CENTRE : DDU KAUSHAL KENDRA

NAME OF THE PROGRAMME : B.VOC (AUTOMOBILE TECHNOLOGY)

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COURSE NAME : ENVIRONMENTAL STUDIES

SEMESTER : III

FACULTY NAME : DR. PRAKASH SVA

DESIGNATION : GUEST FACULTY

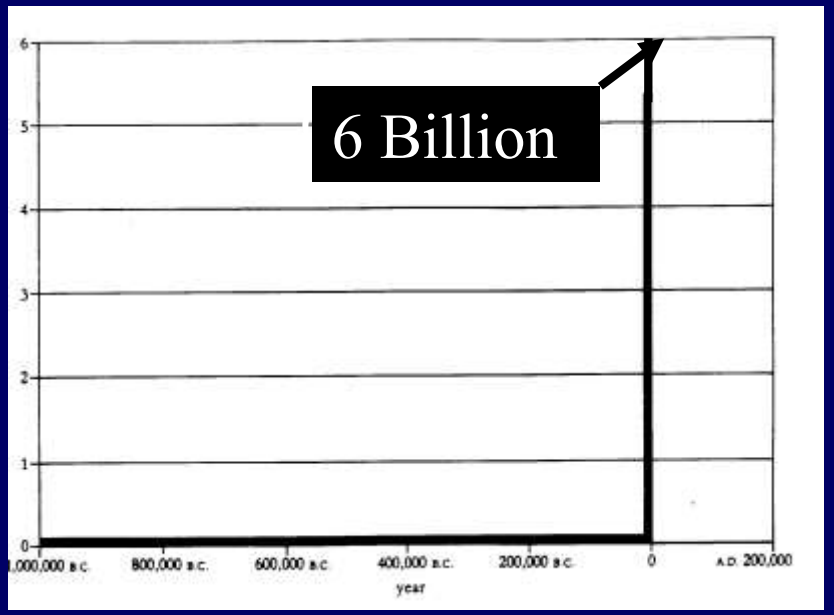
TOPIC : HUMAN POPULATION AND GROWTH

Human Population Growth and the Environment

- Human Population - An Explosive Growth
- Human Needs - Limited Resources
- Our Natural Environment Under Attack
- Roles of Technology and Engineering
- An Uncertain Future

Humans are Recent Arrivals

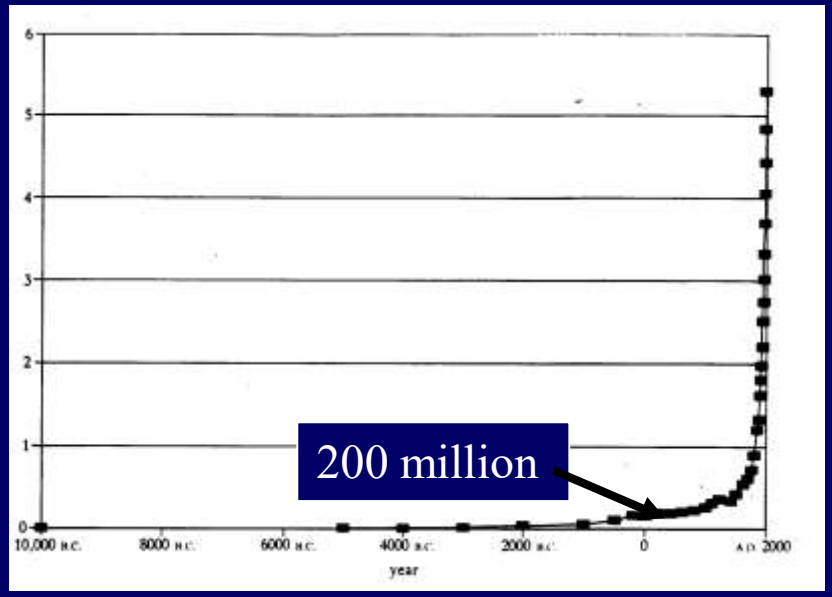
- Earth - 5 Billion Years
- Multi-cell Biota
  - 600 Million Years
- Human Beings
  ~ 2 Million Years
- Human Population Growth into Billions
  - Last 200 years



A Million Years Of Human Growth (1)

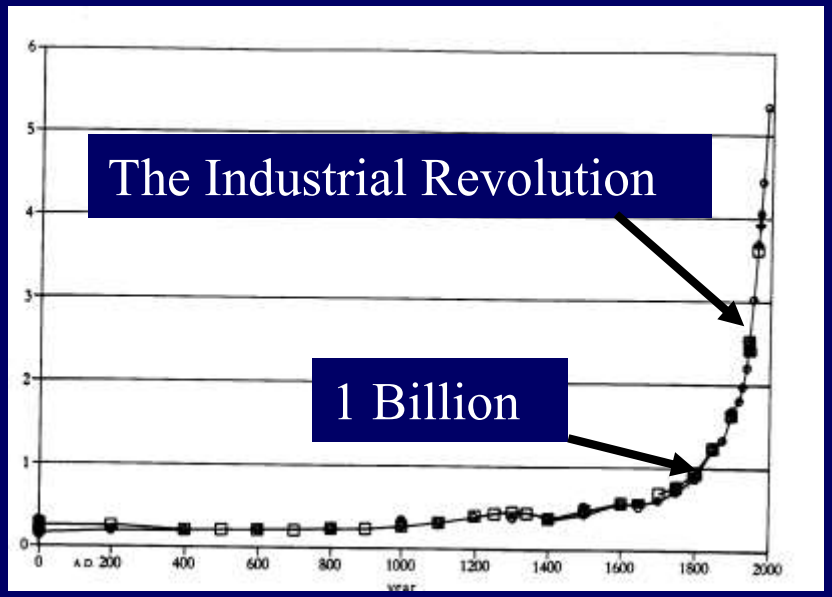
A Closer Look (1)

