

An illustration of a landscape with a brown ground, a green tree on the right, and a stylized orange figure in the center. A large, light-colored, elongated shape is positioned above the ground, resembling a comet or a large object in the sky. The text "Sustainable Development" is written in white on a brown background at the bottom.

Sustainable Development

An identical illustration to the one on the left, featuring a landscape with a brown ground, a green tree, a stylized orange figure, and a large light-colored shape in the sky. The text "Sustainable Development" is written in white on a brown background at the bottom.

Sustainable Development

## Chapter 1

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# Technological progress and the human takeover of spaceship Earth

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# Human evolution

- Human evolution
- Three alternative choices
- The Malthusian phase
- The consumerist phase
- A technotopian phase?

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Homo, Homo sapiens, and technological progress.

- 2 million years.
- 300 000 years.
- 70 000 years.

Genetic and cultural evolution.

# Three alternative choices

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## Three alternative choices

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### Blue tits and milk bottles.

- Reproductive success;
- Consumption;
- Leisure.

Humans?



# The Malthusian phase

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## The Malthusian phase

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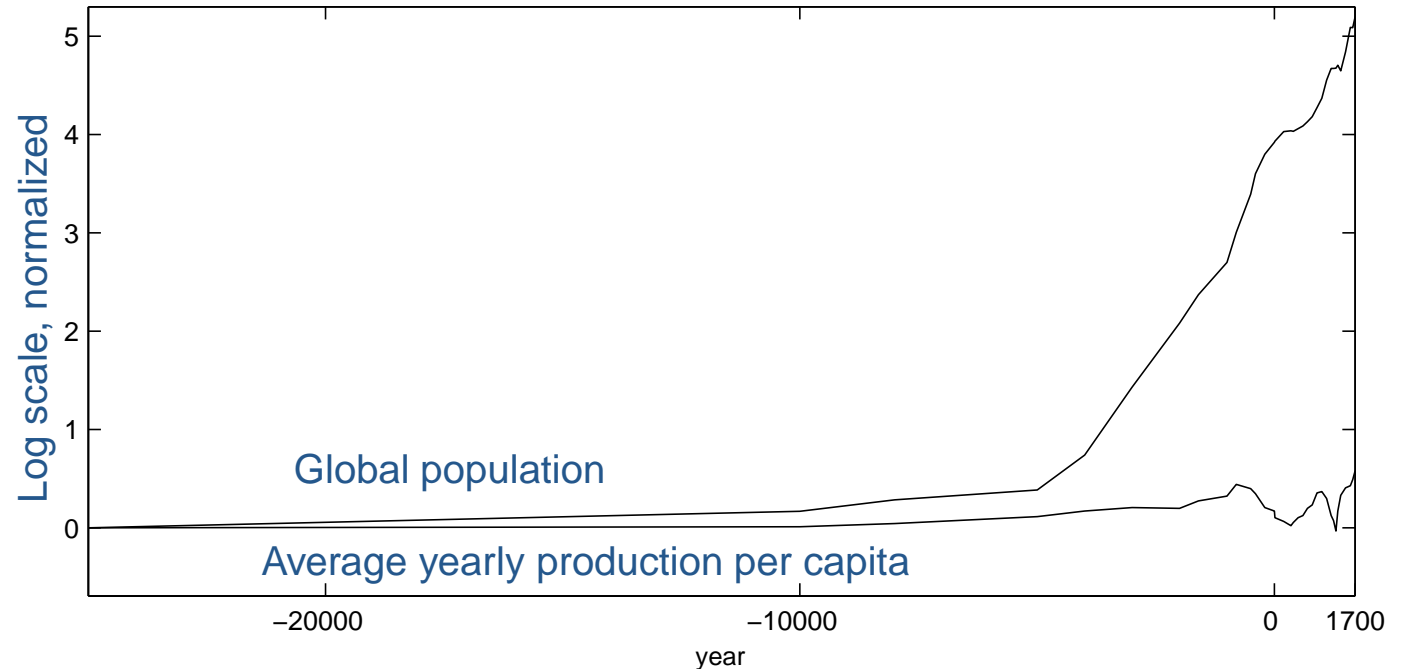


Figure 1: Global product and population, historical (data from Brad DeLong). Both variables are normalized to start at zero. Population grows by a factor of approximately  $\exp[5]$ , i.e. about 150. Average yearly production per capita is close to 100 USD throughout.

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# The Malthusian phase

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Very slow rate of technological progress.

Massive effects on other species:

- Moa;
- Wheat.

Key innovations?

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What ended the Malthusian phase?

