

The Human Earth (MAE 124/ESYS 103)

Lecture 2

Examples: sustainable design

Refrigerators

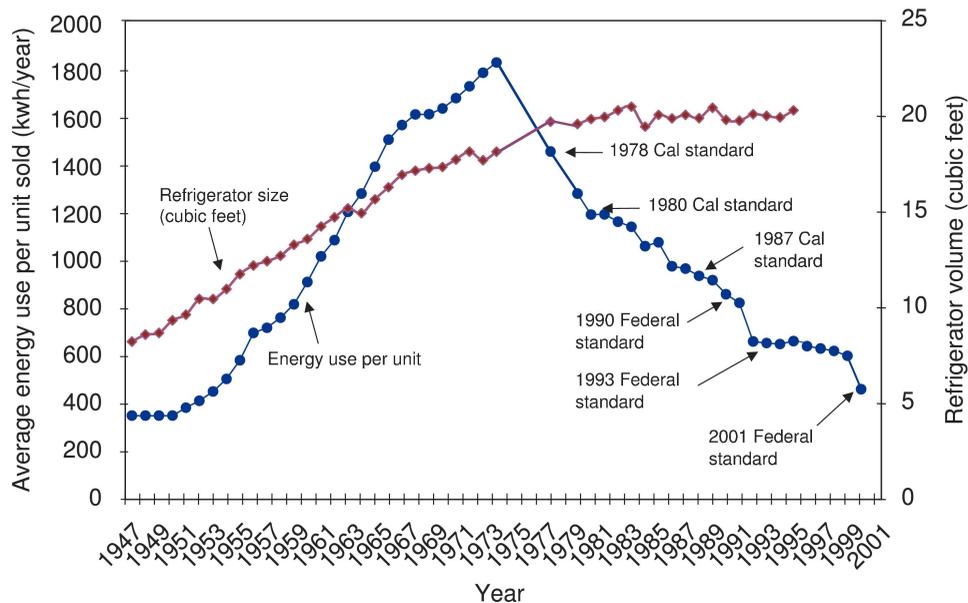
[copyrighted cartoon:

<http://www.cagle.com/news/EnvironmentMadden/environmentCartoonGIFS/fric>

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Chris Madden, <http://www.cagle.com/news/EnvironmentMadden/4.asp>

