Creation Care 2010
Environment
Science and Politics

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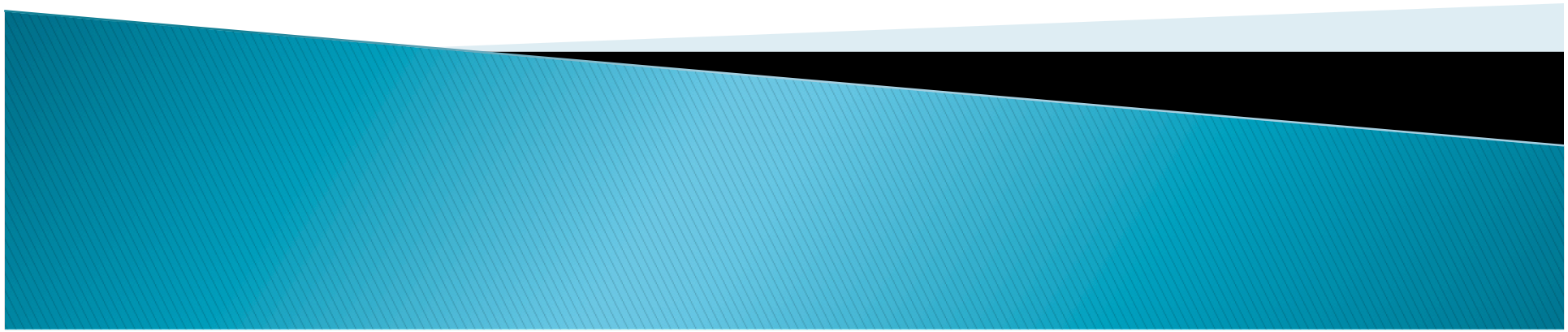
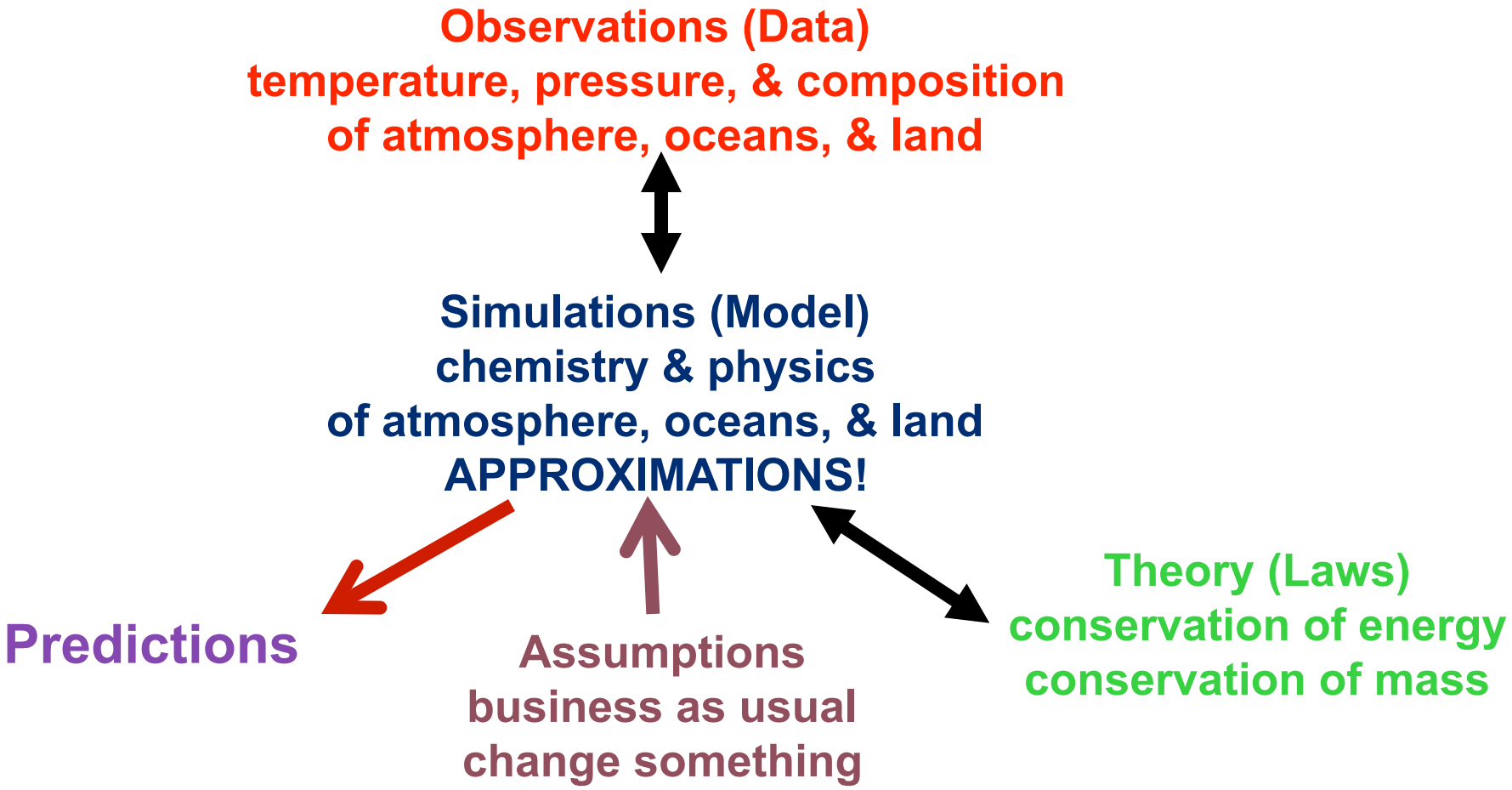
April 17, 2010