- 12,000 years



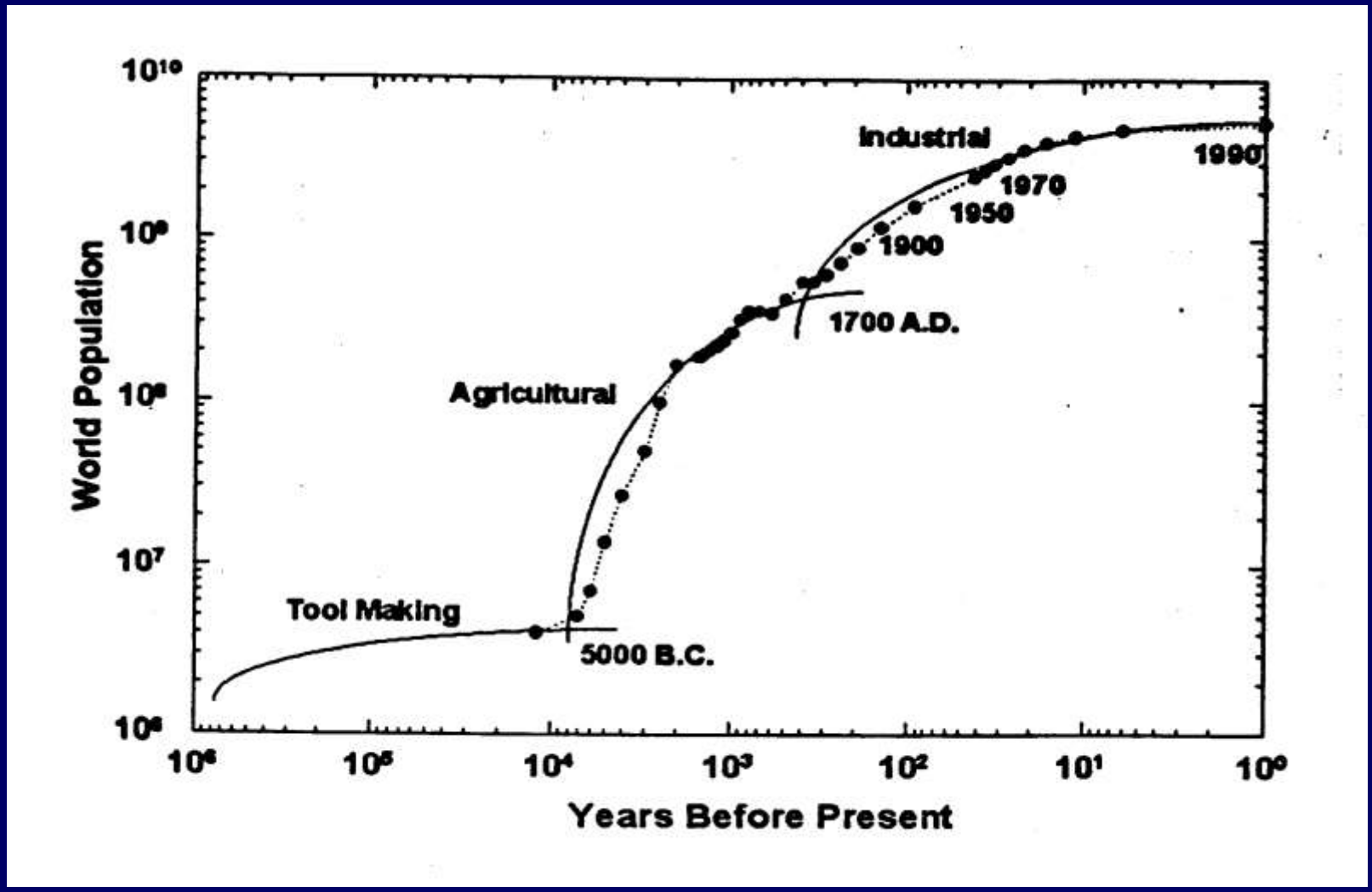
- 200 Million by 1 A.D.

- 2,000 Years



- 1 Billion in 1800 A.D.

Three Technological Eras (2)

