Taming the Climate Dragon

February 2006

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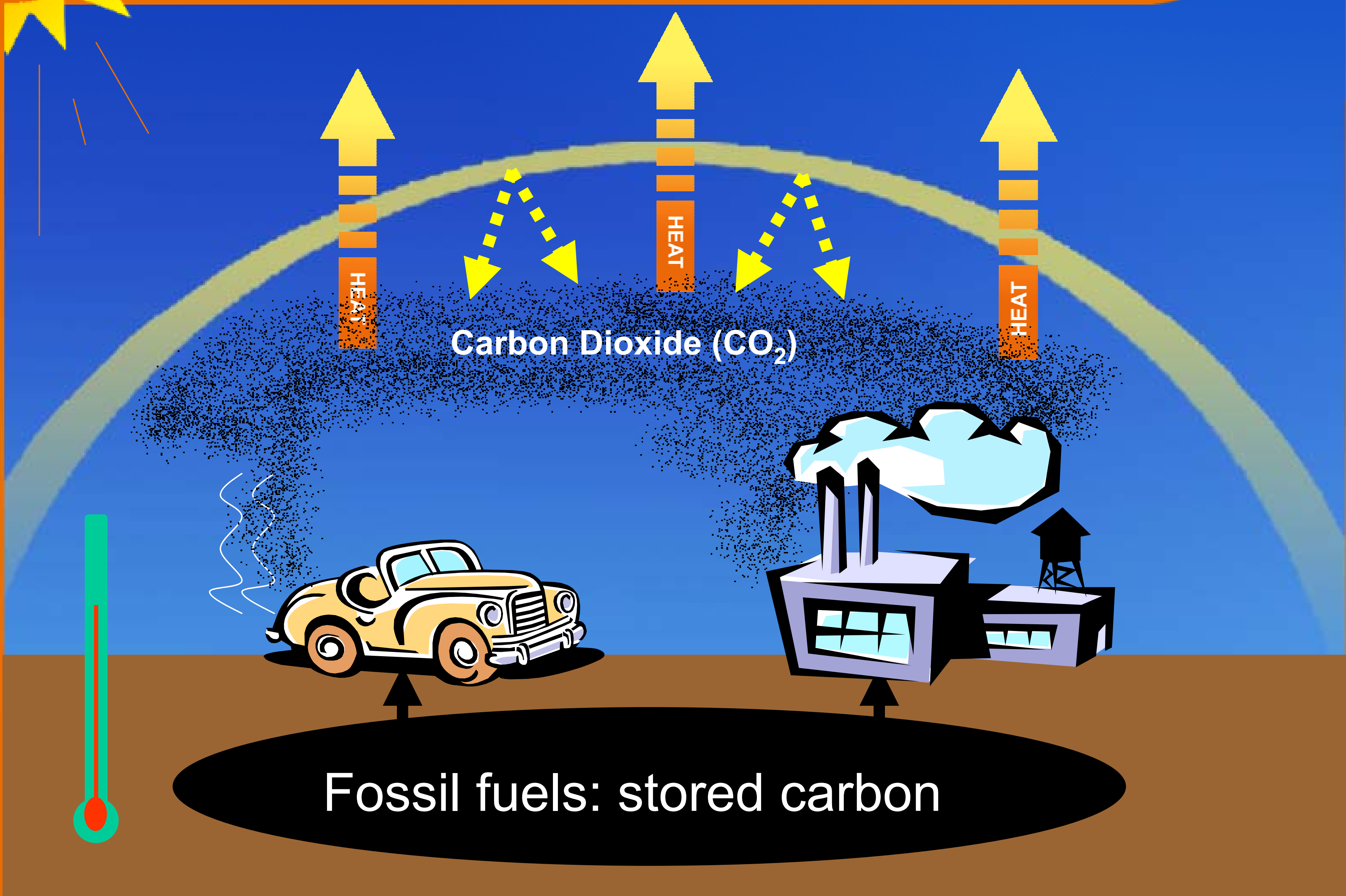
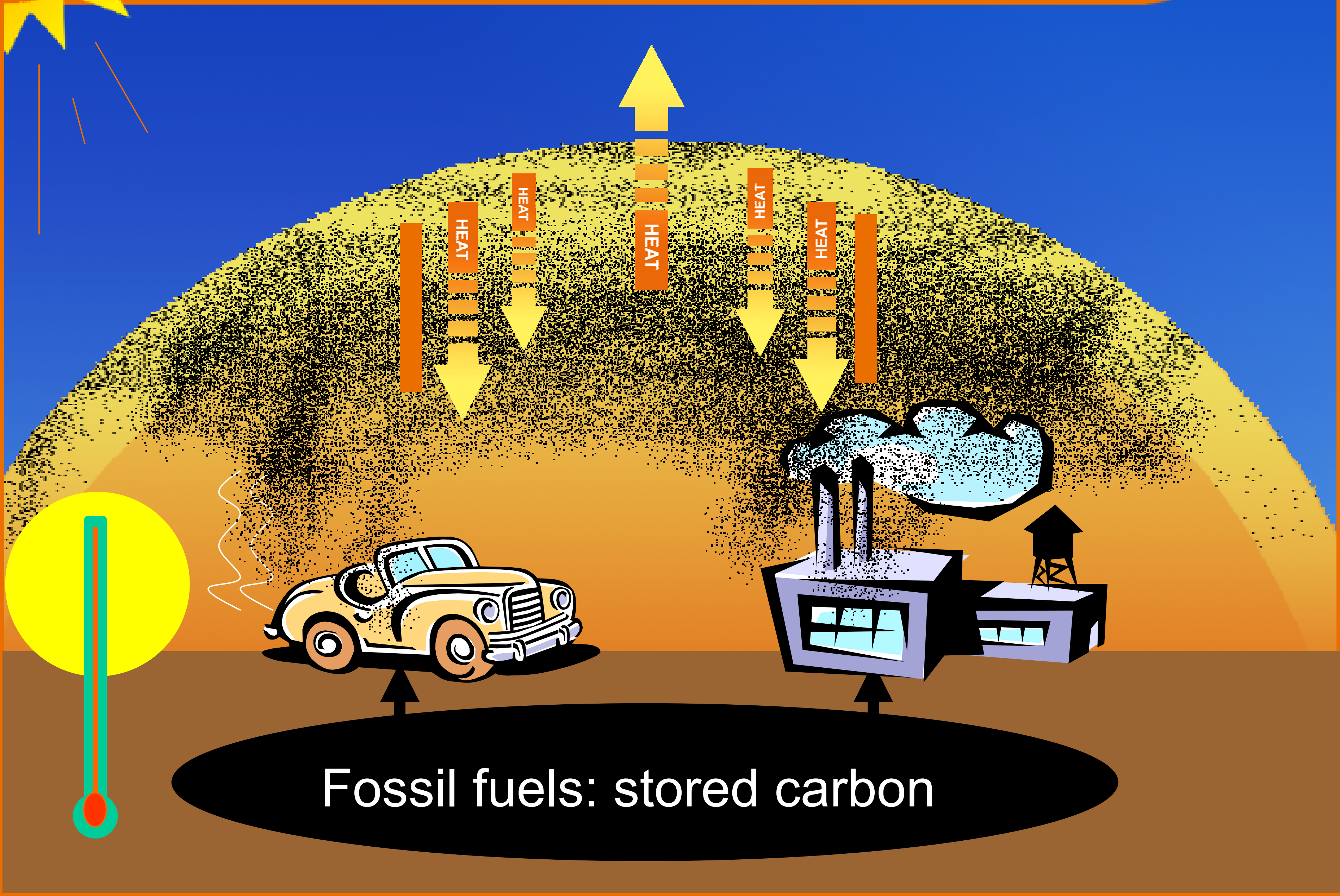
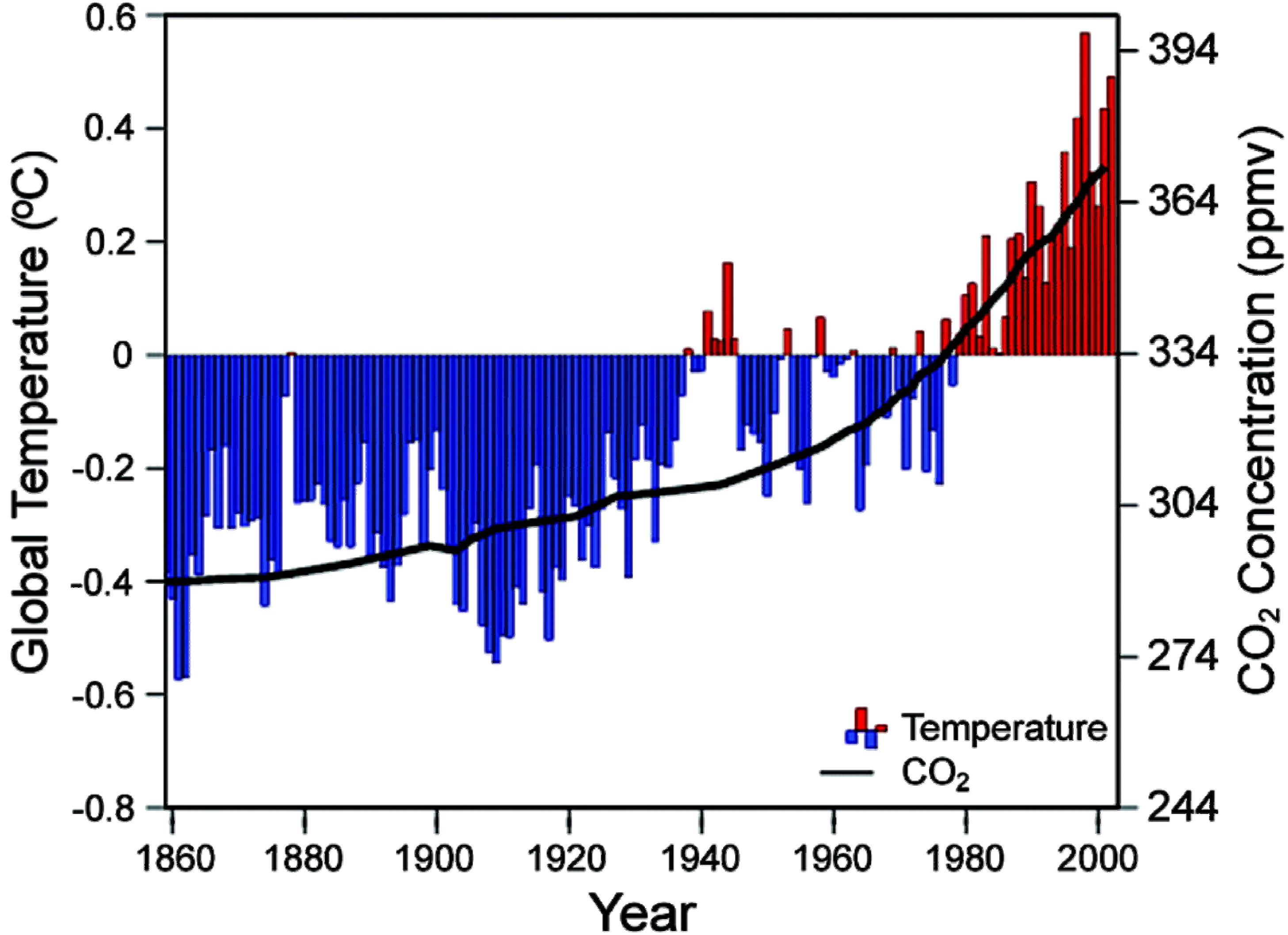
How global warming works



How global warming works

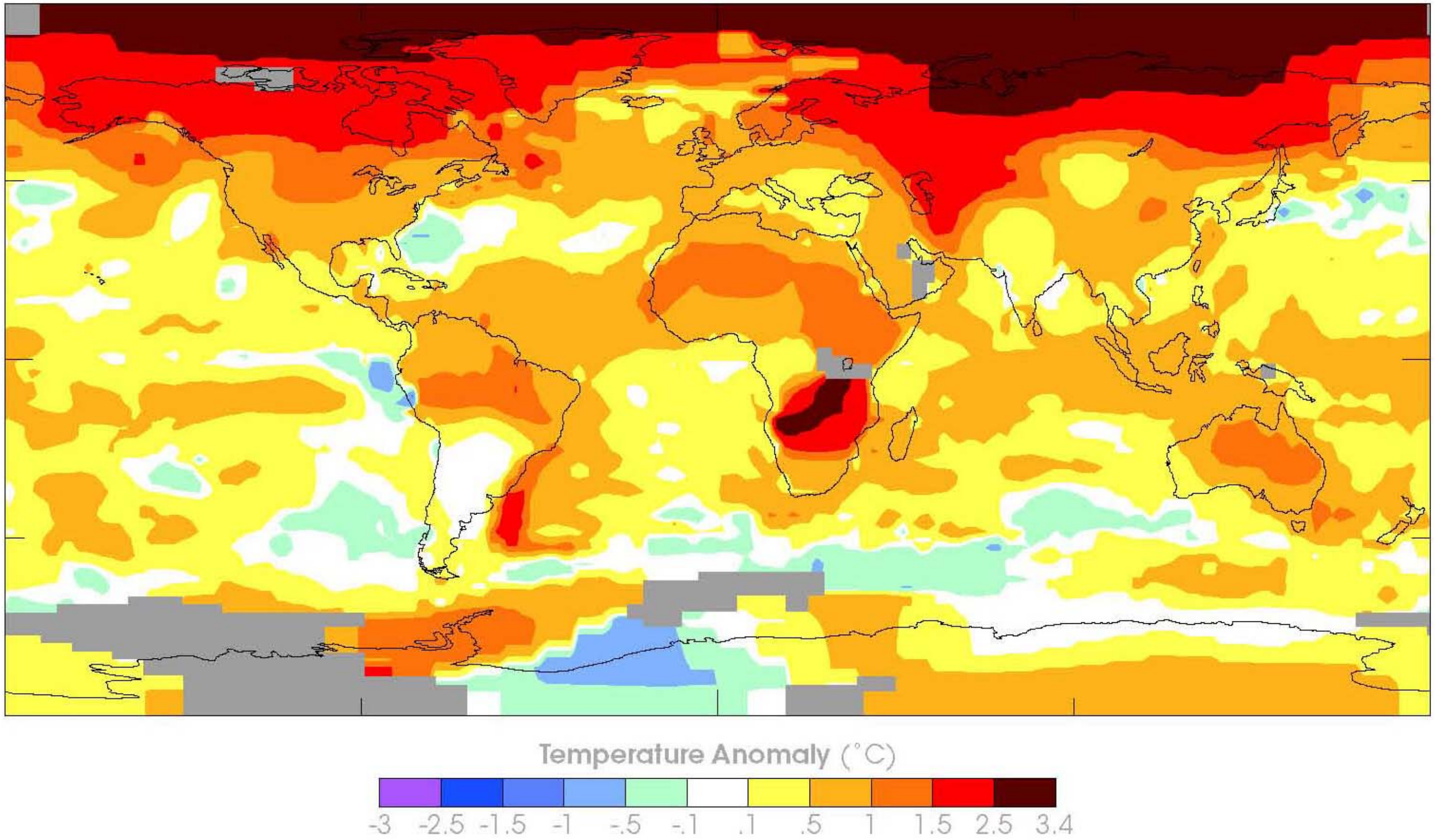


Temperatures are rising



Source: Karl and Trenberth, 2003.

