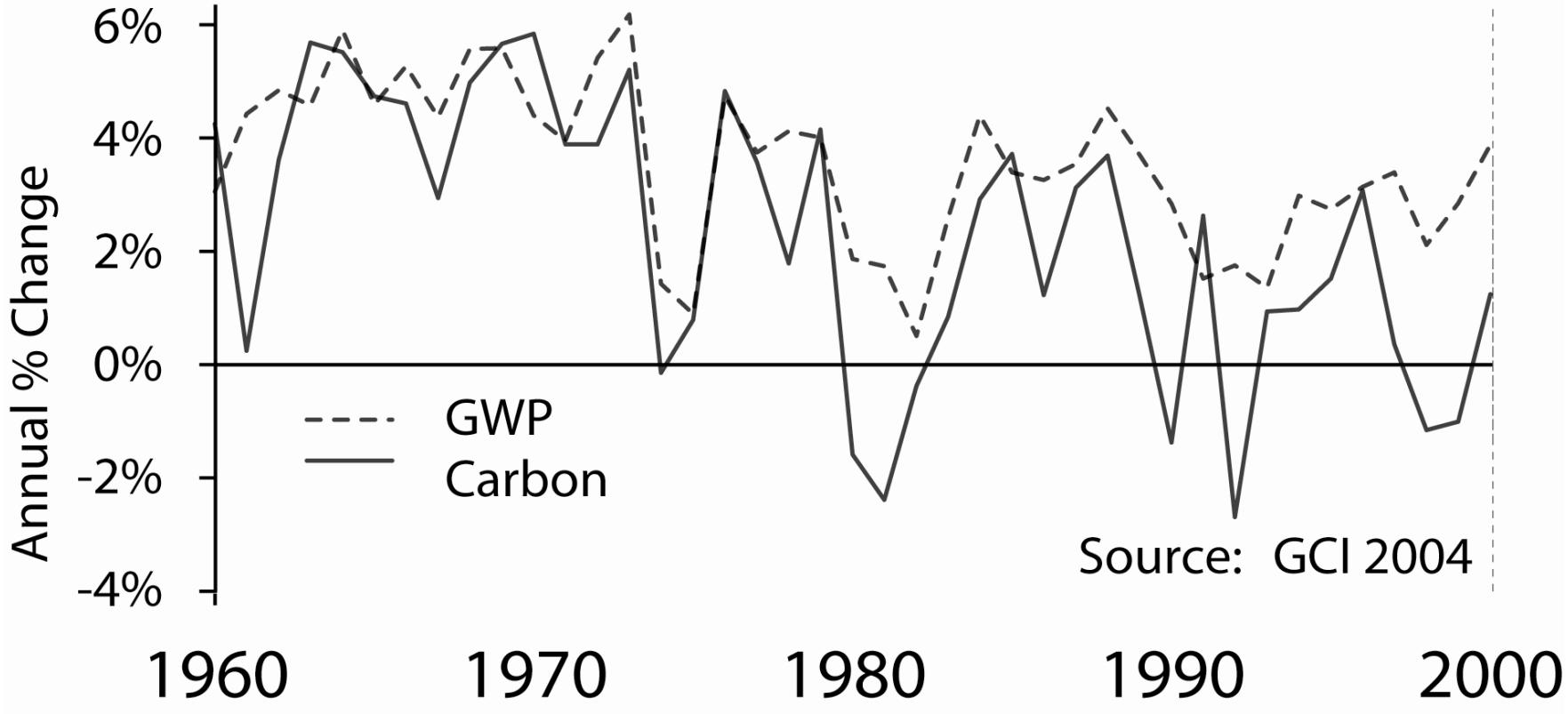
Economy, Energy, Environment

Which matters most in an economy?

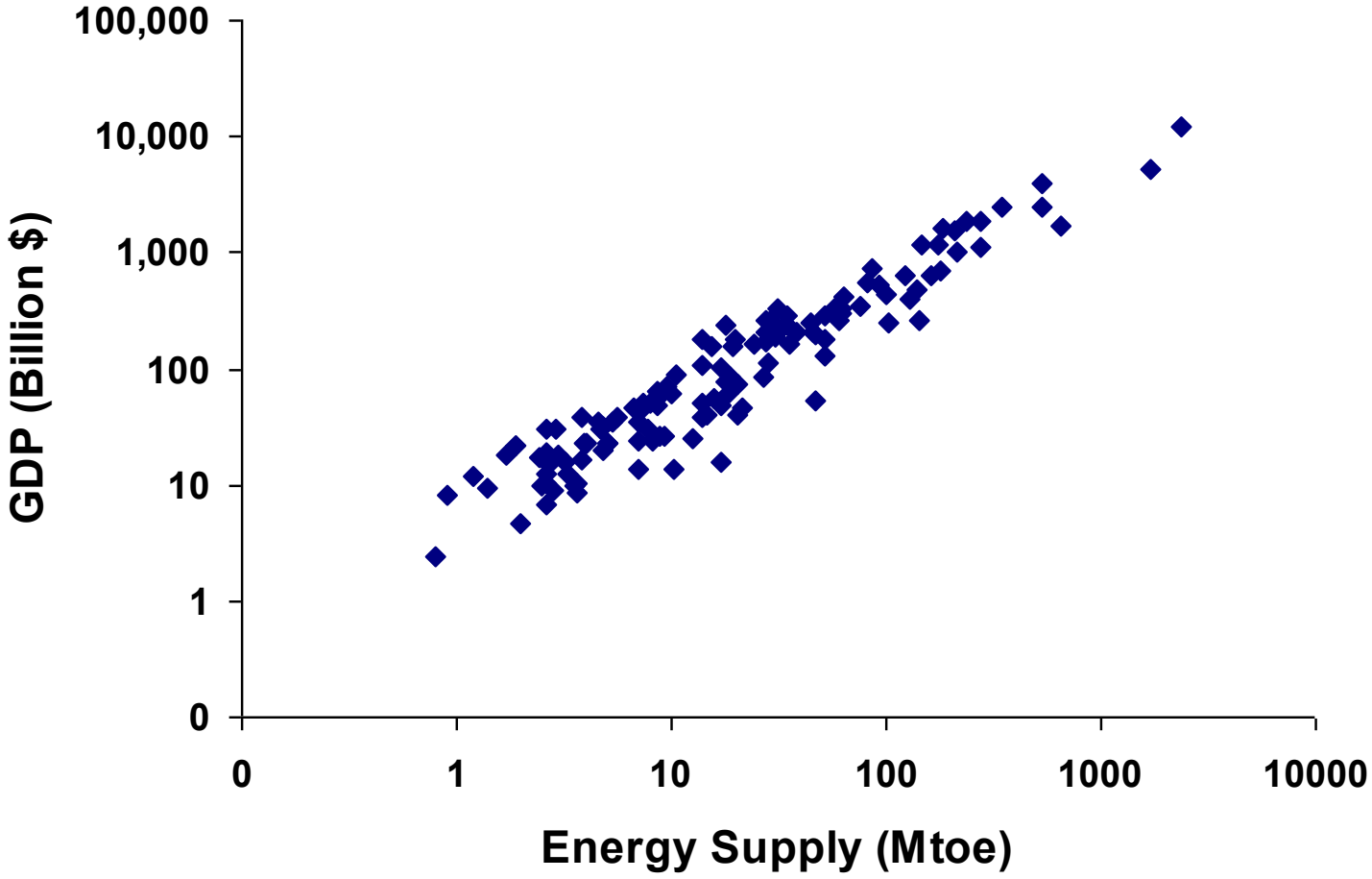
- Money?