A Brief History of Modern Science

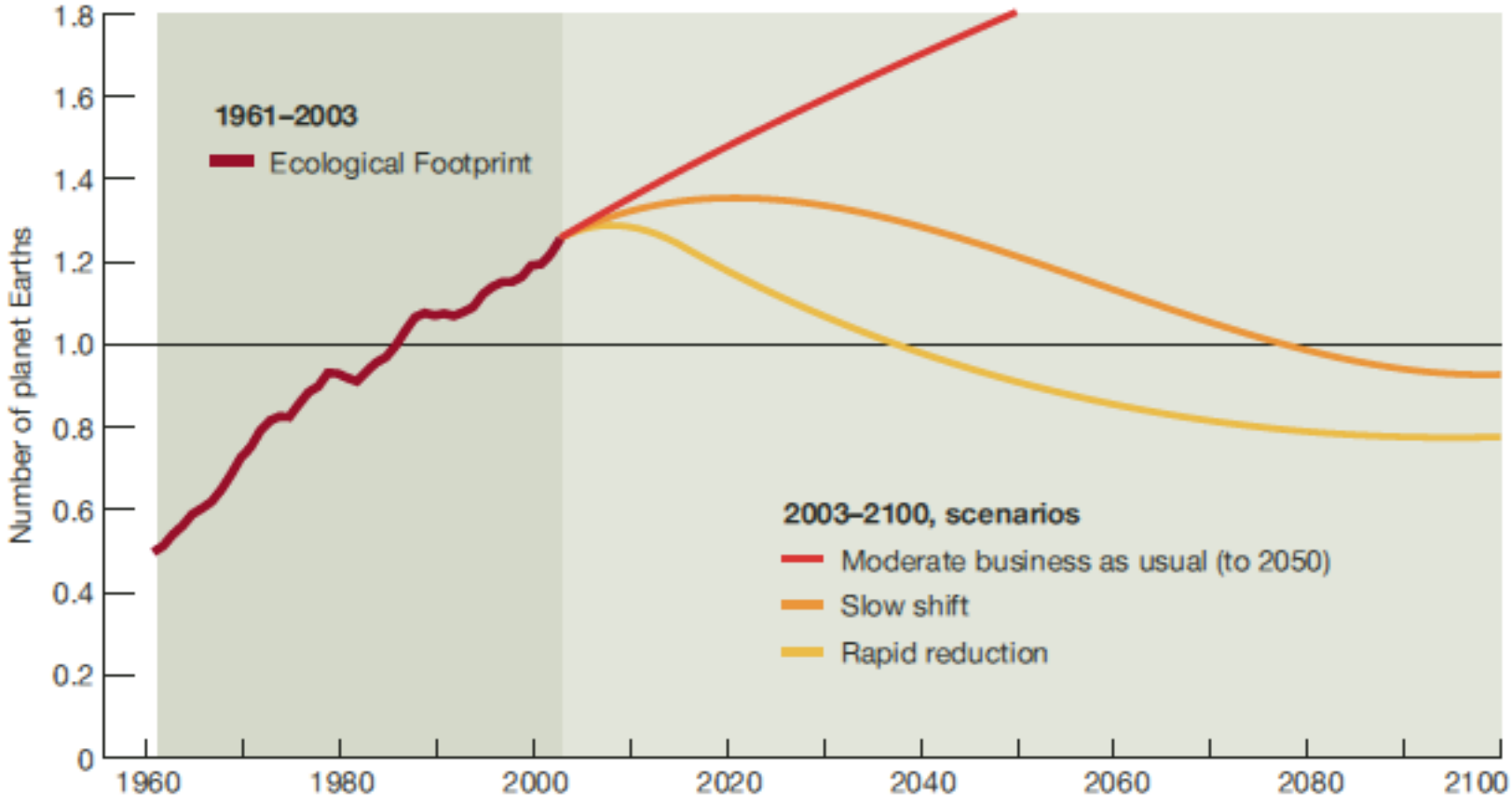
- Modern Experimental Science
  - Galileo Galilei 1564 – 1642
- Classical Mechanics
  - Issac Newton (1687) to William R. Hamilton (1865)
- Electricity and Magnetism
  - Rene Descarte (1638) to James C. Maxwell (1864)
- Thermodynamics
  - Otto von Guericke (1650) to J. Willard Gibbs (1876)
- Fluid Dynamics
  - Claude L. M. H. Navier (1827) to George G. Stokes (1885)
- Quantum Mechanics
  - Max Plank (1900) to Paul A. M. Dirac (1933)
- Industrial Revolution
  - James Watt – steam engine (1763–1775)

How Science is Practiced



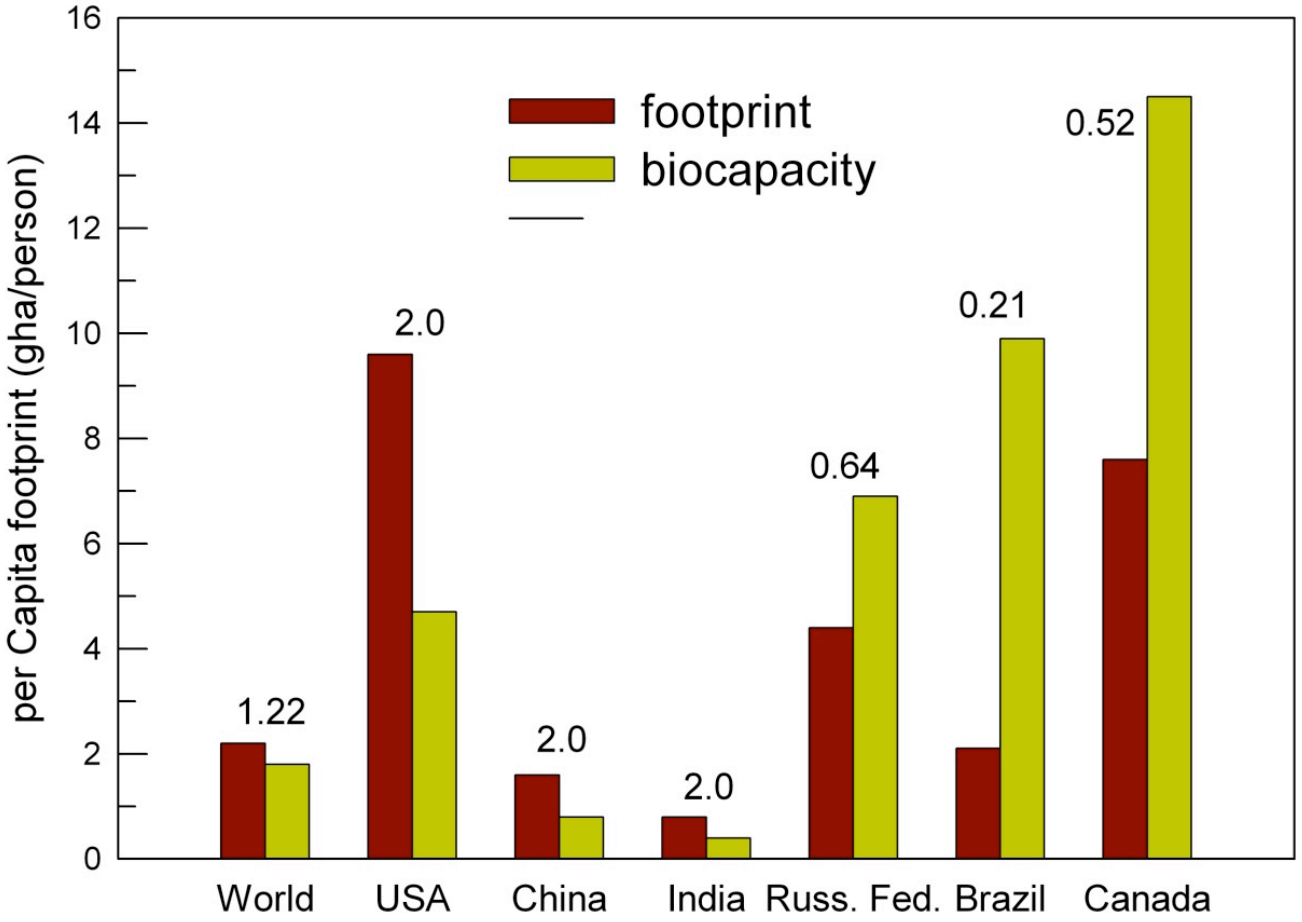
Science: "If I do this, what will happen?"
R. P. Feynman, in *The Pleasure of Finding Things Out,* Perseus Books, 1999.

Ecological Footprint: Central Issue!