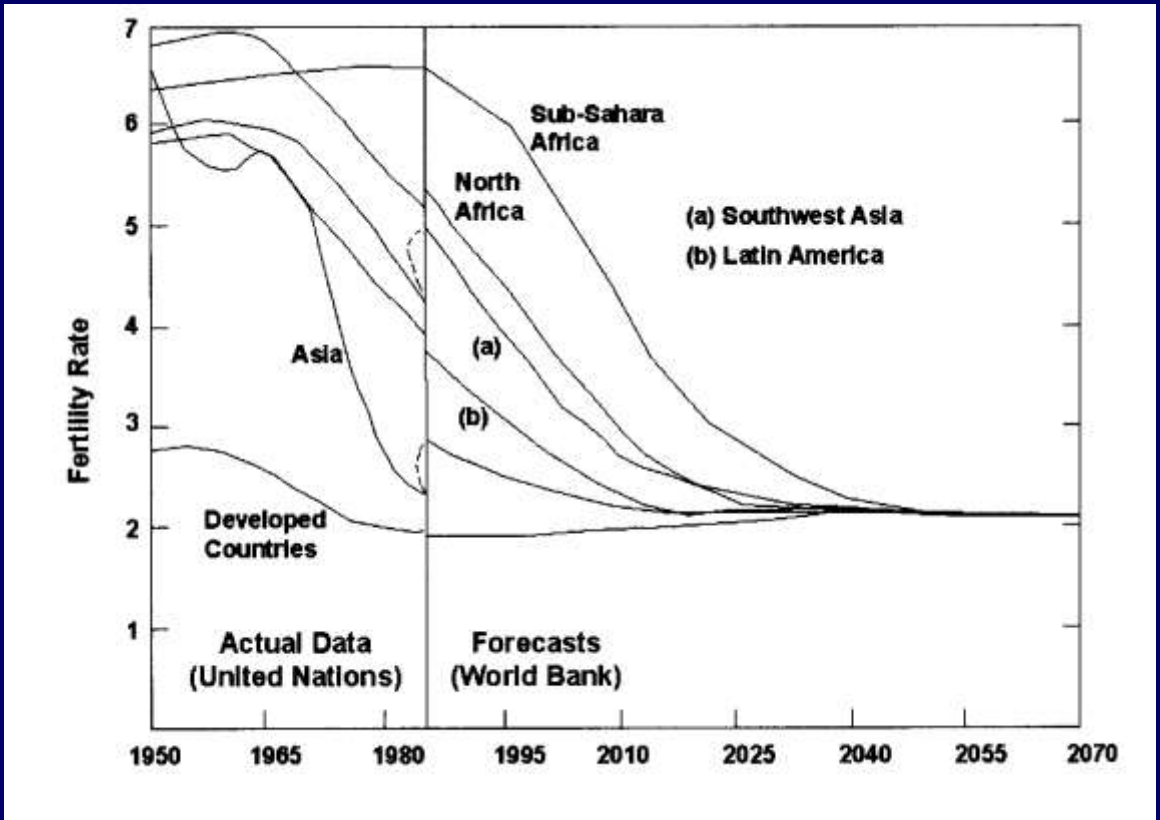


What's Behind Population Growth

- Three Factors
  - Fertility
  - Infant Mortality
  - Longevity
- Animal Domestication and Agriculture
  - Provided for a few to feed many
- Industrial Revolution
  - Growth of Cities and Infrastructure
    - Water
    - Energy
    - Transportation
  - Increased Productivity
  - Nutrition
  - Sanitation
  - Medicine

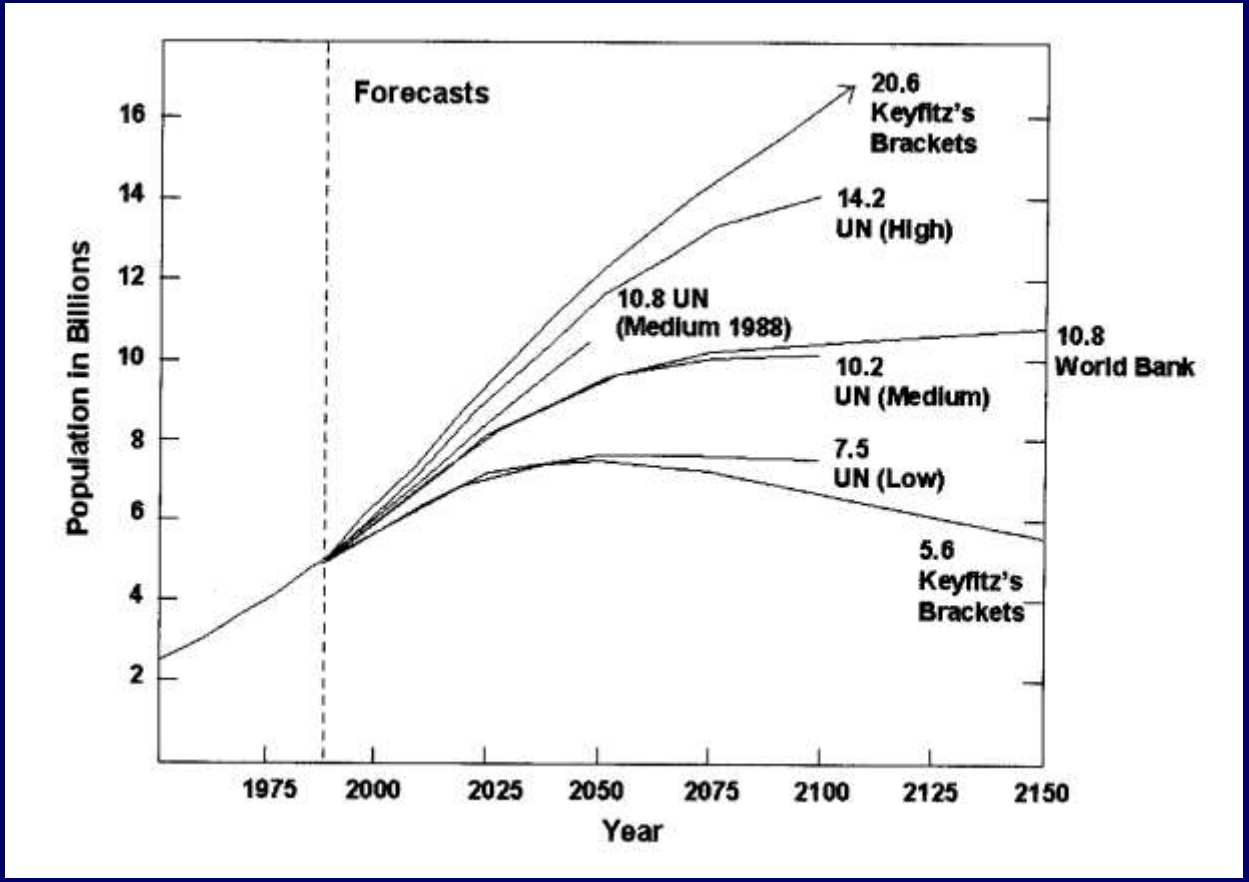
Fertility Trends

- Population predictions are very sensitive to future fertility assumptions
- At 1990 fertility rates (constant by region) population would grow to 110 billion in 2100, over 700 billion in 2150 (3)
- Has been dropping since 1800 in developed nations - now at Zero Growth (4)
- Is on its way down in much of the developing world (4)



