

Balancing population and resources

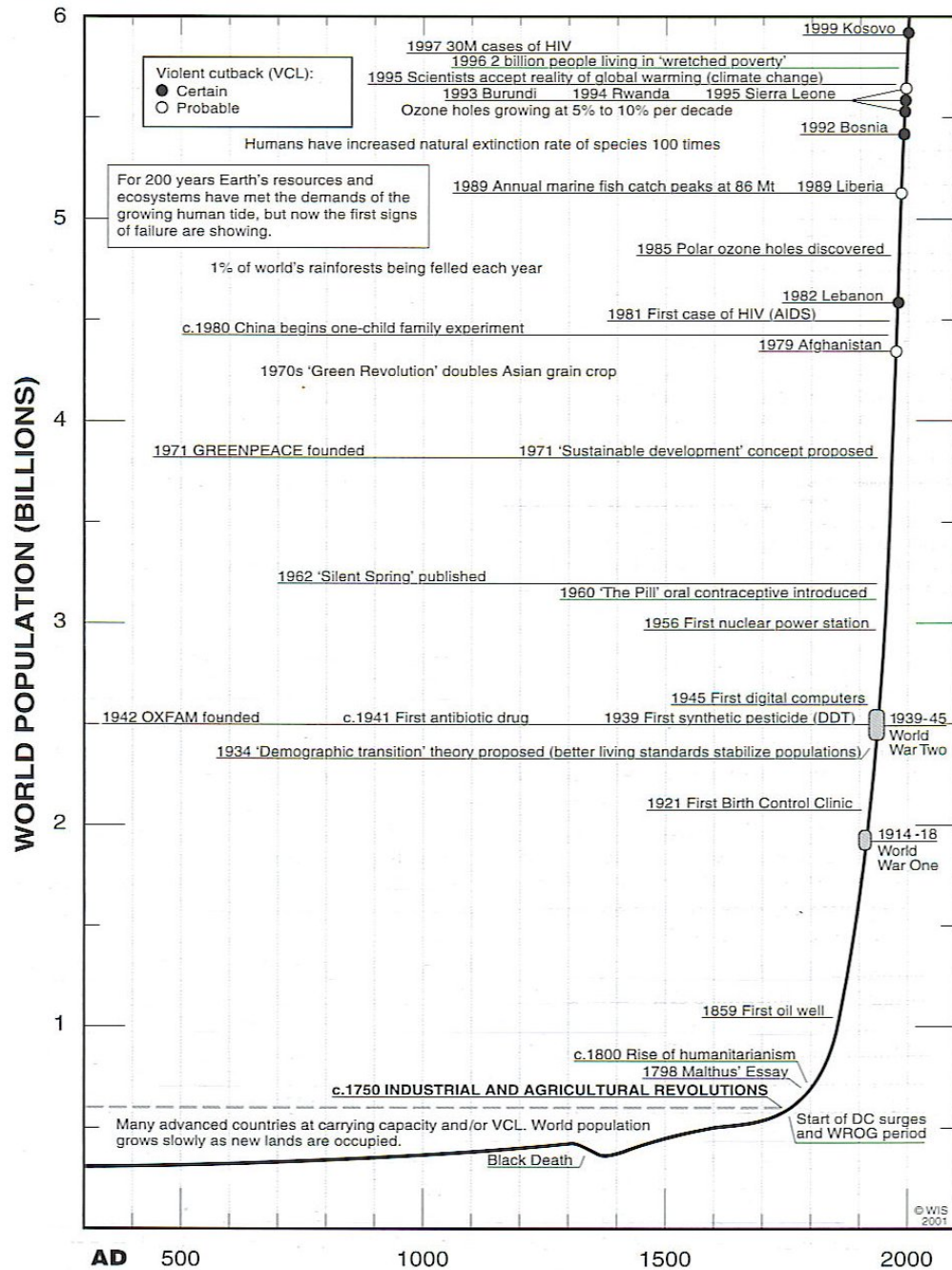
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WORLD POPULATION GROWTH