2005 Surface Temperature Anomaly



http://data.giss.nasa.gov/gistemp/2005/

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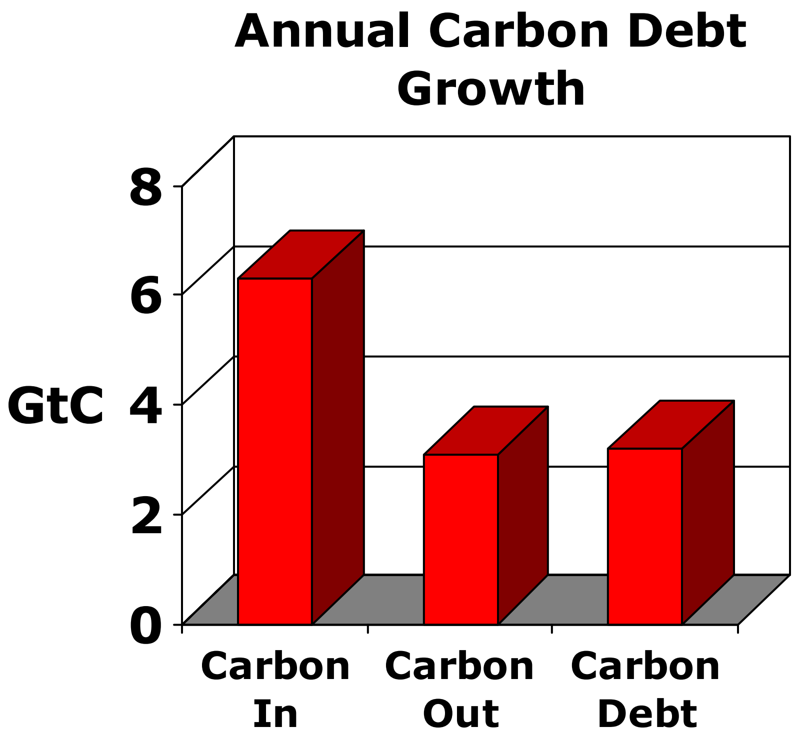
Carbon deficit spending—Do the math

- Energy carbon emissions in year 2000 = 6.3 billion metric tons
- Removal to oceans, soils, trees = 3.1 billion metric tons
- Net buildup in air = 3.2 billion metric tons



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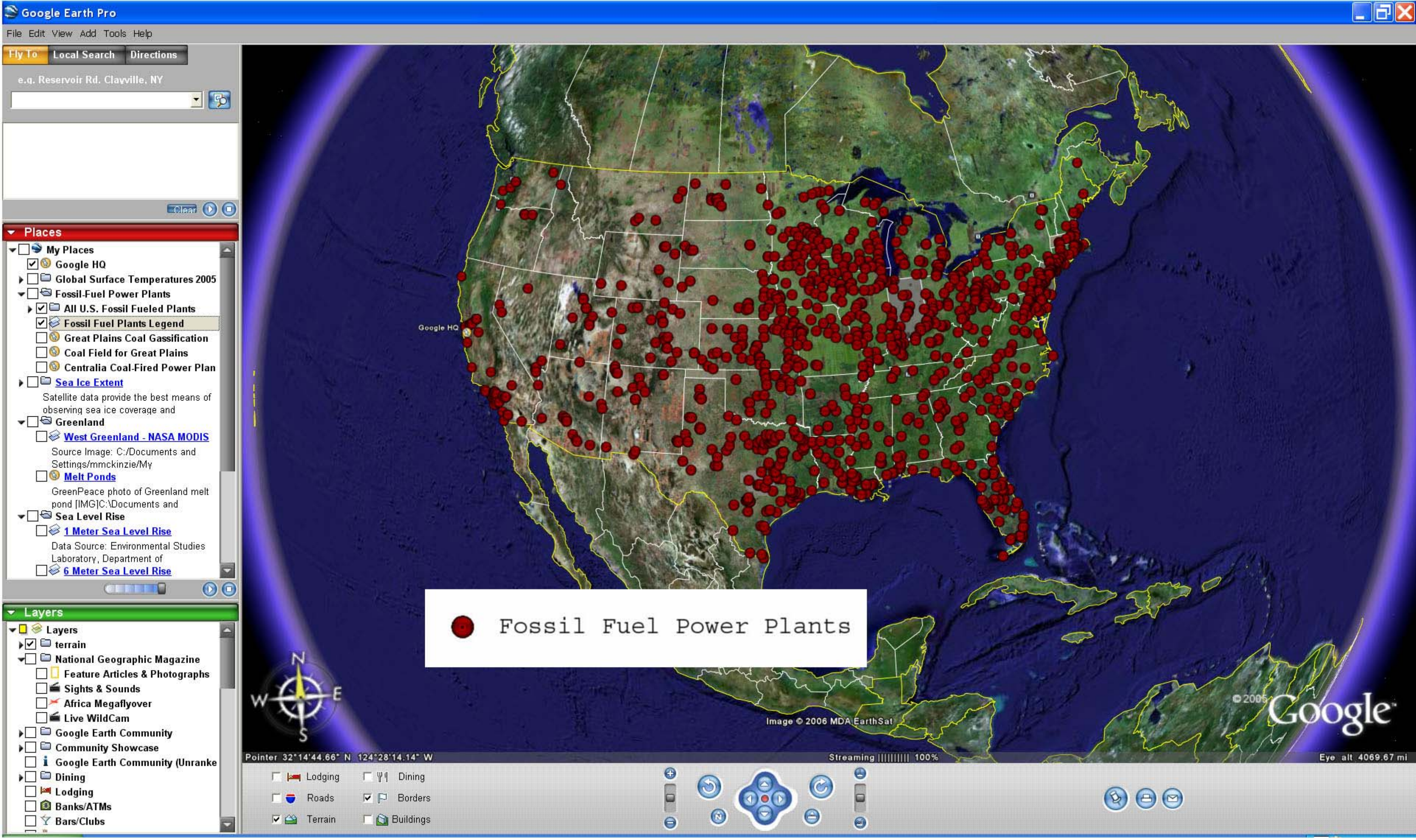

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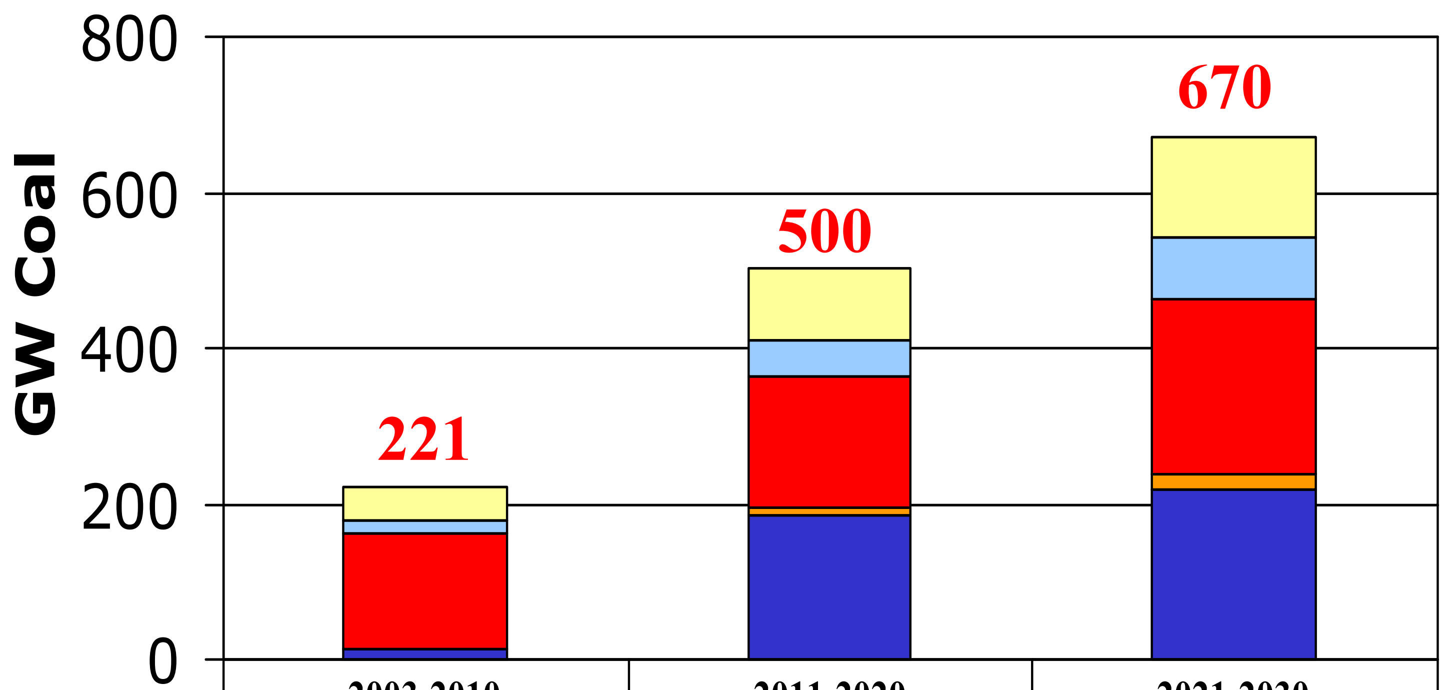
Investments today drive impacts tomorrow

- Investments drive emissions
- Emissions drive concentrations
- Concentrations drive temperature forcing
- Forcing drives impacts

New coal build by decade



	2003-2010	2011-2020	2021-2030
Other Developing	43	90	128
India	16	48	79
China	150	168	226
Transition	1	11	19
OECD	12	184	218

Incremental new coal capacity by decade

Source: IEA, WEO 2004

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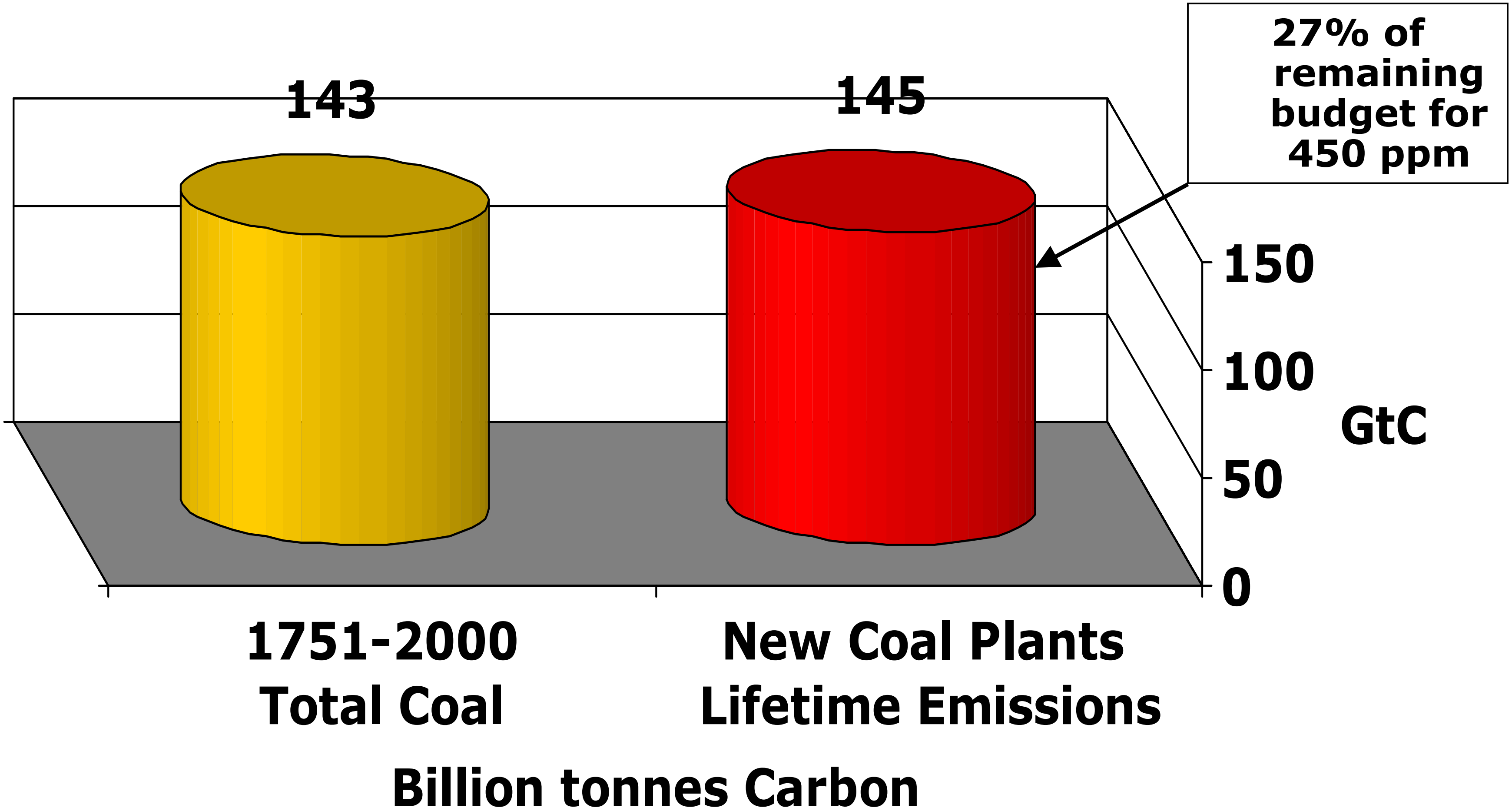
New coal plant emissions equal all historic coal CO_2