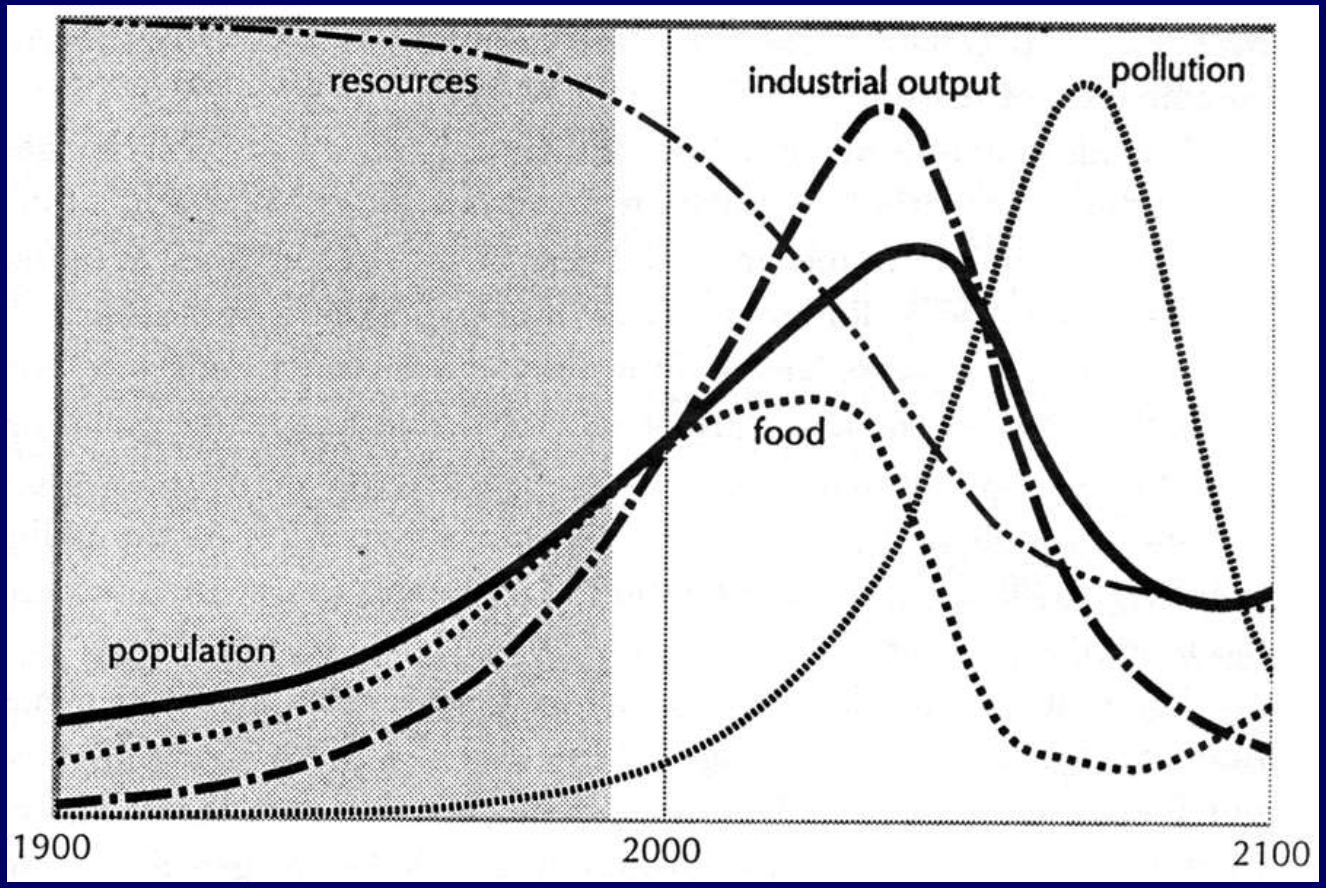
Population Predictions (4)

- Most predictions:
  9-12B by 2050
  10-15B by 2100
- UN (Low) requires global fertility at less than zero growth in 15 years
- Large uncertainties



Population May Overshoot

When Population Outpaces Resources



Scenario - current population trend, doubled resources (5)

Resource Consumption (6)

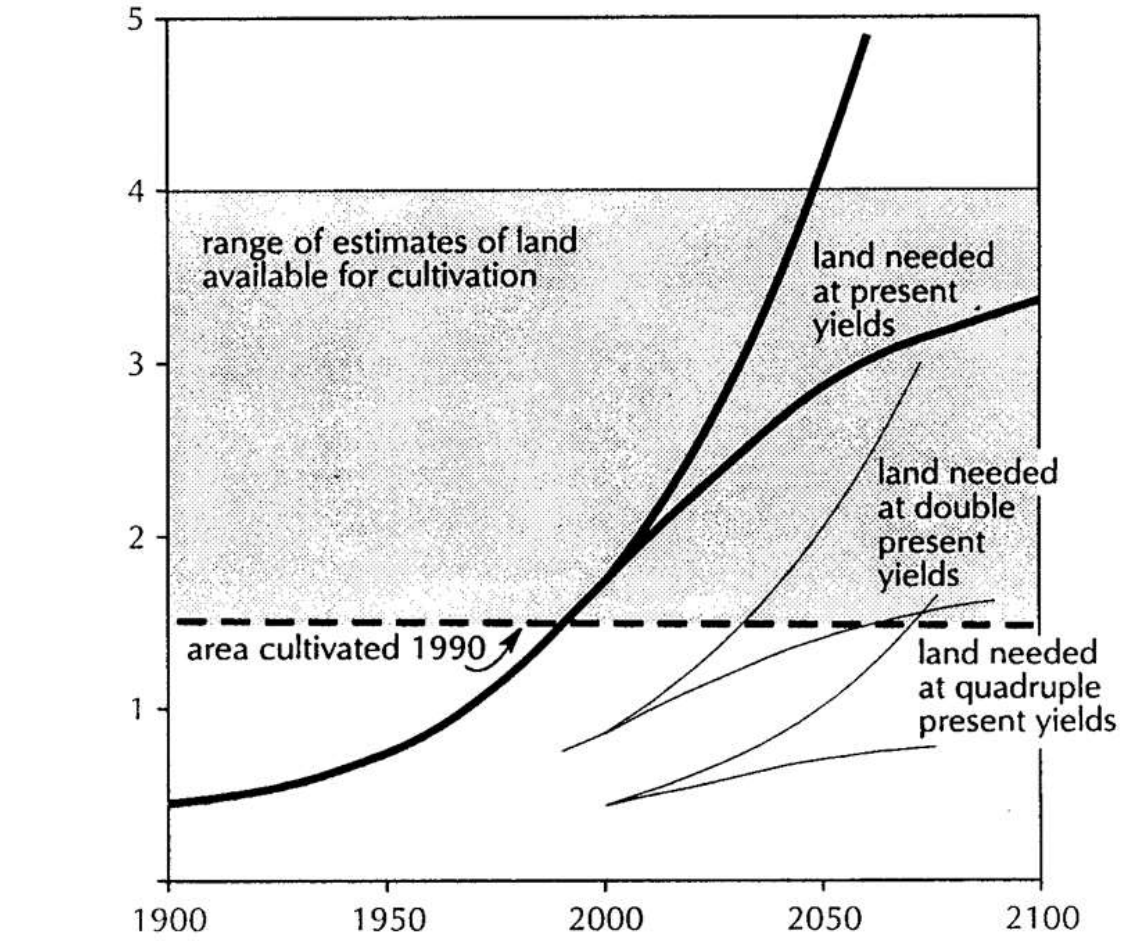
- High consumption
- Getting worse
- Rate increase faster than population growth