Chris Hails, Living Planet Report 2006, www.panda.org
M. Wackernagel et al., www.pnas.org/cgi/doi/10.1073/pnas.142033699

Ecological Footprint & Biocapacity



Sources: Chris Hails, Living Planet Report 2006, www.panda.org [accessed 13 Feb. 2010] Table 1, graph created by JPH Population U.N. database [accessed 6 Mar. 2010]

Ecological Footprint & Biocapacity

Country	Population	CO_2	Crops	Grazing	Water	Total	Cap.	Ratio
WORLD	6,476	1.41	0.64	0.26	1,243	2.7	2.1	1.29
high	972	4.04	1.15	0.28		6.4	3.7	1.73
middle	3,098	1.00	0.62	0.22		2.2	2.2	1.00
low	2,371	0.26	0.44	0.09		1.0	0.9	1.11
U.S.A.	298	6.51	1.38	0.30	2483	9.4	5.0	1.88
China	1,323	1.13	0.56	0.15	720	2.1	0.9	2.33
India	1,103	0.33	0.40	0.01	980	0.9	0.4	2.25
Canada	32	3.44	1.83	0.50	2049	7.1	20.0	0.36
Rus.Fed	143	2.24	0.92	0.03	1858	3.7	8.1	0.46

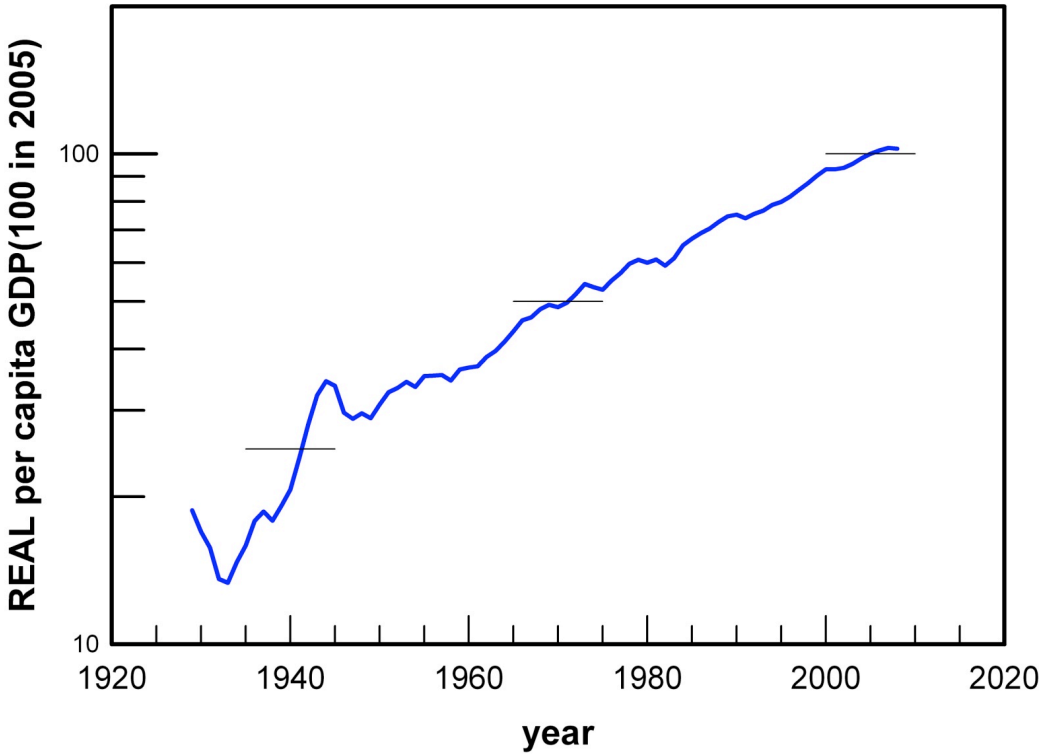
1 global hectare = 383 gal.(U.S.)

m^3/person/yr

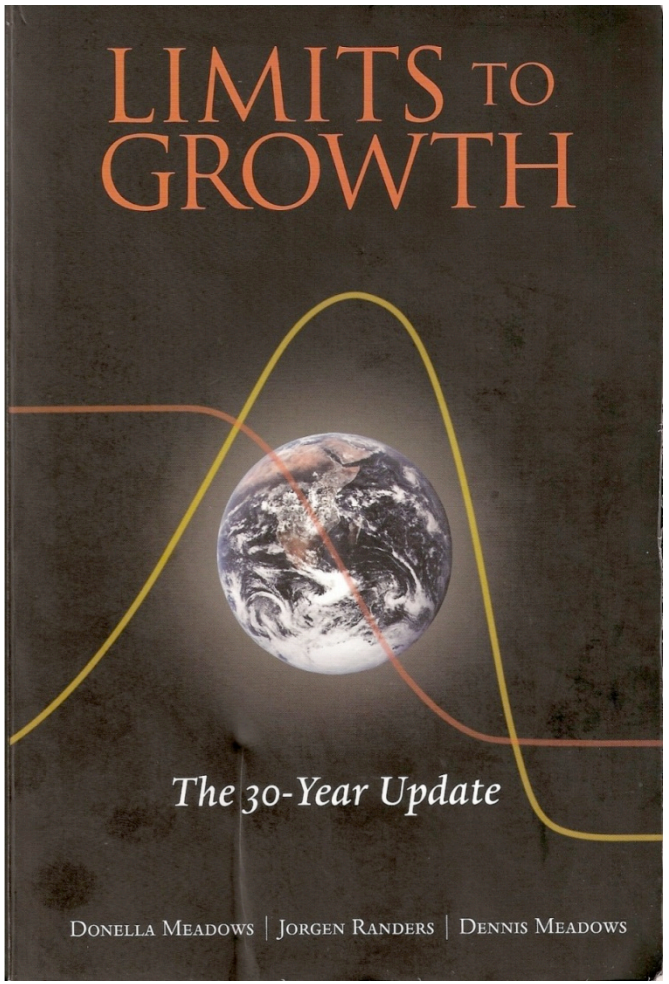
Global hectares per person

Chris Hale, editor in chief, Living Planet Report, 2008, Table 1. pp. 32-39 available at www.panda.org

Exponential Growth in a Finite World



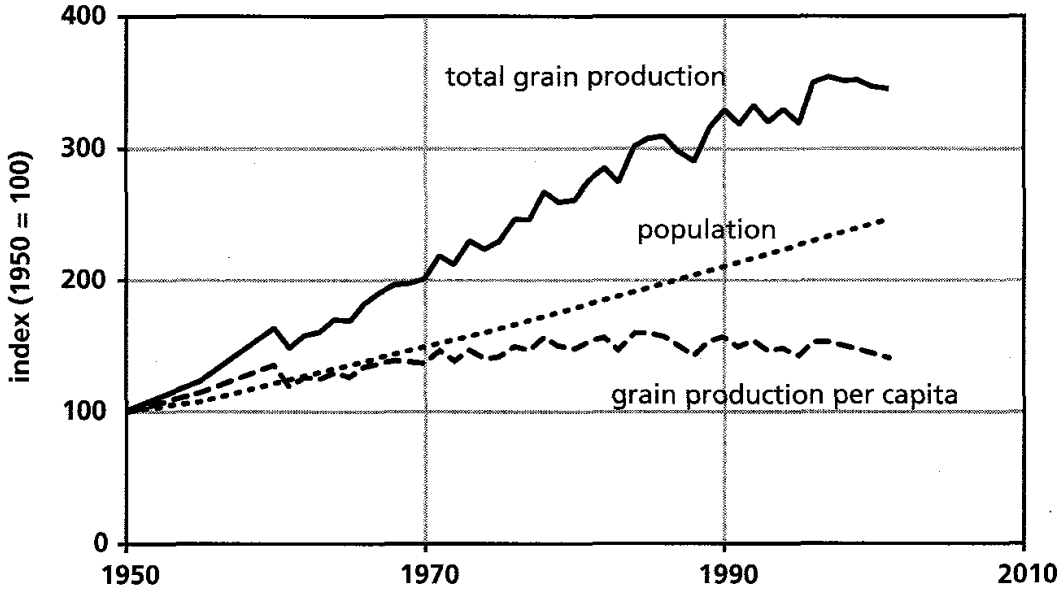
Thomas Robert Malthus, *An Essay on the Principle of Population*, six editions from 1798 to1826.



