

Chapter 1

Introduction

Since thousands of years, the human race has been developing cultural skills and technological capabilities that support its struggle for survival and lead to dominance over all other species. Since about a century, the exponential growth of knowledge, technology, industry and population (see Fig. 1.1) has reached a scale where man modifies biosphere to an extent, that living conditions on the whole planet earth start to change significantly. Resources that had been abundant are becoming scarce within decades. We have arrived in the Anthropocene [1] where man has a significant impact on the basic living conditions of the biosphere of the whole planet. A continuation of this growth rate will unavoidably reach its natural limits where resources vanish; the biosphere will change more rapidly than the ability of organisms and ecosystems to accommodate, and contaminations will endanger living. When such a condition is reached, it is likely that our human civilization will collapse and human population will diminish rapidly. Historic examples demonstrated that drought, hunger, wars and epidemics were typical endpoints of drastic environmental changes and overpopulation. While historic examples mostly affected only individual towns, islands, countries or indigenous nations, the limits of growth this time affect the whole planet and there is no “new world” to which our civilization can migrate. Recent research has proven that the era of a new biological mass extinction has already started [2] and it can be assumed that finally also our species will be affected.

The challenge of this century is the deceleration of growth in general, especially the limitation of the world population to a stable number (e.g. 10 billion people), and the conversion of industrial processes to renewable and sustainable cycles, which will have to be able to supply food and a reasonable standard of living to this large number of people. This paper will focus on the subject of “energy” as one of the essentials of our society, but it will also point out the importance of the nexus of climate, energy, food, water and the carbon cycle.

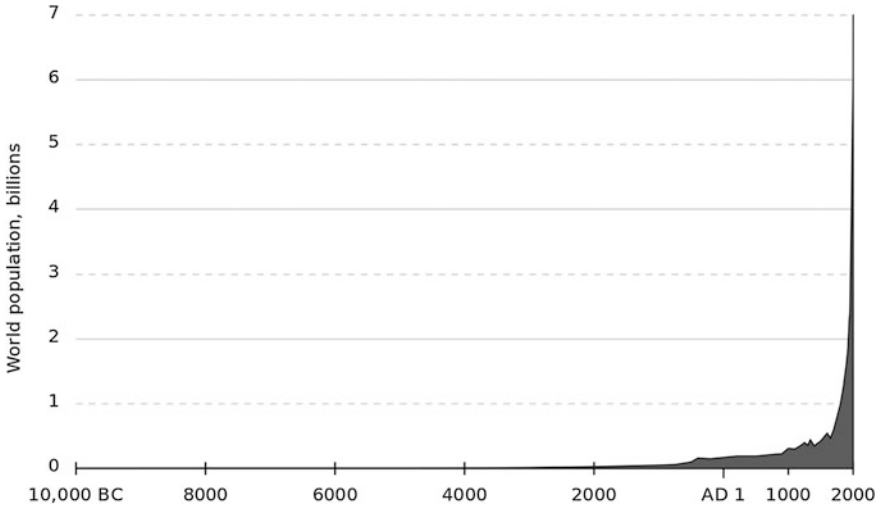


Fig. 1.1 The estimated human population of the last 12,000 years. It has been small and growing moderately for thousands of years. In the last 50 years, population increased by 1 billion every 13 years [3]

How can a stabilization of the population be achieved before millions of people die from starvation, epidemics, environmental catastrophes or wars? Birth control is essential and not the subject of this paper, but it is important to know that since the begin of industrialization, there has been a strong anti-correlation between the economic wealth and the birth rate, termed the demographic-economic paradox [4] : As soon as a country reaches a high level of education, low unemployment and safe living conditions, birth rates stabilize at low levels instead of using the wealth to nourish more children. The self-determination of women is a prerequisite for this process, as there are examples of countries where a high standard of living for men is realized, but to the cost of the repression of women and of high birth rates. For example, Saudi Arabia has a GDP per capita at the level of Europe, but a fertility rate comparable to India or Egypt. Also, religion plays a role here. All major religions have their roots from a time where birth control was counterproductive for the survival of a cultural cohort and not all religions adjusted the interpretation of their basic articles of faith to the current situation where overpopulation is counterproductive for development. In this sense, solving the energy problem is only one out of several aspects, but still it is an important prerequisite for a peaceful future of the global community.

References

1. Wiki: *Anthropocene*; <https://en.wikipedia.org/wiki/Anthropocene>
2. Ceballos et al. (2015) Accelerated modern human-induced species losses: entering the sixth mass extinction. *Sci Adv.* 1:e1400253 19 June
3. Figure: by El T [Public domain], via Wikimedia Commons https://commons.wikimedia.org/wiki/File%3APopulation_curve.svg; The data is from the “lower” estimates at census.gov (archive.org mirror)
4. Wiki: *Income and fertility*; https://en.wikipedia.org/wiki/Income_and_fertility#Paradox

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