- Energy?

GWP, Carbon Lockstep

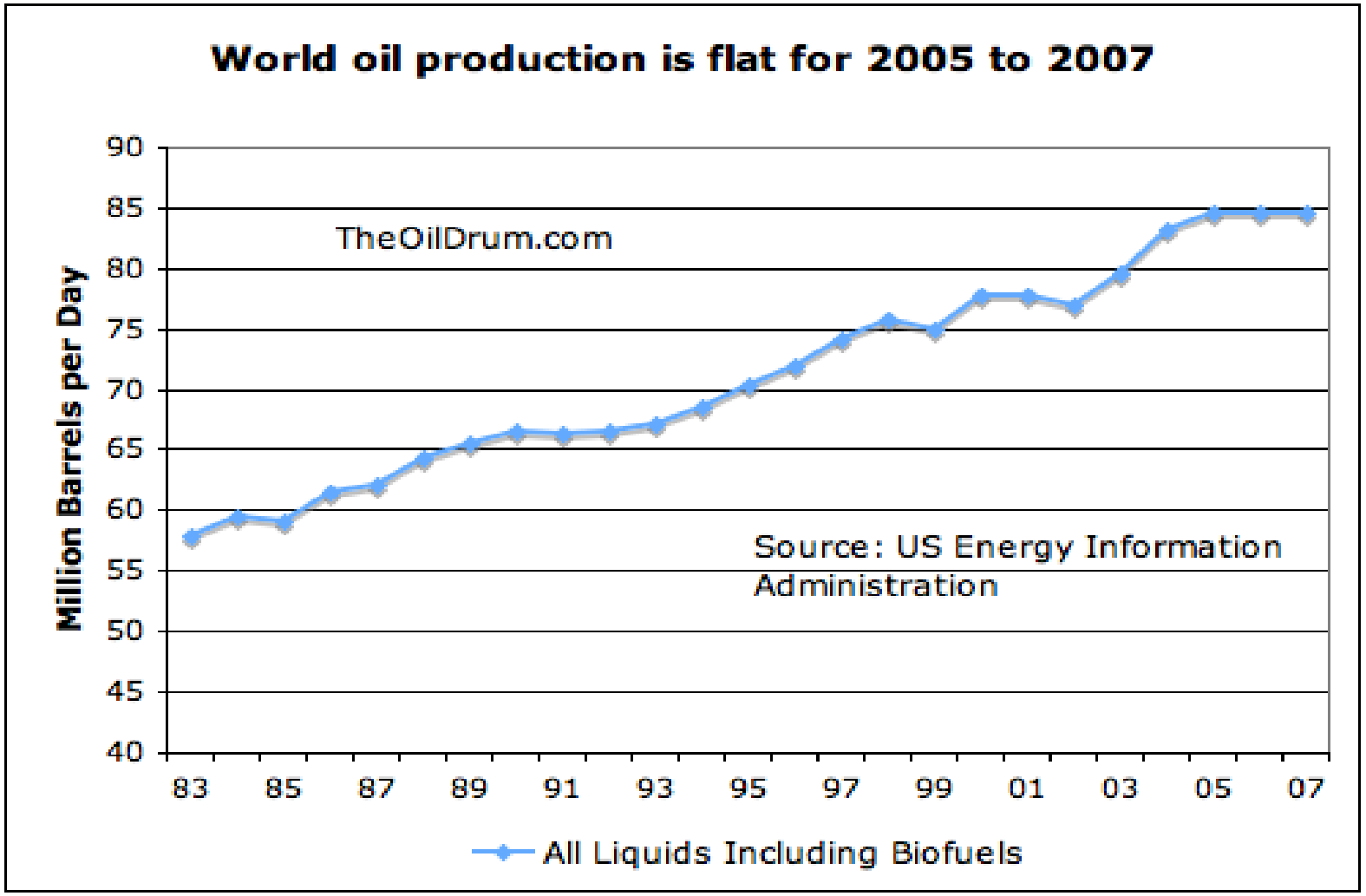


Growth depends on energy



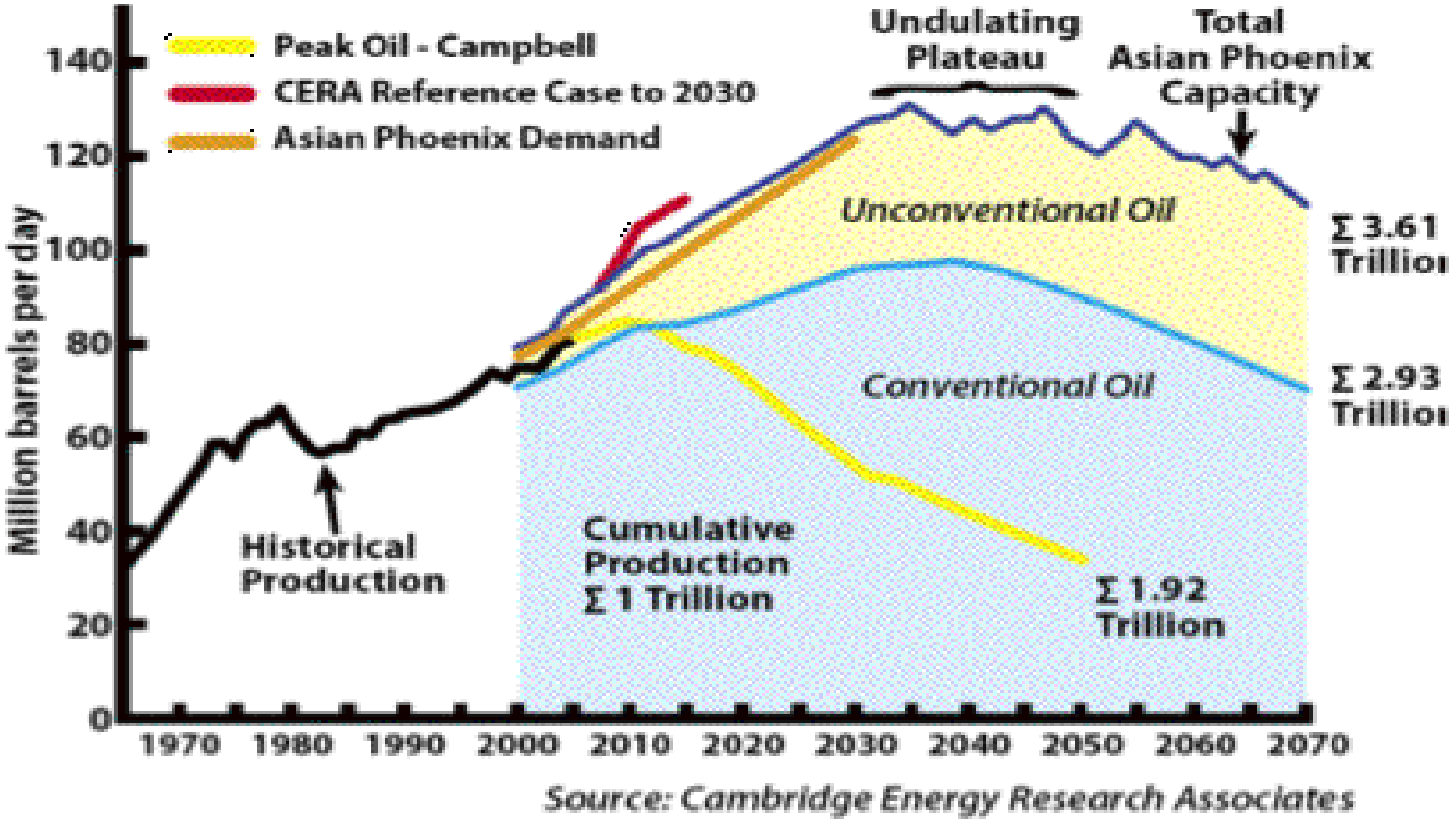
Source: Dan O'Neill, CASSE

Quantity of energy



Source: Dan O'Neill, CASSE

Alternative Scenarios for Peak Oil



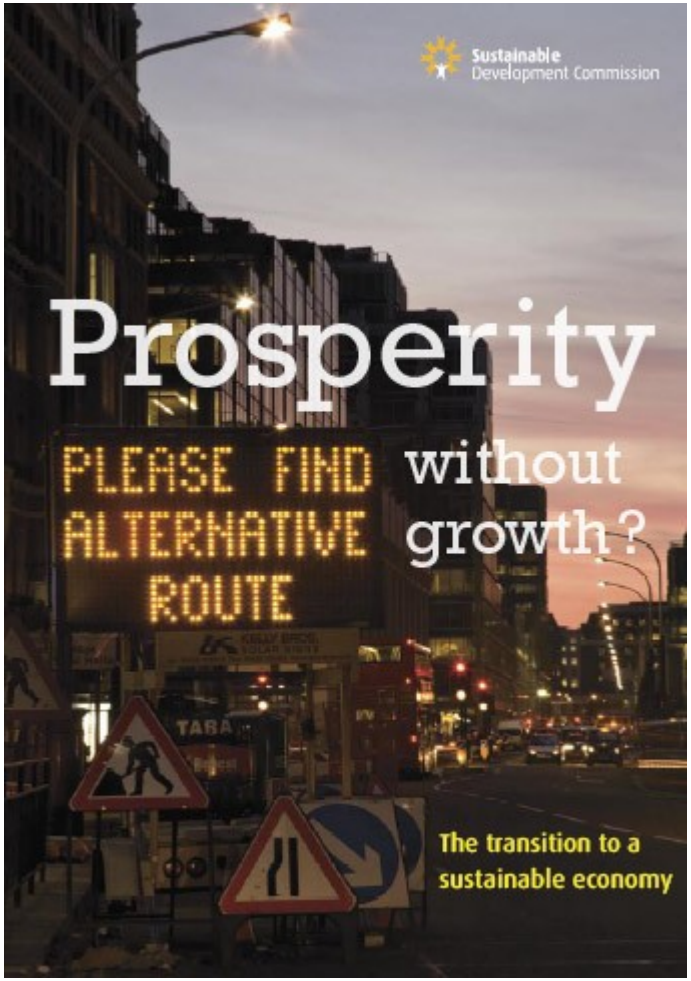
Richard Heinberg's Energy Slaves

- If we were to add together the power of all the fuel-fed machines that we rely on to light and heat our homes, transport us, and otherwise keep us in the style to which we have become accustomed, and then compare that total with the amount of power that can be generated by the human body, we would find that each American has the equivalent of over 150 'energy slaves' working for us 24 hours a day. In energy terms, each middle-class American is living a lifestyle so lavish as to make nearly any sultan or potentate in history swoon with envy.