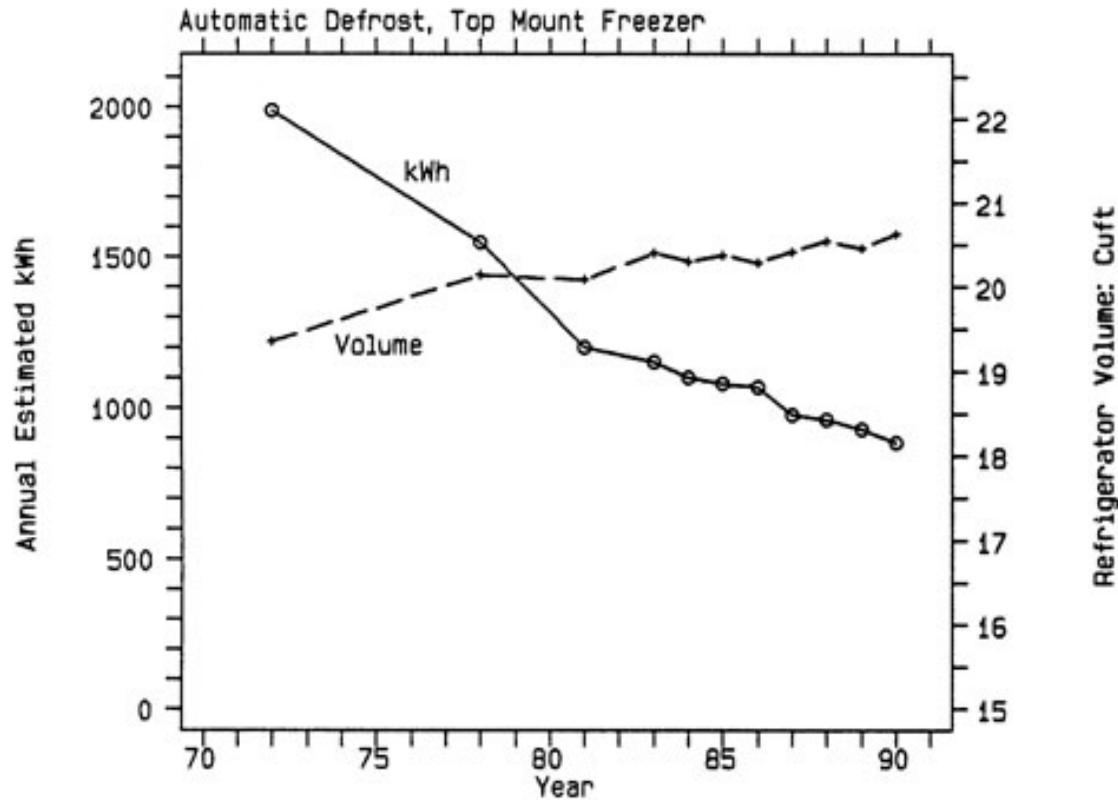
Trends in refrigeration



Change in size and efficiency of US refrigerators.

www.fypower.org/pdf/CEC_EE_and_Climate_Change.pdf

Trends in refrigeration: growth in refrigerators



Trends in refrigeration imply less power demand

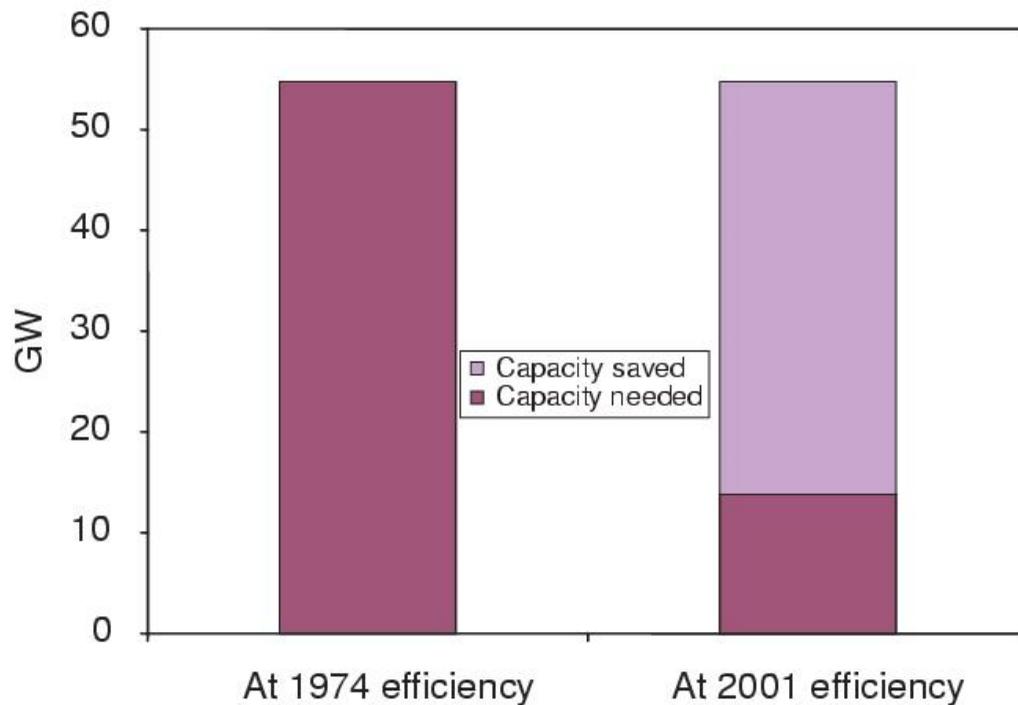


FIGURE 2 Electricity generating capacity for 150 million refrigerators and freezers in the United States.

