

LECTURE 2:

MAY 6, 2014

ENVIRONMENT, RESOURCES & SOCIETY

THE GLOBAL PICTURE

Text Reference: Dearden and Mitchell (2012), Ch. 1, pp.

Geography/Environmental Studies 1120
T. Randall, Lakehead University, SA 2014

Outline

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Source: Dearden and Mitchell (2012)

- Upcoming:
 - ▣ May 7 & 8: ch. 2 (pp. 48→ Energy Flows and Ecosystems)

- Today:
 - ▣ Recall: last class (brief precursor on “sustainable development”, sustainable “livelihoods”, and “resilience”);
 - ▣ Increasing human pressures presenting challenges for environmental management;
 - ▣ Canada’s progress on sustainable development
 - ▣ **Introduction to Library Research Paper (topic, searching skills);**

Preamble

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- Like it or not, Earth is changing:
 - ▣ Unprecedented rates of species extinction
 - ▣ Oceans and seas not the infinite supply of fish they were once thought of
 - ▣ Changes to atmospheric compositions → thus, climate....
- The **Millennium Ecosystem Assessment** (2001 to 2005) aimed to:
 - ▣ Assess the consequences of ecosystem change for humanity;
 - ▣ Establish a basis for actions needed to enhance the conservation and sustainable use of ecosystems;
 - ▣ ~1,360 experts from 95 countries involved in the assessment



Findings: Millennium Ecosystem Assessment

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- More land converted to cropland in 30 years (1950 to 1980) than in the 150 years (1700 to 1850)
- In last 3 decades of 20th Century:
 - ▣ ~20% of world's coral reefs lost, plus another ~20% degraded;
 - ▣ ~35% of mangrove areas lost;
- Atmospheric changes
 - ▣ CO₂ increased 32% between 1750 to 2003 (280 to 376 ppm)
- Numbers of species declining
 - ▣ Extinction rates 1,000 times higher than natural background due to human influences over past few hundred years;
 - ▣ Decline of genetic diversity
- Dramatic increase in population (1960 to 2000)
 - ▣ With associated growth in demand for resources & land;

See Box 1.2, p.17 in Dearden and Mitchell (2012) for more details

Population – ‘exponential growth ...

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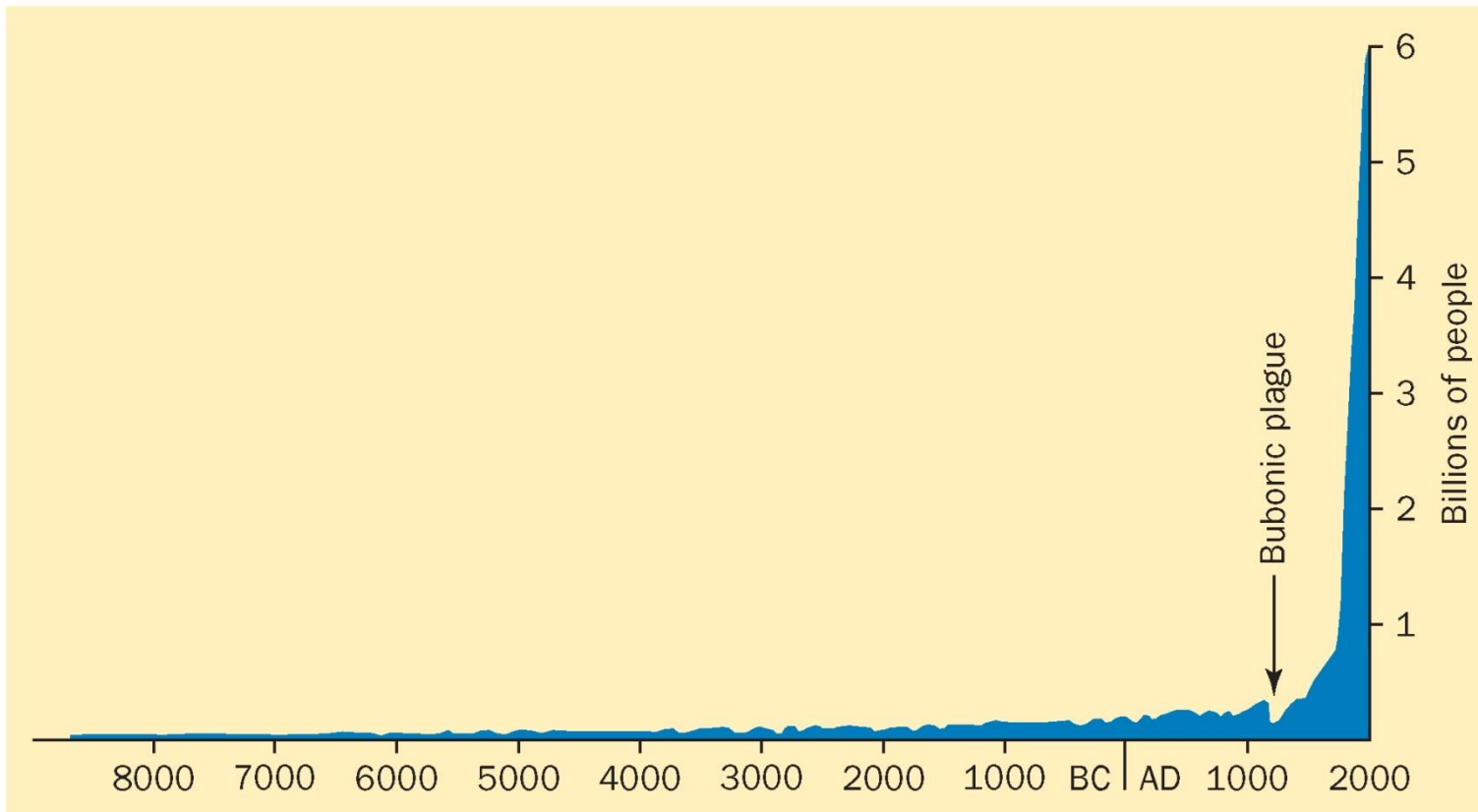