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# The consumerist phase

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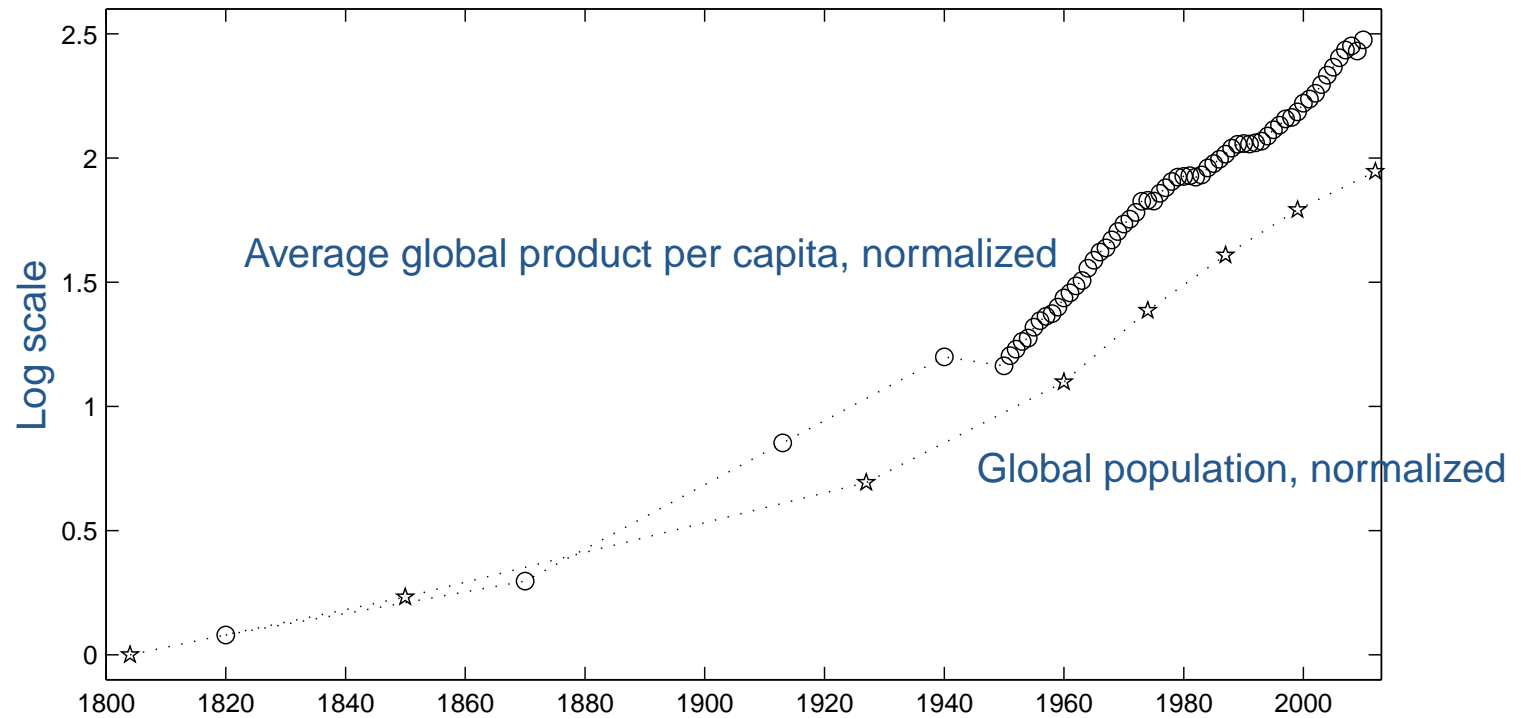


Figure 2: Global product and population, modern.