Other appliances show similar gains

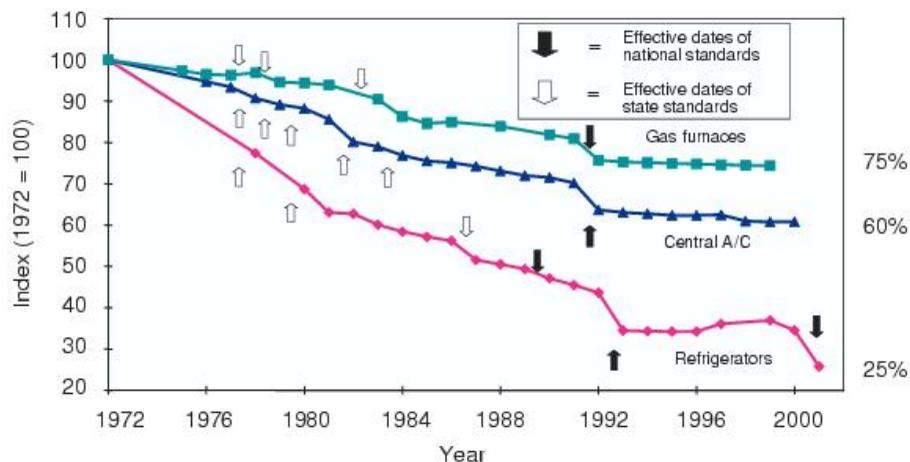


FIGURE 3 Impacts of standards on efficiency of three appliances. From S. Nadel, ACEEE, in ECEEE 2003 Summer Stt
www.eceee.org.

But US energy use has been increasing ...

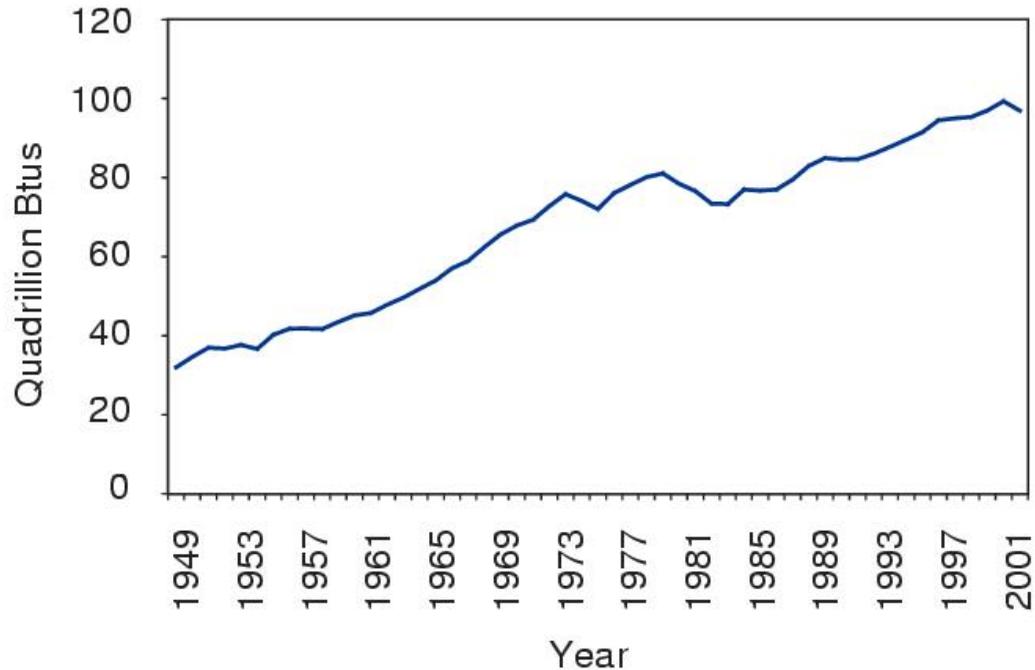


FIGURE 5 United States energy consumption, 1949 to 2001. From Table 1.5, *Annual Energy Review*; data for 2001 is preliminary.

While per capita use has leveled off ...