Figure 1.2 | The growth of human population over time.

Source: Dearden and Mitchell (2012)

- 7 billion in Oct 2011;
- Forecast for 9.3 billion for 2050; 10.1 billion by 2100

Population forecasts

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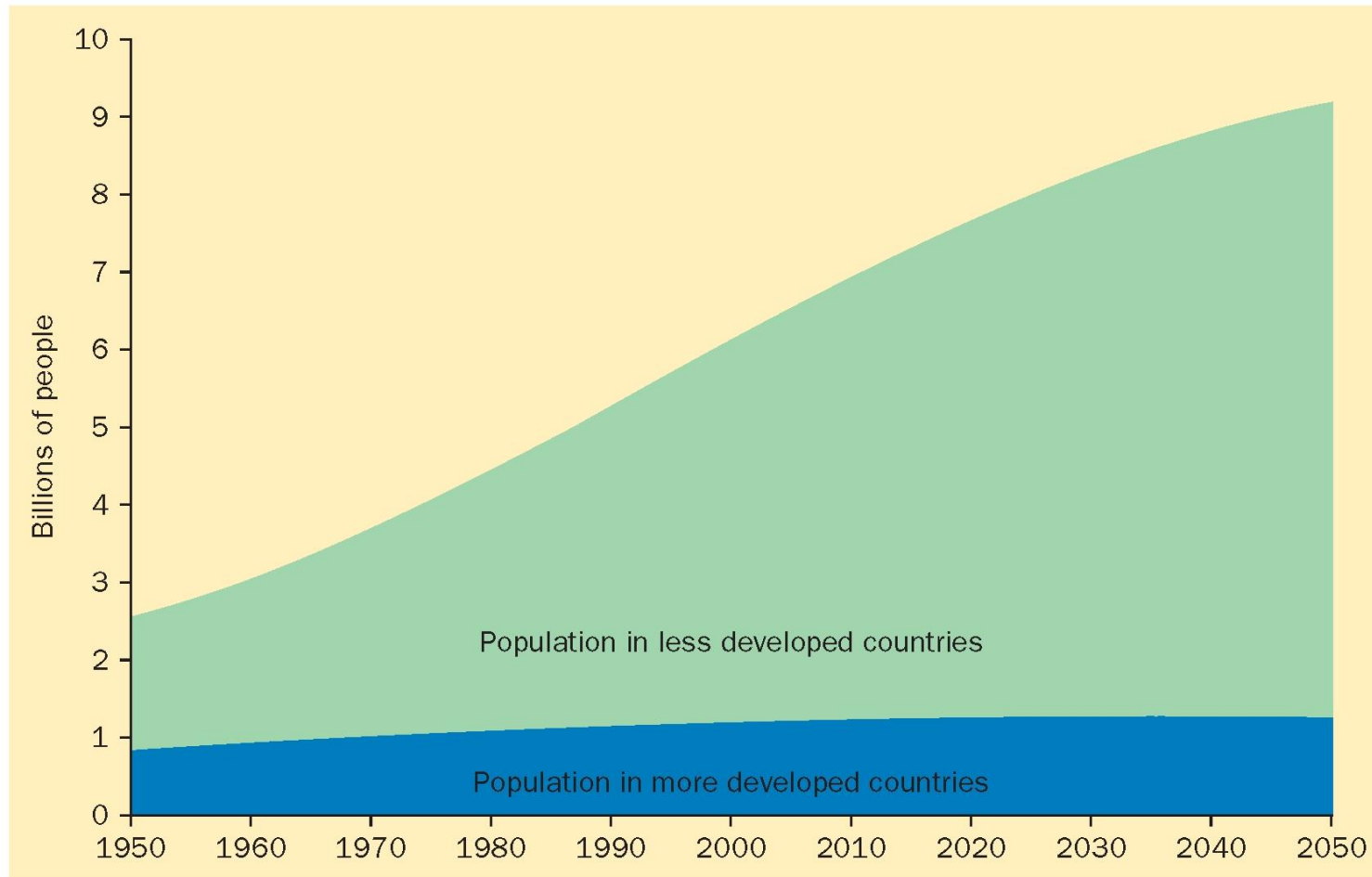