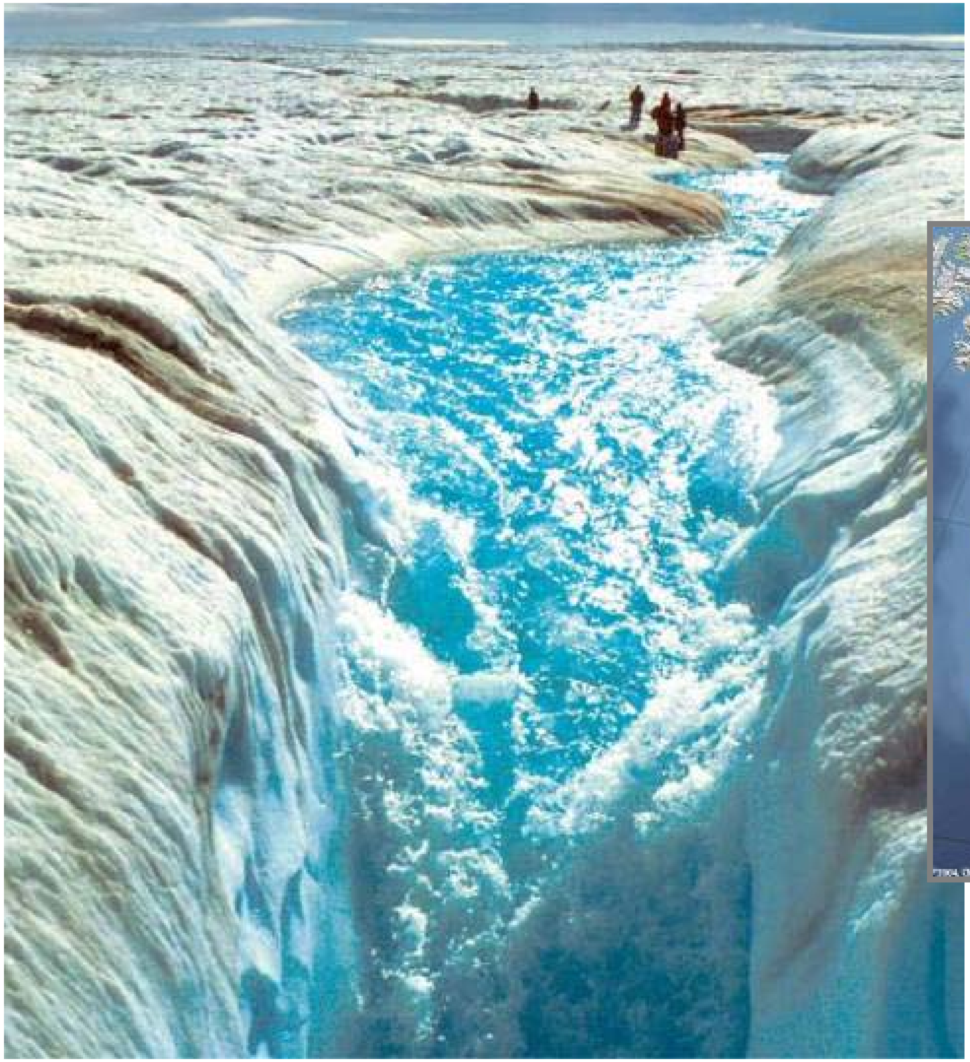
Source: ORNL, CDIAC; IEA, WEO 2004

Melting arctic ice

Photo NASA © NRDC 2005

Peril for polar bears

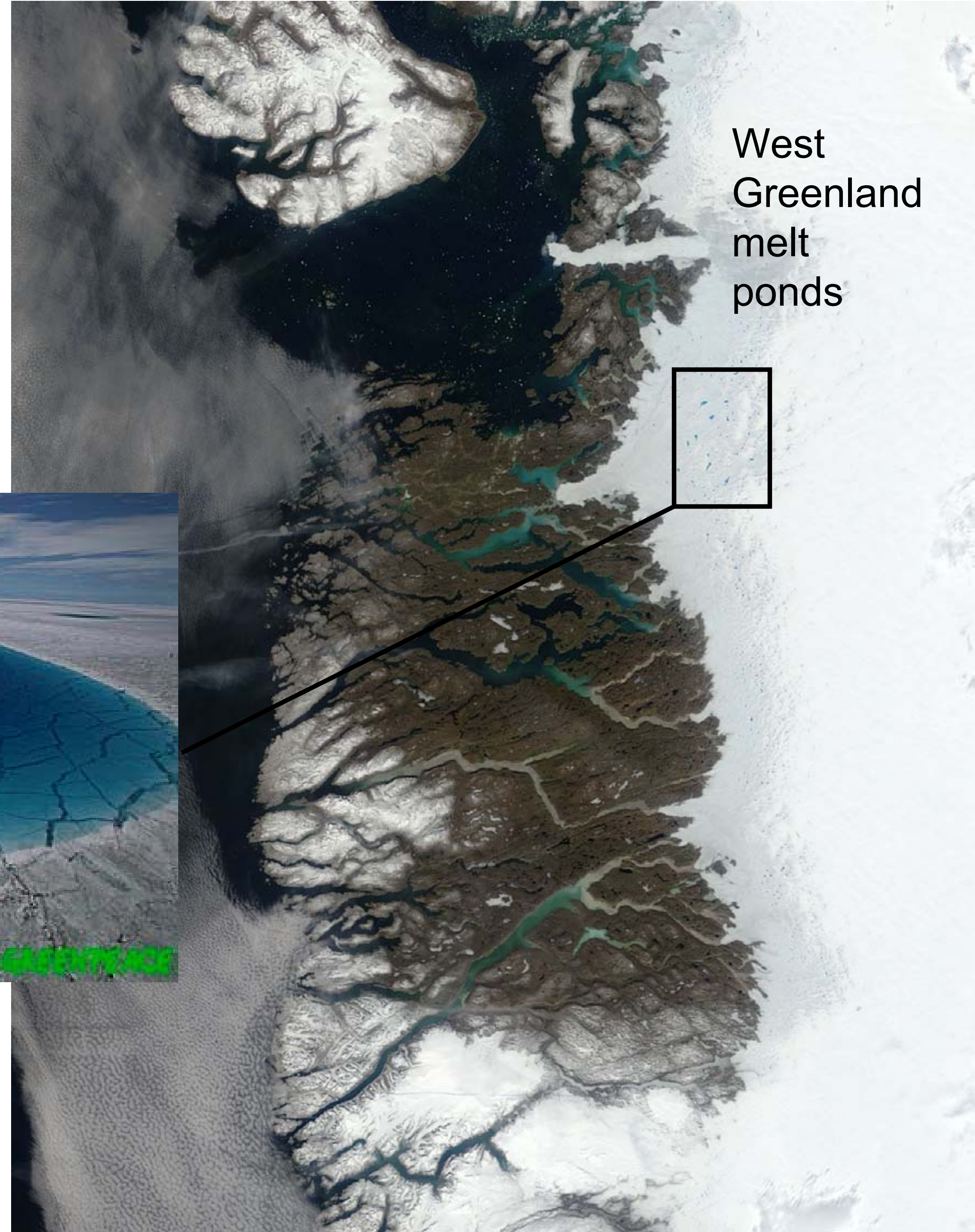
Melting glaciers & ice sheets



Melt Area

1992 2002

Greenland Ice Sheet Melt



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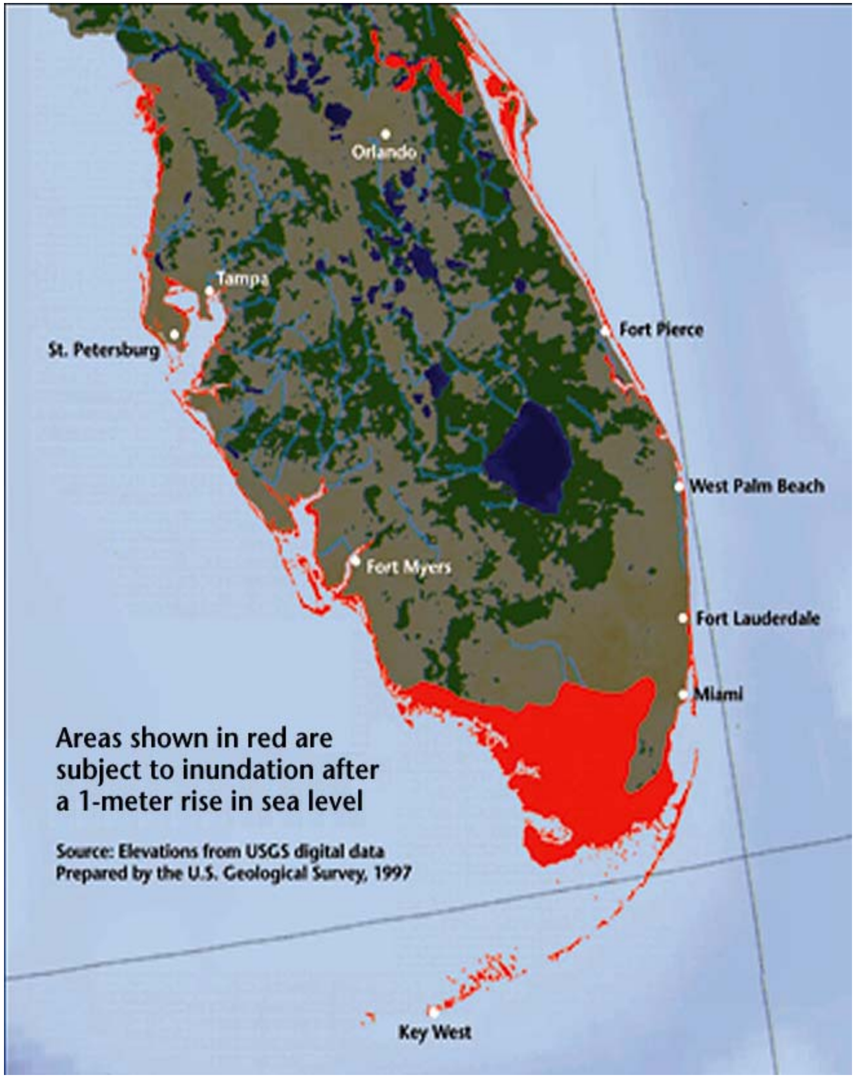
Rising sea levels



- Beach erosion
- Everglades inundation
- Saltwater intrusion
- Storm surge

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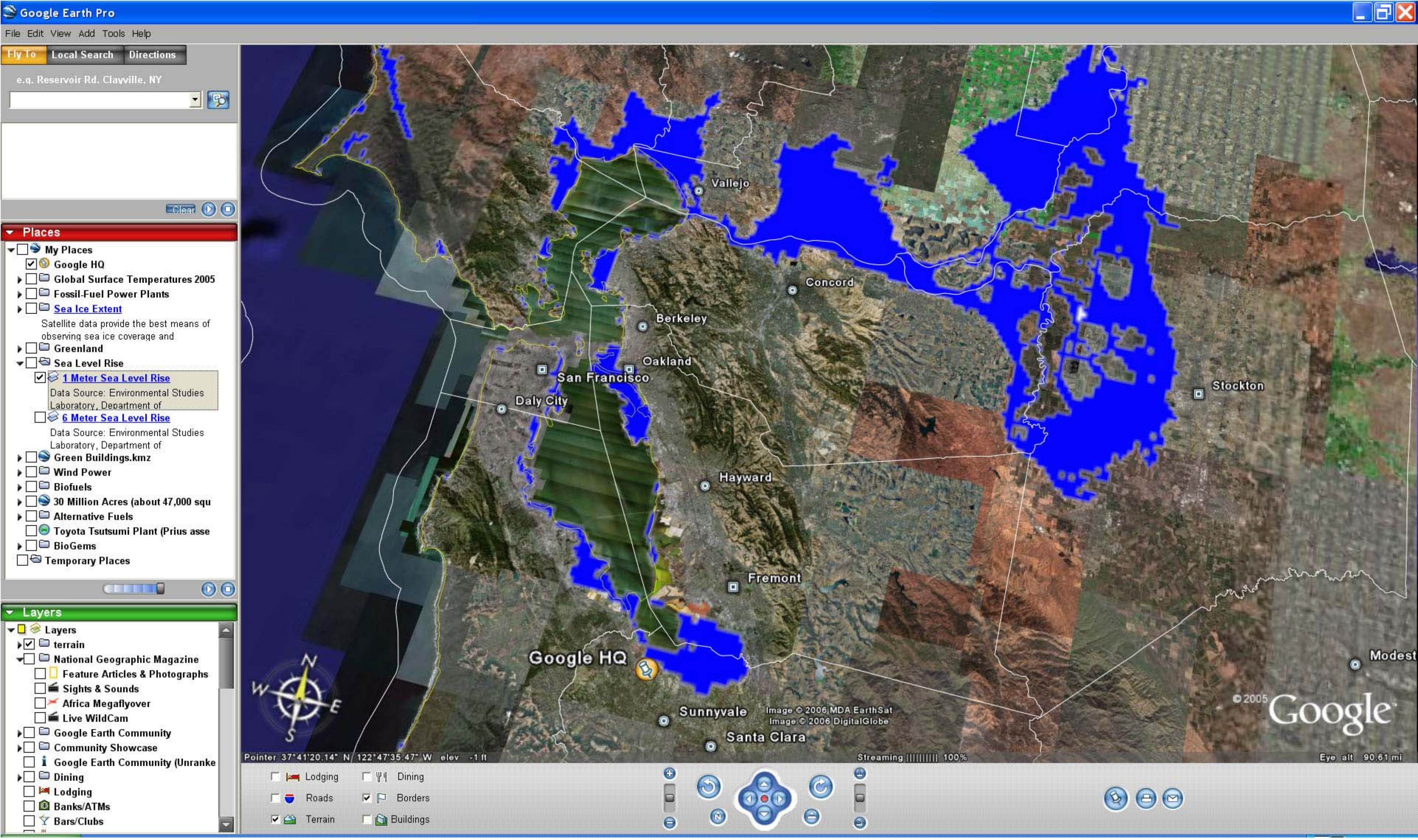

1 meter sea level rise

Data Source: Environmental Studies Laboratory, Department of Geosciences, University of Arizona