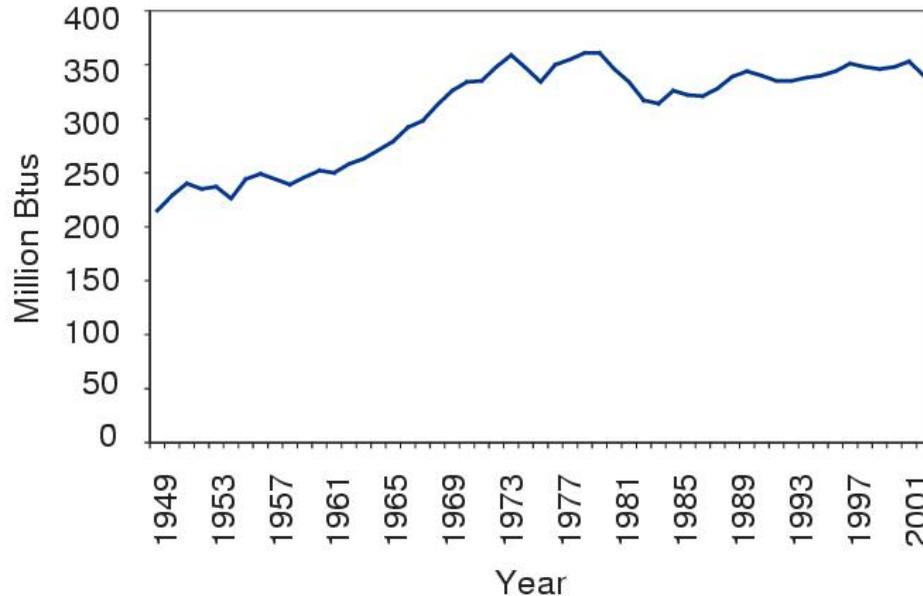


FIGURE 6 Energy consumption per person, 1949 to 2001. From Table 1.5, *Annual Energy Review*; data for 2001 is preliminary.

So population increase is driving our energy usage increase

US energy efficiency is improving (in economic terms)

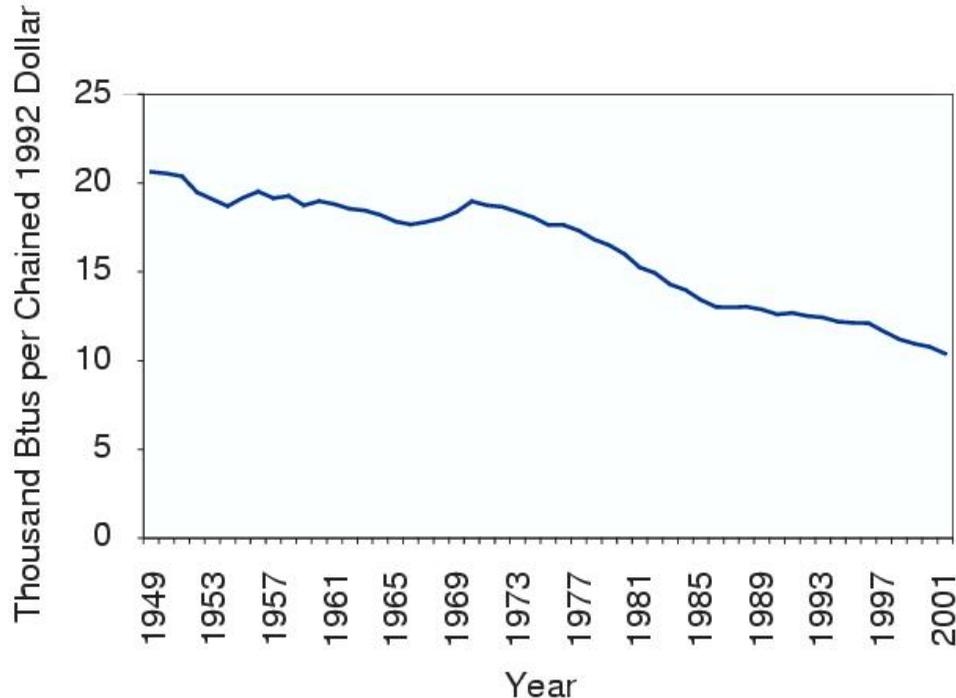


FIGURE 7 Energy consumption per dollar of gross domestic product, 1949 to 2001. From Table 1.5, *Annual Energy Review*; data for 2001 is preliminary.