Figure 1.3 | World population growth and projections, 1950–2050. Source: UN Population Division (2007b).

Source: Dearden and Mitchell (2012)

Population age structure

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- Developing vs developed country profiles;
- Dependents (young, <15; and elderly >65) on working population;
- (top) high birth rates; low life expectancy;
- (bottom) low birth rates; high life expectancy

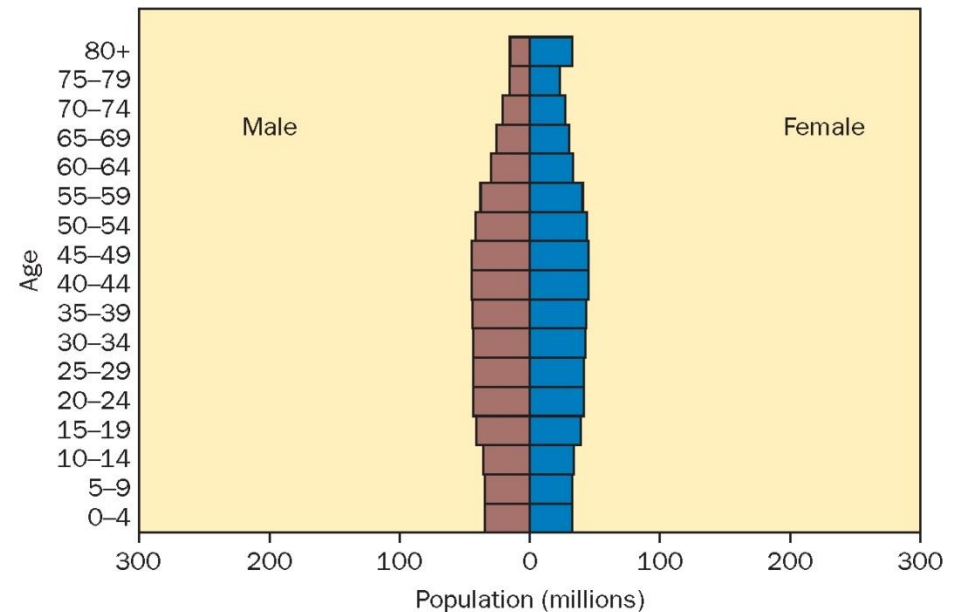
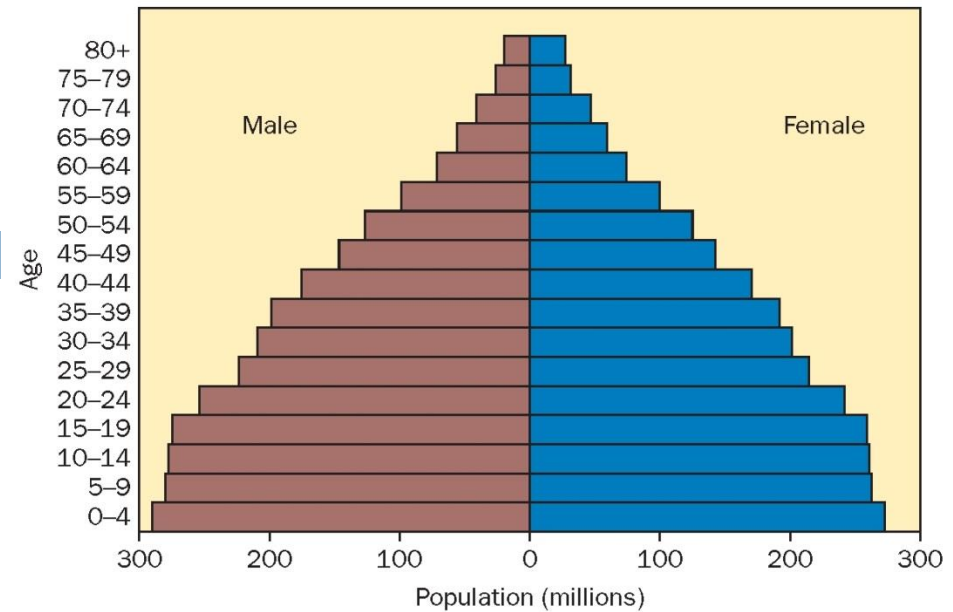
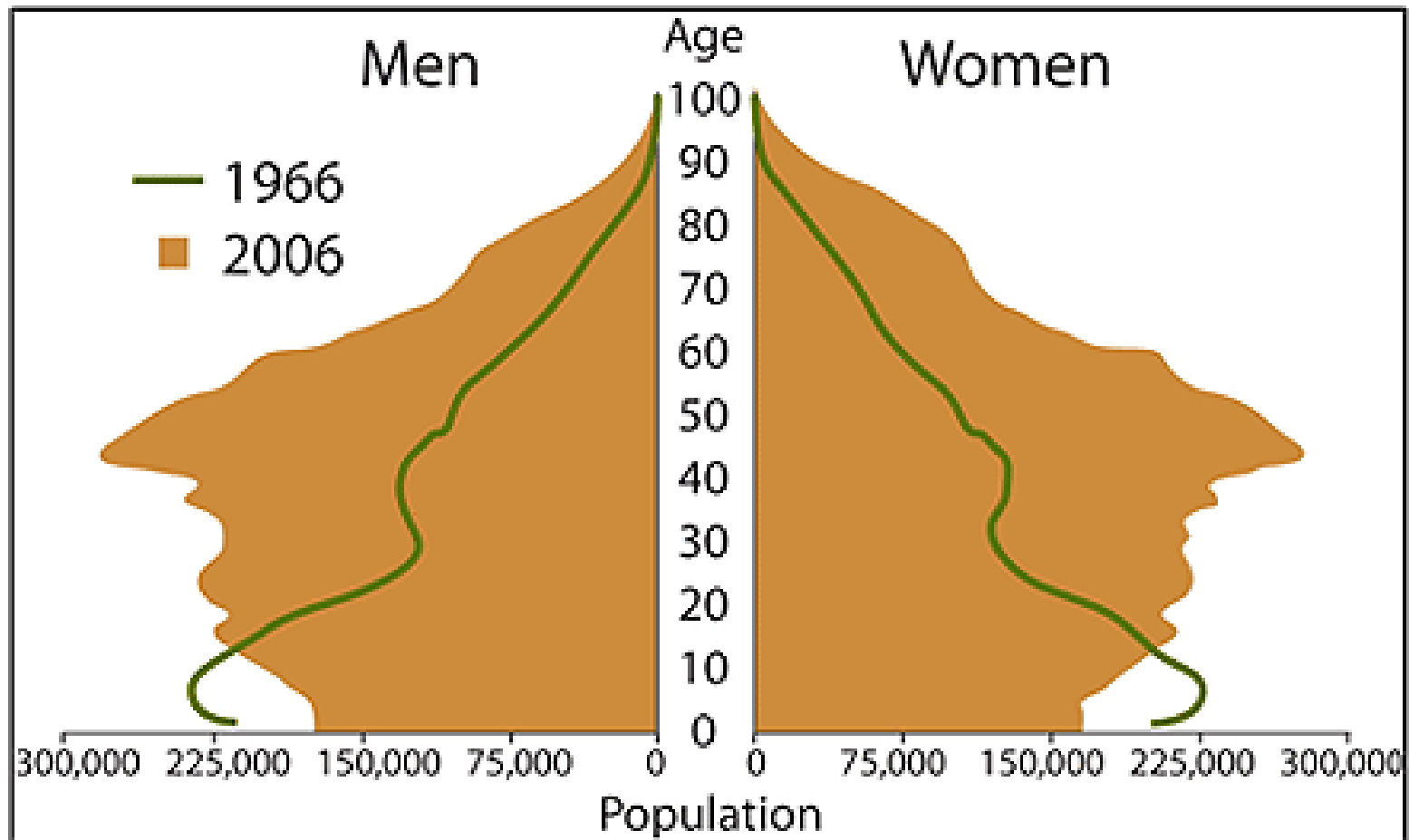