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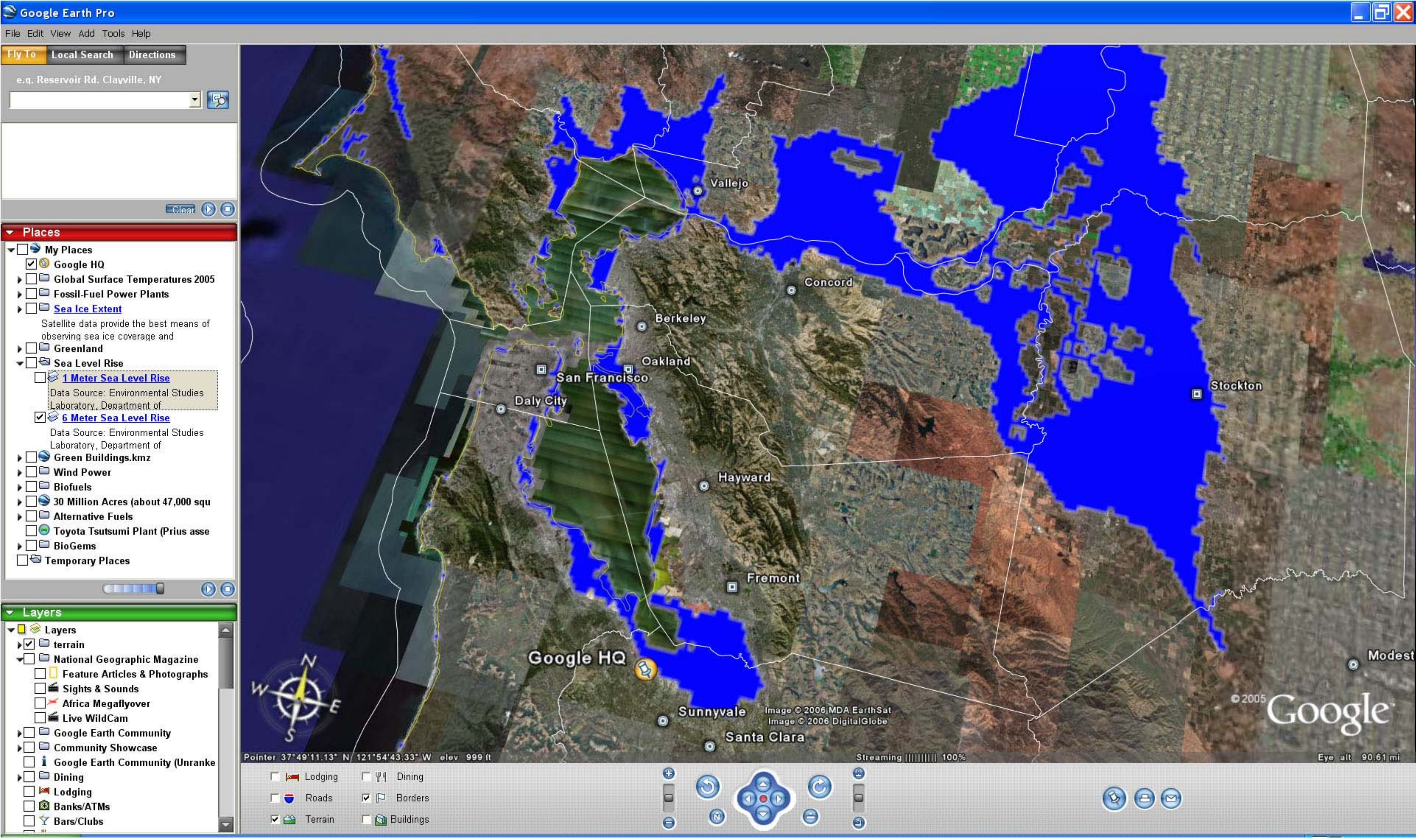

6 meter sea level rise

Data Source: Environmental Studies Laboratory, Department of Geosciences, University of Arizona

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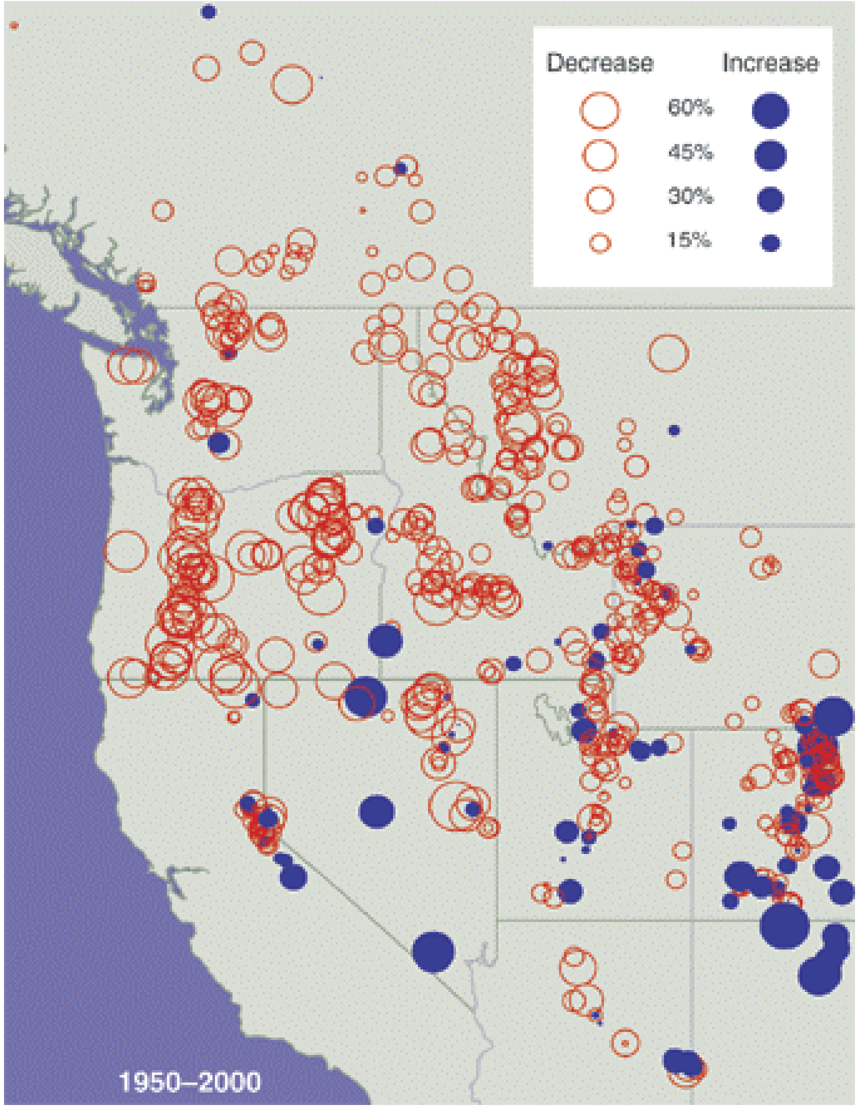
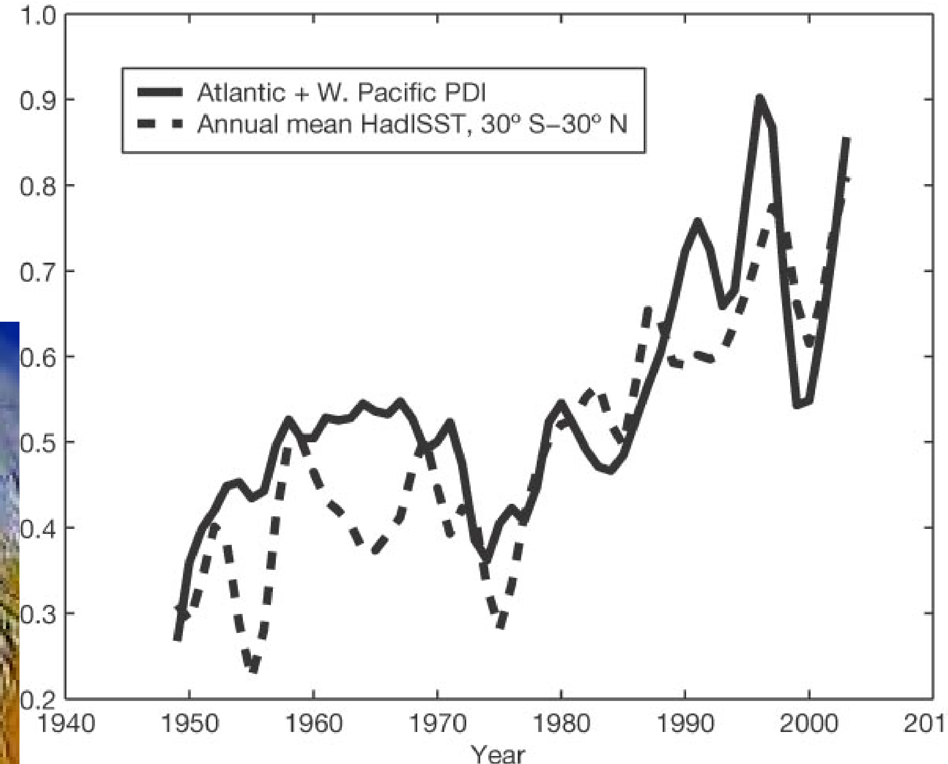
Declining snowpack



Source: P. Mote, U. of Washington

Stronger hurricanes



Source: Kerry Emanuel, Nature 436, 686-688 (4 August 2005)

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Solutions

The Big Players:

- Energy Efficiency

- Renewable Energy

- CO_2 Capture & Geologic Storage

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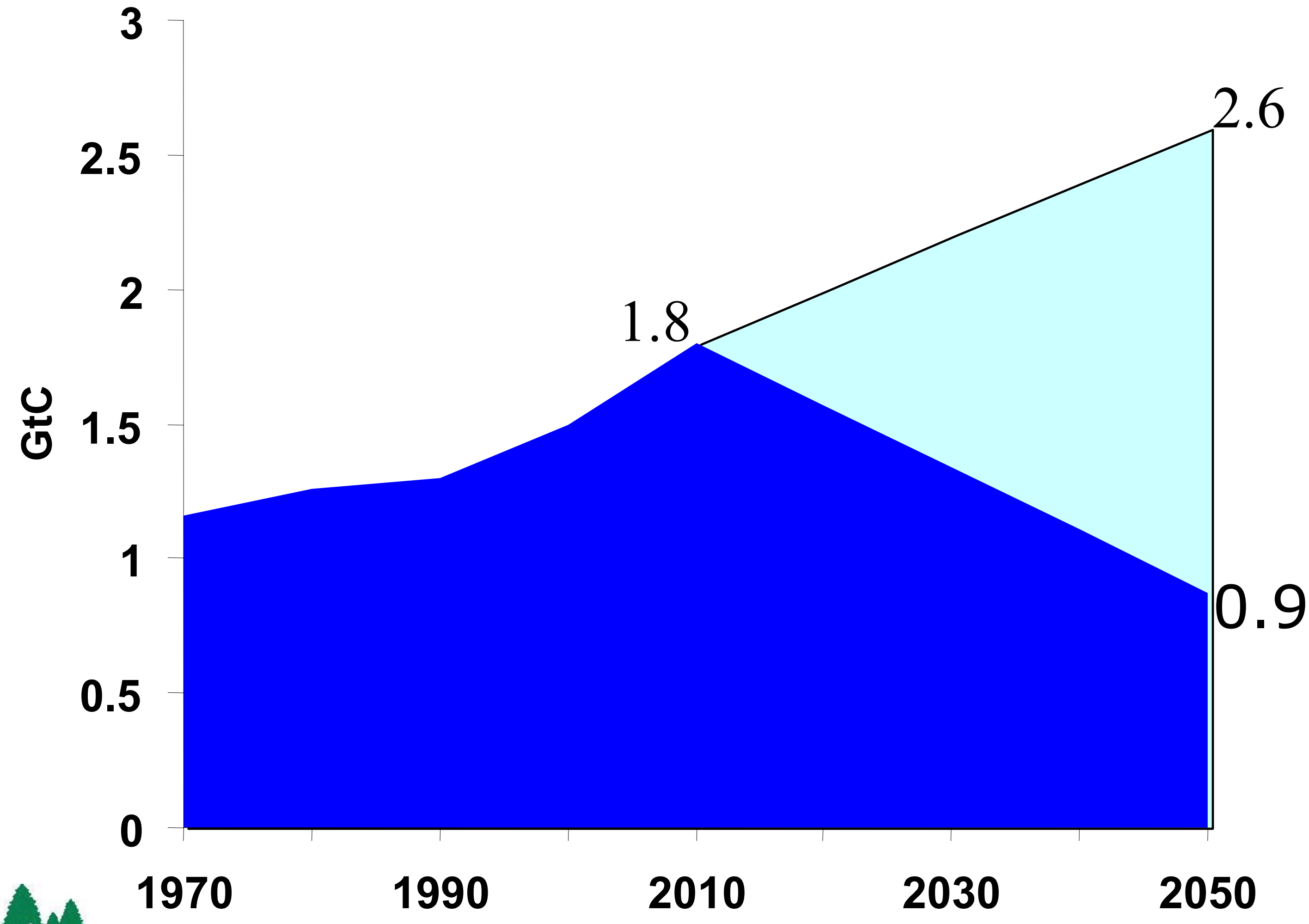
Cutting U.S. emissions in half



After Pacala and Socolow, 2004; ARI CarBen3 Spreadsheet

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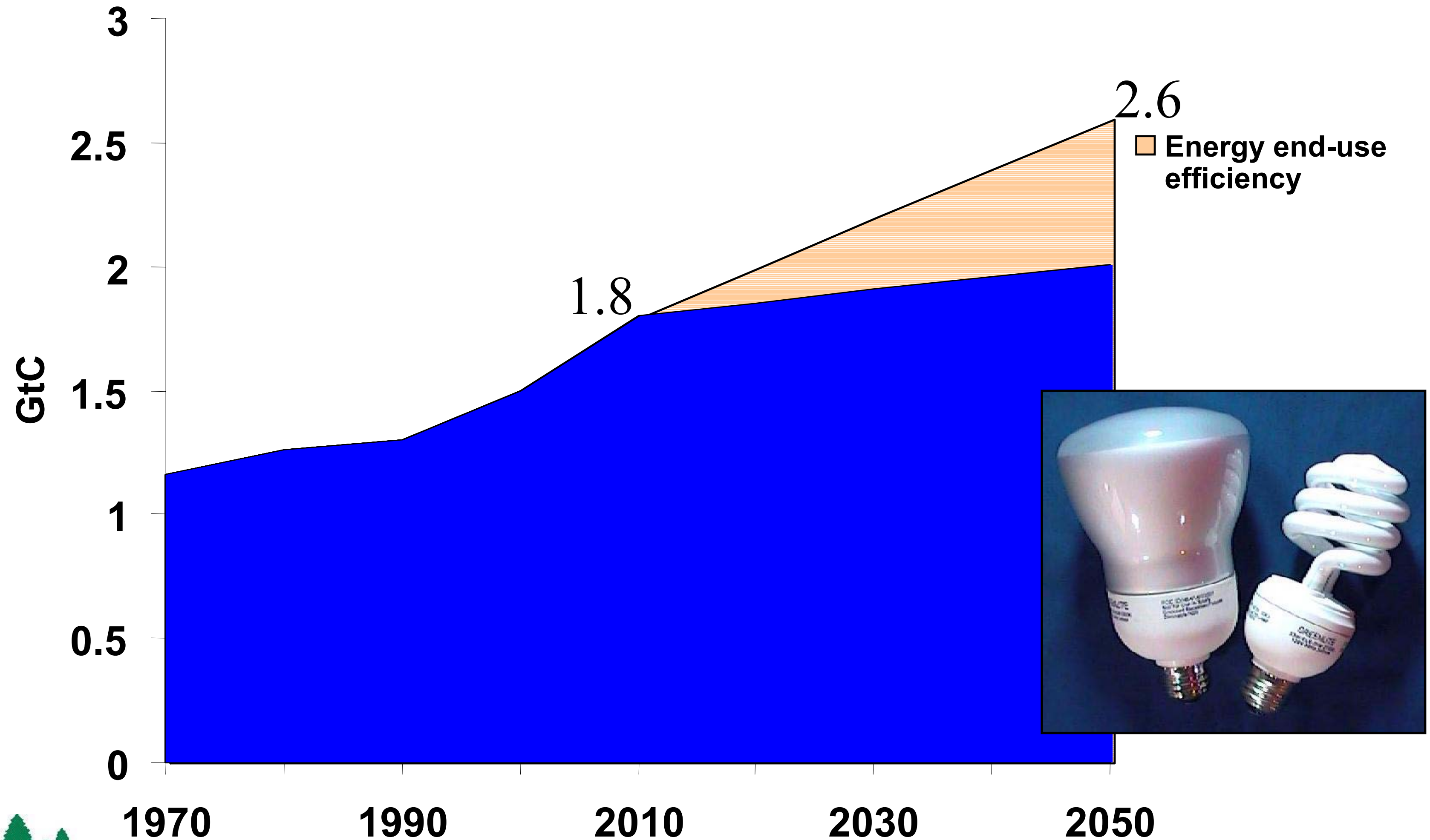