	1970	1990
Human population	3.6 billion	5.3 billion
Registered automobiles	250 million	560 million
Kilometers driven/year (OECD countries only)		
by passenger cars	2584 billion	4489 billion
by trucks	666 billion	1536 billion
Oil consumption/year	17 billion barrels	24 billion barrels
Natural gas consumption/year	31 trillion cubic feet	70 trillion cubic feet
Coal consumption/year	2.3 billion tons	5.2 billion tons
Electric generating capacity	1.1 billion kilowatts	2.6 billion kilowatts
Electricity generation/year by nuclear power plants	79 terawatt-hours	1884 terawatt-hours
Soft drink consumption/year (U.S. only)	150 million barrels	364 million barrels
Beer consumption/year (U.S. only)	125 million barrels	187 million barrels
Aluminum used/year for beer and soft drink containers (U.S. only)	72,700 tonnes	1,251,900 tonnes
Municipal waste generated/year (OECD countries only)	302 million tonnes	420 million tonnes

Resource Limits - Land (7)

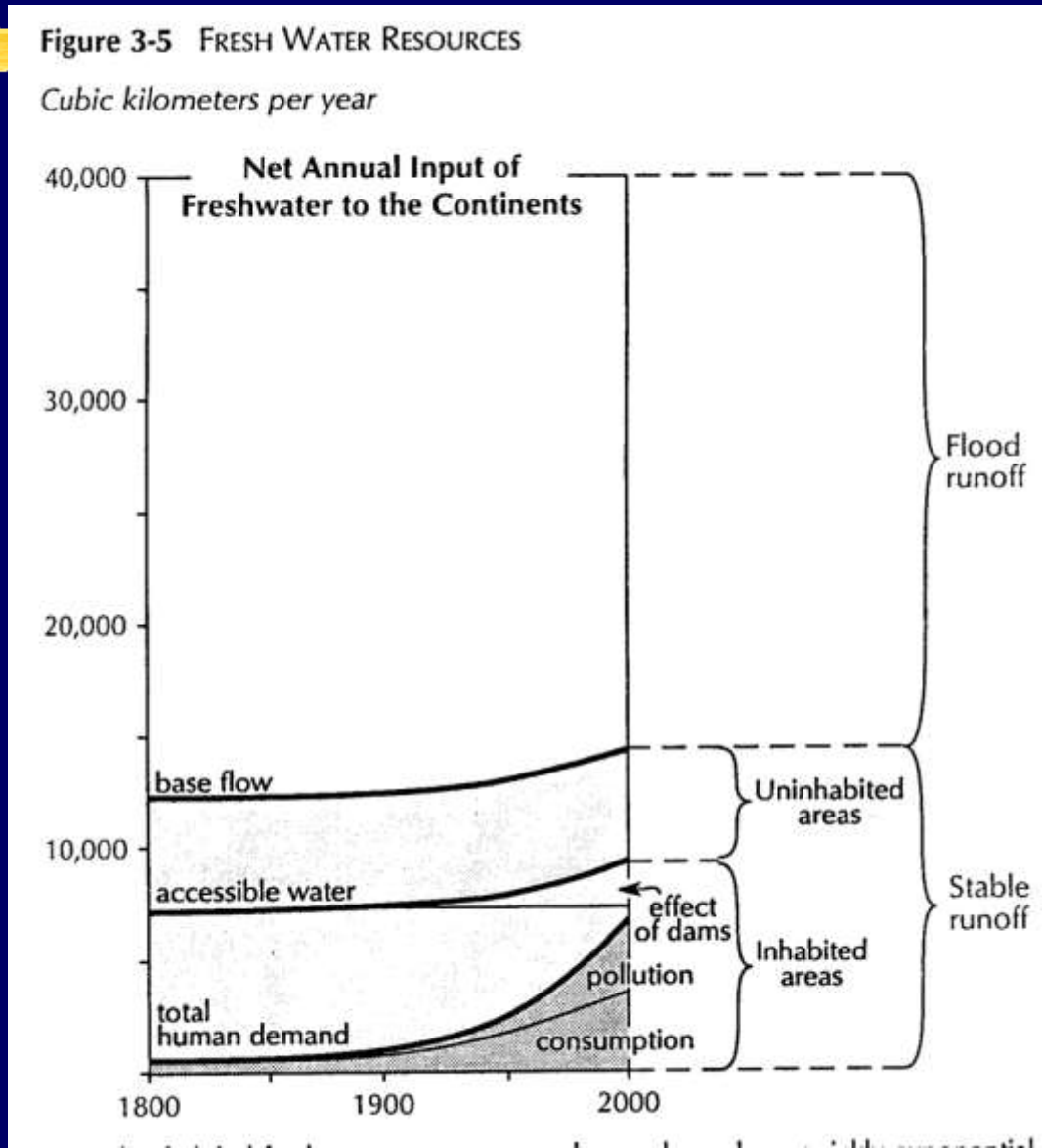
- Deforesting to acquire more arable land
- Would run out in next century at current yields
- Probably need to double yields

