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EAS 2803H

Patterns and Trends in Global and American Energy Use

Eighty percent of global primary energy is derived from fossil fuels (oil, natural gas, and coal), with traditional biomass, nuclear, and hydroelectric making up most of the remainder. So-called 'new renewables', which include solar, wind, and bio-fuels, account for roughly 2% of global primary energy. Growth in global energy consumption has been approximately linear from 1950 to present, over which time global energy consumption has increased from 100 exajoules/year (EJ/yr, or 1x 10^{20} J/year) to 450 EJ/yr. Energy consumption is not uniformly distributed, however – the wealthiest countries comprise 14% of global population but consume 48% of global energy. Indeed, a significant relationship exists between per capita energy consumption and per capita Gross Domestic Product (GDP), suggesting a strong link between economic health and energy consumption. However, the aforementioned relationship cannot explain the fact that Japan uses less than half the energy of the United States on a per capita basis, yet its per capita wealth is roughly equivalent to that of the United States. Differences in countries' per capita energy useage to GDP ratios likely stem from a complex combination of geographic, cultural, and historical factors.

A pragmatic definition for 'sustainable energy use' is when a country's energy production equals or exceeds its energy consumption. In this sense, America's energy use is not sustainable, as it produces ~73EJ/yr of energy but consumes 100EJ/yr (equivalent to a per capita consumption of 20kilowatts). Contrast this with Denmark, which produces 1.1EJ/yr and consumes 0.8EJ/yr (5kilowatts per capita). Denmark has achieved sustainable energy useage mostly by conserving energy since the 1970's. Given that America's per capita energy

consumption is more than twice as high as the European average, the quickest path to sustainable American energy use is likely through aggressive energy conservation.