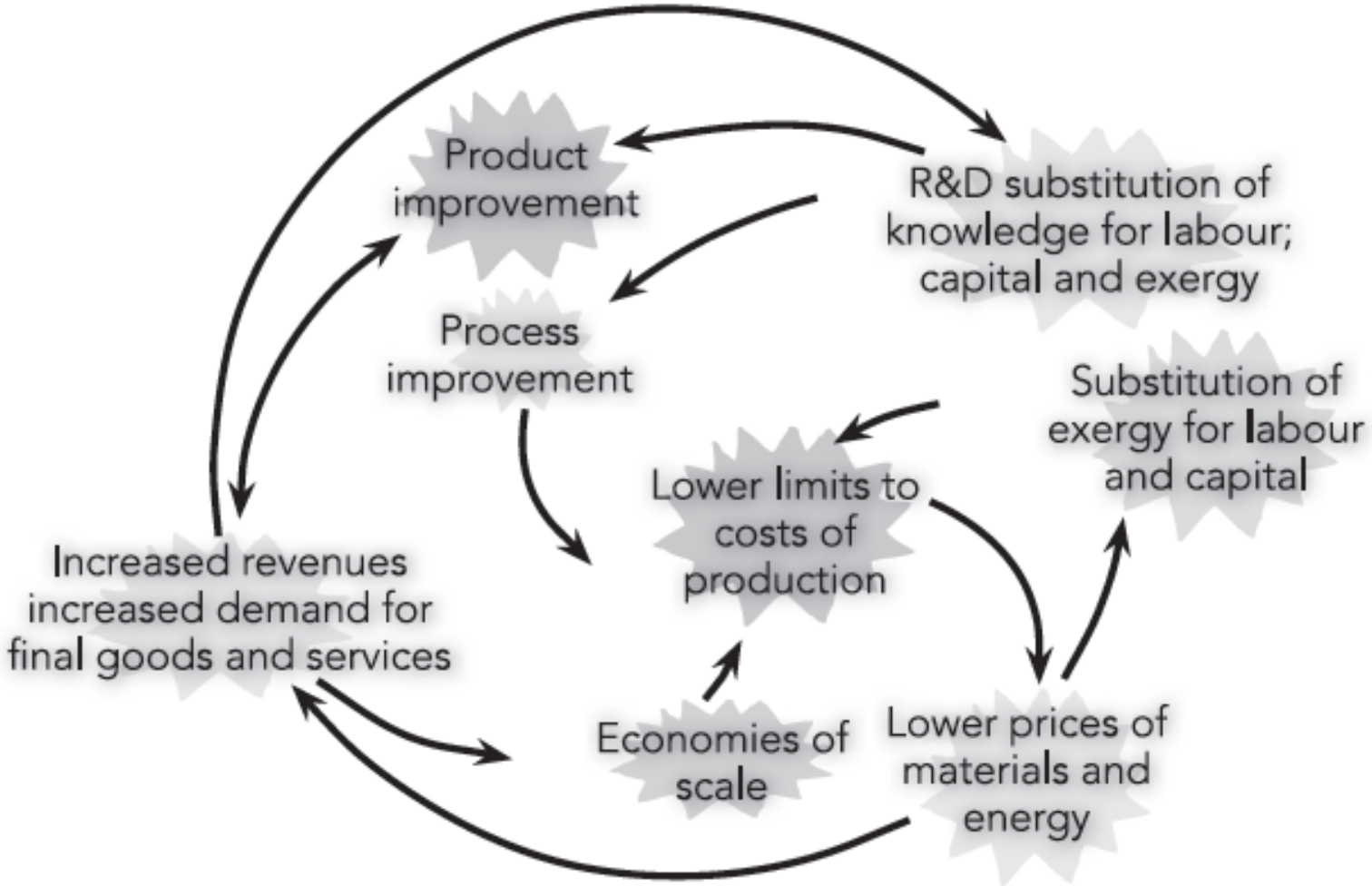
Heinberg, R. (2005), *The Party's Over: Oil, War and the Fate of Industrial Societies* (Gabriola Island, BC: New Society), pp. 30-1

The limitations of decoupling

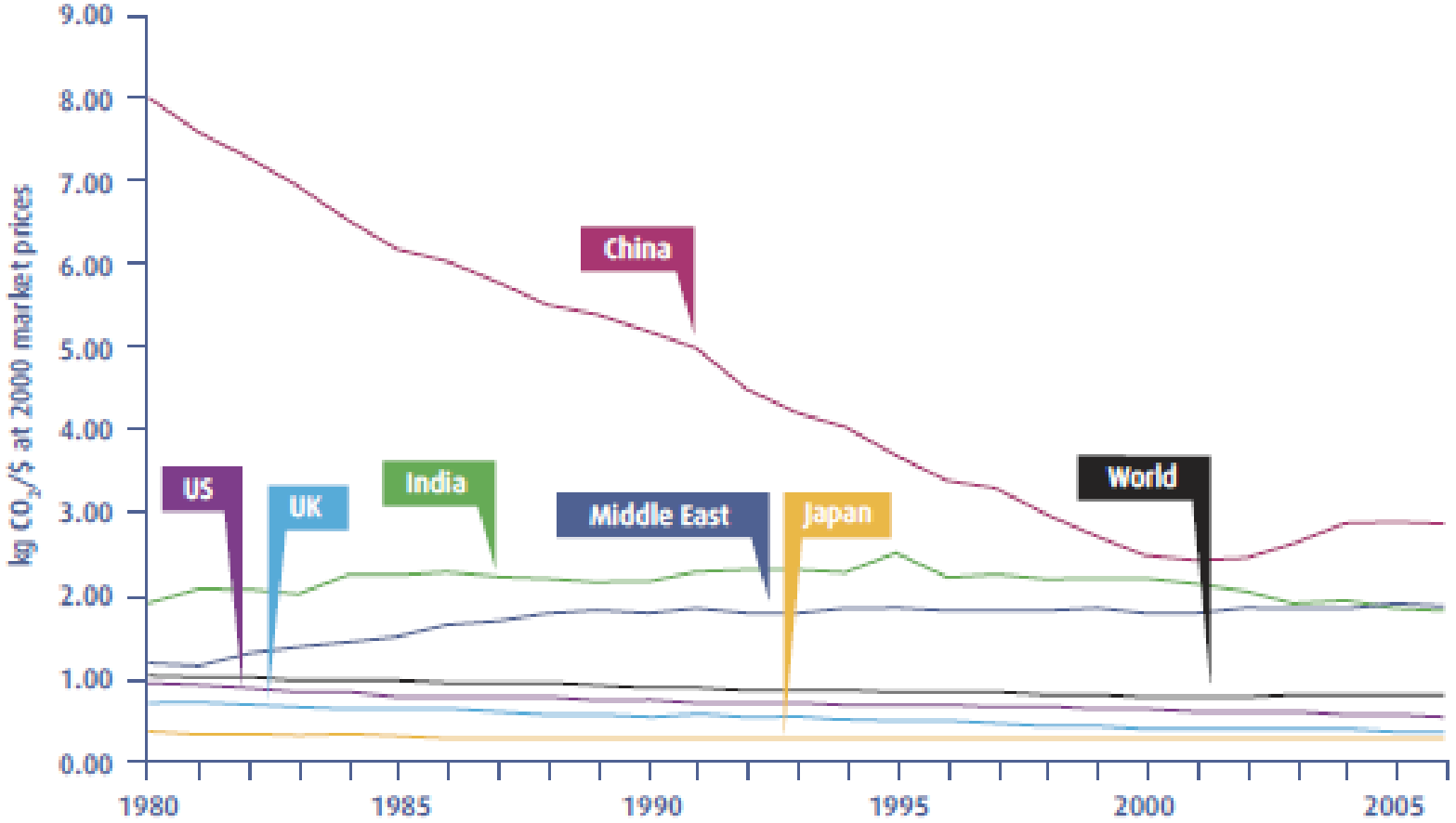
- ‘Relative vs. absolute decoupling’
- ‘It is entirely fanciful to suppose that ‘deep’ emission and resource cuts can be achieved without confronting the structure of market economies’



