materials)
- Leased Facilities

General Formula

Activity Data	x	Emission Factor	=	Carbon Emissions

Activity Data for a Printer in 2007

Natural gas	**5,600 therms**
Delivery Trucks	**4,000 gals / yr of gasoline**
Electricity	**4.6 million kWh /yr**
Employee commuting	**1.5 million miles / yr**

Emission Factors

- Convert activity data to carbon emissions
- World Resources Institute
  - http://www.ghgprotocol.org/calculation-tools
- Department of Energy
  - http://www.eia.doe.gov/oiaf/1605/coefficients.html
- Power company

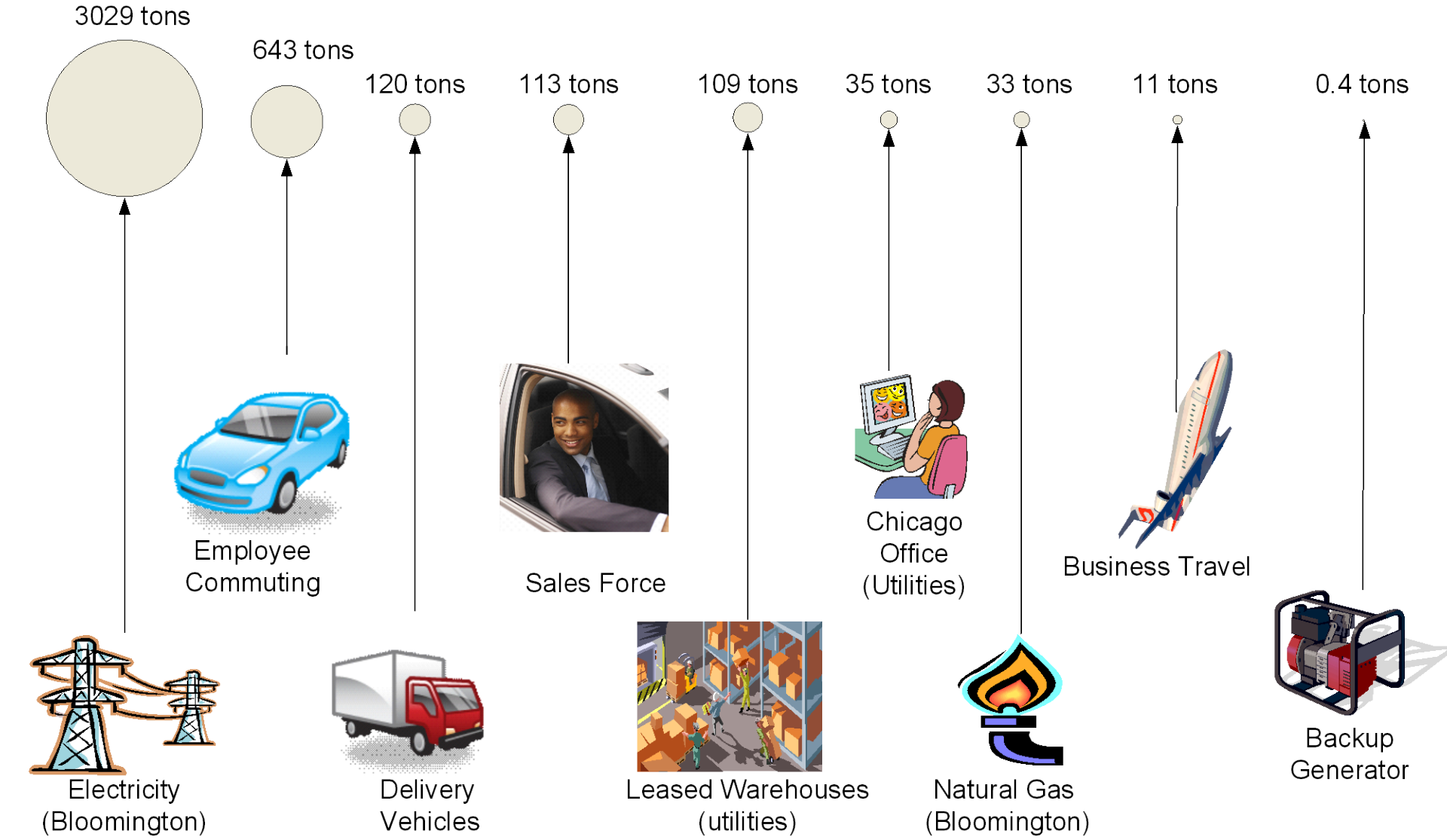
From the power company

AVERAGE AMOUNTS OF EMISSIONS and AMOUNT OF NUCLEAR WASTE per 1000 kilowatt-hours (kWhs) PRODUCED from KNOWN[1] sources for the 12 months ending September 30, 2007

Carbon Dioxide	1,770 lbs
Nitrogen Oxides	2.96 lbs
Sulfur Dioxide	7.43 lbs
High-Level Nuclear Waste	<.0001 lbs
Low-Level Nuclear Waste	<.0001 ft^3

	Activity Data	x	Emission Factor	=	Carbon Emissions
Natural gas	**5,600 therms**	**x**	11.7 lbs CO_2 / therm		
Delivery trucks	**4,000 gals / yr of gasoline**	**x**	19.6 lbs CO_2 / gal of gas		
Electricity	**4.6 million kWh /yr**	**x**	1.77 lbs CO_2 / kWh		
Employee commuting	**1.5 million miles / yr**	**x**	19.6 lbs CO2/ gal of gas 22 mpg		

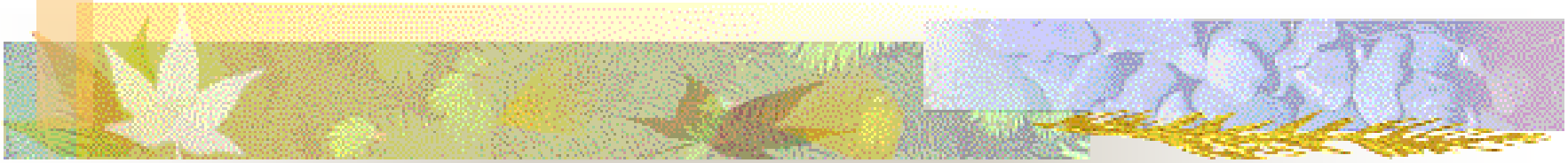
Carbon Footprint



Recommendations for Small Companies

- Keep it simple
  - It is OK to not include small sources
  - Focus on fossil fuels and CO_2 emissions
- Establish a baseline and reduction targets
  - Use footprinting to help achieve other organizational goals
- ISTC can assist with carbon footprinting

Questions




Hurricane Rita
September 22, 2005
10 PM CDT Thursday
NWS TPC/National Hurricane Center
Advisory 22
Current Center Location 26.2 N 90.3 W
Max Sustained Wind 140 mph
Current Movement WNW at 10 mph
Current Center Location
Forecast Center Positions
H Sustained wind > 73 mph
S Sustained wind 39-73 mph
Potential Day 1-3 Track Area
Hurricane Warning
Tropical Storm Warning
Tropical Storm Watch
7 PM Sun
7 PM Sat
7 PM Fri
10 PM Thu
CO
KS
MO
OK
AR
NM
TX
LA
Mexico
35N
30N
25N
105W
100W
95W
90W
85W
True at 30.00N
SM 125 250 375 500
Approx. Distance Scale (Statute Miles)