

The sustainability of human populations: How many people can live on Earth?

Summary

Human impact on the planet has increased massively (approx. 400% since 1900) in the modern era causing deforestation, soil erosion, increased salinity of the soil, pollution, waste disposal to landfill, desertification, declining fish stocks, biodiversity loss and climate change. The Earth can no longer support the number of people who live on it. It crossed the boundary to ecological overshoot in the 1980s: human demands on the planet now run at 50 per cent above planetary biocapacity. This 50 per cent overshoot is projected to rise to nearly 200 percent by 2050 when humankind will need the equivalent of almost three Earths to support it, in a 'business as usual' scenario.

The sheer strain such numbers place on the global ecosystem suggests that the UN's prediction of a world population of over nine billion by 2050 will never be realised. Instead, resource wars and starvation threaten the worst population crash in the history of humankind. There is an urgent need for national strategies on sustainable population not only in the UK but in all countries. Politicians need to demonstrate courage and leadership on this issue: they must persuade their nations to accept the necessity of smaller families and provide the means for people to reduce their family size and, in the case of the affluent countries, to consume less.

Ecological footprinting data suggest that a sustainable global population is around 2-

3 billion people. For the UK, the corresponding figure is currently between 17 and 27 million depending on the level of affluence. In the UK, target reduction in CO₂ emissions will be cancelled out by population growth, leaving the country with 50 million "too many" people by mid-century.

Key Points

- In 470 BC Plato declared: "*A suitable total for the number of citizens cannot be fixed without considering the land...*" Control of death without a corresponding control of birth rate has caused an 11-fold explosion in population to over 6.9 billion in just 250 years. In the modern era, human population has increased two million times faster than in the prehistoric era, when world population grew at an average of seven people per year.
- The impact of humanity has been expressed in the so-called Commoner-Ehrlich Equation: $I = P \times A \times T$. This states that *impact* (I) on the environment is proportional to *population size* (P), *affluence* (A), defined as the resources a population consumes and wastes, and the *technology* (T) a society uses. However, reducing *impact* by decreasing *affluence* (consumption) only partly addresses the problem since in many regions, for example Africa, population growth is exceeding growth in affluence. *Technology*, meanwhile, tends not to "decrease": it can reduce the effects of affluence but its benefits in energy-saving tend to be cancelled out since businesses

use it to encourage consumer spending and maximise economic growth which in turn increases the affluence factor. The *population* element is rarely addressed.

- The limit to population at any given time is determined by the planet's ability to support that population's impact indefinitely. Ecological footprinting, developed in the 1990s, quantifies impact, and assesses the earth's biological capacity as well as the human demands made on it, (the ecological footprint) using a standardised unit of land area - the global hectare.

- In 2007, with a total of 6.7 billion humans sharing the earth's biocapacity of 11.9 billion global hectares (gha), the biocapacity available to sustain each person was 1.8 gha. However, the average individual footprint was 2.7 gha, an excess over biocapacity of 50 per cent. The result is an unsustainable consumption of land and other resources due to the inability of carbon sinks to absorb humanity's continually increasing waste CO₂. In 2007 one and a half planets were needed indefinitely to sustain the population of 6.7 billion.*

- The UK's current footprint is 3.8 times greater than its biocapacity, reflecting both its high population density and its affluence. If the whole world consumed and generated waste like the UK, it would require 2.7(an additional 1.7) planets to sustain the human race.

- Given total global biocapacity of 11.9 billion gha, an average individual footprint of 2.7 gha will sustain only 4.4 billion people. This gives an immediate estimate of world overpopulation as 2.3 billion people in 2007.

- National footprints vary widely. If everyone lived with an average EU lifestyle of 4.7 gha per capita, Earth could sustain only 2.5 billion people; an American lifestyle of 8.0 gha/cap could sustain just 1.5 billion. Both figures are far in excess of the 2007 world biocapacity of 1.8 gha/cap and emphasise that the developed world enjoys its affluence only because people in developing countries have a much lower footprint.

- In 1961, with a footprint of 1.5 gha/cap, the world's population of three billion was sustainable. Between 1980 and 1990 it moved into overshoot. Until 1990 the trend to overshoot was attributable to a combination of increasing ecological footprint and growing population. Since 1990, however, population increase has become the main driver of overshoot.

- With a footprint of 4.9 gha/cap, the UK's sustainable population is 17 million. The UK thus has currently 44 million more citizens than could be sustained in the long term without relying on other countries to supply food imports and for the absorption of its waste CO₂ emissions. To live sustainably, a UK population of 61.1 million would have to reduce its average individual footprint to 1.3 - a "lifestyle" equivalent currently to that of countries such as Philippines, Liberia, Algeria, Sudan and the Dominican Republic.

- If the UK met the Government's target of a 60 per cent cut in CO₂ emissions by 2050, its per capita footprint would decrease from 4.9 to 3.18 gha, implying a sustainable population of 25 million. However, UK population is projected to

grow by a further 16 million by 2050, to 77 million. In terms of sustainability, a 60 per cent cut in emissions – even if achieved – will thus be more than cancelled out by population growth: in 2050 there will be 52 million UK citizens more than the UK can sustain.

- In the unlikely event that the UK could cut its CO₂ emissions to zero, the maximum sustainable population would be 39 million if its non-carbon footprint remained constant. In reality, therefore, a “zero-carbon” UK could never reach sustainability without population reduction: the lifestyle reductions demanded would be too great. The Government should introduce a strategy to reduce UK population towards 17-27 million in the long term.

- There is an urgent need for national population strategies in all countries. It is the sheer weight of human numbers that is causing the overdrawing of natural resources. If this continues uncorrected, a population crash will be inevitable. It is neither sufficient nor realistic to try to apply *technology* to solve merely the *affluence* element in the Commoner-Ehrlich equation. The *Population* aspect needs deep and urgent scrutiny; it has been avoided for far too long.

- The data suggest a sustainable global population of around two to three billion, given an ecological footprint of 3.5 to 5.5 gha/cap. For the UK, the figure is 17-27 million.

All data in this paper based on Living Planet Report (LPR) 2010 (WWF, Global Footprint Network, Zoological Society of London). The full original version was presented by the author to The OPT Environmentally Sustainable Populations Conference at The Royal Statistical Society in London, March 26th, 2009, and can be found on the website. The latter document used data from LPR 2006, which has been updated in this paper.

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