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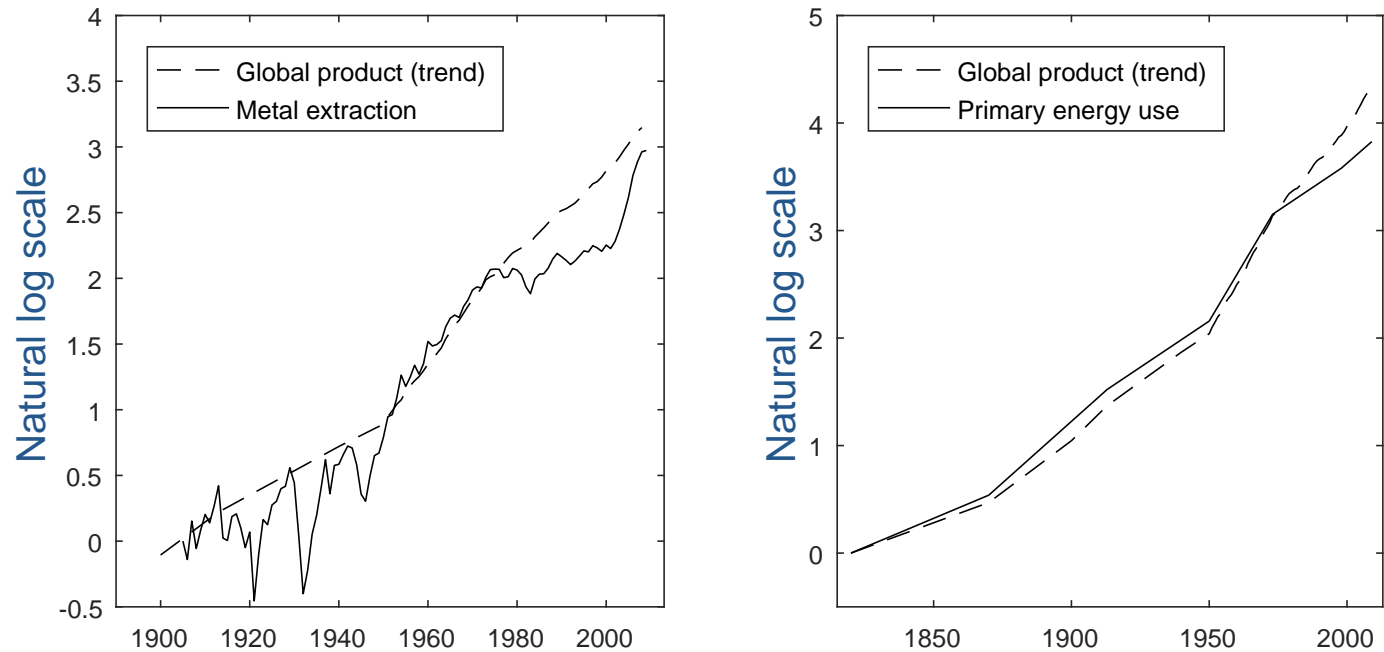


Figure 3: Long-run growth in total consumption compared to growth in total global product, for (a) Metals (tons extracted), and (b) Primary energy from combustion (joules burnt).

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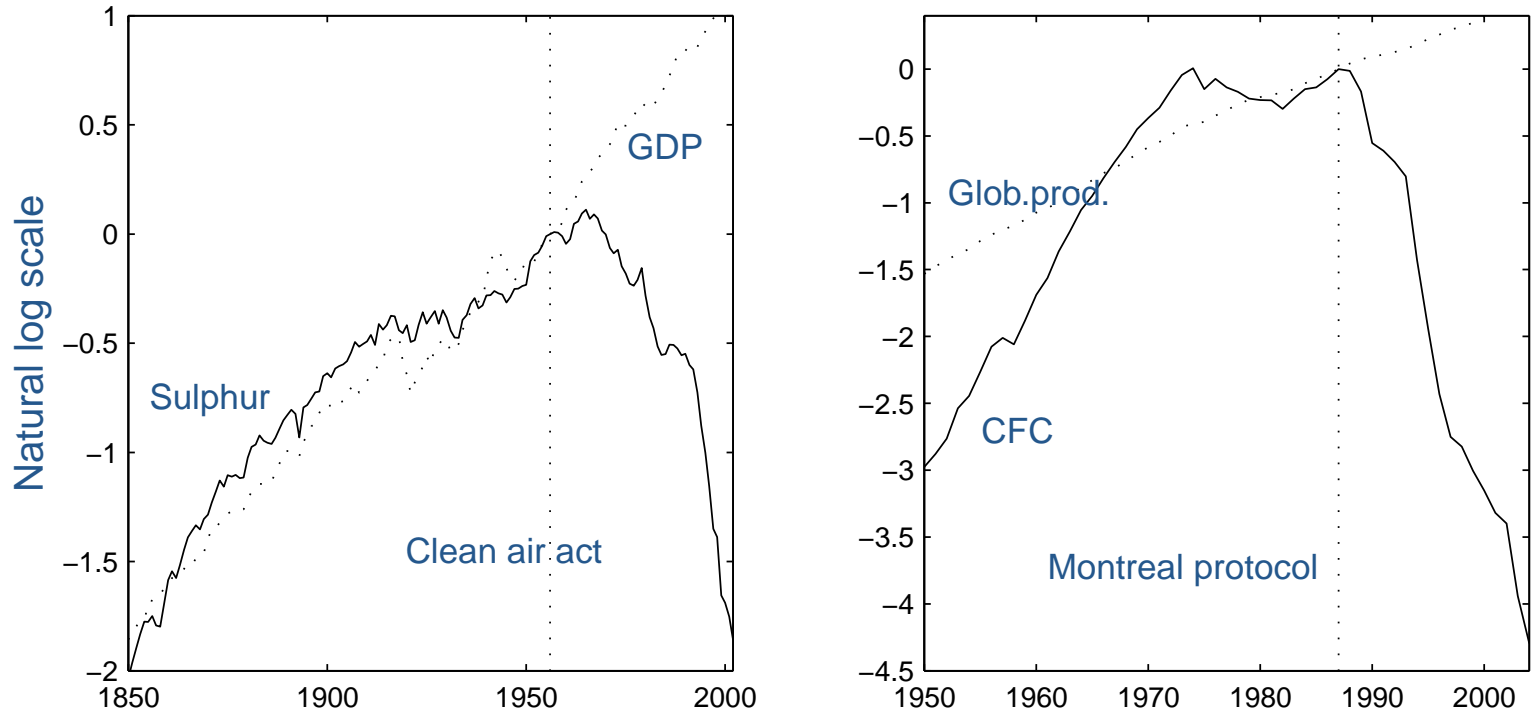