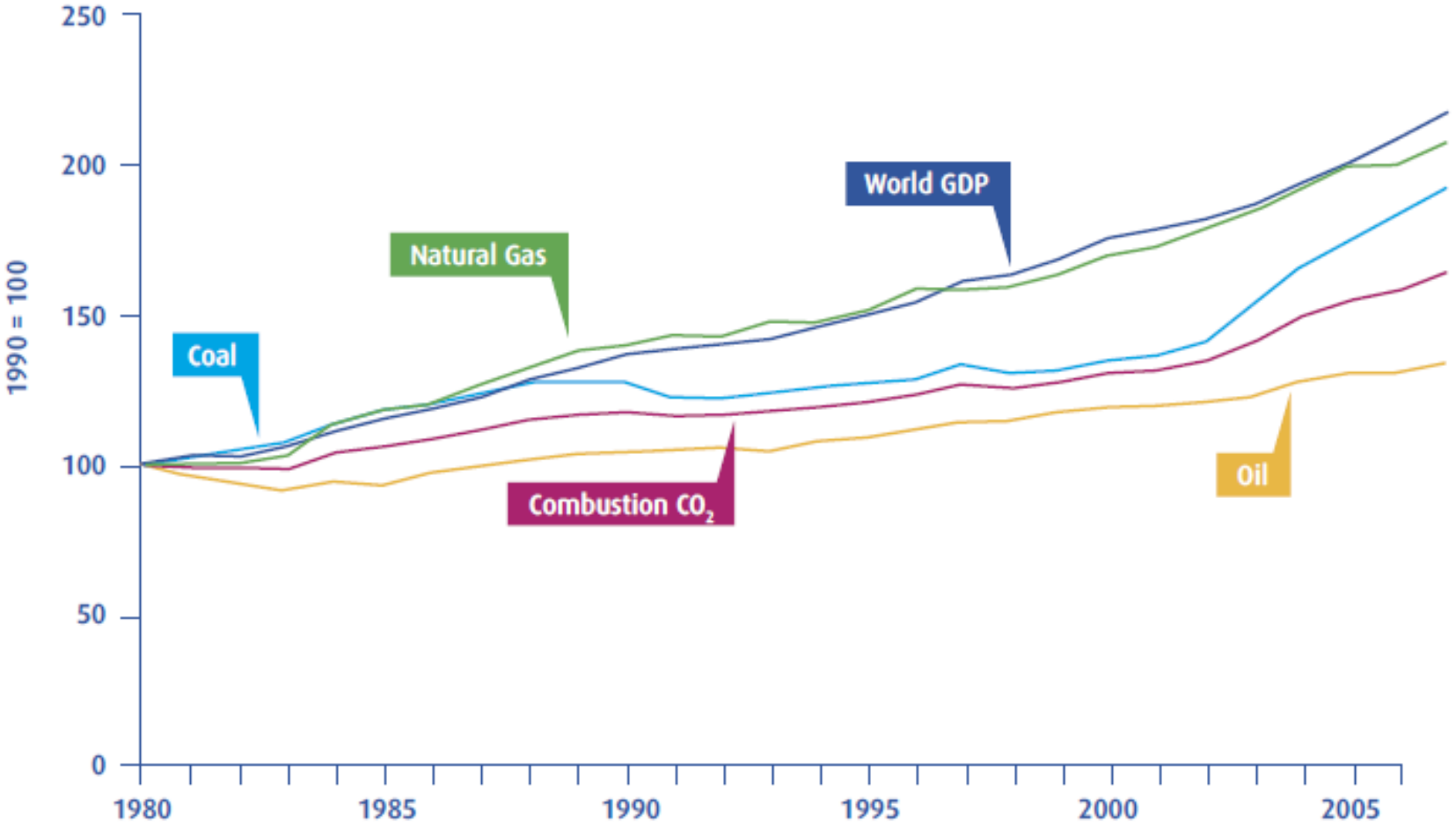
Rebound effects



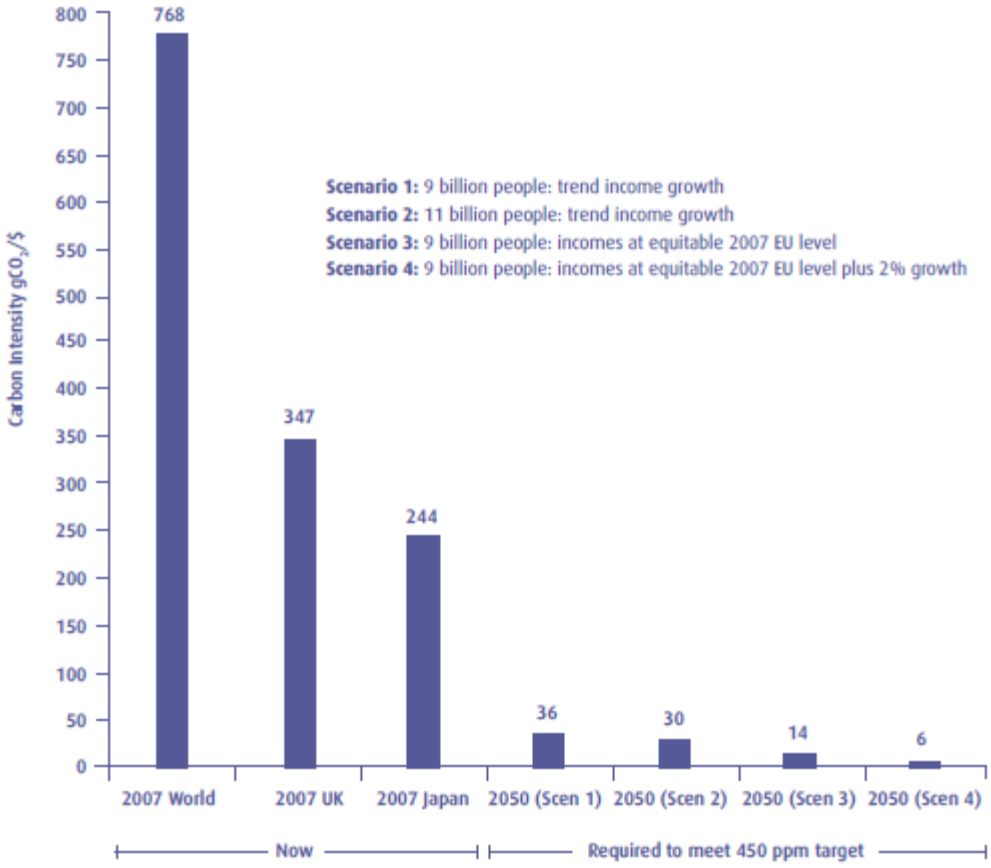
CO2 intensity of GDP across nations: 1980–2006