Donella H. Meadows, Dennis L. Meadows, Jorgen Randers, & William W. Behrens III, *The Limits to Growth*, New York, Universe Books, 1972

Food Security

Photo: Simon Rawles/Alamy



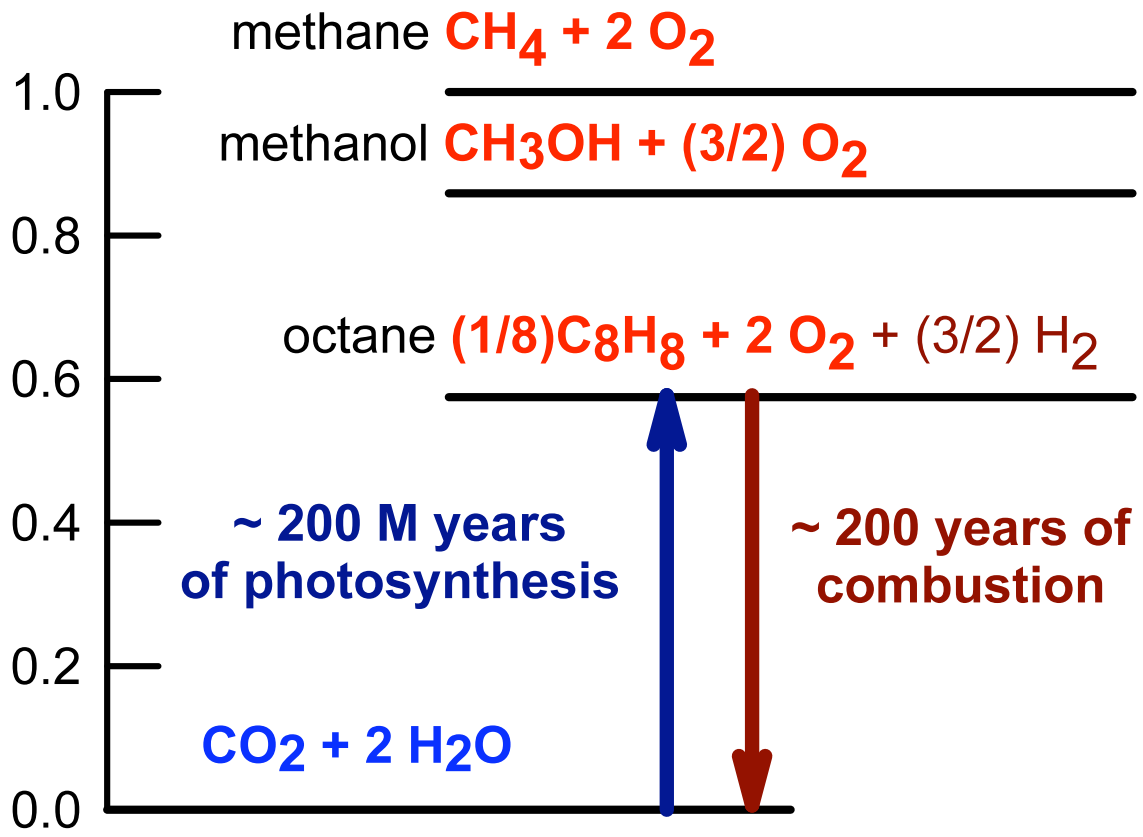
We have little time to waste. Godfray *et al.* (p. 812) note that we have perhaps 40 years to radically transform agriculture, work out how to grow more food without exacerbating environmental problems, and simultaneously cope with climate change. Although estimates of food insecurity vary (Barrett *et al.*, p. 825), the number of undernourished people already exceeds 1 billion; feeding this many people requires more than incremental changes (Federoff *et al.*, p. 833).

Science Vol. 327 (12 February 2010).
http://www.sciencemag.org/special/foodsecurity/

"The amount of moisture on Earth has not changed. The water the dinosaurs drank millions of years ago is the same water that falls as rain today. But will there be enough for a more crowded world?"
Barbara Kingsolver, *National Geographic* A Special Issue, Water our Thirsty World, April 2010, Vol. 217(4) p. 37