Key events on the graph



Population size at 14/10/06 – about midday

- World 6,555,500
- Australia 20,681,300

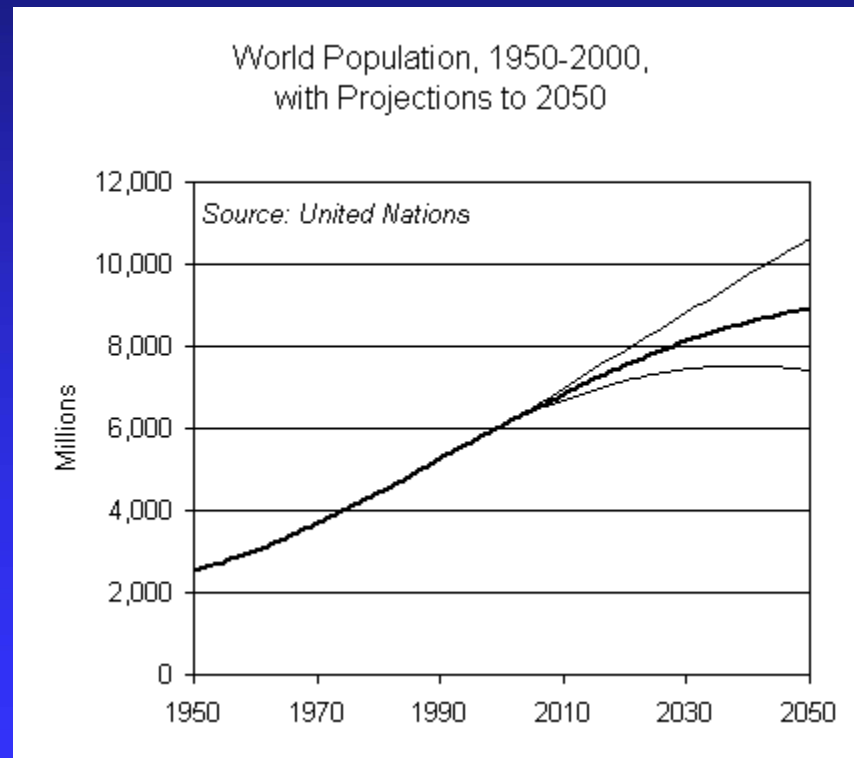
Annual world growth

76 million

3 million in industrialised world

73 million in developing world

Projections



CARRYING CAPACITY

= maximum *permanently*
supportable load

Human carrying capacity can be raised by human ingenuity e.g.

- 2m BP: tools
- 0.5m BP: fire
- 35,000 BP: spear-thrower, bow and arrow
- 10,000 BP: horticulture
- 6,000 BP: metallurgy (bronze)
- 5,000 BP: plough, iron tools
- 1750 AD: fossil-fuelled machinery
- 1865: antiseptic surgery
- 1940s: penicillin etc

Population/economic activity

Economic activity	Years	Population in millions
Hunter gatherer	35,000 BP	3
Horticultural	10,000 BP	8
	6,000 BP	86
Agrarian	1 AD	300
	1400 AD	336
Industrial	1800	969
	2006	6,550

...however...