Figure 4: UK Sulphur emissions compared to total UK GDP, and global CFC production (CFC11+CFC12) compared to total global product.

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Rapid technological progress: labour productivity and (e.g.) energy productivity.

Slow increase in leisure.

Rapid increase in production and consumption; shifts in consumption *patterns*.

Rapid increase in resource and energy use.

EKC?

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What might end the consumerist phase?

# A technotopian phase?

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## A technotopian phase?

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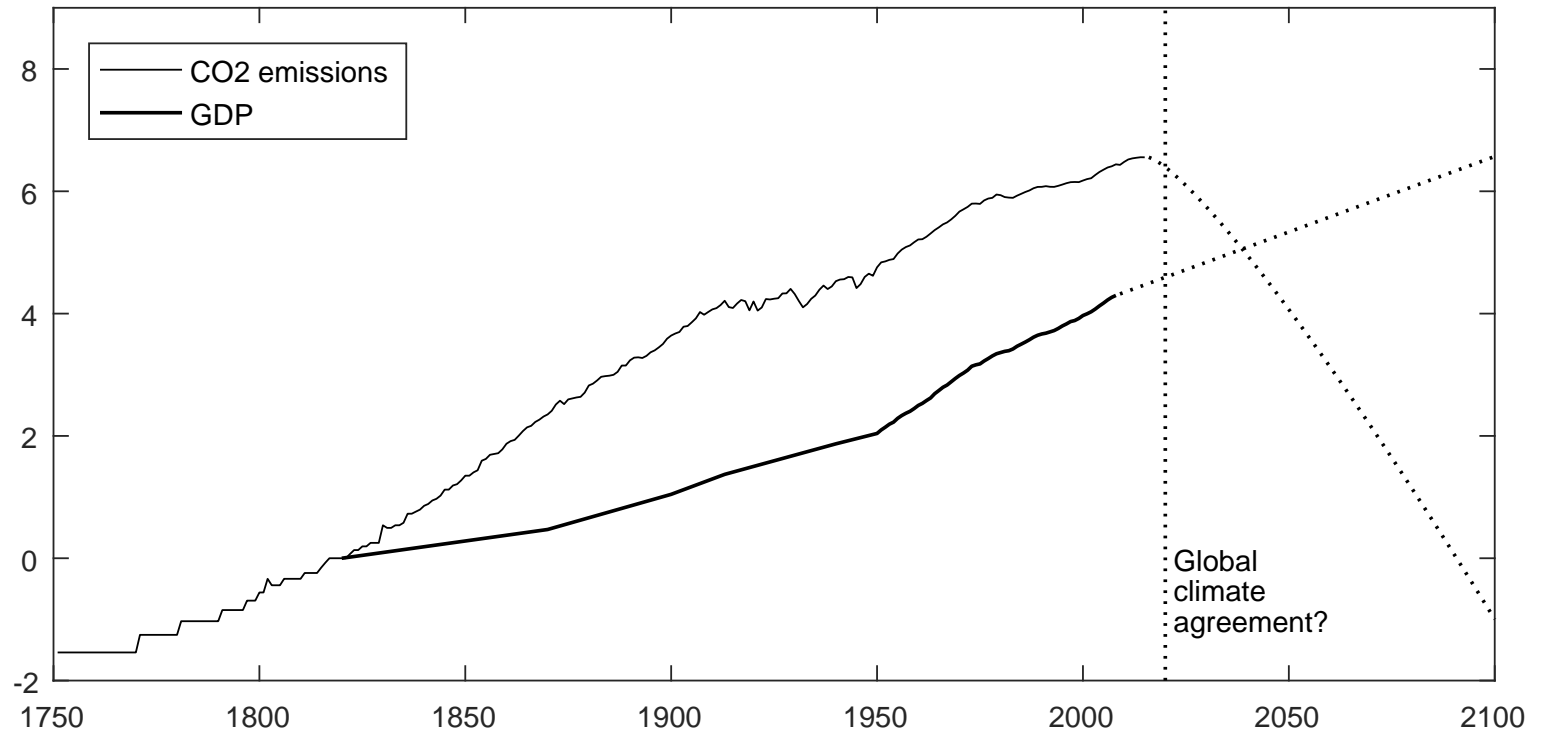