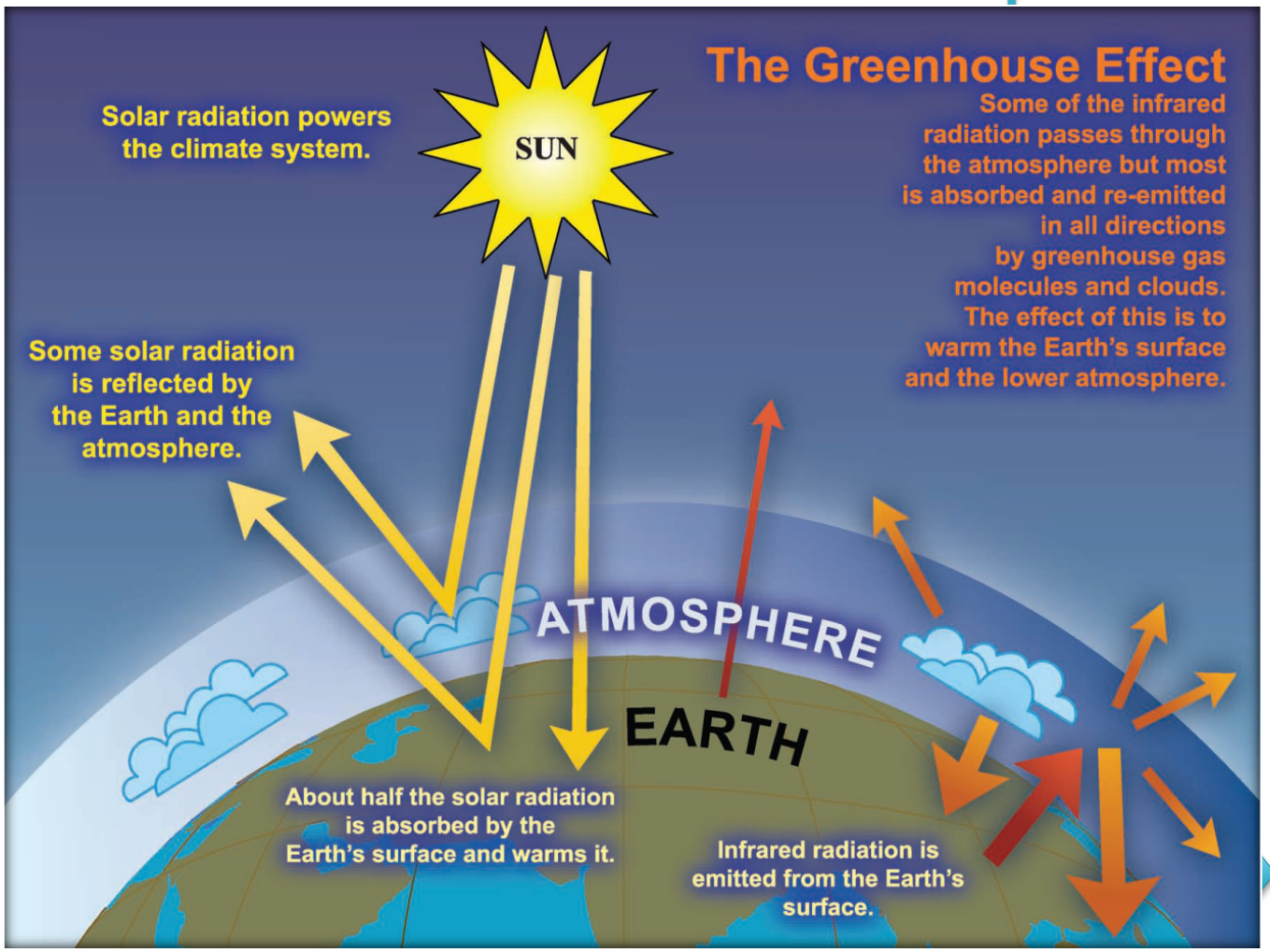
Chemical Storage of Energy

Chemical Energy Diagram



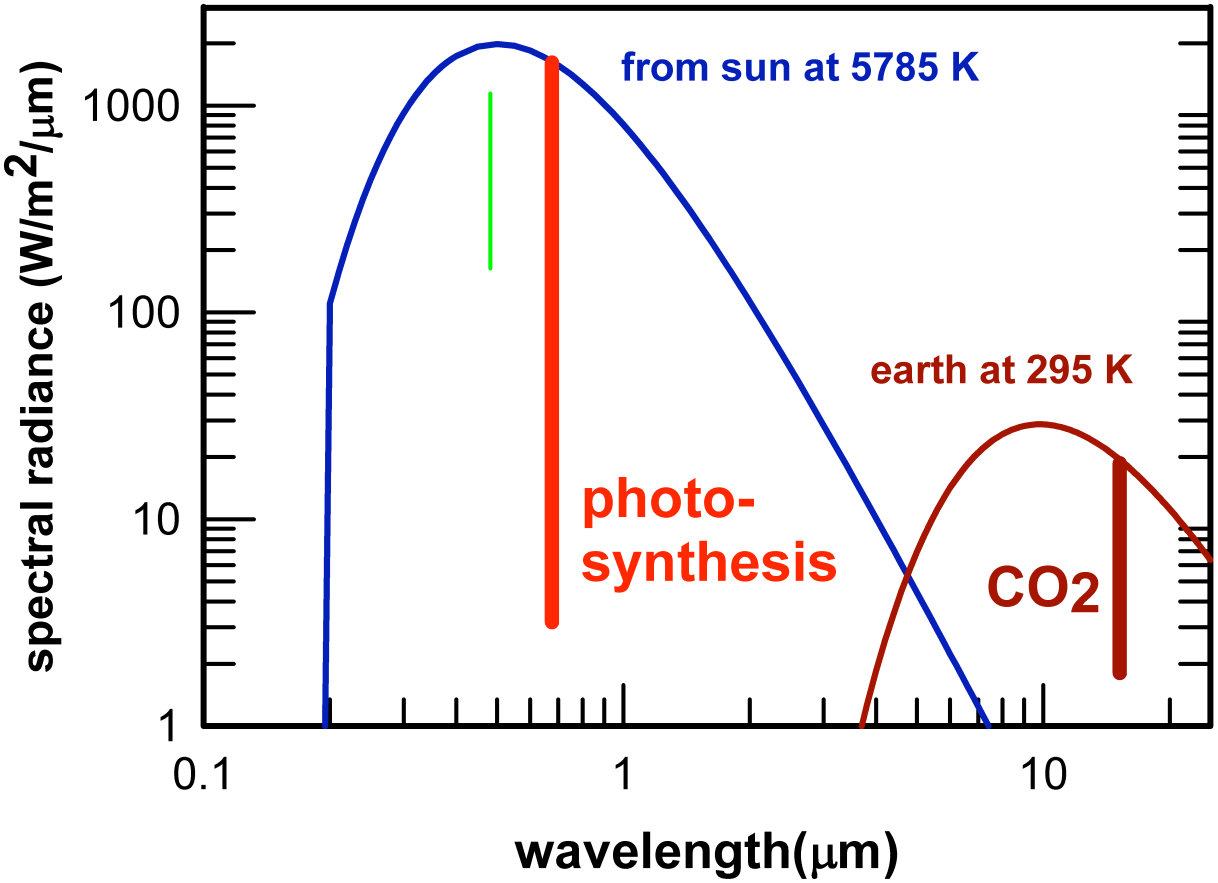
$$C_xH_y + (x + y/4)O_2 \Leftrightarrow xCO_2 + (y/2)H_2O + \text{energy}$$

Arrhenius's Model of the Atmosphere

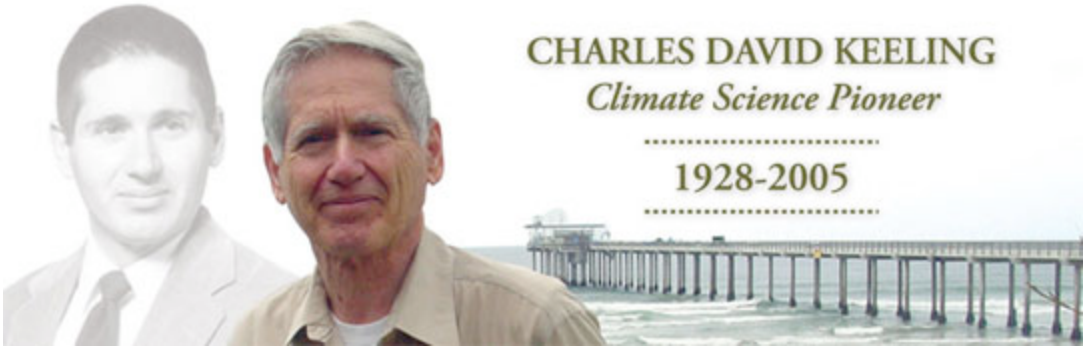


S. A. Arrhenius, "On the Influence of Carbonic Acid in the Air upon the Temperature of the Ground", *Philosophical Magazine* 41, 237–276 (1896).