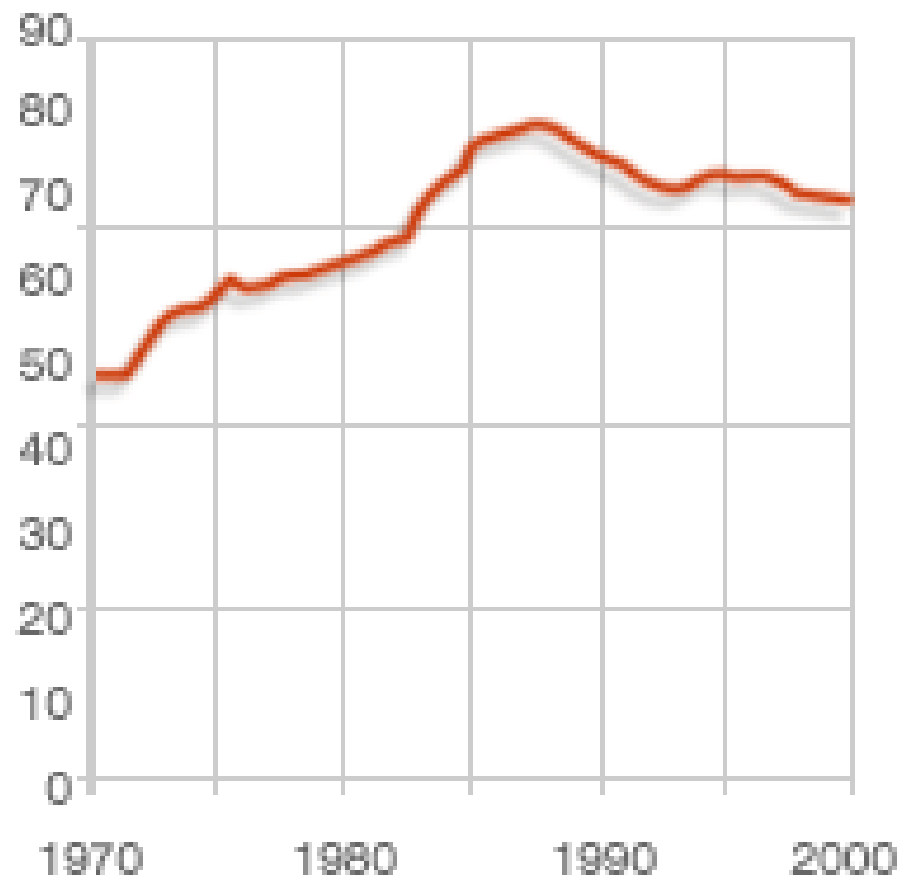
- these technological breakthroughs that enlarged the human carrying capacity were at the expense of other species and ecosystems...

Millennium Ecosystem Assessment 2005

- Of 24 evaluated ecosystems, 15 are being damaged
- About 20% coral reefs lost in 20 years; about 20% degraded
- Nutrient pollution has led to eutrophication of waters and to coastal dead zones
- Species extinction now 100-1000 times the background rate.