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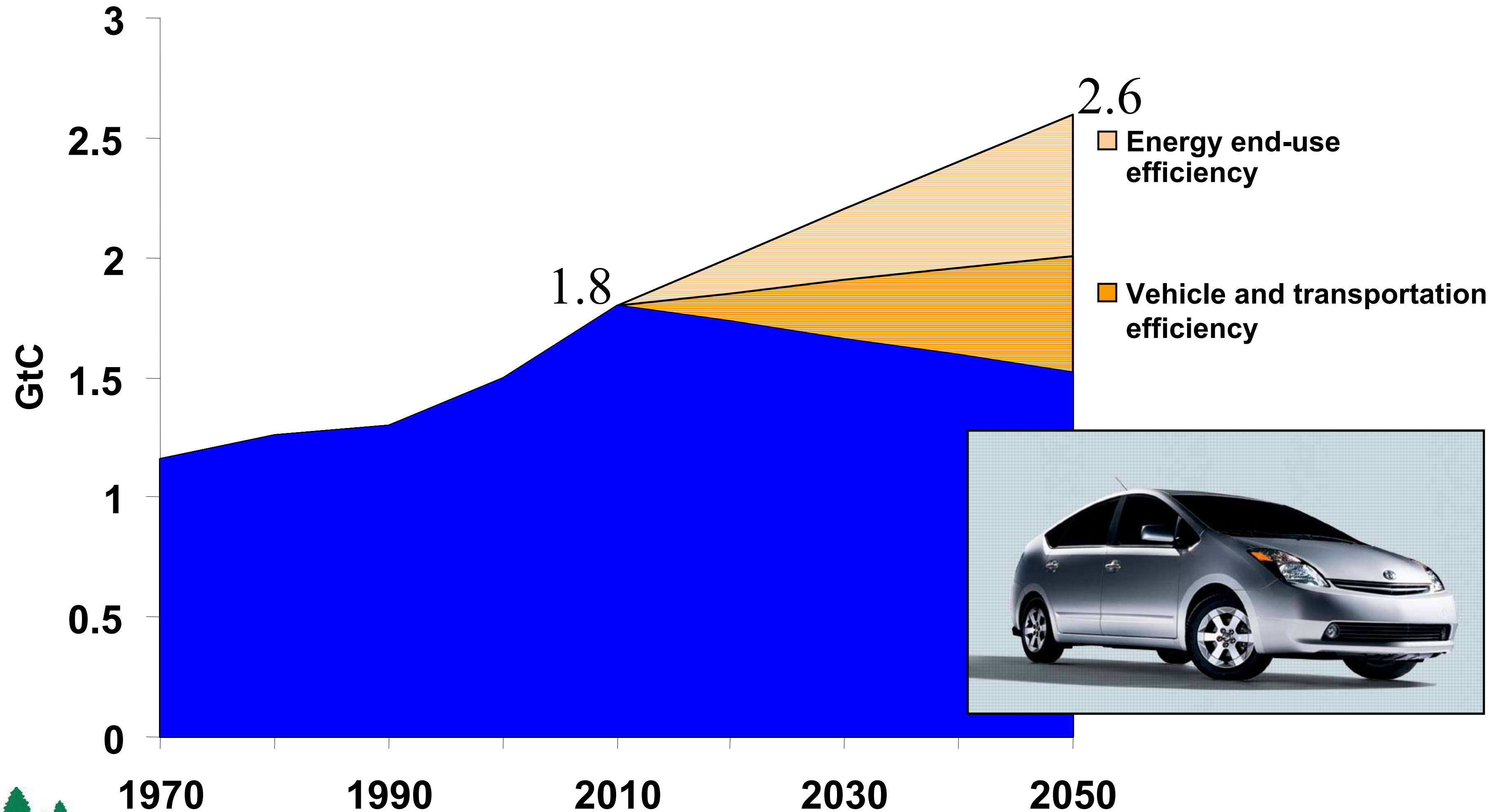

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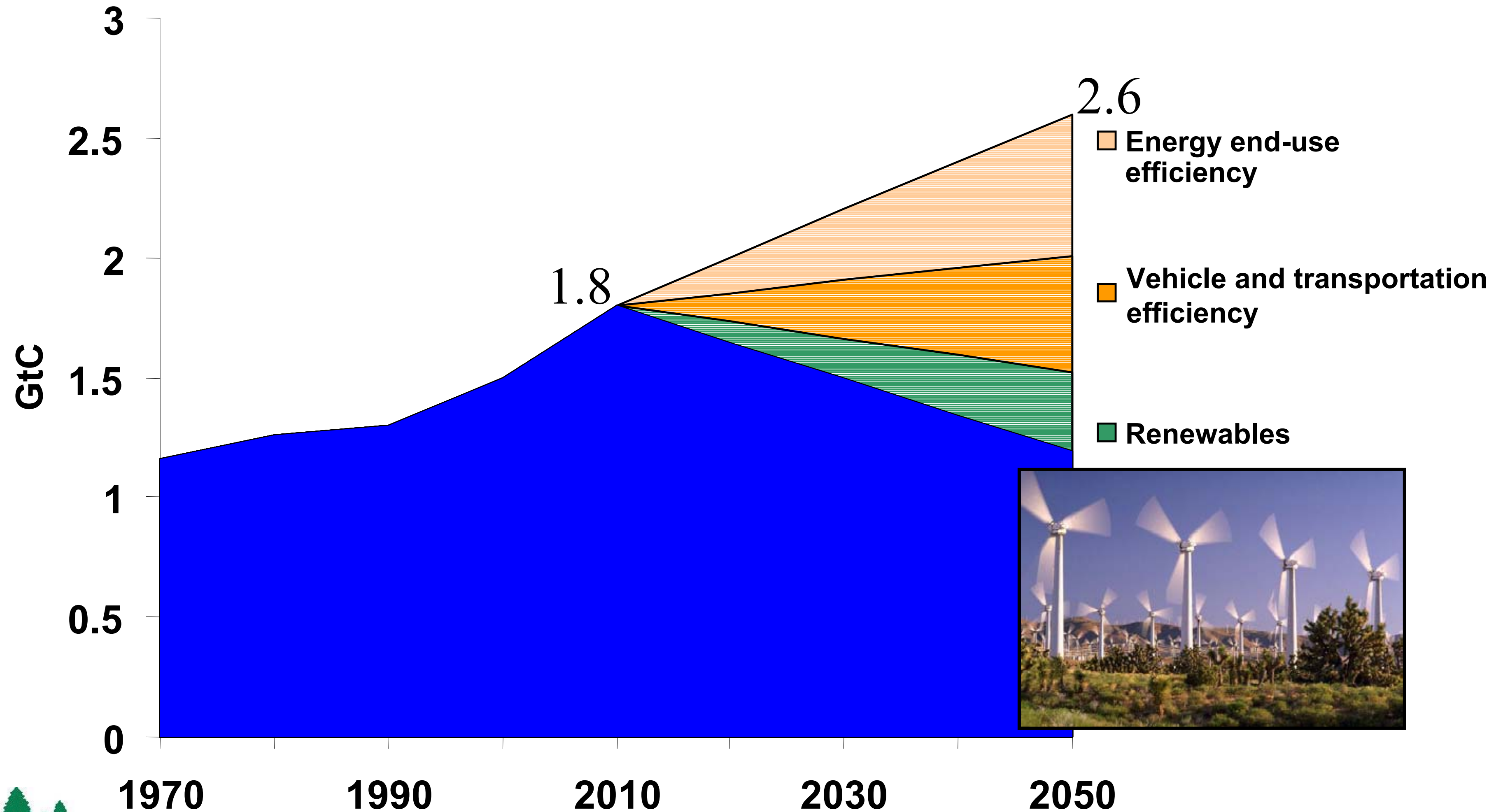

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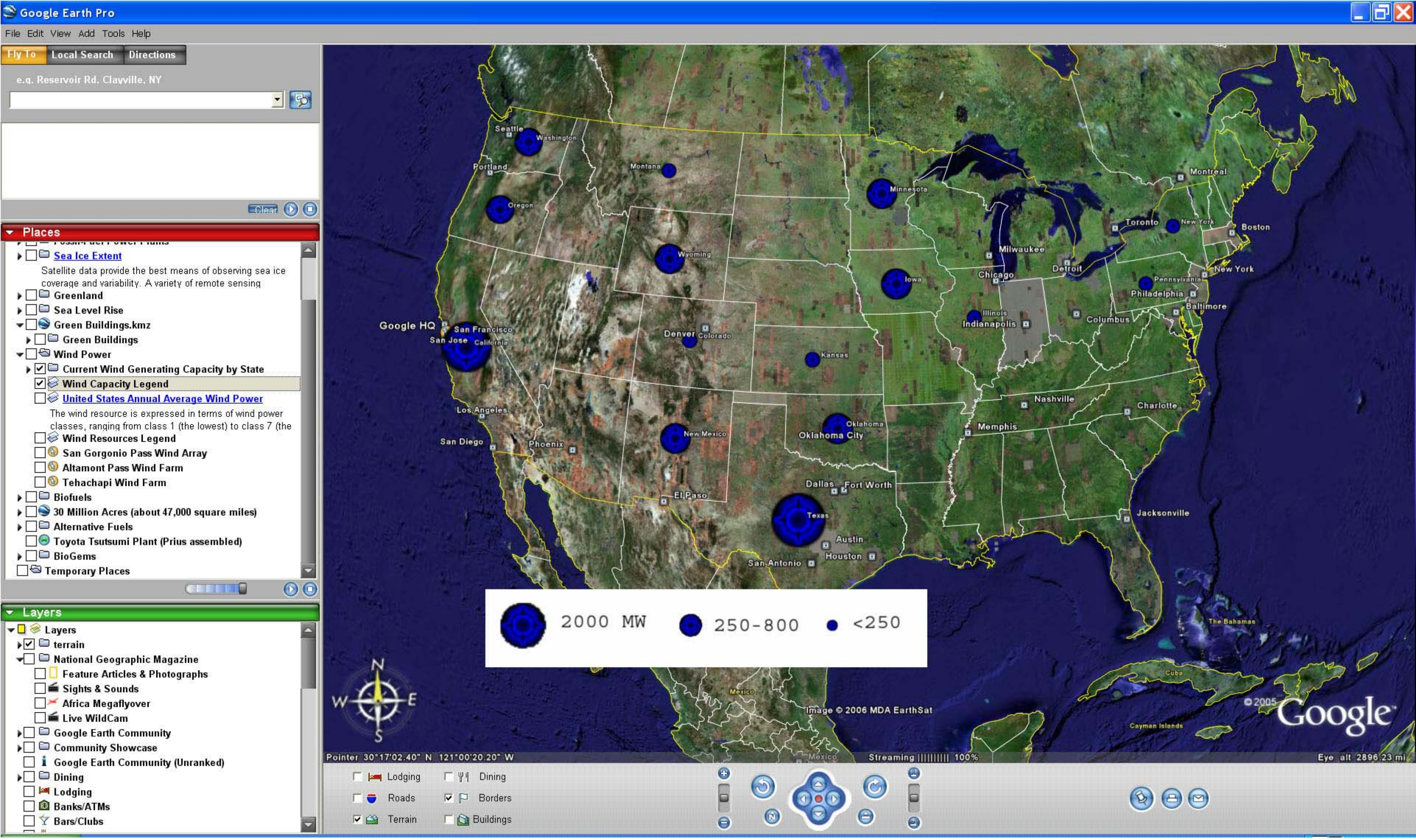
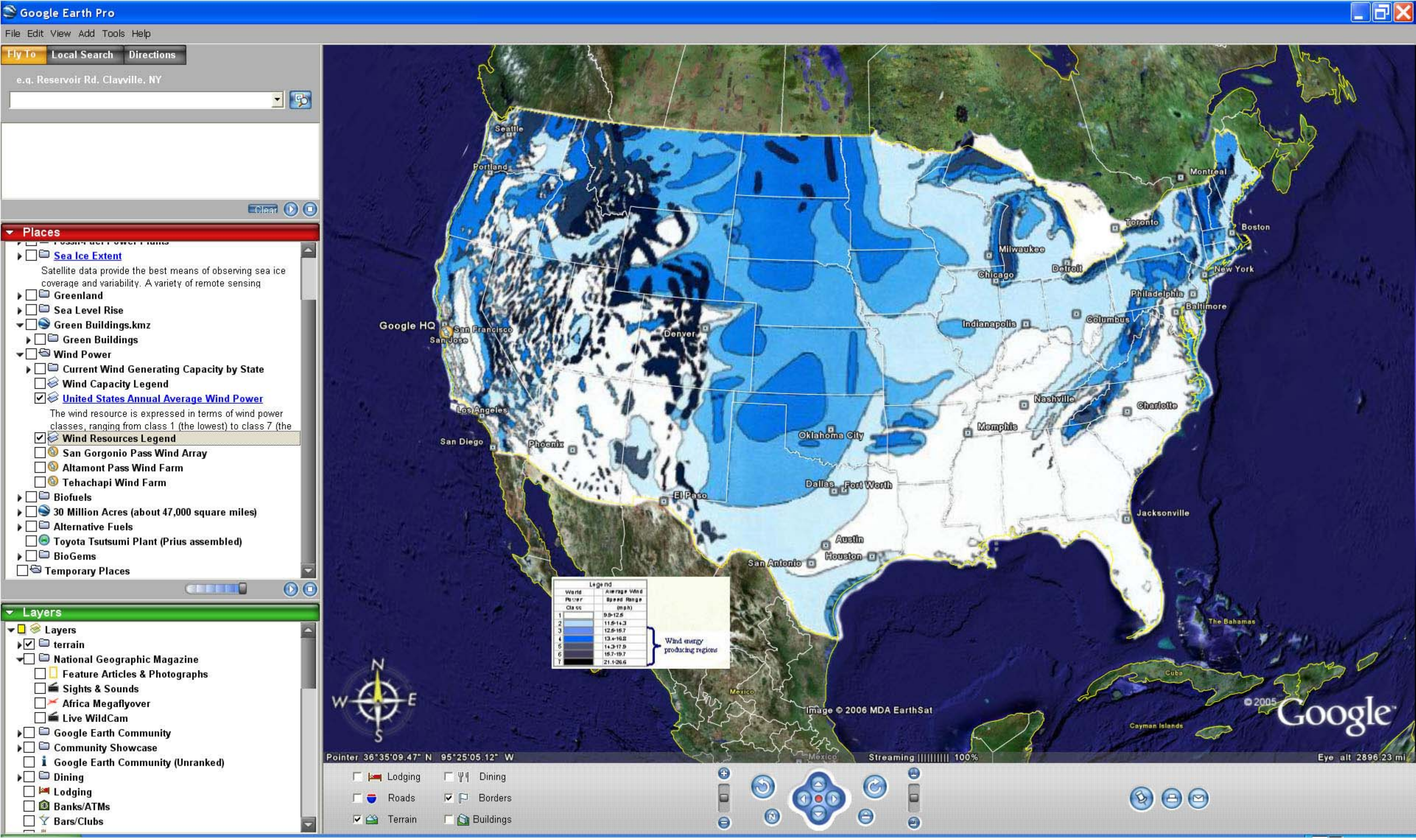