Figure 3-4 POSSIBLE LAND FUTURES



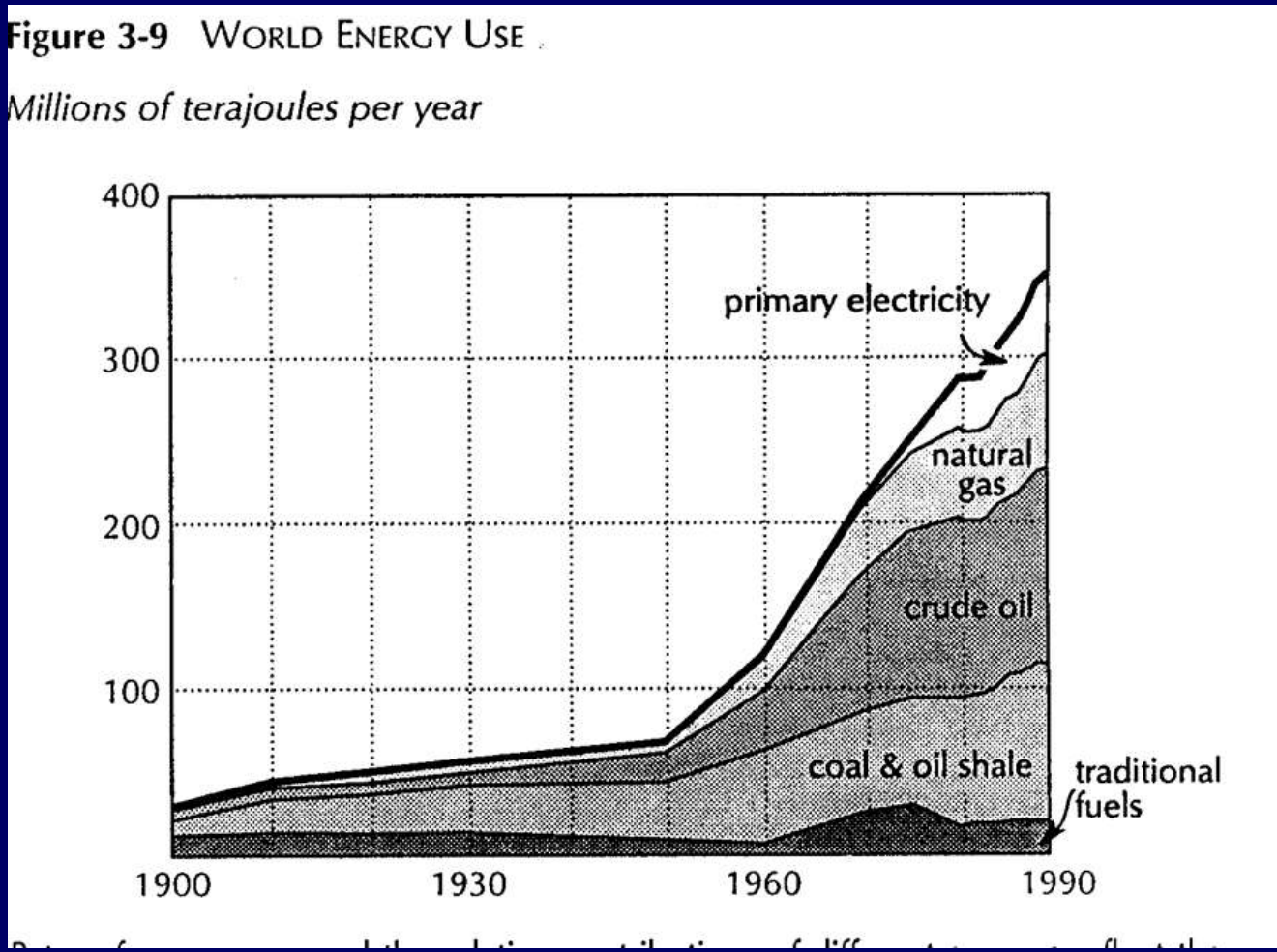
Resource Limits - Water (8)

- In 1950 people used half of accessible water
- Are now dependent on dams
- Pollution loses 33% of potential water
- Getting close to limits



Energy Consumption (9)

- Energy growth very high last fifty years
- Mostly hydrocarbon fuels
- Nonrenewable resource consumption and climate change issues



