Global Change The Conflict: Short Term Goals vs. Long Term Impacts

Jeff Gaffney
World Population reached:
1 billion in 1804
2 billion in 1927 (123 years later)
3 billion in 1960 (33 years later)
4 billion in 1974 (14 years later)
5 billion in 1987 (13 years later)
6 billion in 1999 (12 years later)

Unless we reduce our growth rate soon, World Population will reach:
7 billion in 2013 (14 years later)
8 billion in 2028 (15 years later)
9 billion in 2054 (26 years later)

U.S. and world combustion of coal (in millions of metric tons) has increased steadily from 1937 to the present. It is expected to increase even more between now and beyond 2040.
Our Planet is not HOMOGENEOUS

Wetter!

Drier!

Hotter!

Colder!

This used to be full of big icy mountains... new look at it!

Have you heard the latest? Dublin may become as cold as Spitzbergen in the Arctic Circle because of global warming...
Chapter 3. Atmospheric Composition
AEROSOL IMPACTS – NEW DOE/ASP FOCUS
MEGACITIES

- **10 Million**
  - 1950 – 1 (NYC)
  - 1995 – 14
  - 2015 – 21

Mini – MEGACITIES

- **5 Million – 10 Million**
  - 1995 – 7
  - 2015 – 37

ASIA – AFRICA

- 2/3 rural to ½ urban by 2025
Black Carbon

i.e. Diesel Soot
THE $^{12}\text{C}/^{13}\text{C}$ RATIO IN BLACK PULMONARY PIGMENT: A MASS SPECTROMETRIC STUDY

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THE $^{12}\text{C}/^{13}\text{C}$ RATIO IN BLACK PULMONARY PIGMENT—SLATKIN ET AL.

Figure 1. Longitudinal section through a typical cervical lymph node. Although overall black pigmentation is moderate, focal zones of the node are intensely pigmented, particularly in medullary streams and in connective tissue surrounding nutrient blood vessels.
RATE OF CHANGE IMPORTANT - Timing!

SO THESE SCIENTISTS DID THIS EXPERIMENT THAT IF YOU DROP A FROG INTO BOILING WATER HE JUMPS OUT.

BUT IF YOU PUT HIM IN WARM WATER AND HEAT IT SLOWLY, HE JUST SWIMS AROUND UNTIL HE'S COOKED.

HEH, HEH, HEH, HEH, HEH, HEH, HEH, HEH.

WHAT'S THE POINT OF THAT EXPERIMENT?

PROBABLY THE SAME ONES STUDYING GLOBAL WARMING.

BEATS ME.
Increases in Severe Weather – EXTREMES!
RATE of CHANGE – Will Determine How We ADAPT!

Temperature in ’97 set a record

Global Temperature Rising

Every year scientists track surface temperatures from around the world to create a global temperature index. Since 1990, the index has risen almost 1 degree, making 1997 the warmest year of the century.

THIS IS YOUR PLANET ON GREENHOUSE GASES
Of Course, Some Habits May be Hard to Change!
Global Change Scientists Must Also Adapt!
ITS BIG..
But Resources Still have LIMITS

AIR
WATER (FRESH)
FUELS
RISE AND FALL OF PETROLEUM BASED ECONOMIES..

ASSUMPTIONS…

OIL – ENDLESS SUPPLY? NO ---- Obvious impacts

FOOD SUPPLY – TIED TO OIL – YES – Strongly

Irrigation\Fertilization– Mechanization – PROCESSING, Transportation

Example: Breakfast Cereal – Grind Corn, Milling, Wetting, Drying and Baking – Costs 4 calories for every calorie of food.

Two pounds of Corn Flakes – one half a gallon of gasoline just to make it.. Not counting transportation to the store – and you driving to the store to get the food. Very Energy Intensive…

BEEF, PORK, CHICKEN – Even more Energy Costs.

LAND USE CHANGES ---- CAN WE MAINTAIN THIS?
SHORT TERM..

$$$$$$$$$$$$$ - HOW TO KEEP GROWTH UP..

Vs.

LONG TERM

SUSTAINABILITY and QUALITY OF LIFE
SHORT TERM APPROACH – QUICK FIX?

LONG TERM Options:
Solar/Wind/Hydro/Geothermal…. (local sources/power needs?)
Hydrogen – (Fresh Water)
Fusion, Fission, etc. – Electricity – Electric Vehicles/Hybrids
Conservation – Increased efficiency (there is a limit..)
MASS TRANSIT (Need Capital Investment- commitment
ENERGY PORTFOLIO
REVISIT LAND USE – BACK TO LOCAL FOOD PRODUCTION?
COAL/CLIMATE?
TRADEOFFS – TOO MANY OF US.. DEMAND HUGE
NEED TO UNDERSTAND THE GLOBAL SYSTEMS

IDENTIFY PITFALLS IN ENERGY STRATEGIES BEFORE WE HAVE MAJOR PROBLEM…

CFC’s – Ozone Depletion and Global Warming
MTBE – Water Supply contamination
Tall Stacks – Acid Rain

YOUR GENERATION WILL NEED TO LEAD THE WAY

WILL REQUIRE A WORKING KNOWLEDGE OF THE SYSTEMS TO ADDRESS CRADLE TO GRAVE IMPACTS OF ENERGY STRATEGIES.. And TRADEOFFS
Census 2000 in United States, counted 281 million people. 33 million people added to the U.S. population between 1990 and 2000 is the largest census-to-census increase ever. The growth rate during the 1990's was 13 percent more than the rate in the 1980's at 10 percent, but significantly less than the rate experienced during the 1950's, baby boom contributed to an 18 percent gain. In 2003- U.S. Topped 290 Million (1% increase in a year).

Better health care impacts
Longer life expectancy
Over the past half century, the world's population growth is at 2% each year, doubling in 37 years and increasing from about 2.5 billion in 1950 to 6 billion by 2000. The growth rate is slowing, so the world's population may not double again by 2050. Even so, the population will probably be 9.4 billion (7.7-12.4 range) considering declining birth rates and AIDS or other epidemics. The Future Globe Will Be a More Crowded Place.
And most of the Change will be in Africa, Asia, and South America
FUTURE WILL REQUIRE GLOBAL CHANGE TO ADAPT TO THE POPULATION DISTRIBUTIONS FOR FOOD, WATER AND ENERGY

WILL NEED GLOBAL COOPERATION AND PLANNING AND A REAL UNDERSTANDING OF THE GLOBAL SYSTEMS.

IMPROVED TECHNOLOGY WILL PLAY A ROLE
SO WILL INFORMED LAND AND RESOURCE MANAGEMENT

ENVIRONMENT AND ENERGY USE WILL NEED TO BE EXAMINED JOINTLY FOR LONG TERM SOLUTIONS!
REAL NEED FOR BETTER SCIENCE IN ENVIRONMENTAL SCIENCE AND GLOBAL CHANGE RESEARCH – AND WELL TRAINED SCIENTISTS – YOU (SURE AND GREF)

GOOD LUCK WITH YOUR RESEARCH EFFORTS IN SURE AND GREF – IT ALL ADDS UP TO BETTER KNOWLEDGE BASE!