

1.1 World's Energy consumption

By using fossil fuels such as wood, coal, oil and gas, it was possible for humanity to set up civilization in colder climates. Due to the increasing demands of comfort, a higher mobility and a larger world population, energy consumption rose tremendously over the last 150 years (see Figure 1) and exhaustion of these fuels is foreseeable in the midterm. Additionally, the emitted carbon dioxide hinders the heat radiation exchange between the Earth's surface and space, which causes climatic changing effects (see following chapters). While these facts have been known since the early seventies (Meadows 1972), energy consumption of humanity (and correlated CO₂-emissions) rose to 429.4 EJ (429.4·10¹⁸ J) in the year 2004.

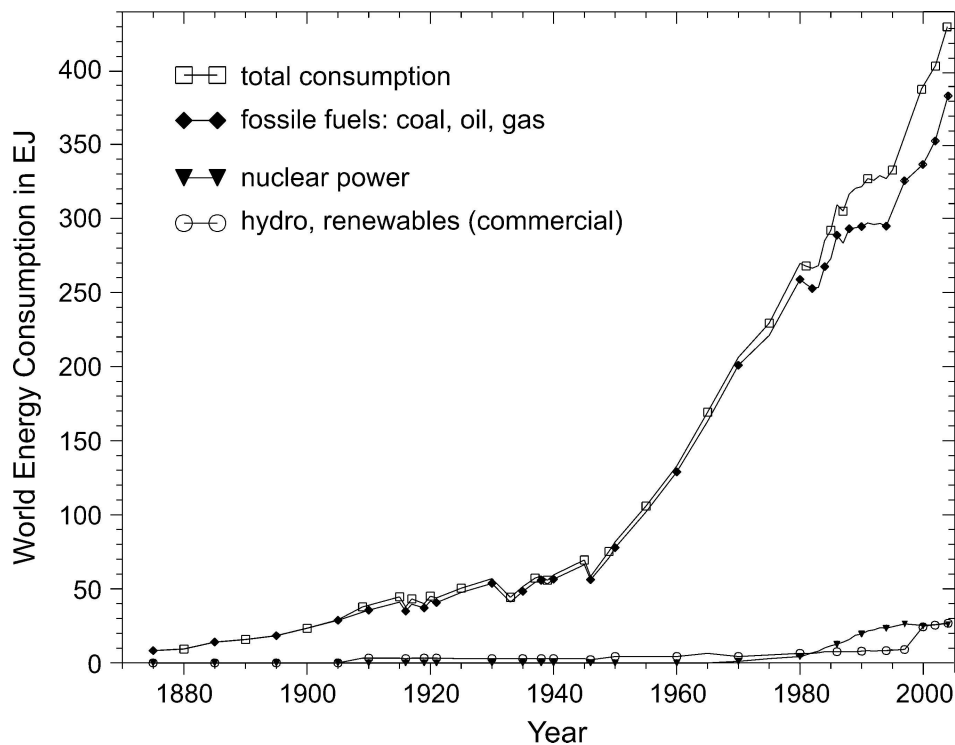


Fig. 2. Primary energy consumption of the world in EJ (10¹⁸ Joule) as a function of time (1875-1995) with shares of CO₂-emitting and CO₂-free fuels (Sources: 1875-1965: Interatom-Shell-Study 1992, 1970-1988: UN Yearbook of World Energy Statistics, 1989-1995: BP Statistic Review of World Energy, 1996,).

Figure 2 illustrates the potential of solar energy: the Sun's irradiation on Earth is 14,000 times higher than the World's energy consumption. Accumulated over one year, the energy of solar irradiance on Earth is much higher than all known fossil fuel resources.

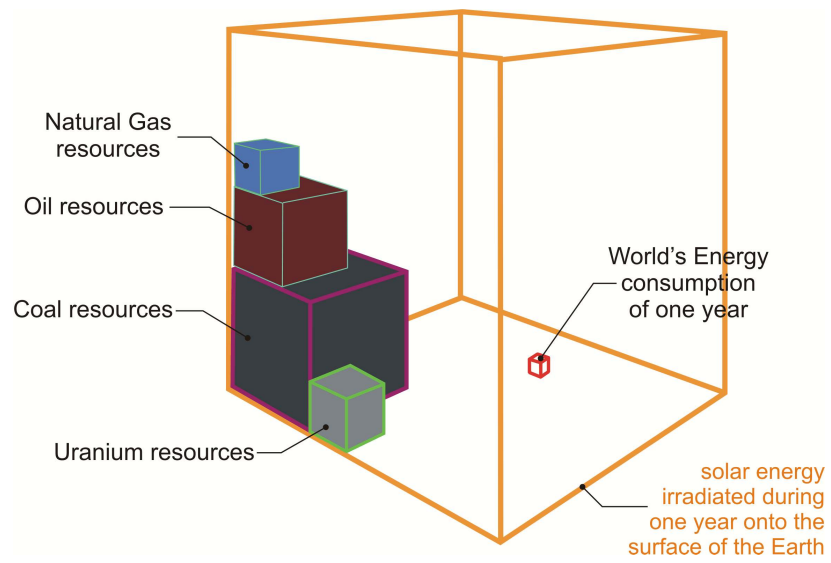


Fig. 3. World's energy consumption in comparison to all its fossil resources and its annual solar energy potential (adapted from Greenpeace).