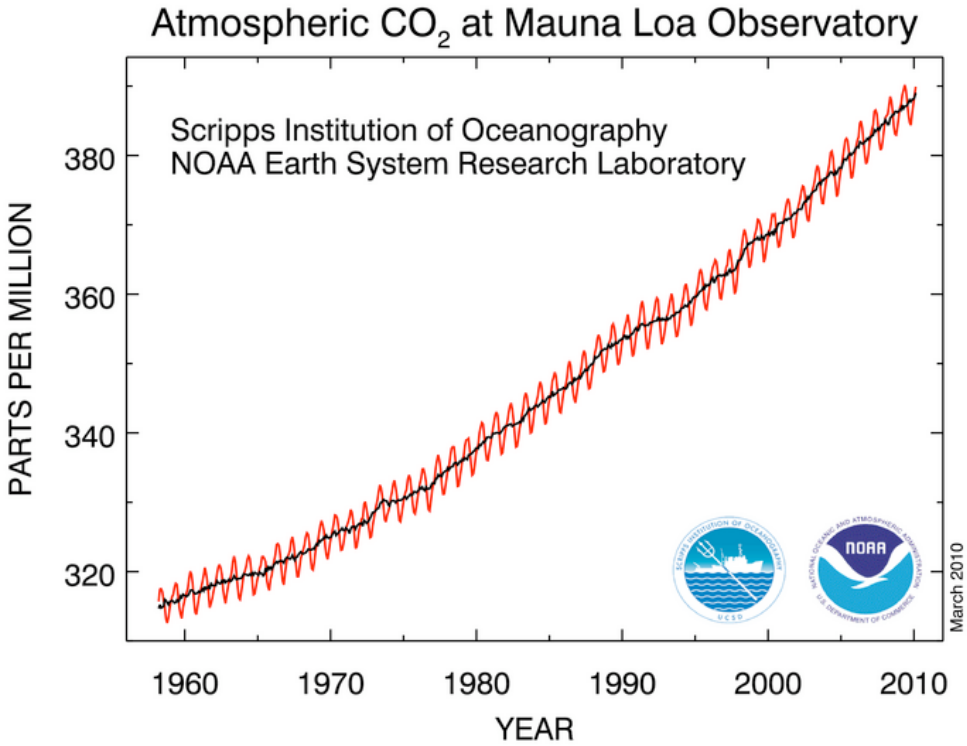
Planck's Model of Radiation



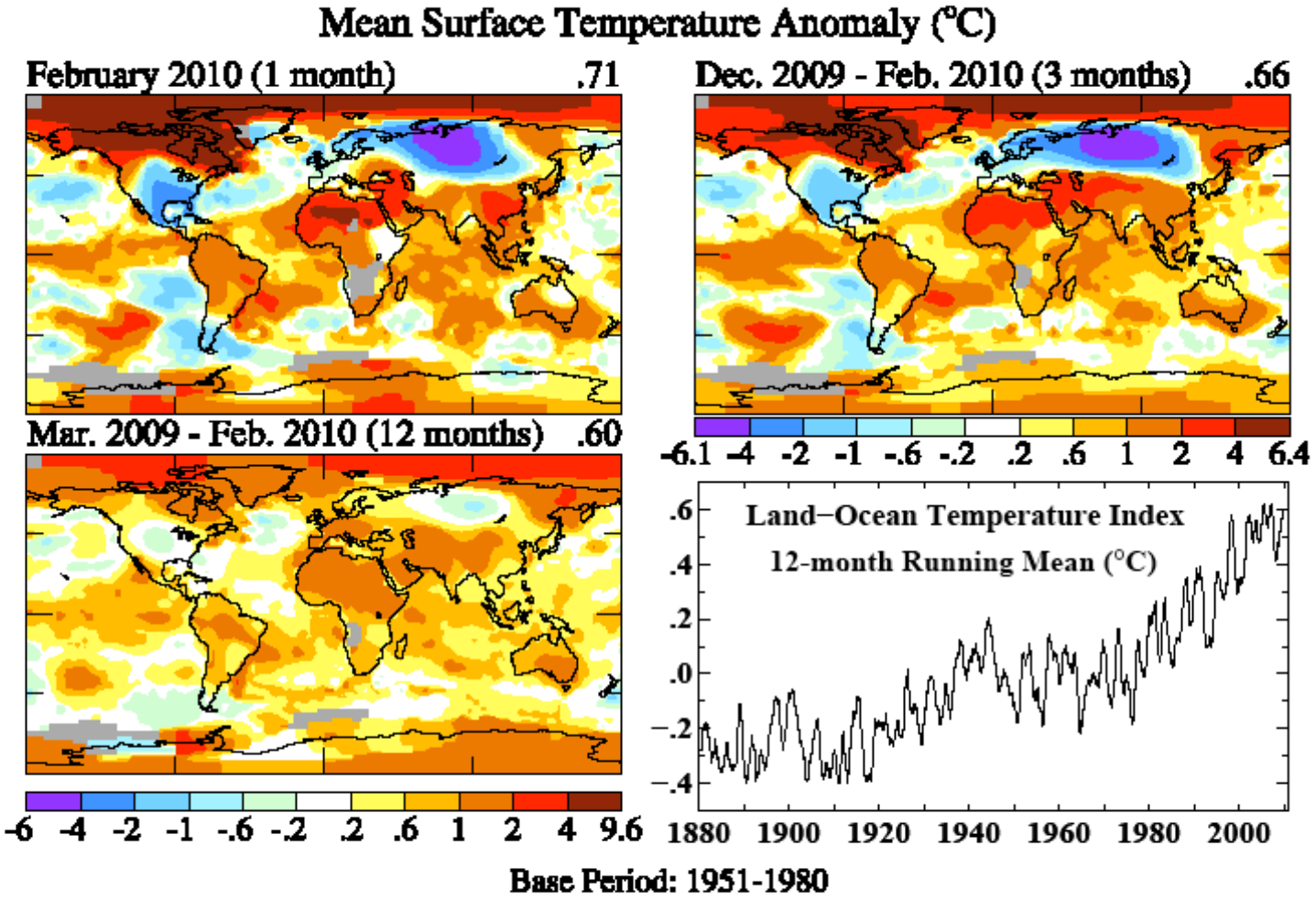
M. Planck, "On the Theory of the Energy Distribution Law of the Normal Spectrum", *Verhandlungen der Deutschen Physikalischen Gesellschaft* **2**, 202 (1900).



Mars: - 50 C
Earth: + 15 C
Venus: + 450 C

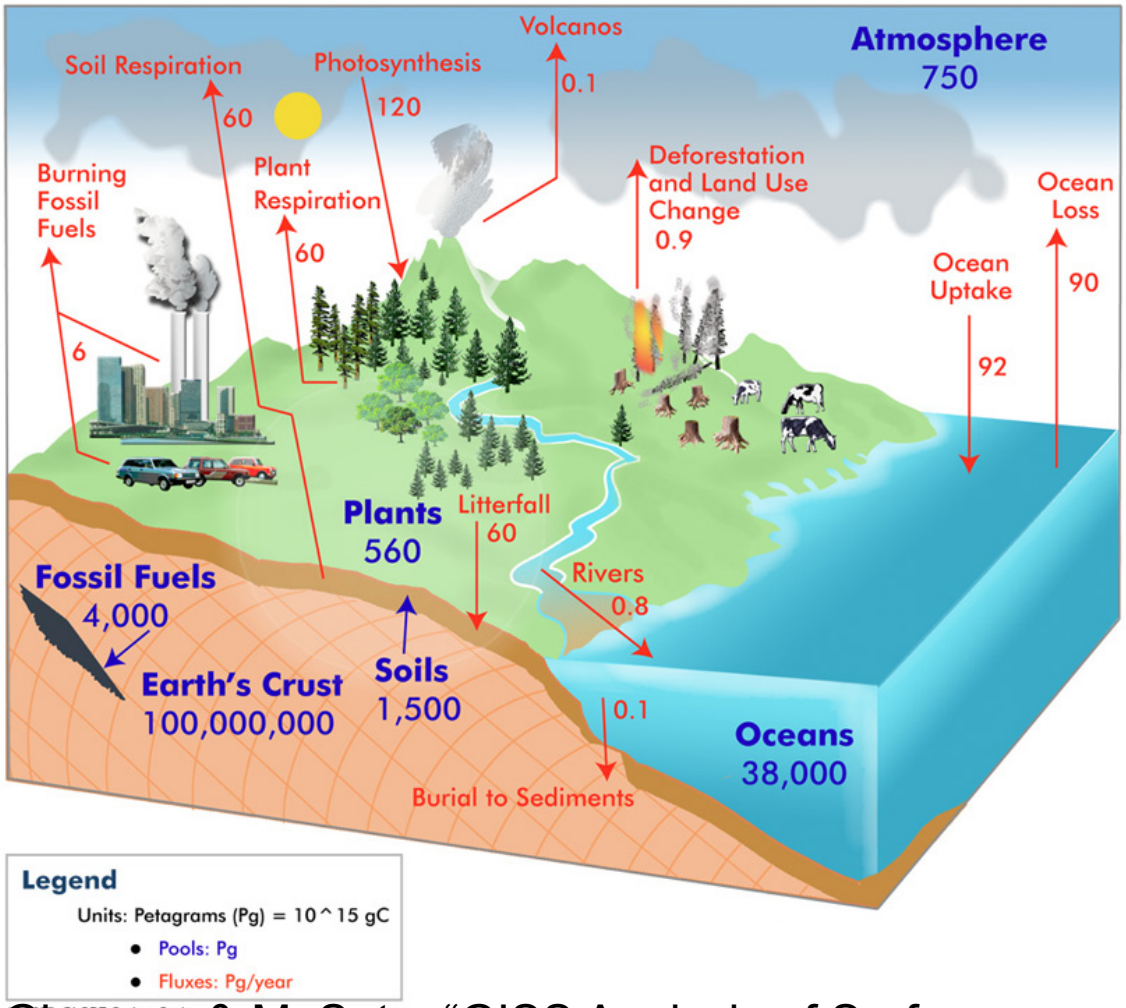


Ref.: C. D. Keeling et al., *Tellus*, Vol. 28, 538-551 (1976)
http://www.esrl.noaa.gov/gmd/ccgg/trends/