Figure 1.4 | Population pyramids for developing (top) and developed (bottom) countries. Source: UN Population Division (2007b).

Source: Dearden and Mitchell (2012)

Canada's changing pyramid (1966 to 2006)

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<http://www.cihr-irsc.gc.ca/e/34013.html>

Figure 1. Age structure of population in 1917 and 2006 (Finland)

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The Demographic Transition

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1. High Equilibrium: both high death and birth rates (pre-industrial societies)
2. High Expanding: high birth rates, advanced health care lowered death rates (early-stage industrialization)
3. Low Expanding: low high death and birth rates – high cost to raise children, additional children no benefit (Western societies)
4. Low Equilibrium: both low death and birth rates

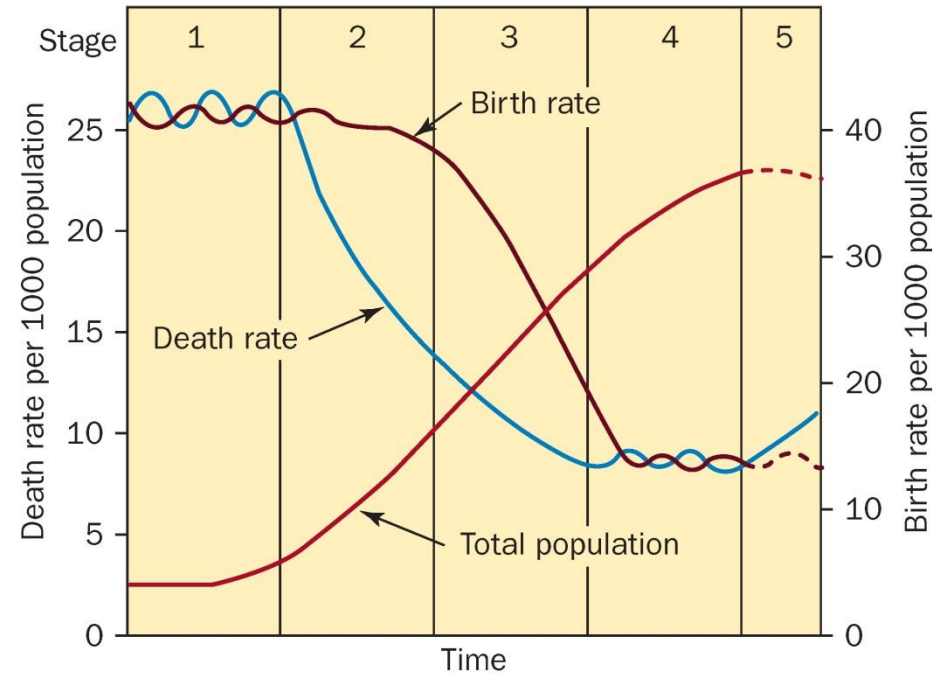


Figure 1.6 | The demographic transition.