Trends in Fossil Fuel Consumption and Related CO2: 1980–2007



Carbon Intensities Now and Required to Meet 450 ppm Target

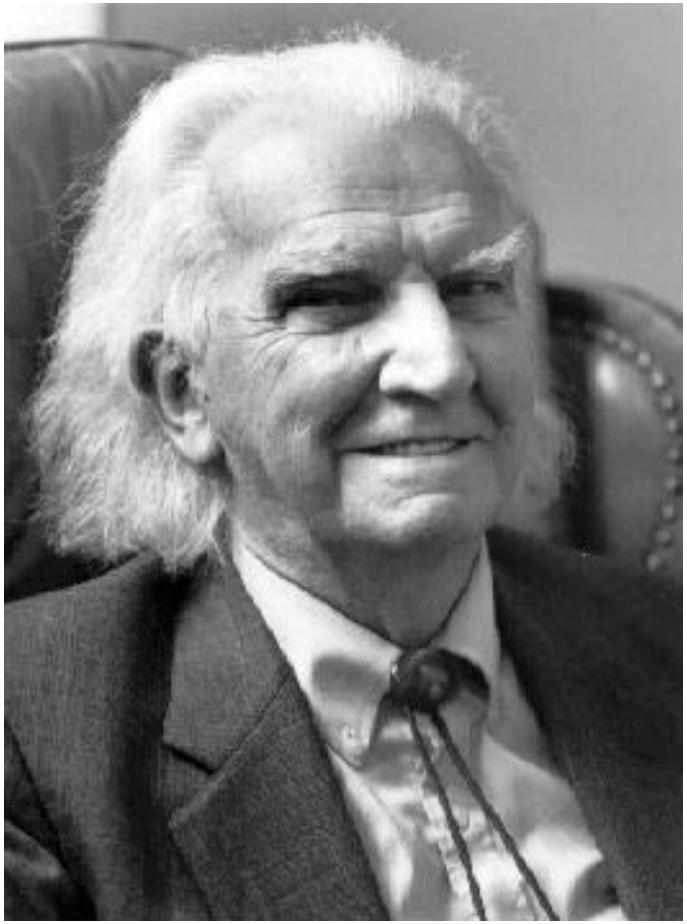


Quality of Energy

- Entropy law: second law of themodynamics: while quantity remains the same (First Law), the quality of matter/energy deteriorates gradually over time.
- Inherent tendency towards chaos or „less orderliness“
- ‘a measure of the amount of energy no longer capable of further conversions to create useful work’

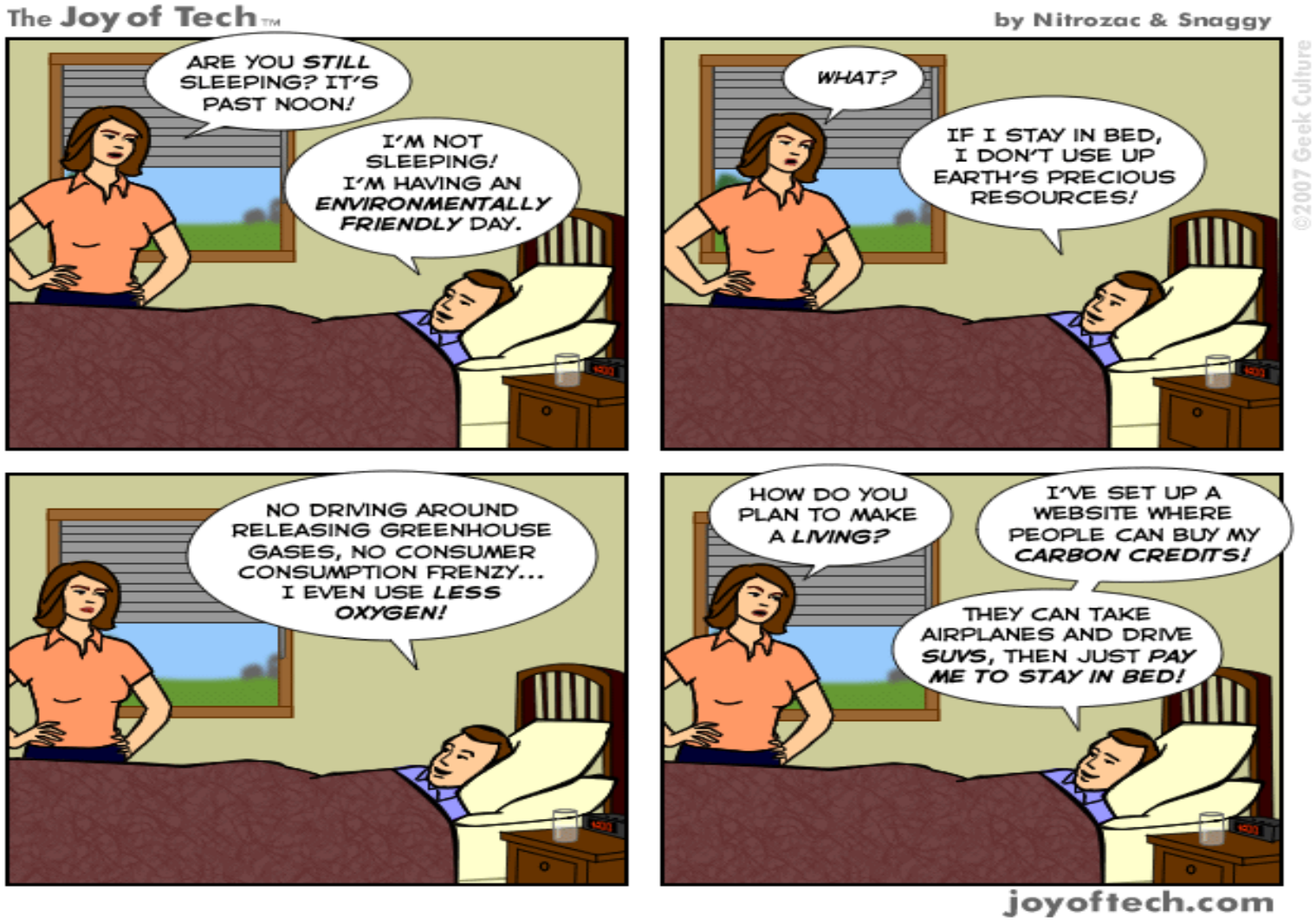
- Entropy as a „biophysical limit to growth“
- We use low-entropy inputs and create high-entropy wastes
- Only the use of a huge amount of energy can offset this process

From linear to cyclical economy



- ‘cannot turn pots back into clay’
- ‘extracts fossil fuels and ores at one end and transforms them into commodities and waste products’
- Wastes become inputs to new productive processes

