Datasets and Two-point Comparison Phil Gyford 1999-11-30

Total US energy consumption and energy-related carbon dioxide emissions by sector, 1949-1998.

Consumption: www.eia.doe.gov/pub/energy.overview/aer98/txt/aer0201.txt Emissions: www.eia.doe.gov/oiaf/1605/ggrpt/tble3.html

Over the past fifty years, energy consumption and its related carbon dioxide emissions have risen and fallen at similar rates, and changed direction at identical times, as might be expected. They have not, however, remained proportional, and there have been changes between different sectors of use. Total emissions more than doubled between 1949 and 1973 (from 595.6 million metric tons of carbon to 1278) as did consumption (from 32 quads to 75.8): growth rates of 3.2% and 3.6% respectively.

Both levels have had temporary increases in their rates, and later falls, most noticeably falling in the early 70s, rising later that decade and falling back to resume a more steady climb by around 1984. This was presumably due to the rise in oil prices, which jumped up in the early 70s and dropped in the mid-80s. After this both continued to rise again with slightly lower growth rates of 1.3% (emissions) and 1.5% (consumption).

Averaging the rates of growth for both sets of data confirms what is apparent in the graph: emissions have risen more slowly than consumption. The latter has an average annual growth rate of 2.2%, while carbon dioxide emissions rose only 1.9% per year. This shows less carbon dioxide is being emitted by each unit of energy use as time goes on, that usage is becoming more efficient.

Within the increasing total energy use, usage by the residential and commercial sectors have been increasing at a greater rate, now rivalling the levels of industry. Combined residential and commercial use has risen as a proportion of the total from 29% in 1949 to 35.8% in 1998. The proportion of industrial usage has declined over the same period from 46% to 37.6%. Transportation has steadily accounted for around 25% of total energy use (with a low of 23% and high of 27%).

The levels of emissions within each sector have not increased at the same rates however, allowing us to see which sectors have improved their efficiency the most. Dividing the number of million metric tons of carbon emitted by quads of energy used allows us to judge the relative levels of efficiency. Of the three, industry has made the most progress dropping from 18.2 to 13.5 over the half century. Transportation has improved the least, from 20.6 to 19.4 over the same period, and has in fact become worse since 1961 when it was at a level of 19.1. Residential and commercial combined have dropped from 17.5 to 15.5.

We have seen that while both energy consumption and emissions have increased at tremendous rates over the past fifty years, the latter has done so at a slightly slower rate. This difference is mainly do to improvements in efficiency in the industrial, residential and commercial sectors.