Installed wind capacity by state



Wind potential

Battelle Wind Energy Resource Atlas:
http://rredc.nrel.gov/wind/pubs/atlas/

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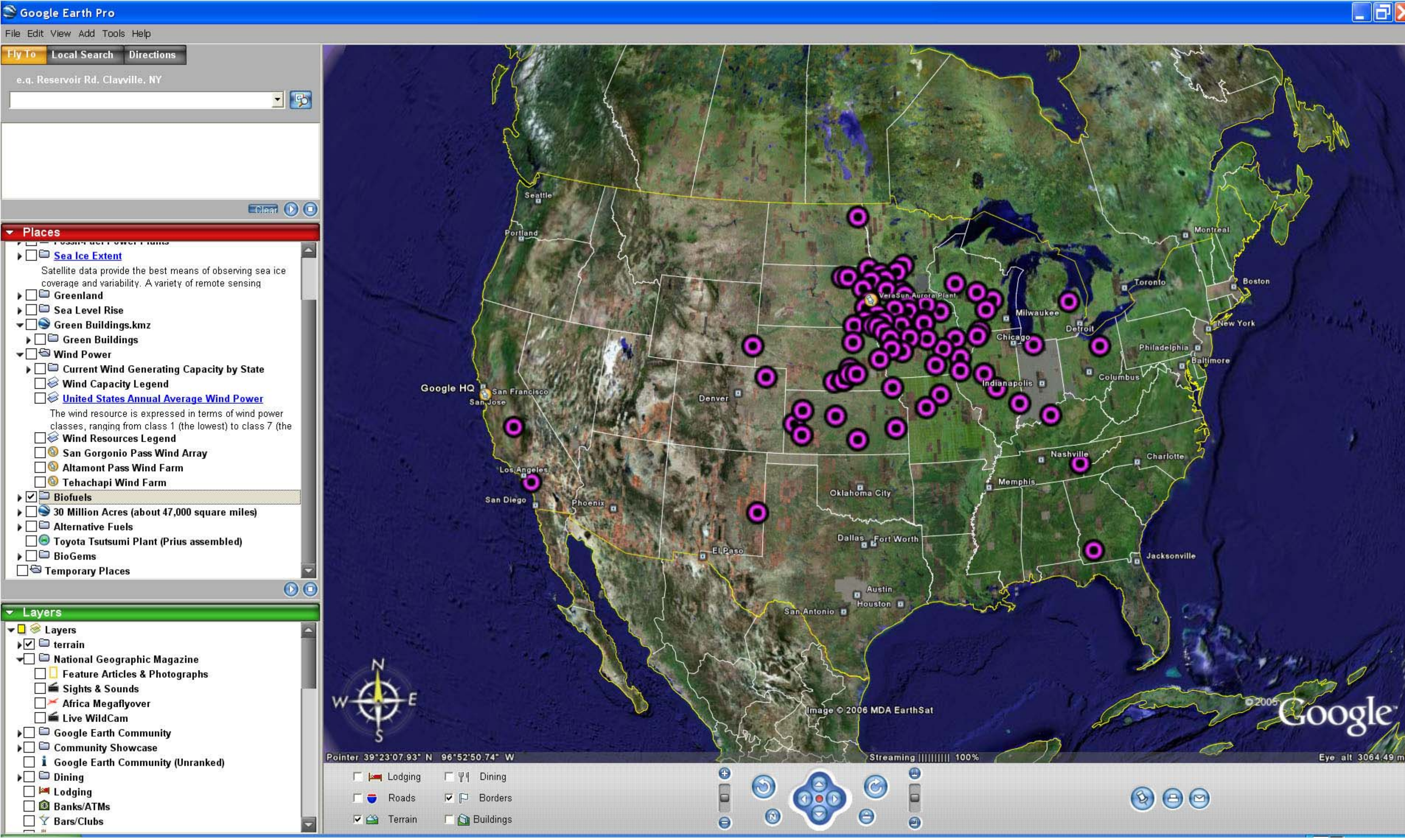
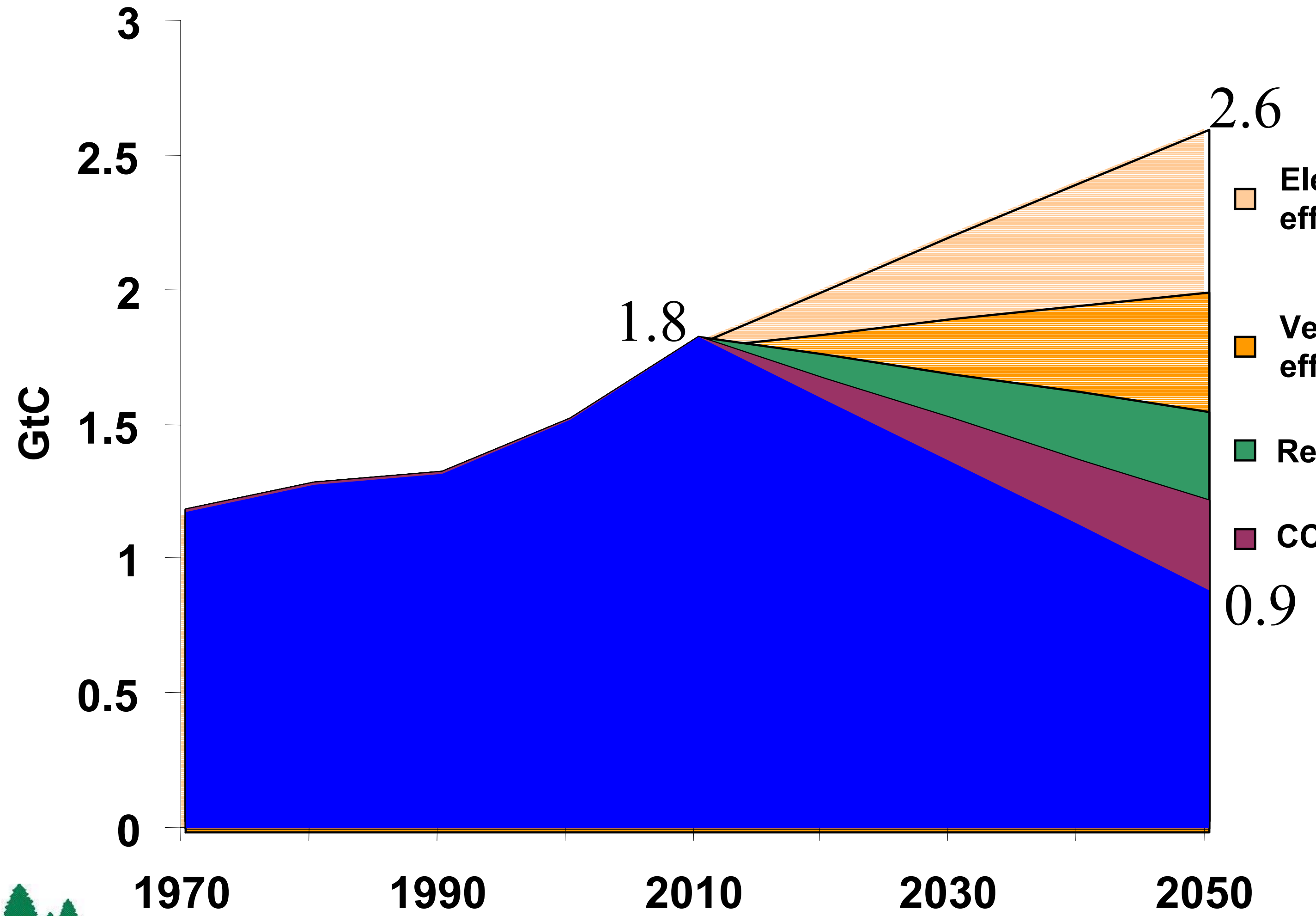


Current Biofuels

Cutting U.S. emissions in half



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Energy efficiency: cuts 600 MtC

- Reduce 2050 electricity demand by 25%
  - Motors and controls
  - Lighting
  - Refrigeration
- Reduce building & industry direct fuel use by 40% in 2050
  - Green building design
  - Industrial processes
  - Combined heat and power

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Transport efficiency: cuts 475 MtC

- Passenger vehicles
  - 2050 fleet averages 54 mpg, not 24 mpg
    - Hybrids
    - Fuel cells
    - Conventional vehicle improvements
- Other transport efficiency
  - Trucks average 13 mpg, not 7 mpg
  - Aircraft average 105 smpg, not 80 smpg
  - Smart growth reduces travel by 10%

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Renewable energy: cuts 325 MtC

- Wind
  - 30% of electricity generation
  - Requires 300,000 2 MW turbines
  - Land area of 25 million acres, multiple use
- Biofuels
  - 40 billion gallons
  - 30 million acres growing 12 tons biomass/acre
  - Area equal to Conservation Reserve set aside

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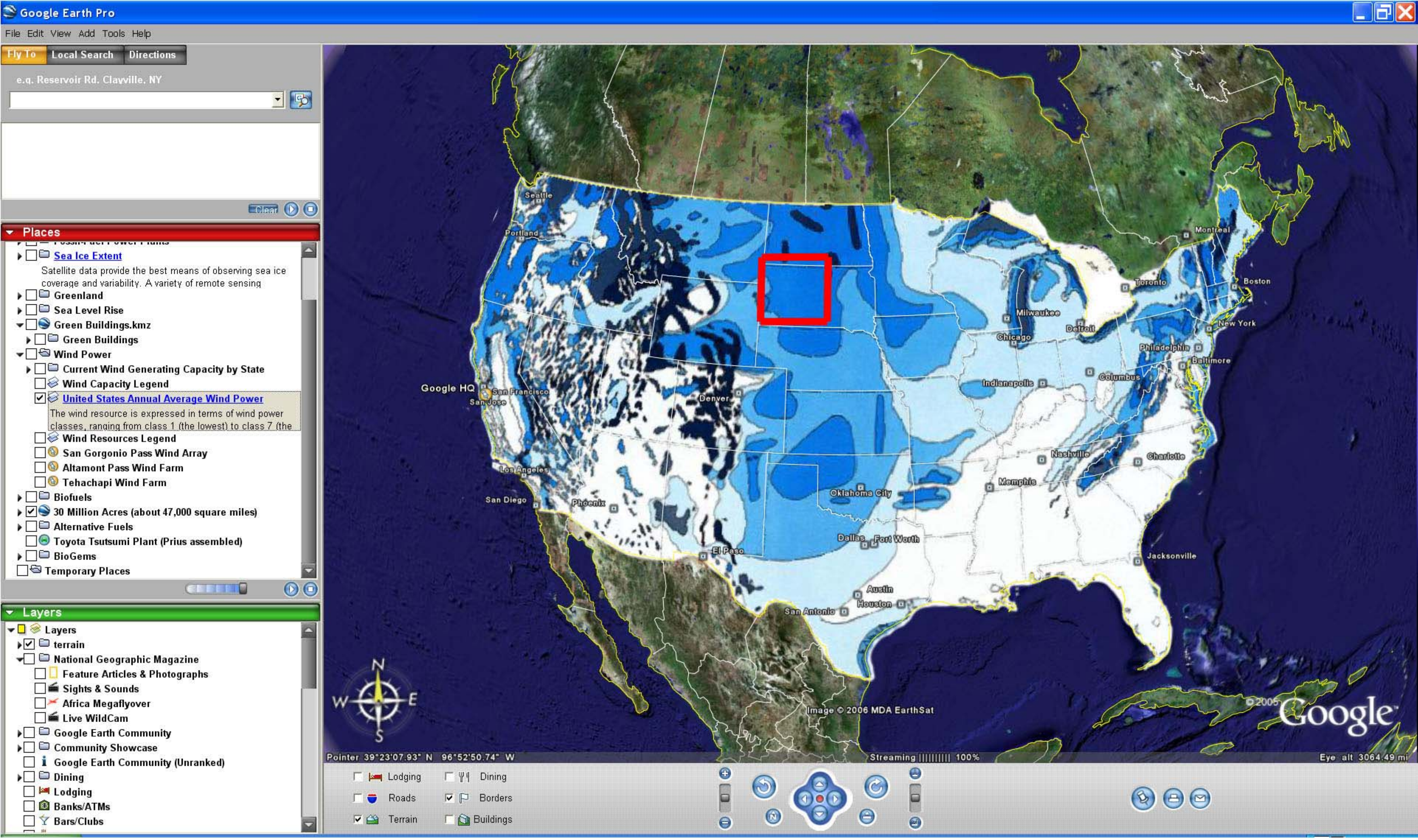

30 million acres

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CO_2 capture and storage: cuts 325 MtC

- Equip 180 GW of coal with CCS
  - 25 x current CO_2 use for EOR
  - 4 x current natural gas buffer storage flows
- Additional CCS at other stationary sources
  - Large industrial facilities
  - Natural gas production