The appeal of a low-energy life

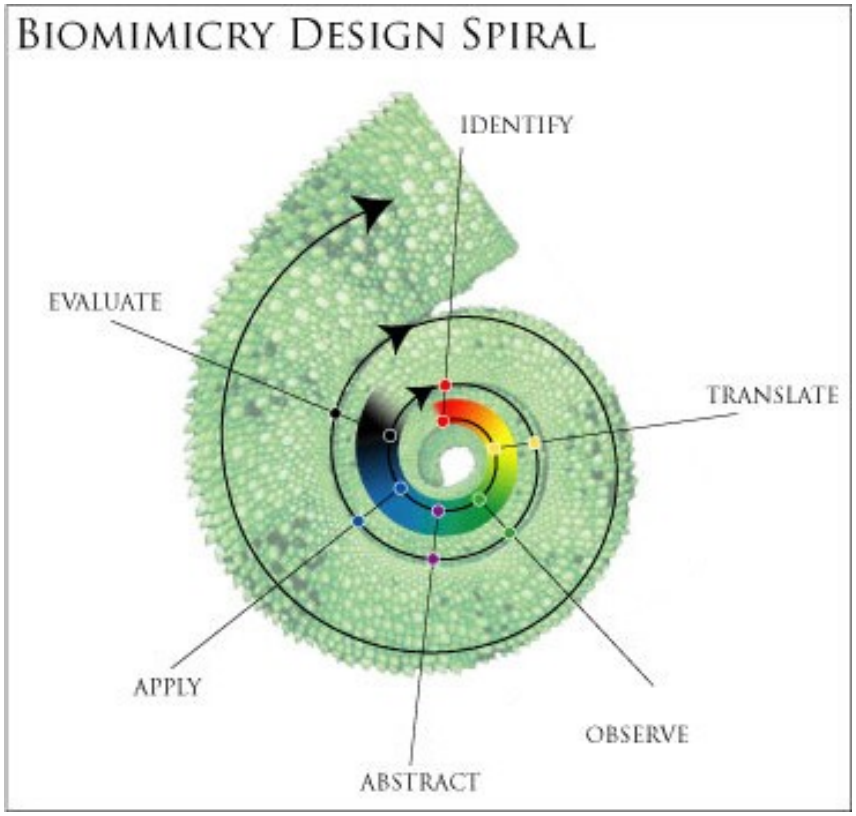


Questions

- Is the exhaustion of fossil fuels a real limit on economic activity? What alternatives are there?
- Questions about the entropy law?
- Where does the energy come from?

Industrial ecology: designing with nature in mind

- A powerful prism through which to examine the impact of industry and technology on the biophysical environment
- Examines local, regional and global uses and flows of materials and energy in products, processes, industrial sectors and economies



Natural metabolism

- Porritt encourages businesses to 'match the metabolism of the natural world'--biomimicry

- 'Buildings that, like trees, produce more energy than they consume and purify their own waste water'

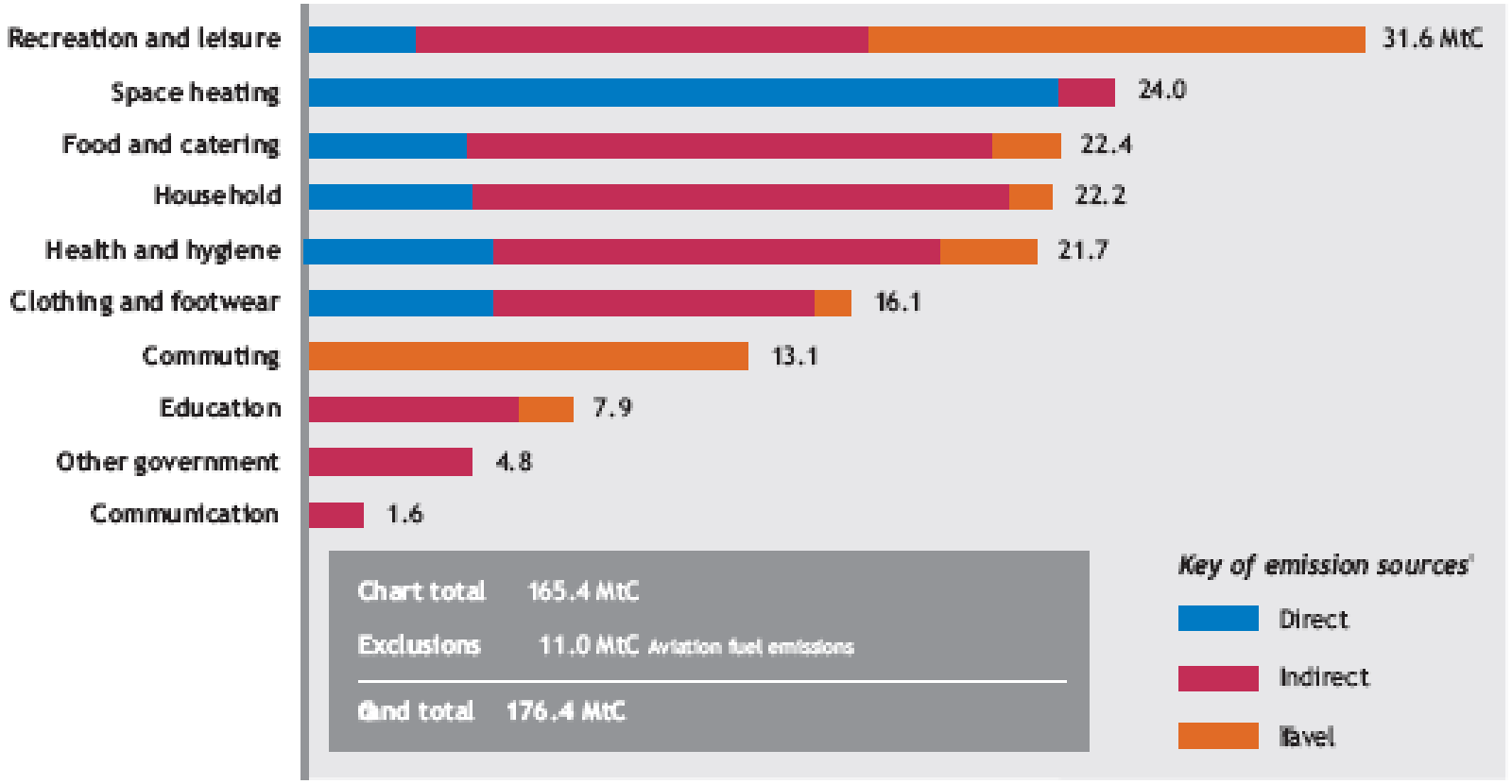
•'Products that, when their useful life is over, do not become useless waste but can be tossed on to the ground to decompose and become food for plants and animals and nutrients for soil'

Examples

- Novacem: render that absorbs rather than produces carbon dioxide
- Biochar, which converts plant material into charcoal rather than decomposing and producing methane
- A rush-seated chair rather than a plastic chair—or plastic that can rapidly biodegrade or be turned into fuel?