Internationally, as well, we're ever more efficient

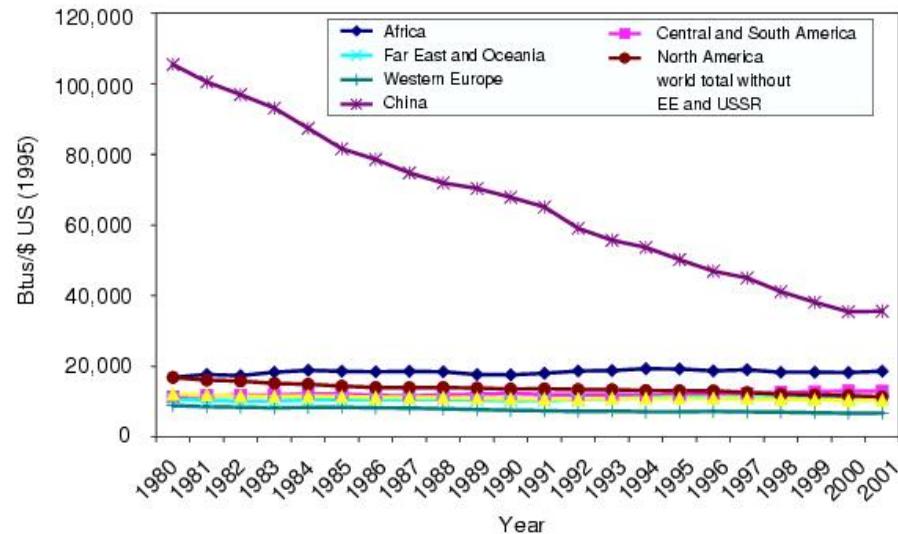
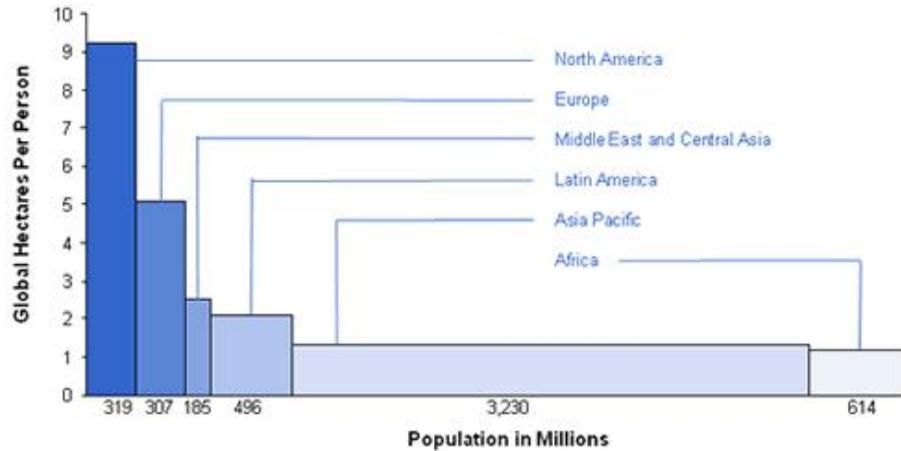
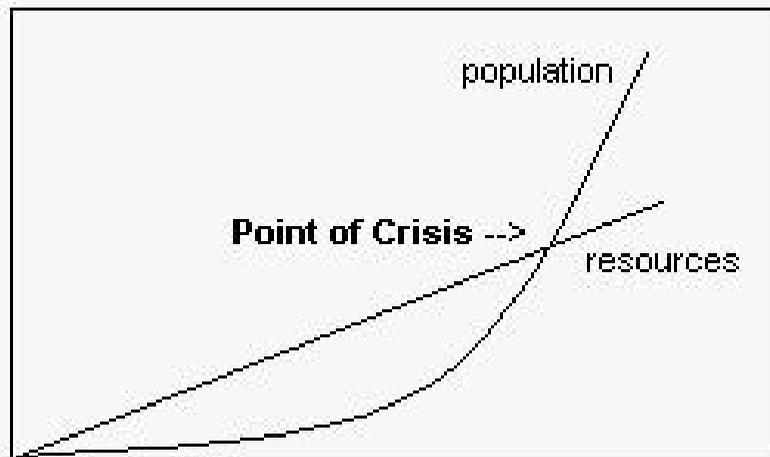


FIGURE 8 Energy intensity by geographic region including China, 1980 to 2001 (Btus/\$US 1995). From Energy Information Agency (EIA) data.

But our consumption isn't necessarily sustainable



Population Growth (Malthus)



Malthus' Basic Theory

<http://www.econ.duke.edu/Economists/>

<http://academic.brooklyn.cuny.edu/history/virtual/core4-8.htm>