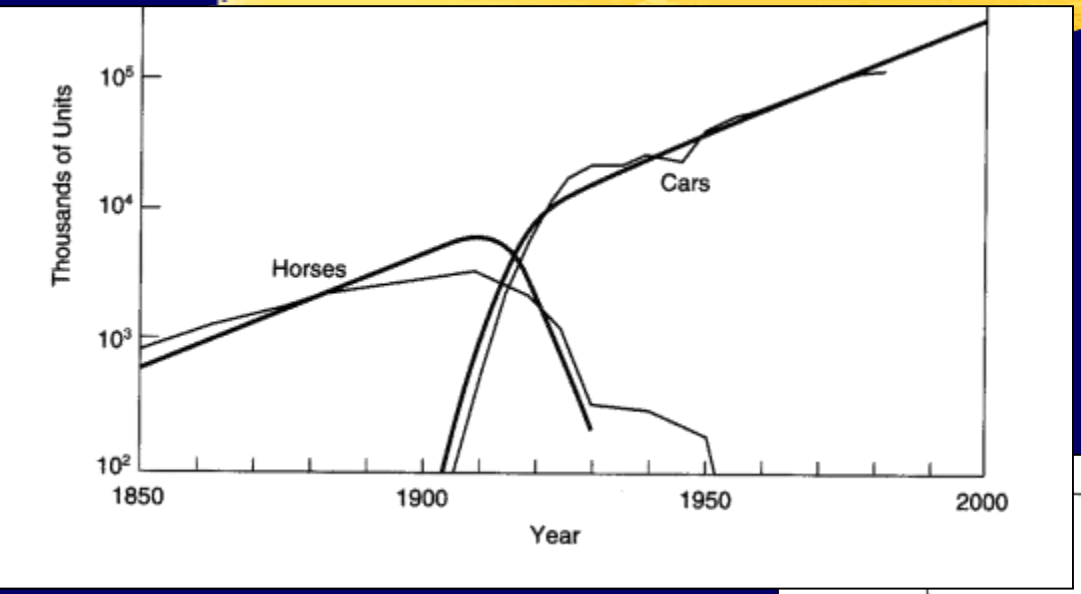
Fossil Fuel Reserves (9)

Table 3-1 ANNUAL PRODUCTION AND RESERVE/PRODUCTION RATIOS FOR OIL, COAL, AND GAS, 1970 AND 1989

Fuel	*1970 production (per year)*	*1970 R/P (years)*	*1989 production (per year)*	*1989 R/P (years)*
Oil	16.7 billion barrels	31	21.4 billion barrels	41
Coal	2.2 billion tons	2300	5.2 billion tons	326 (hard coa 434 (soft coal
Gas	30 trillion cu. ft.	38	68 trillion cu. ft.	60

- Lots of coal - but heavy CO2 contributor
- Look for alternative forms of energy to emerge

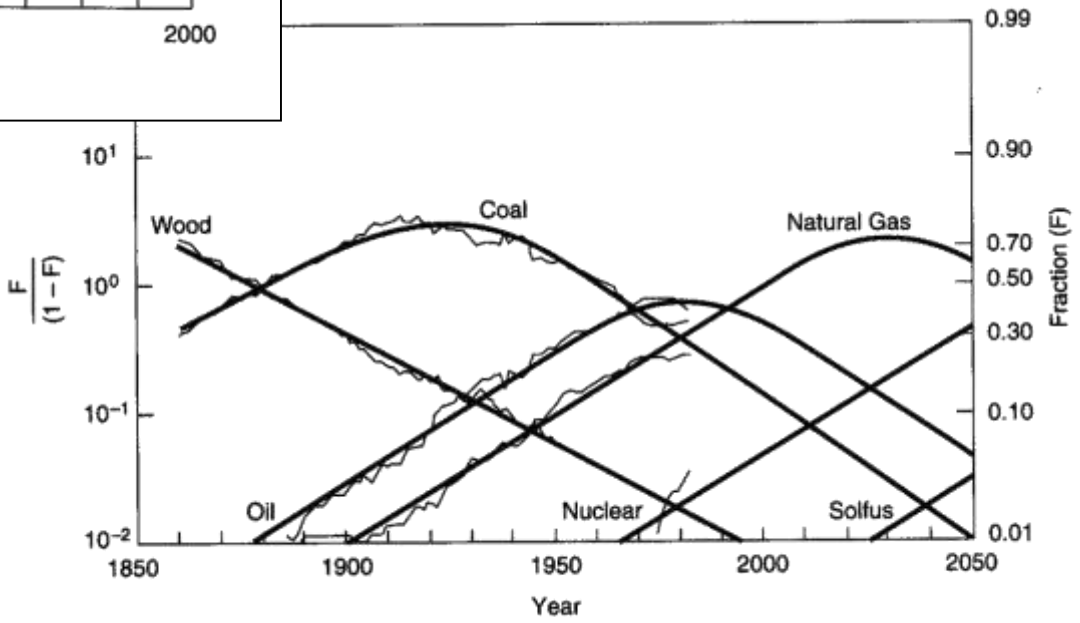
Technology Evolves (10)