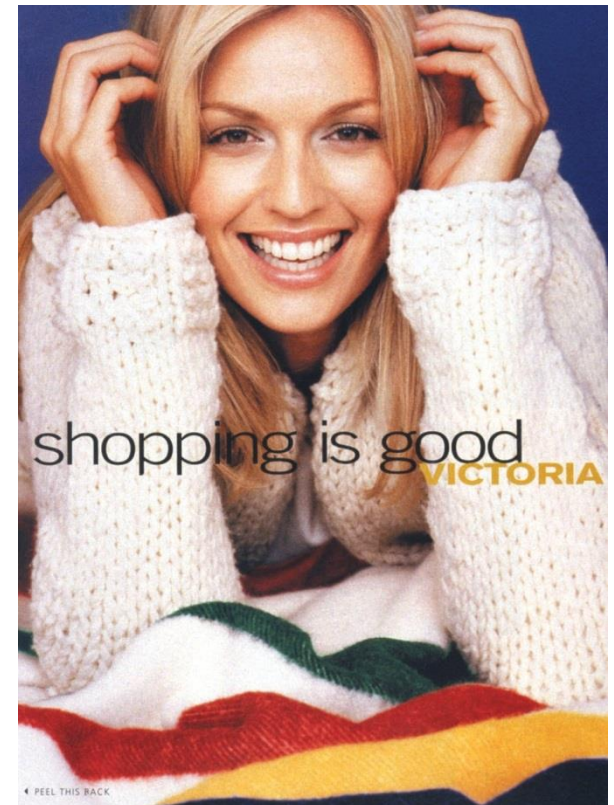
Consumption

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- Richest 20% of world's population consume 75% of world's resources (World Bank 2008);
- Canadian's amongst the top per capita consumers of energy



(above) Vietnam's one child policy.