MARINE FISH HARVEST

Million tons



SOURCE: Millennium
Ecosystem Assessment

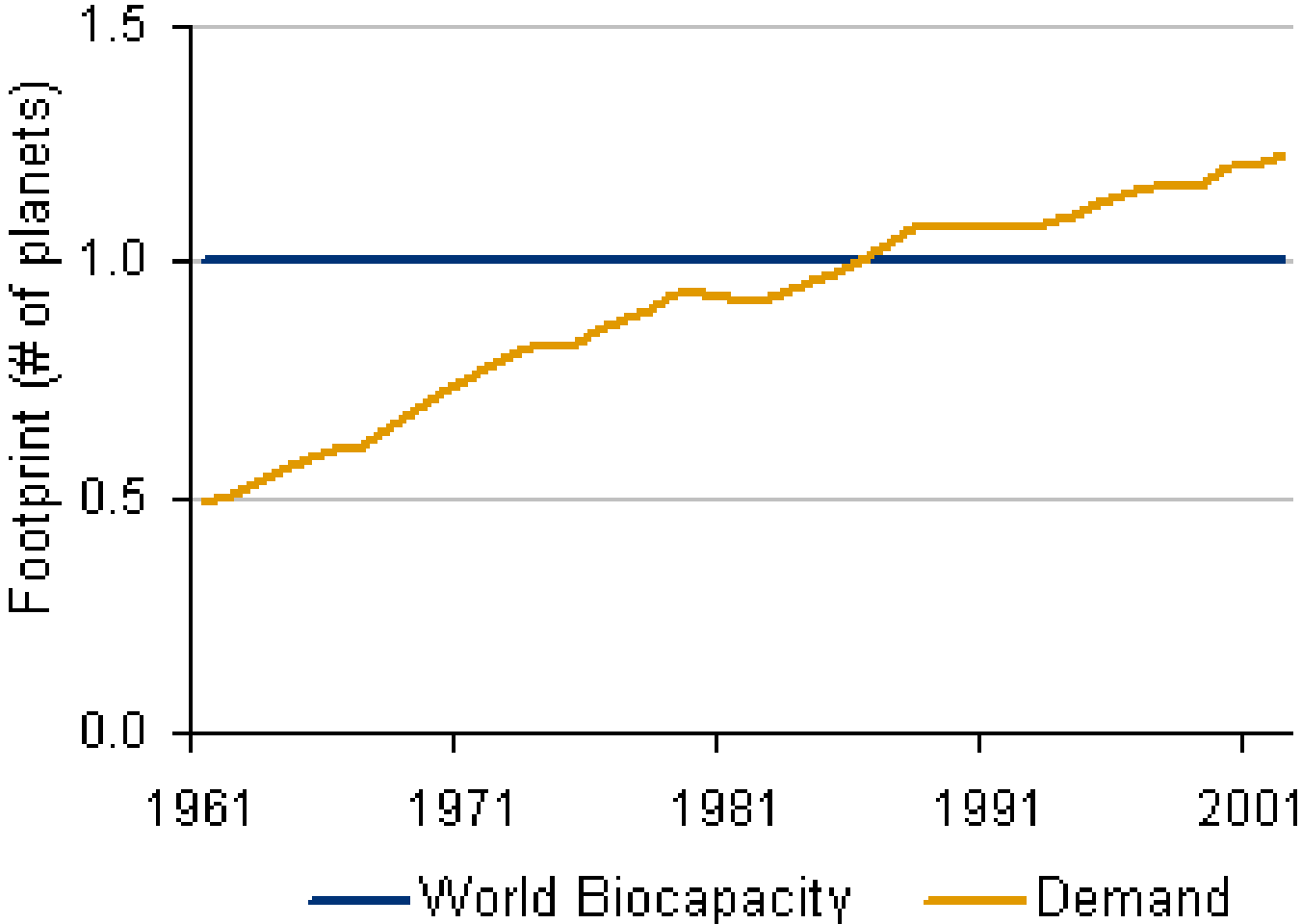
A society *may* collapse due to damage to its environment e.g.

- Deforestation and habitat loss
- Soil problems e.g. erosion
- Water management problems
- Overhunting
- Overfishing
- Effects of introduced species
- Human population growth
- Increased per capita impact of people e.g. resource use, bad technologies