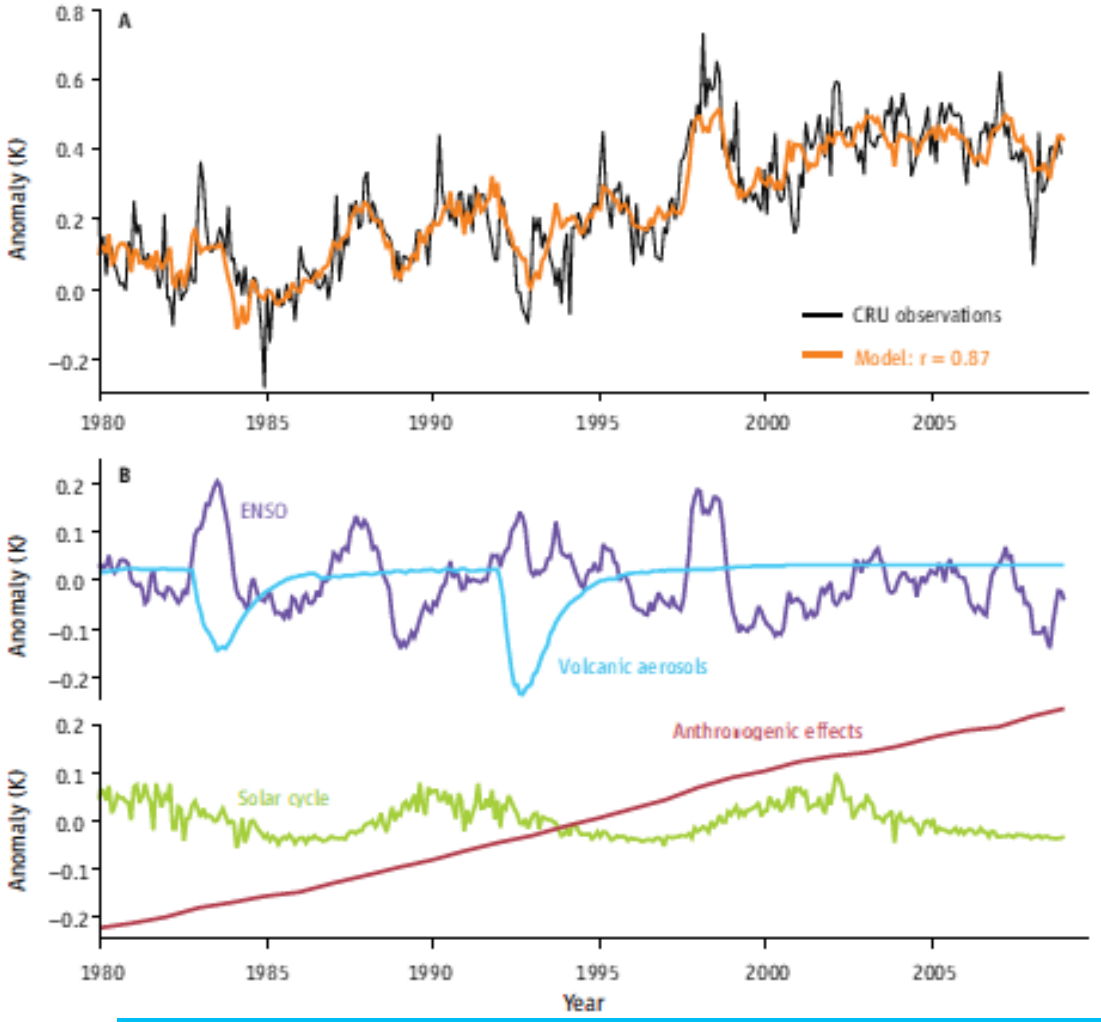
Goddard Institute of Space Science (GISS)
National Climate Data Center (NCDC)
Hadley Centre of U.K. Metrological Office (HadCRU)

Global Carbon Cycle



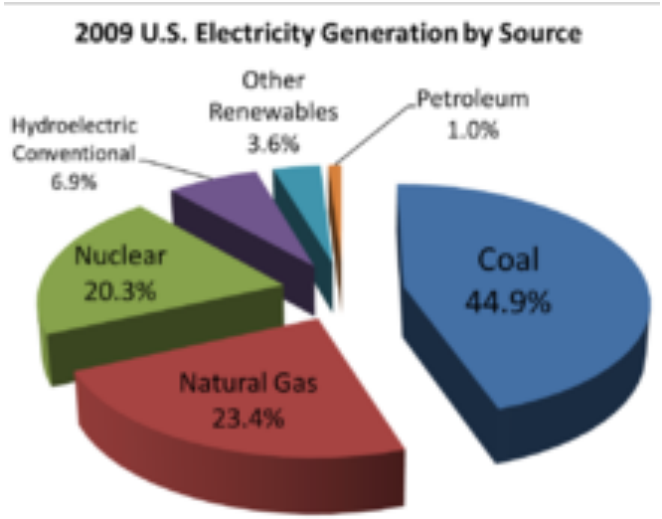
Ref: J. Hansen, R. Ruedy, J. Glascoe, & M. Sata, "GISS Analysis of Surface Temperature change." *J. Geophys. Res.*, 104(D24), 30,997–31,022.