Contract	Expand
Intensive farming	Organic farming, community farms
Waste disposal, new production	Recycling, reuse, mending
Construction based on concrete and materials with high levels of embodied energy	Sustainable construction using local materials that fix carbon dioxide, e.g. wood, straw, hemp etc.
Crop-based biofuels	Biofuels made from recycled waste oils

Remember to include all sources of carbon

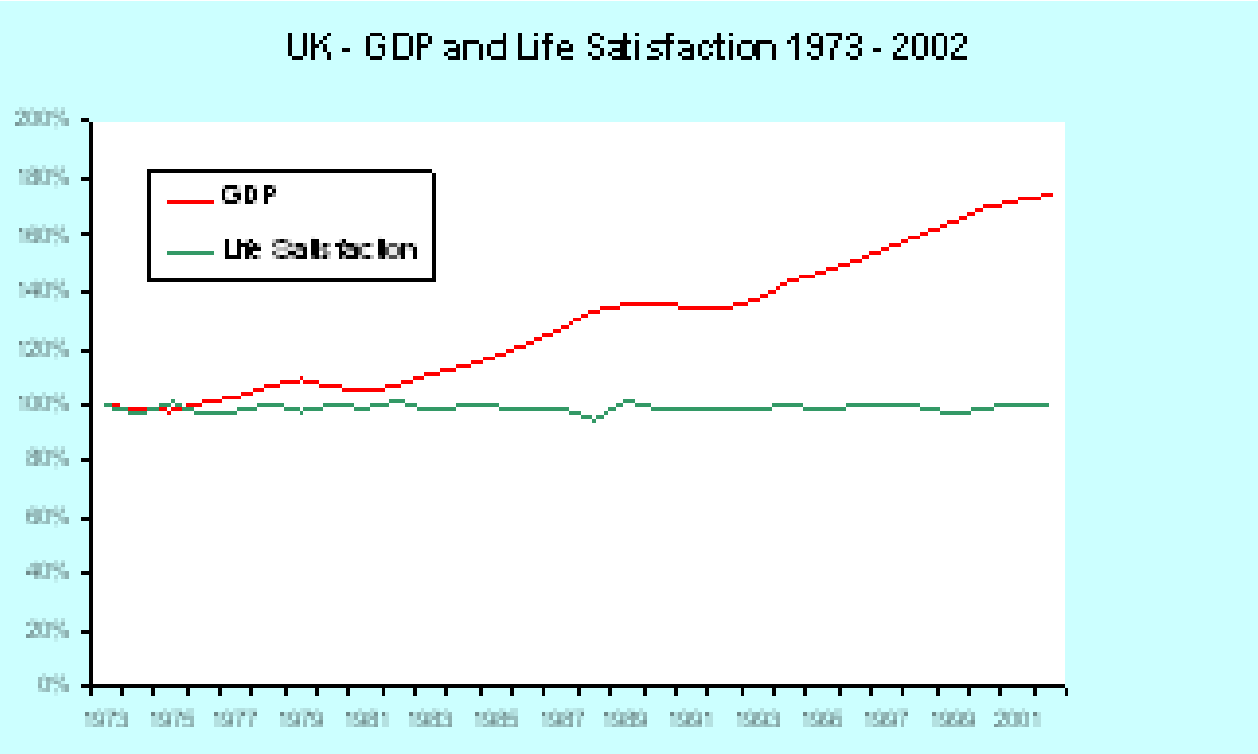


Source: Carbon Trust, 2006.

Remember to ask what the energy achieves

GDP and Life Satisfaction

A Challenge to the Political Status Quo



An economy based on renewable resources carefully managed for sustained yield and long-term productivity of all its resources can provide useful, satisfying work and richly rewarding life-styles for all its participants. However, it simply cannot provide support for enormous pyramided capital structures and huge overheads, large pay differentials, windfall returns on investments, and capital gains to investors.

Hazel Henderson, *The Politics of the Solar Age*, 1988

Principles to guide energy policy

- Energy is fundamental to life and to the economy
- While energy can be neither created nor destroyed, it flows from "higher" to "lower" forms – the entropy law
- Living creatures survive by exploiting this flow
- All energy is ultimately derived from the sun, which is a flow of energy
- Fossil fuels represent a stock of energy (or capital) and so should be treated differently
- Economic development has moved us from using flow energy to stock energy; we need to reverse this trend

Political principles

- We should reduce our energy demand to a minimum
- What energy we still require should be produced through renewable sources
- The energy supply systém is a public good and so should be under political control
- A profit-driven systém will lead to greater consumption
- Distribution and political control of energy should be organised as locally as possible

Policies for conservation

- Building regulations to include embodied energy of building materials, energy used in construction, energy consumption in use, on-site energy generation and use of heat distribution networks.
- Increased use of combined heat-and-power schemes: shared use of energy
- Energy rationing?
- Taxes on fossil fuels?
- How to protect those on lower incomes?

Renewable energy

- Use the market: feed-in tariff
- Avoid volatility: ensure fixed upward trajectory for fossil-fuel prices
- Provide economic incentives: fuel-duty escalator

Bedzed Development

- Beddington Zero Energy Development is the UK's largest mixed use sustainable community. It was designed to create a thriving community in which ordinary people could enjoy a high quality of life, while living within their fair share of the Earth's resources.
- BedZED was initiated by BioRegional and BDa ZEDfactory, and developed by the Peabody Trust. It was completed and occupied in 2002. The community comprises 50% housing for sale, 25% key worker shared ownership and 25% social housing for rent.

Design principles

- solves problems such as heating and water usage;
- help people make sustainable choices such as walking rather than driving
- the community have created their own facilities and groups to improve quality of life and reduce their environmental impact.

Energy improvements

- **Reducing energy demand**
- • *81% reduction in energy use for heating* ***5.2kWh/person/day***
- • *45% reduction in electricity use* ***3.4 kWh/person/day***
- BedZED homes are kept at comfortable temperatures with fresh air
- using simple passive architectural techniques rather than high tech
- solutions. Energy efficient appliances, good daylighting and visible
- meters have led to behaviour changes.
- **Zero carbon energy provision**
- • *Local waste wood CHP (efficient and zero carbon) and solar PV*
- Solar PV panels provide 20% of the electrical demand. The combined
- heat and power plant (CHP) delivers the remaining electricity and
- all the hot water through a district heating system, using local waste
- wood from our Croydon TreeStation. The company operating the
- CHP ceased trading in 2005, so the CHP isn't currently in use.

Indirect energy gains

- *64% reduction in car mileage* **2,318km/year**
- *58% reduction in water use* **72 litres/person/day**
- *60% waste recycled including composting*
- *86% of residents buy organic food*