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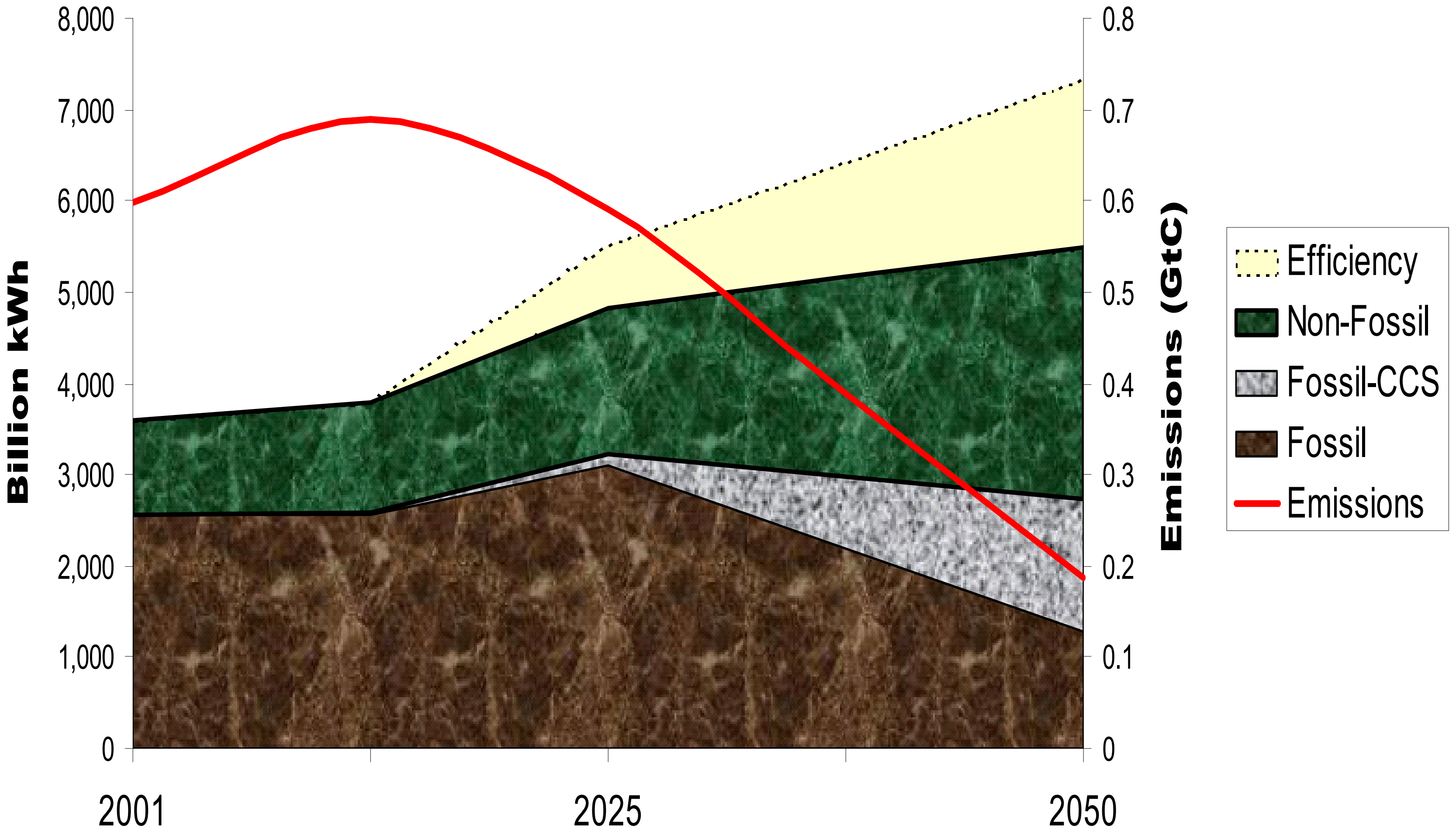
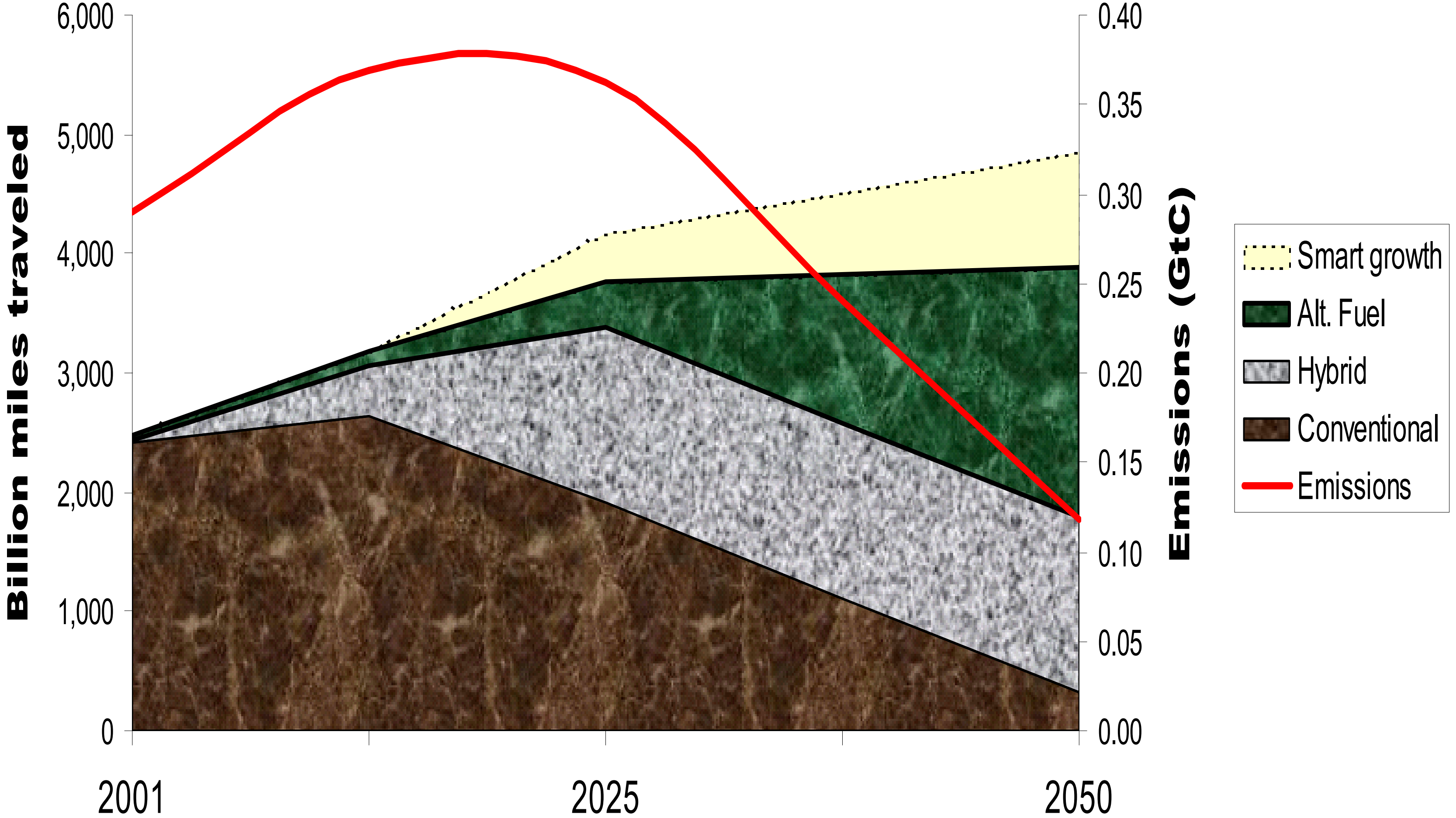
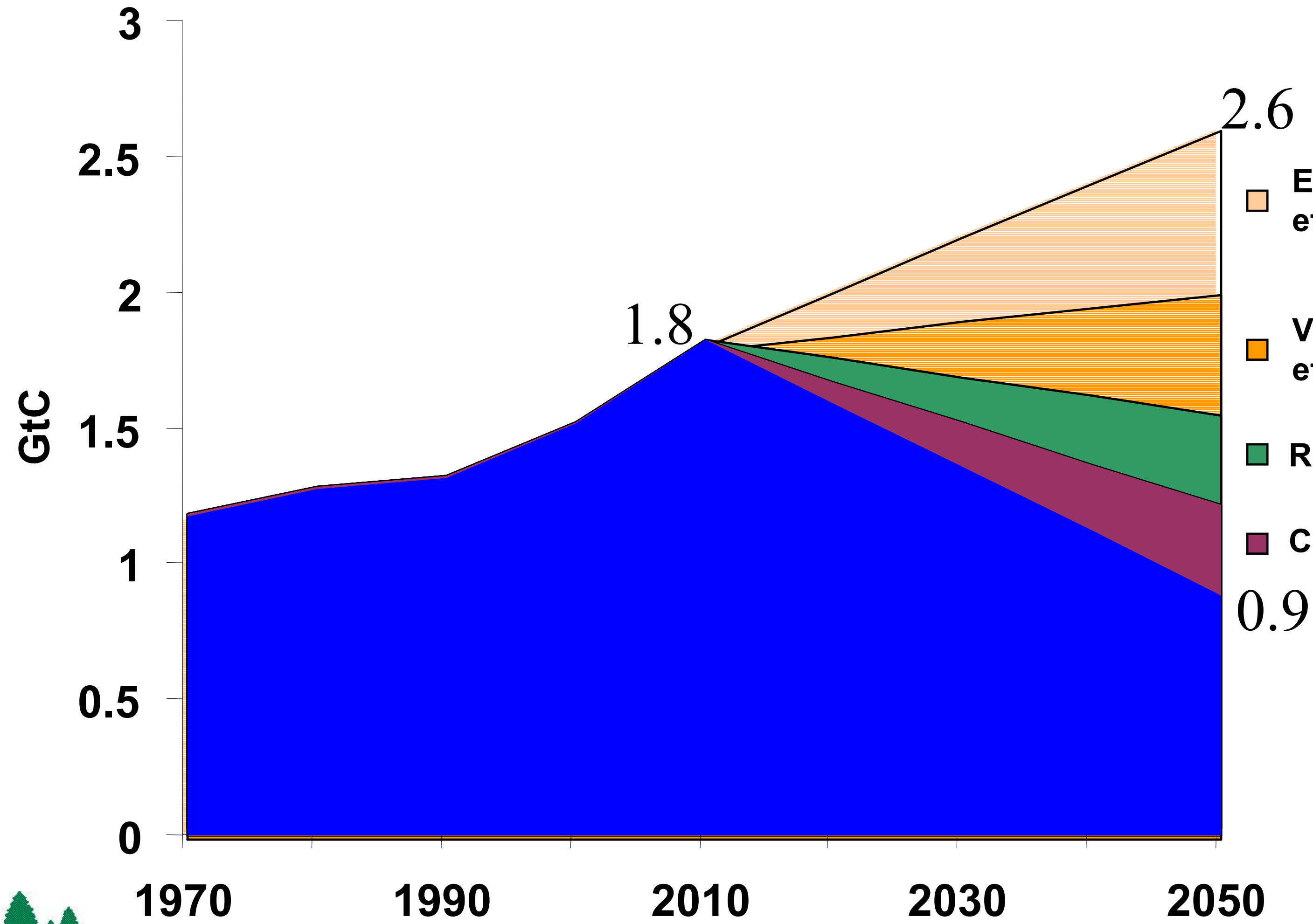
Cleaning up electricity



Cleaning up vehicles



Cutting U.S. emissions in half



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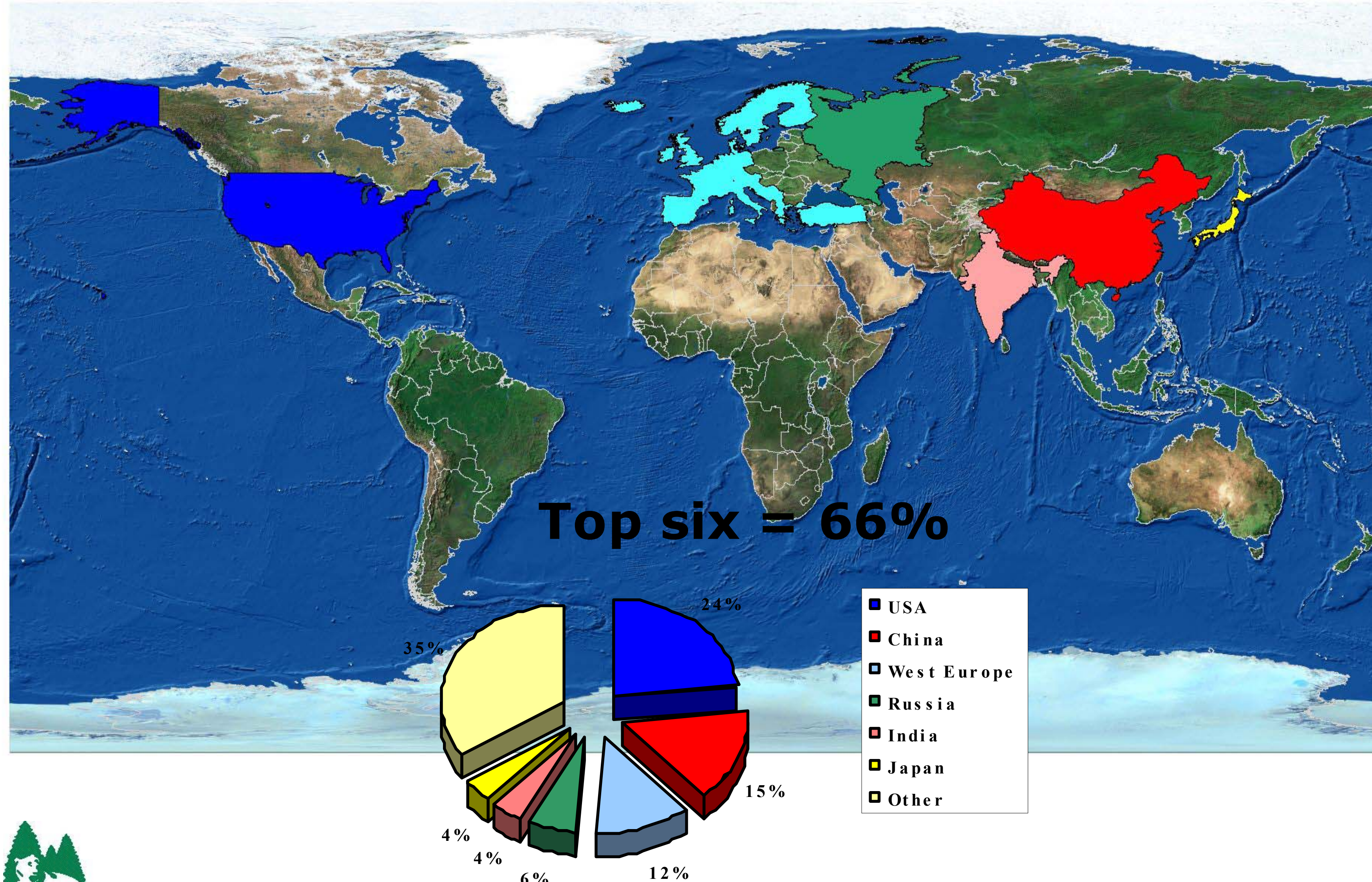
Biggest CO_2 emitters 2000-2025