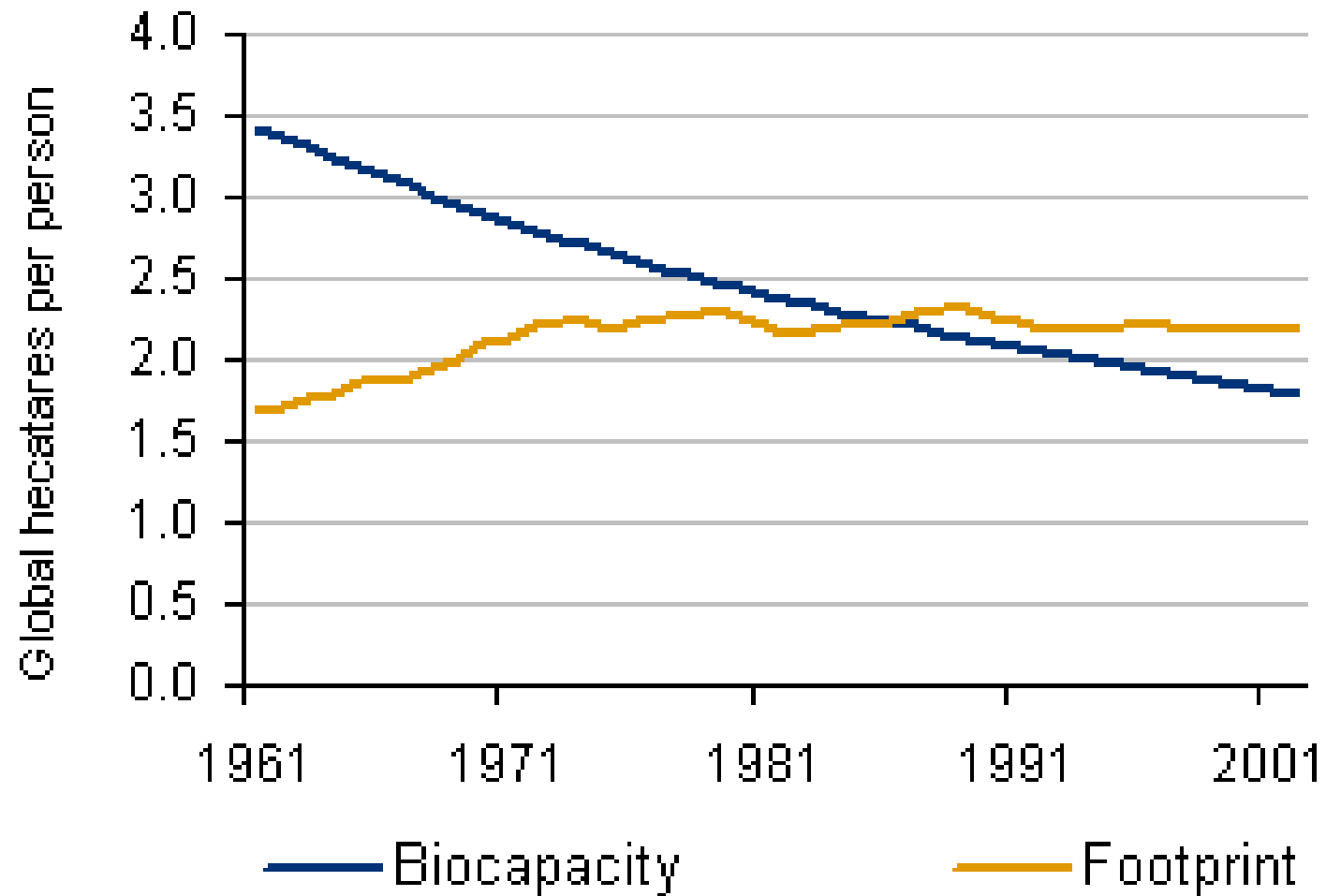
More recent reasons why society may collapse...

- Human-induced climate change
- Build-up of toxic chemicals
- Energy shortages (notably conventional oil)
- Full human utilisation of the Earth's photosynthetic capacity

Demand vs. Biocapacity



Footprint and Biocapacity



Liebig's Law

- Carrying capacity is always limited by whatever resource is in least supply

In Australia, what resource is in least supply?

■ Oil?

■ Water?



Water?

- UK Met Office predicts a “net overall global drying trend” for 21st century – the greater the global warming, the greater the trend
- For Australia, southern half of the continent will be drier and the northern half wetter

Implications for food production

- Food production increasing but not at pace needed to keep up with population growth
- World stocks shrunk from 116 to 57 days
- Food production will be adversely affected by climate change, higher fuel prices and competition for land (biofuels, urbanisation)

How do we stabilise population?

- Meet unmet need for contraception (320 million couples have no access to modern information and methods)
- Achieve new target under Millennium Development Goal no.5 for universal access to reproductive health by 2015

What is the optimum population?

- Globally: 2 billion

(P and A Ehrlich, *New Scientist*, 30/9/06)

- Australia:

- 10 million at current standard of living

- 21 million if you halve standard of living

- ...but probably less (6 million?)

How do we achieve a lower level without excessive ageing?

- Need to have lower than replacement fertility (2.1) to ultimately achieve reduction
- BUT! need to keep fertility above 1.5 to stop distortion of the age structure
- High migration no panacea for ageing
- Australia may be pressured to accept many environmental refugees

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