- Cars replaced horses as transportation needs grew

- Energy forms have changed to meet changing needs

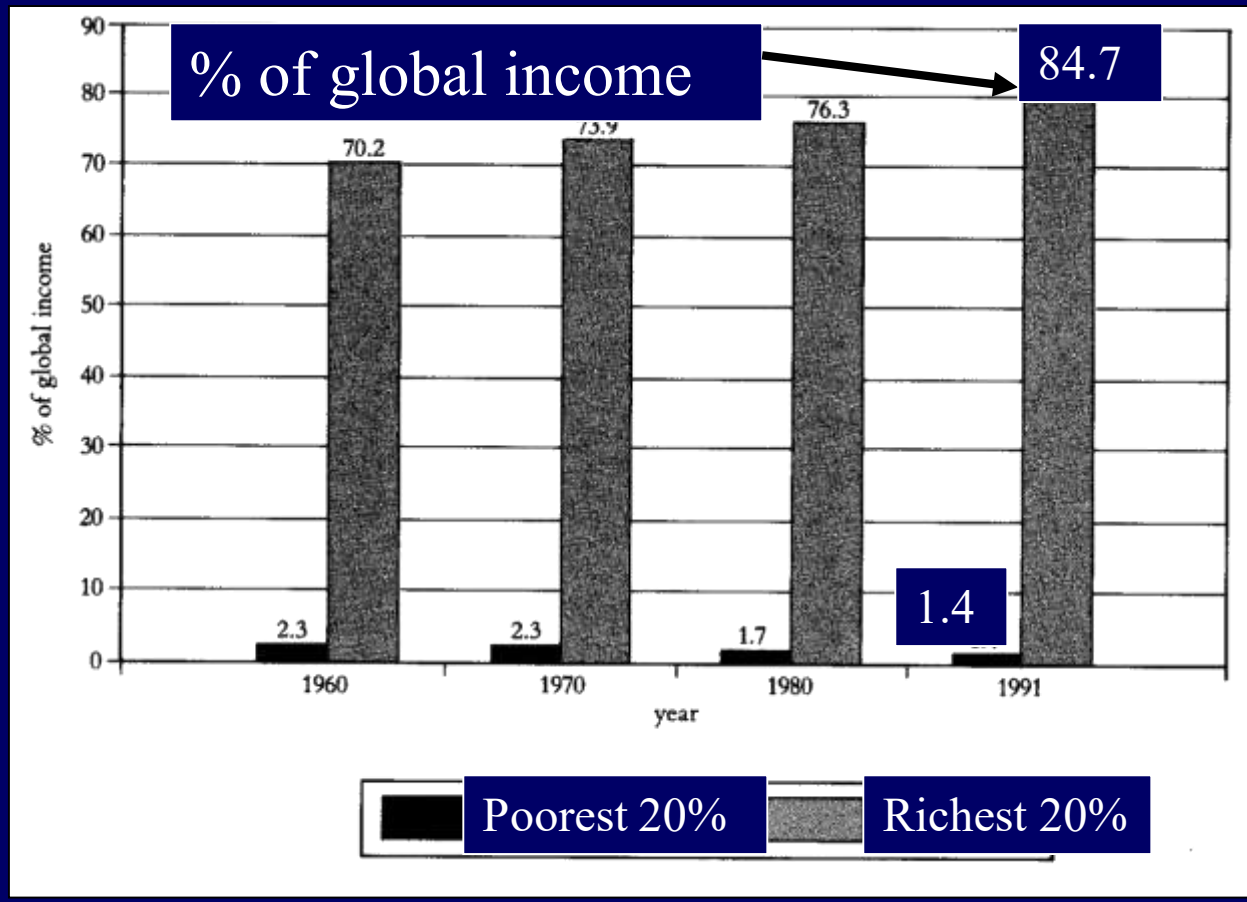
- New economic and environmental needs are emerging



Economics and Resources (11)

1.1 billion people suffer from malnutrition

- Impact = P*A*T
  - Population
  - Affluence
  - Technology
- US - 5% of global population but 20-25% of environmental impact



Planet Earth is Impacted (12)

- Ecological Footprints
  - United States - 5 hectares/person
  - Developing nations - 0.5 hectare/person
- For everyone to live at today's US footprint would require 3 planet Earths
- Increasing affluence and population is damaging Earth's essential ecology

Our ‘Commons’ are in Danger

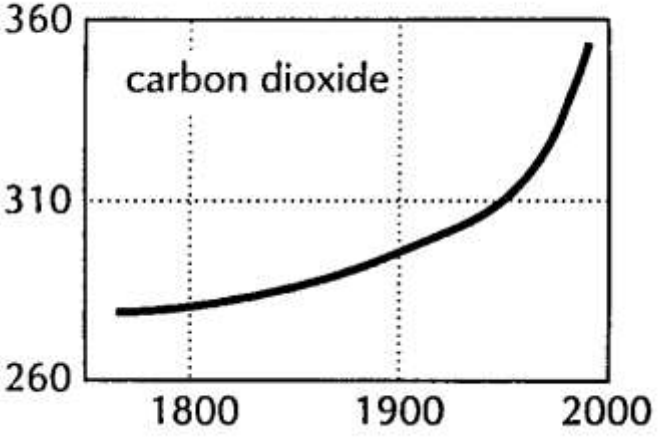
- Atmospheric pollution and climate change
- Water pollution, including ground aquifers
- Deforestation and loss of oxygenation
- The oceans, coral reefs and their bounty
- National parks, wildernesses and wetlands
- Nonrenewable natural resource depletion
  - Fossil fuels, mineral ores, topsoil…..

Biodiversity is in Danger (13)

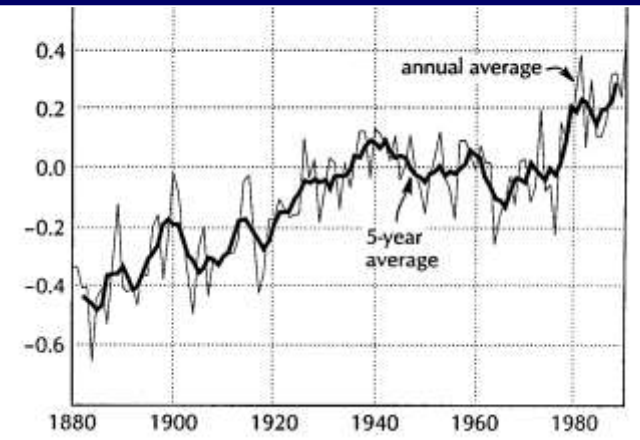
- Humanity has spawned a species extinction to rival the 5 great extinctions of 65 - 440 million years ago
- Recovery times from the great extinctions took 10's of millions of years
- Biodiversity is essential to life on Earth and holds untold treasures for the future
- An ecological ethic is emerging

Global Warming - A Good Example

- Atmospheric CO2 is increasing, and creates greenhouse effect.(14)
- 3-5°C rise predicted by computer models for this century would have major environmental impact. (15)
- Observed change of 0.25-0.4°surface and 0.0-0.2°C troposphere rise in last 20 years doesn't agree with models and may or may not be due to CO2.(16)
- Humans - 6 billion tons/year of CO2 (up 500% from 1950, and increasing) (17)
  - Other sources 200B tons/year
  - Total atmosphere load - 775B tons
  - Total earth load with oceans - 42,000B tons



0.6°C rise in last 100 years



Predicting the Future - Be Careful

- Don't assume it cant be done
- Leave room for the unknown
- Consider alternatives carefully
- Pursue all potential solutions