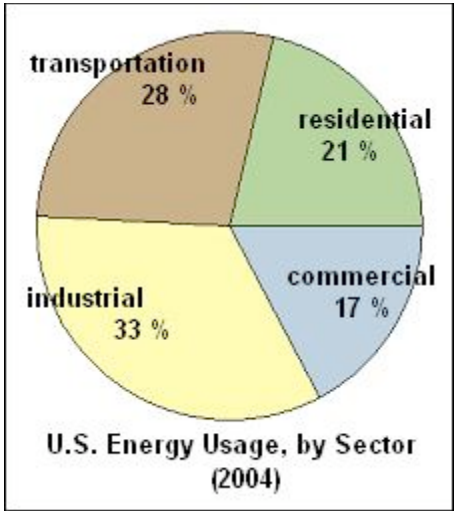
Environment: CO_2 influences climate

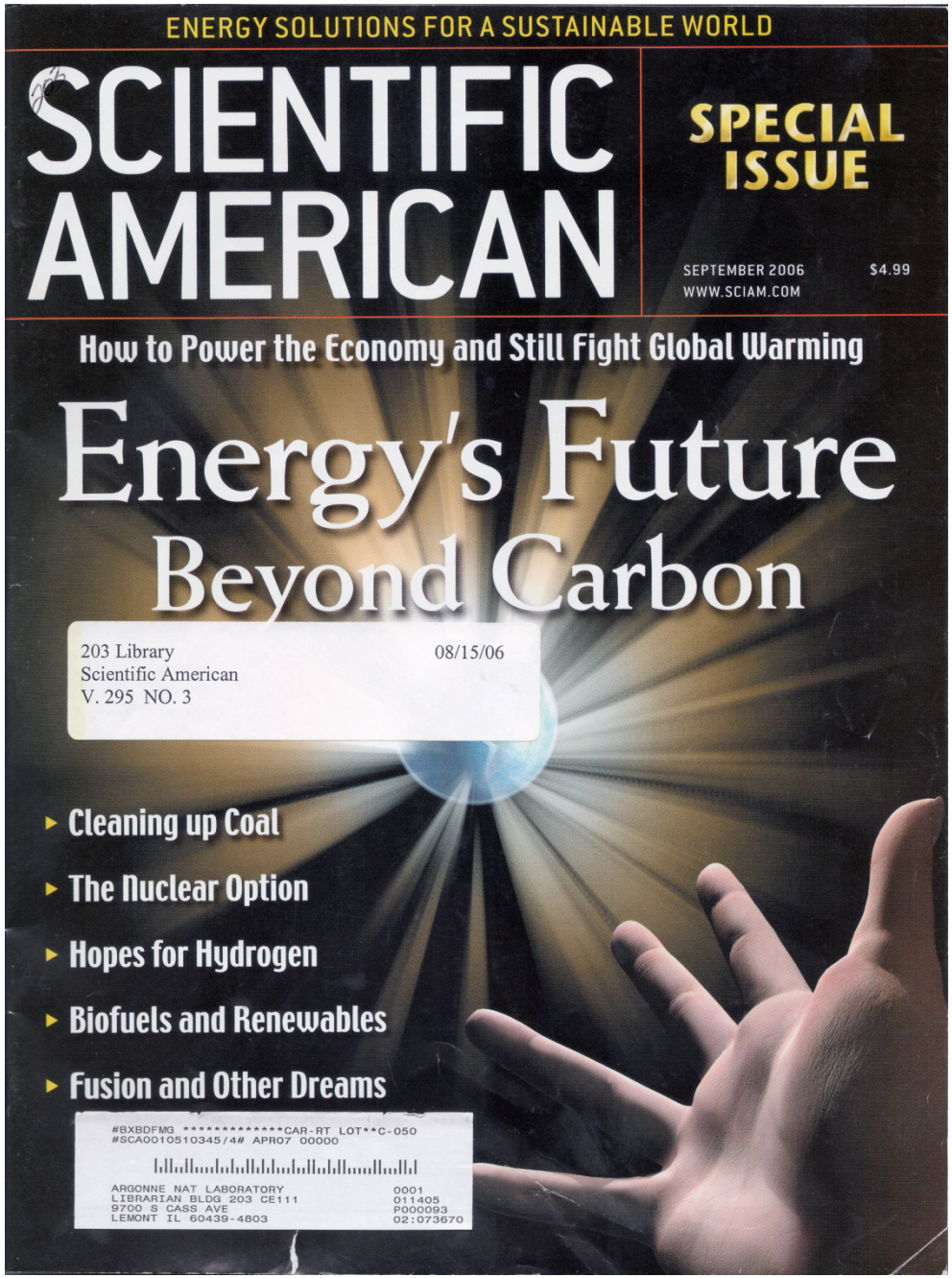


J. J. McCarthy, Science, 18 December 2009, vol. 326, pp. 1646-1655 and ref. 29.

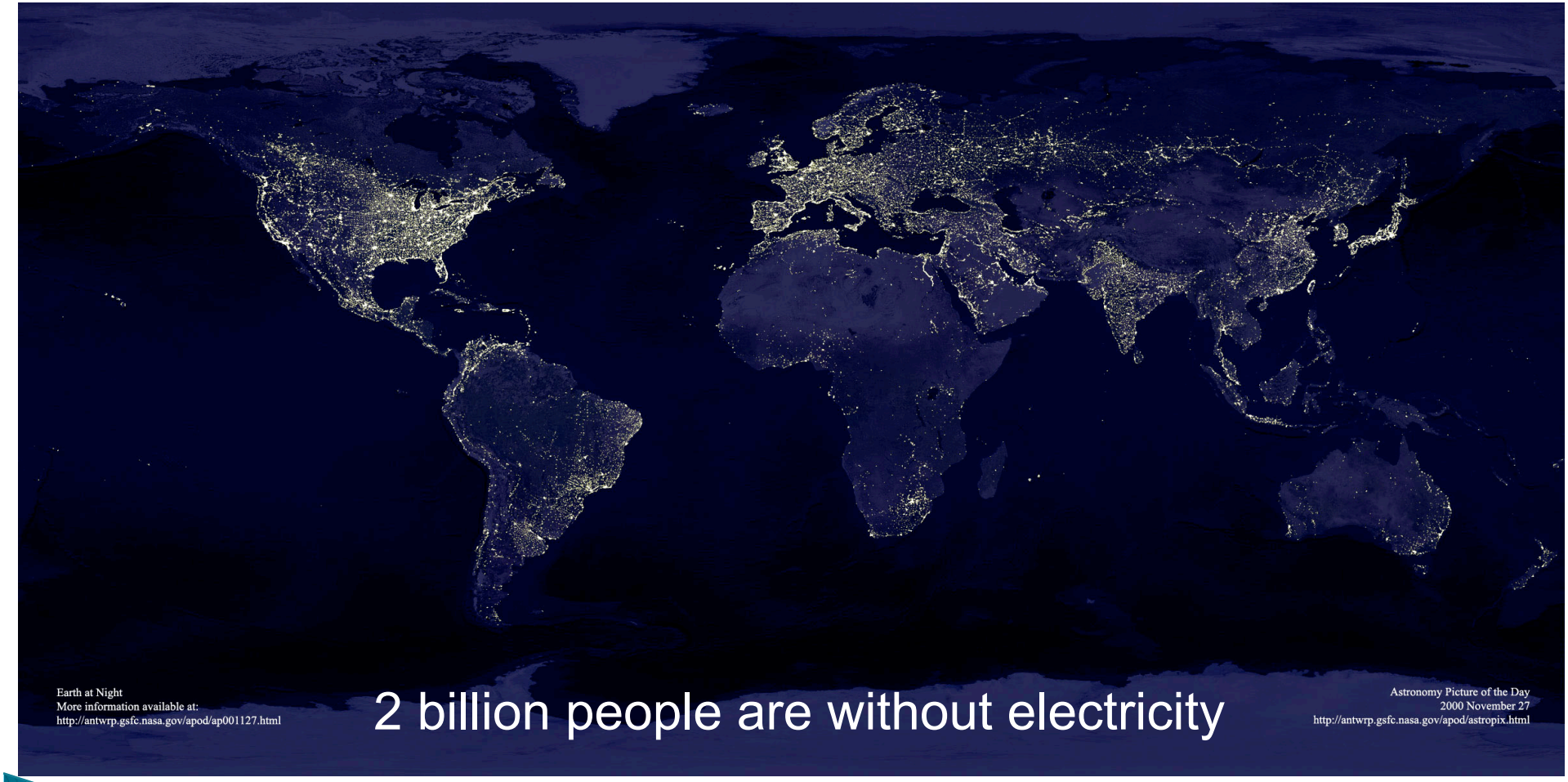
Its all about Energy!







Earth at Night, Nov. 27, 2000



Credit: C. Mayhew & R. Simmon (NASA/GSFC), NOAA/ NGDC, DMSP Digital Archive

A Plan to Keep Carbon in Check

Robert H. Socolow & Stephen W. Pacala, *Scientific American* Sept. 2006, Vol. 295(3) pp. 50-57.

A Simple Suggestion for Legislation:

By January 1, 2035 stationary power plants may emit only water, oxygen, and nitrogen. Any other species must be sequestered via a process that has demonstrated a 95% confidence level for stability for at least 100,000 years.

All mobile energy generators must be sustainable. (1 global hectare ~ 383 gal.(U.S.))

Whether you think that you can, or that you can't, you are usually right.
Henry Ford

2009 Union of Concerned Scientists