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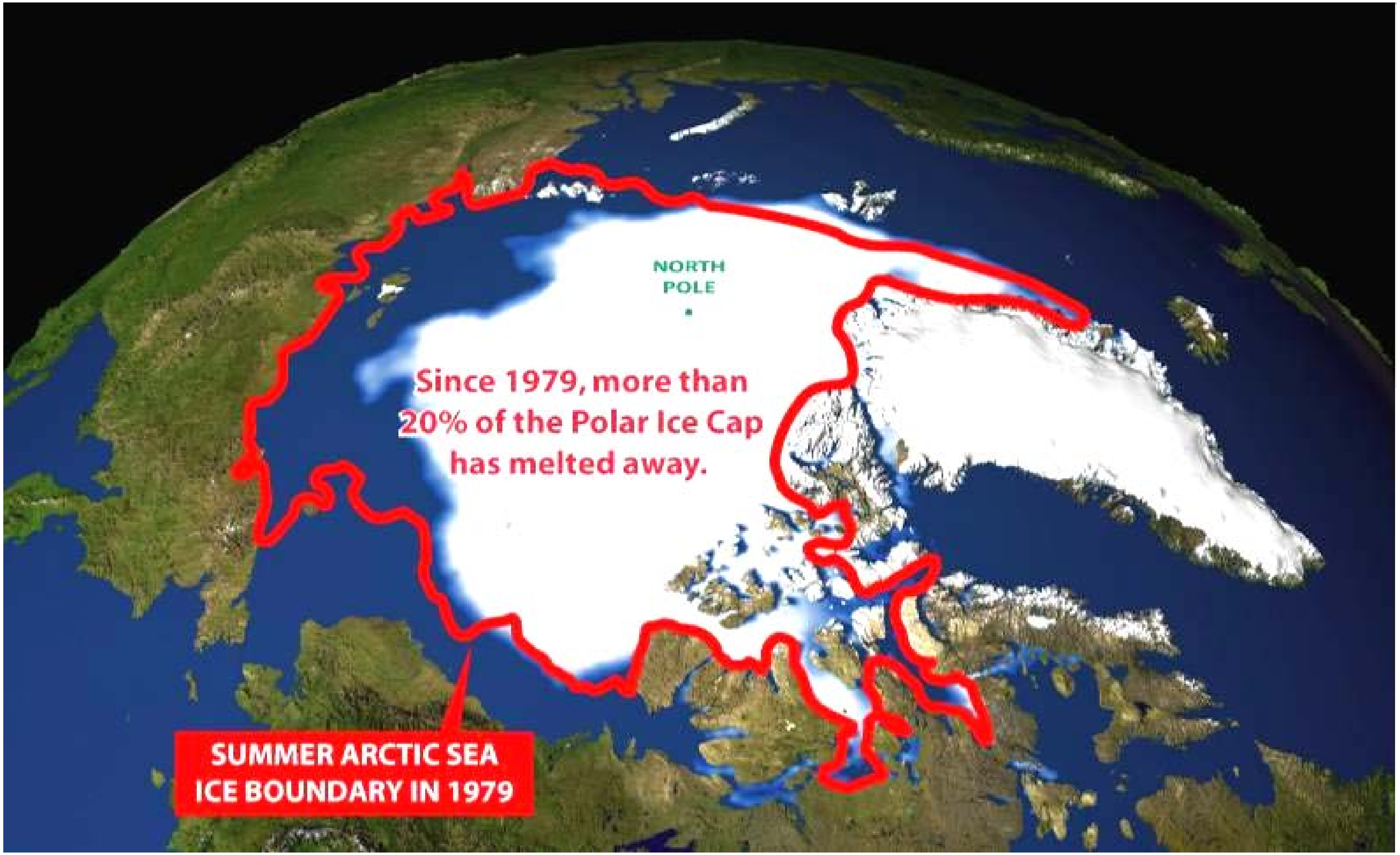
Cumulative CO2 Emissions 2000-2025, US EIA, IEO 2004

Warming won't wait. Will we?



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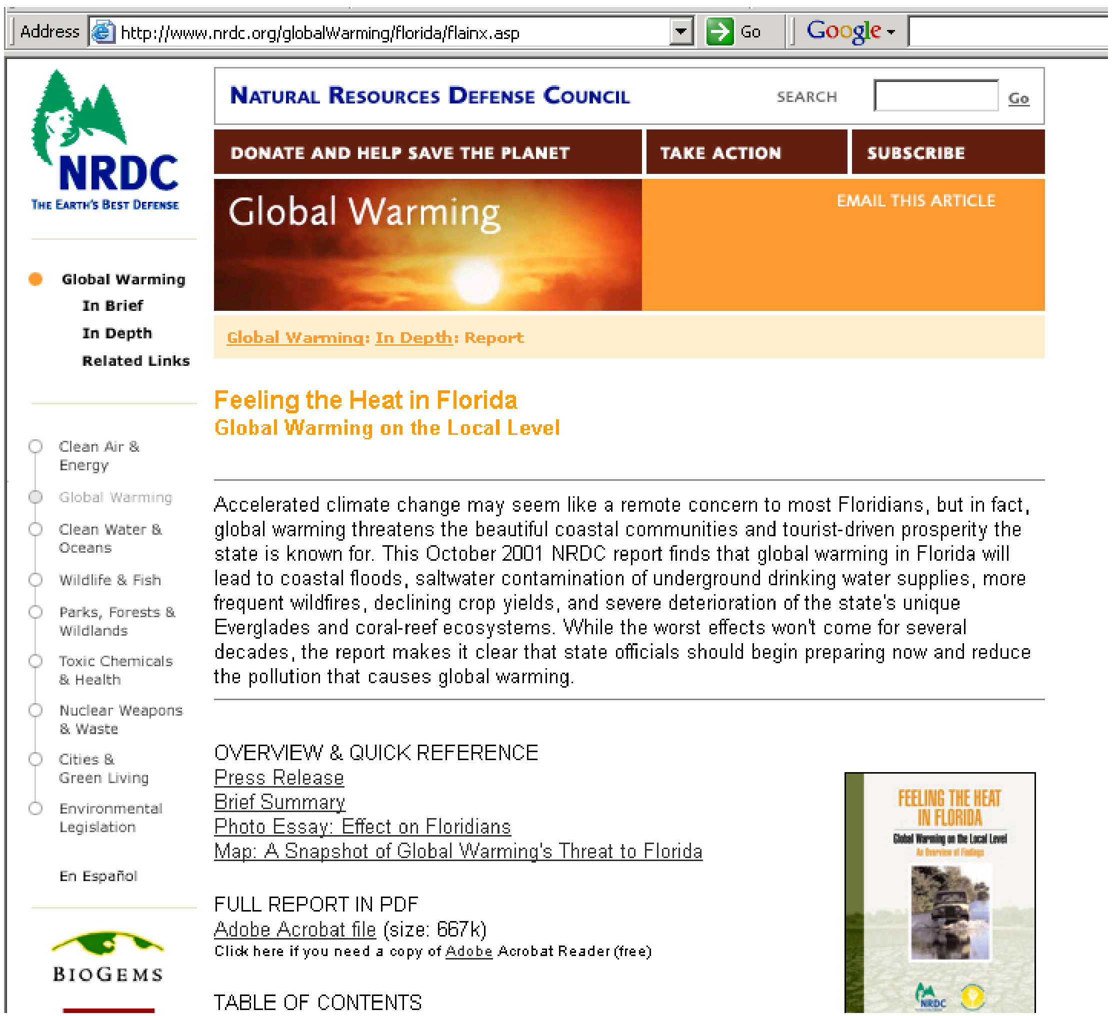
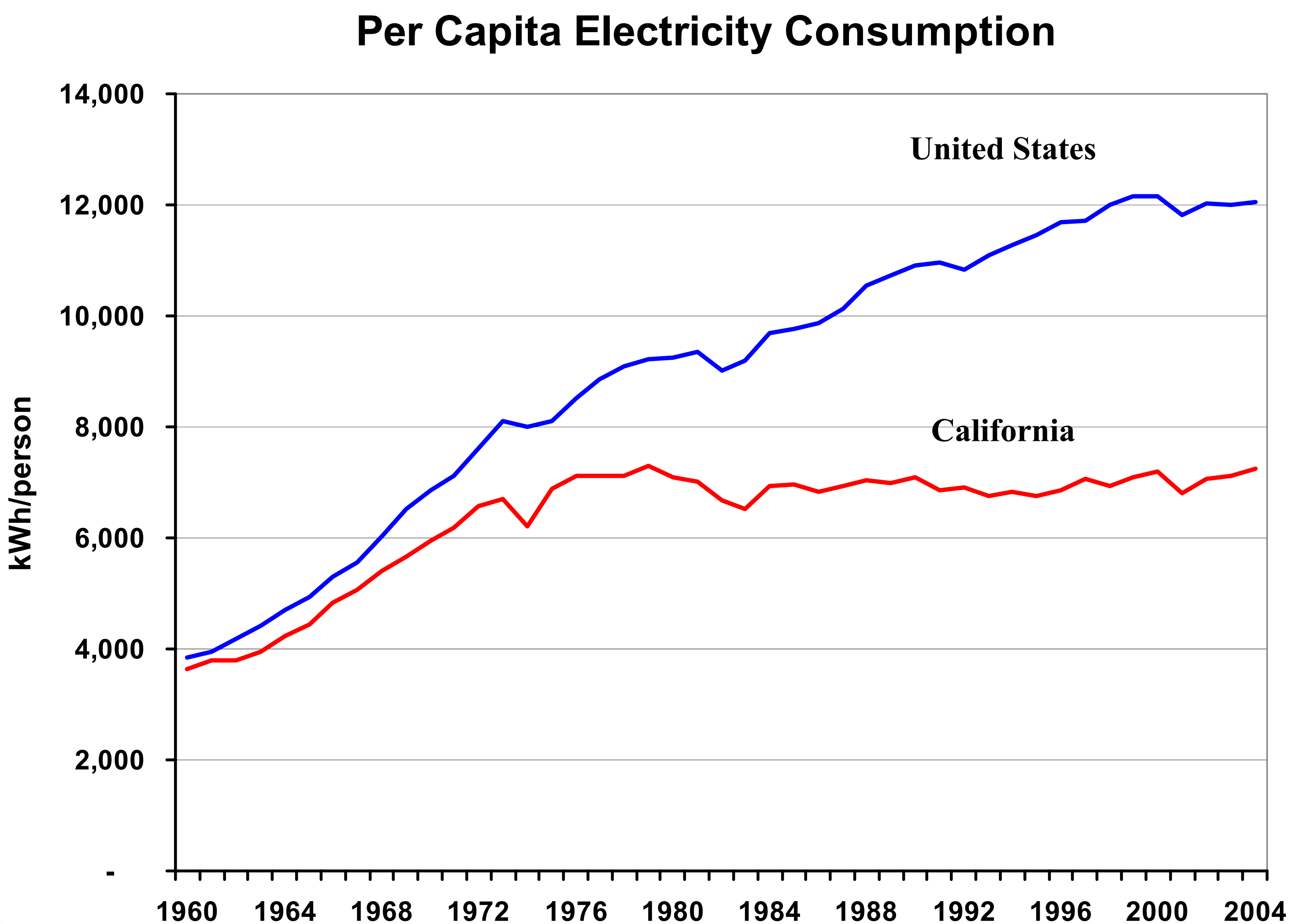
More information: www.nrdc.org



California leads the nation



Source: California Energy Commission, 2005

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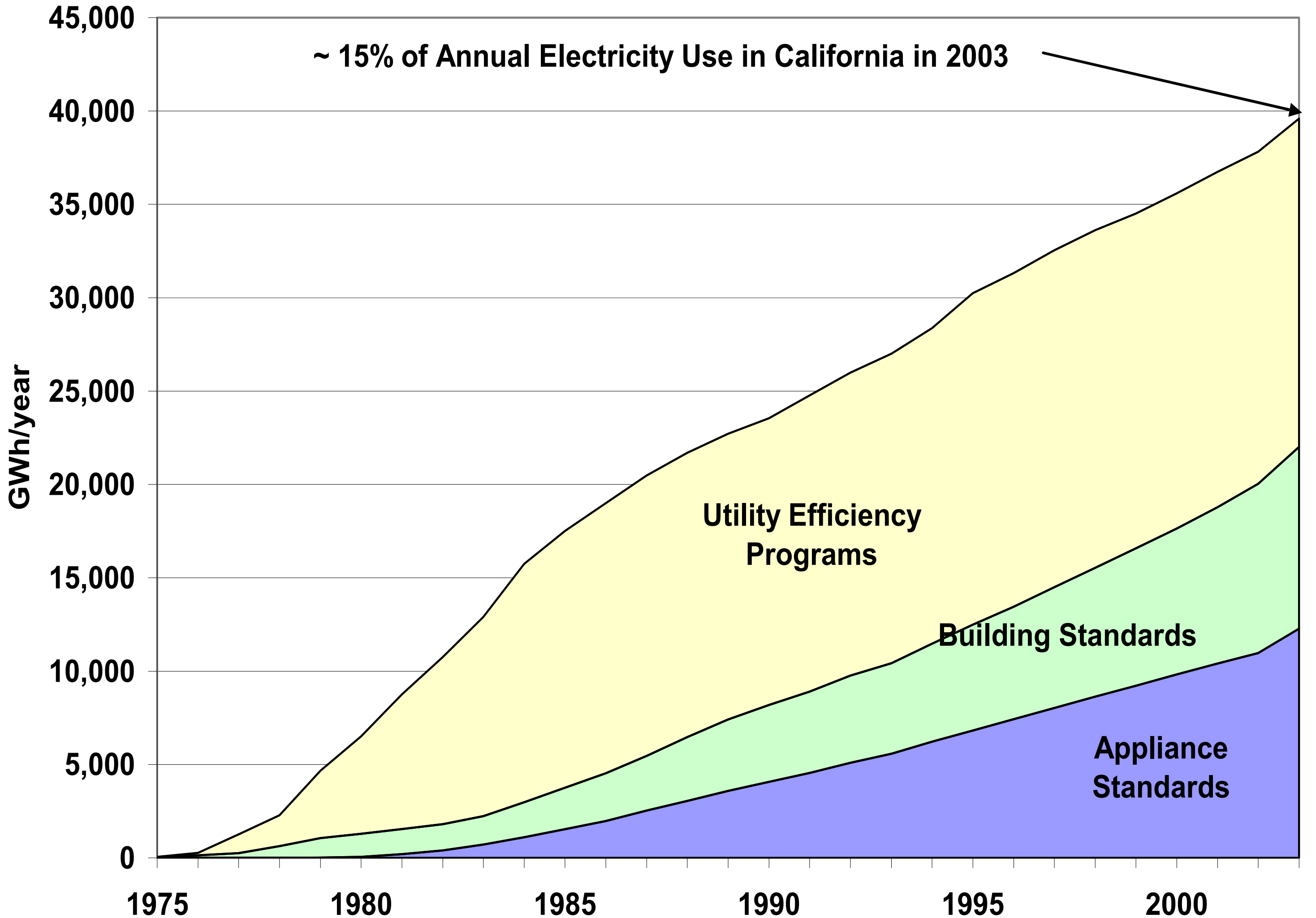
Efficiency: a critical resource



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