PEEL THIS BACK

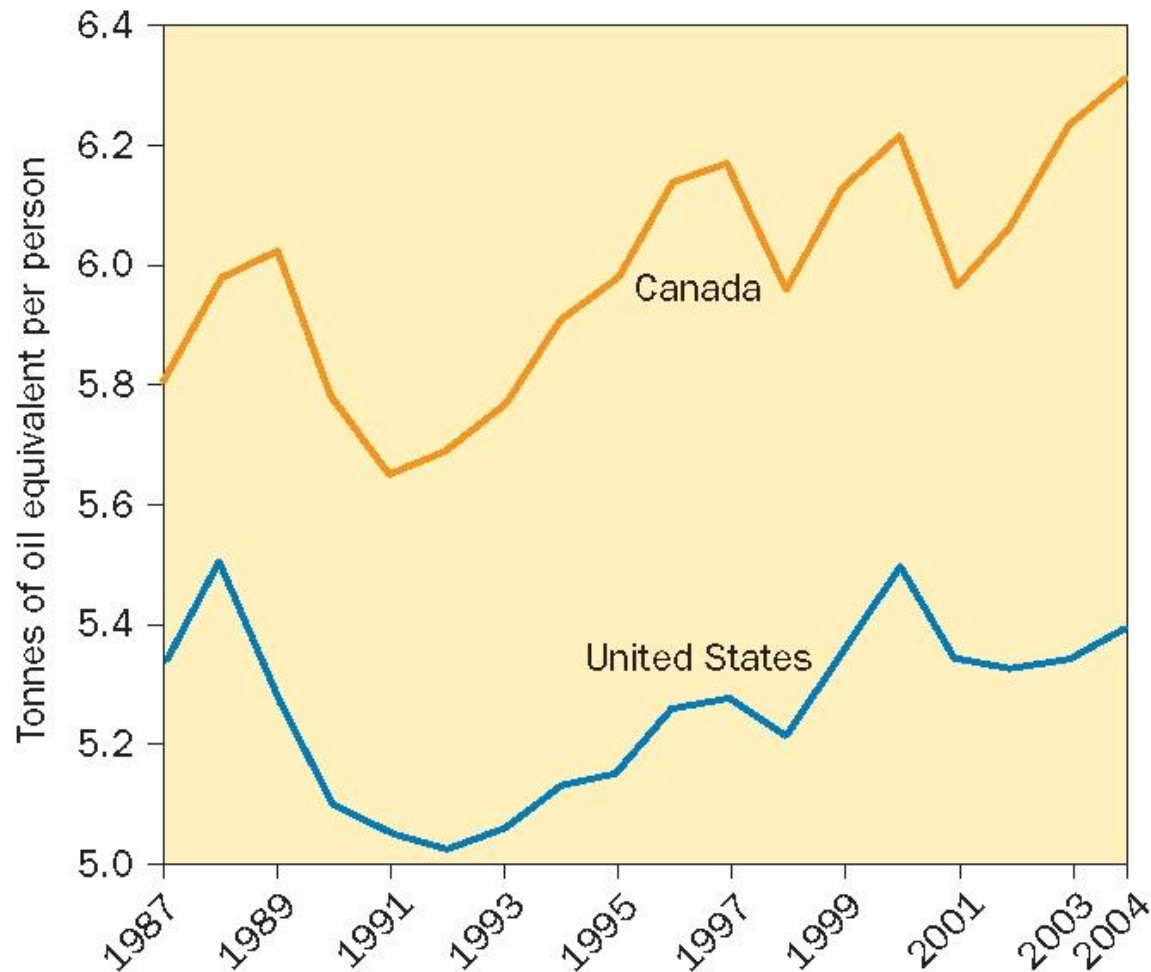
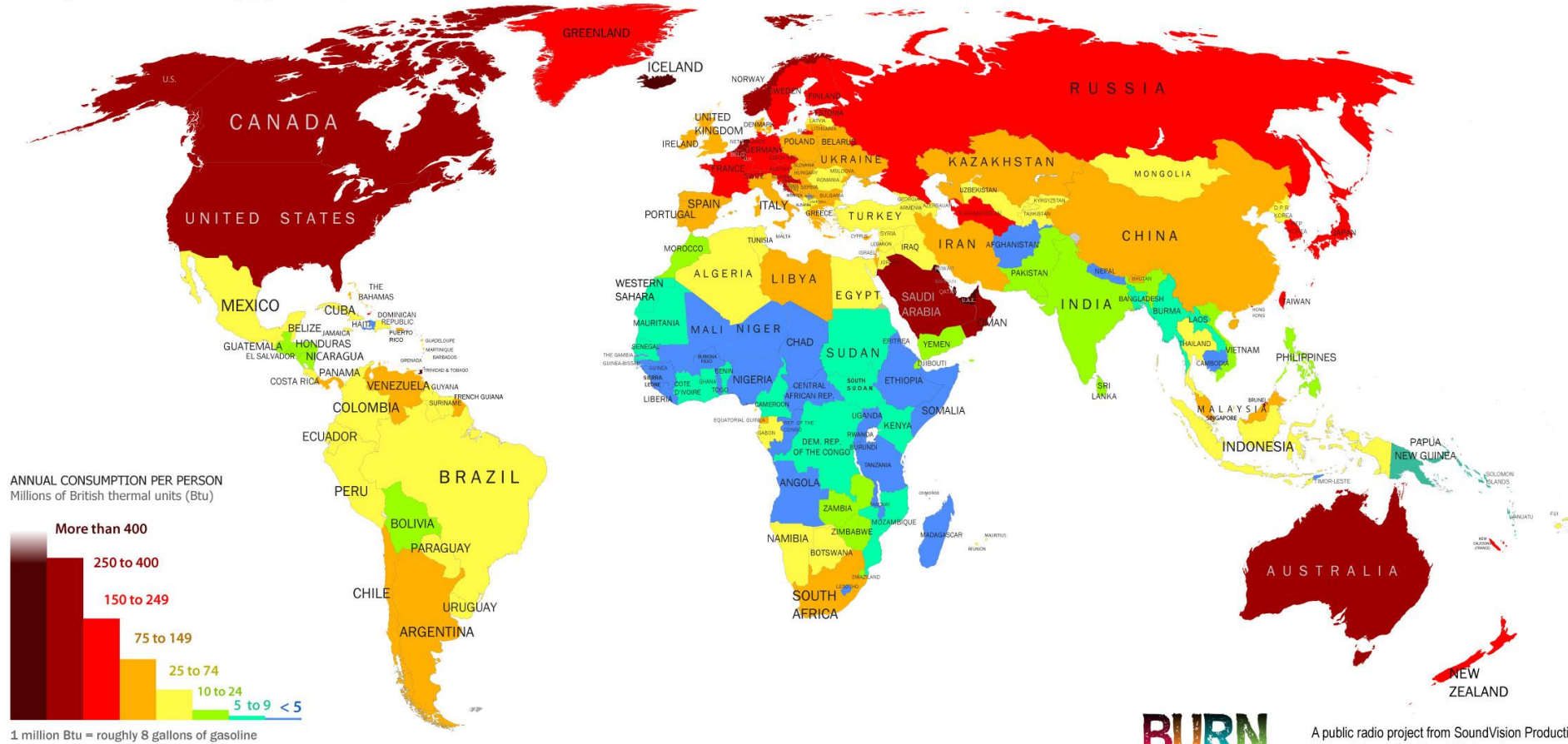


Figure 1.7 | Per capita energy consumption of Canada and the US, 1987–2004. Source: GEO data portal, compiled from IEA (2007) and UNPD (2007).

Energy Consumption Per Person, by country, 2010.