Figure 5: Global CO<sub>2</sub> emissions and gross global product: historical data from CDIAC, Maddison, and JRC, plus arbitrary projections into the future.

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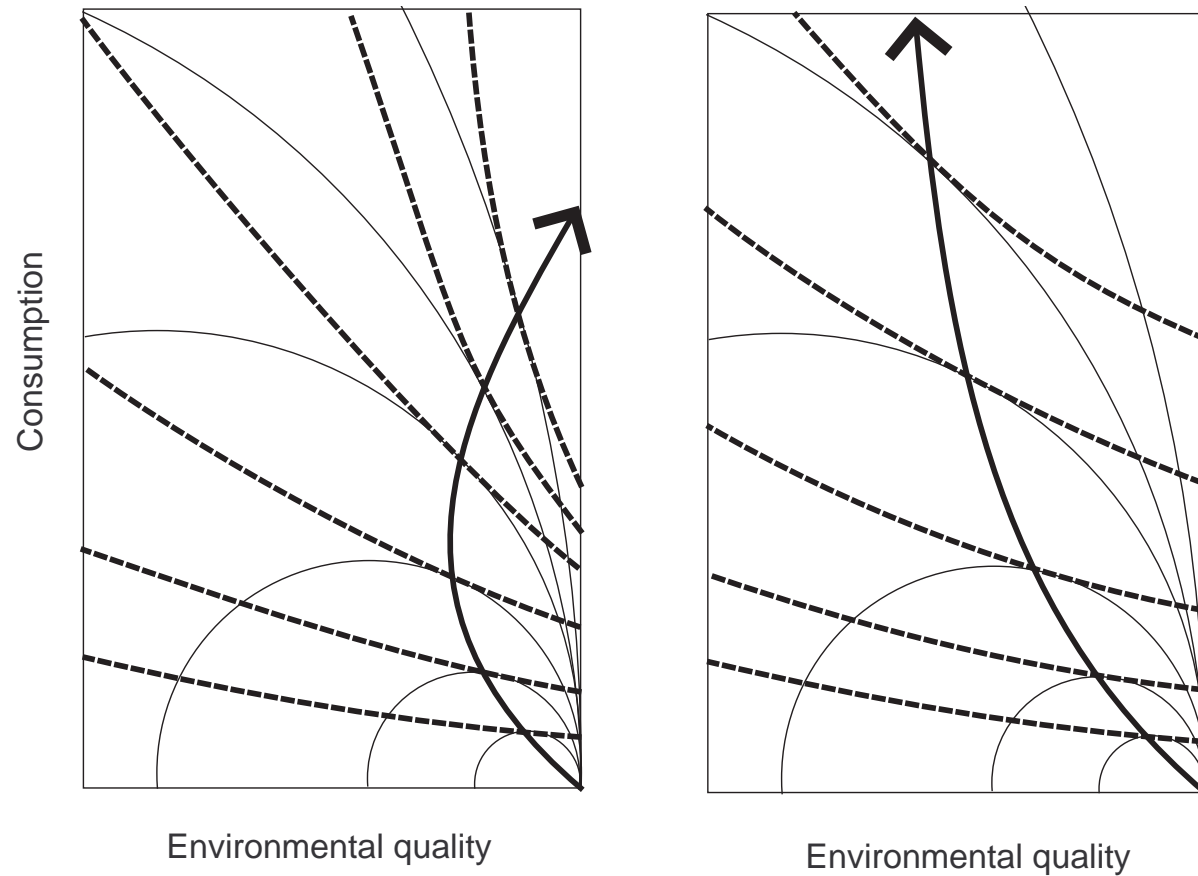


Figure 6: Alternative preferences yielding clean and dirty futures.

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Other dimensions: nature, and leisure.

Another factor: uncertainty and incompetence.