SOURCES: U.S. Energy Information Administration, International Energy Agency, CIA World Factbook, U.N. Dept of Economics and Social Affairs

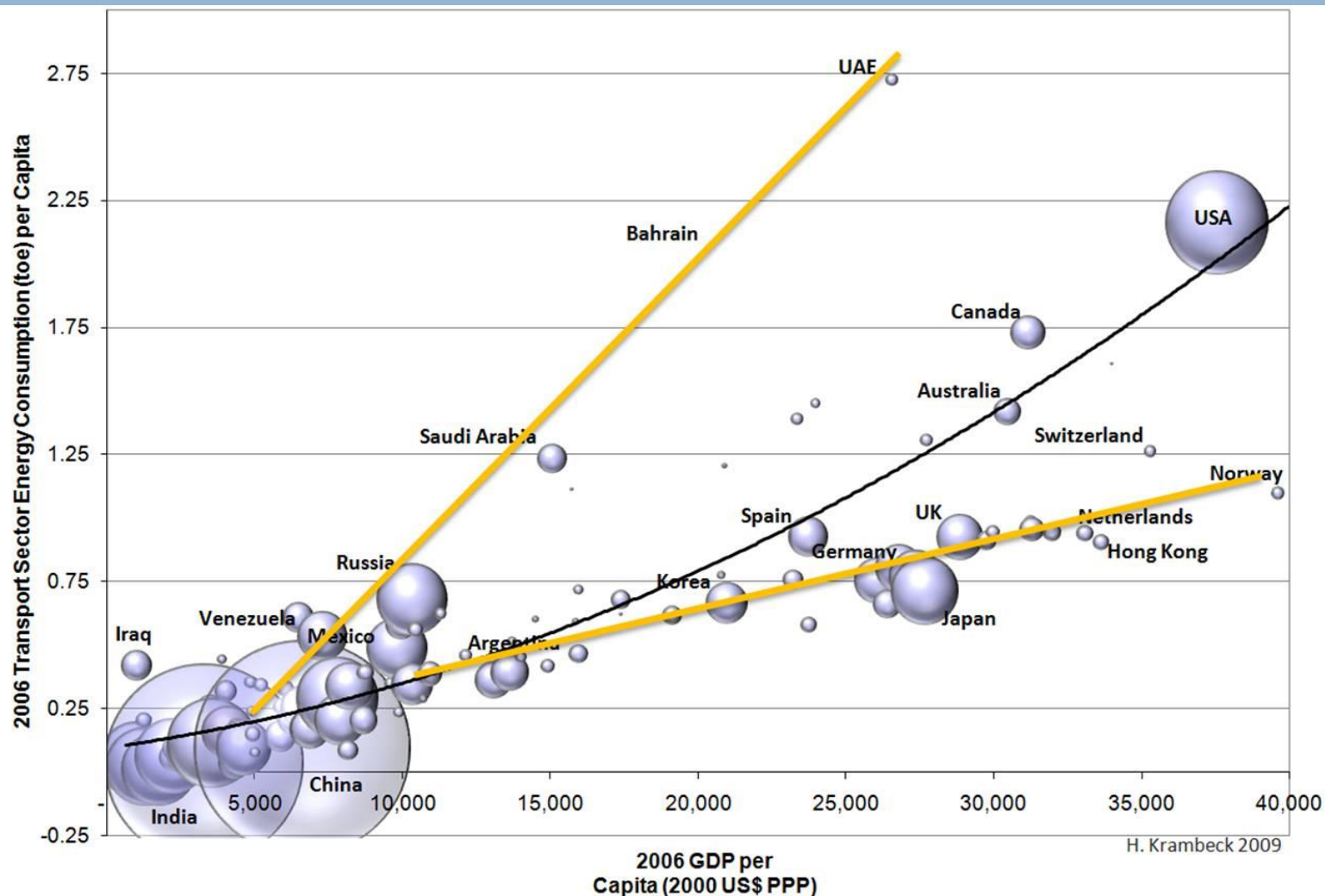


A public radio project from SoundVision Productions
Anrica Deb, contributing digital producer

http://burnanenergyjournal.com/wp-content/uploads/2013/03/WorldMap_EnergyConsumptionPerCapita2010_v4_BargraphKey.jpg

Transport Sector Energy Consumption (per capita)

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<http://blogs.worldbank.org/transport/energy/global-implications-of-transport-sector-energy-consumption-in-the-developing-world-0>

E use relative to Human Development Index

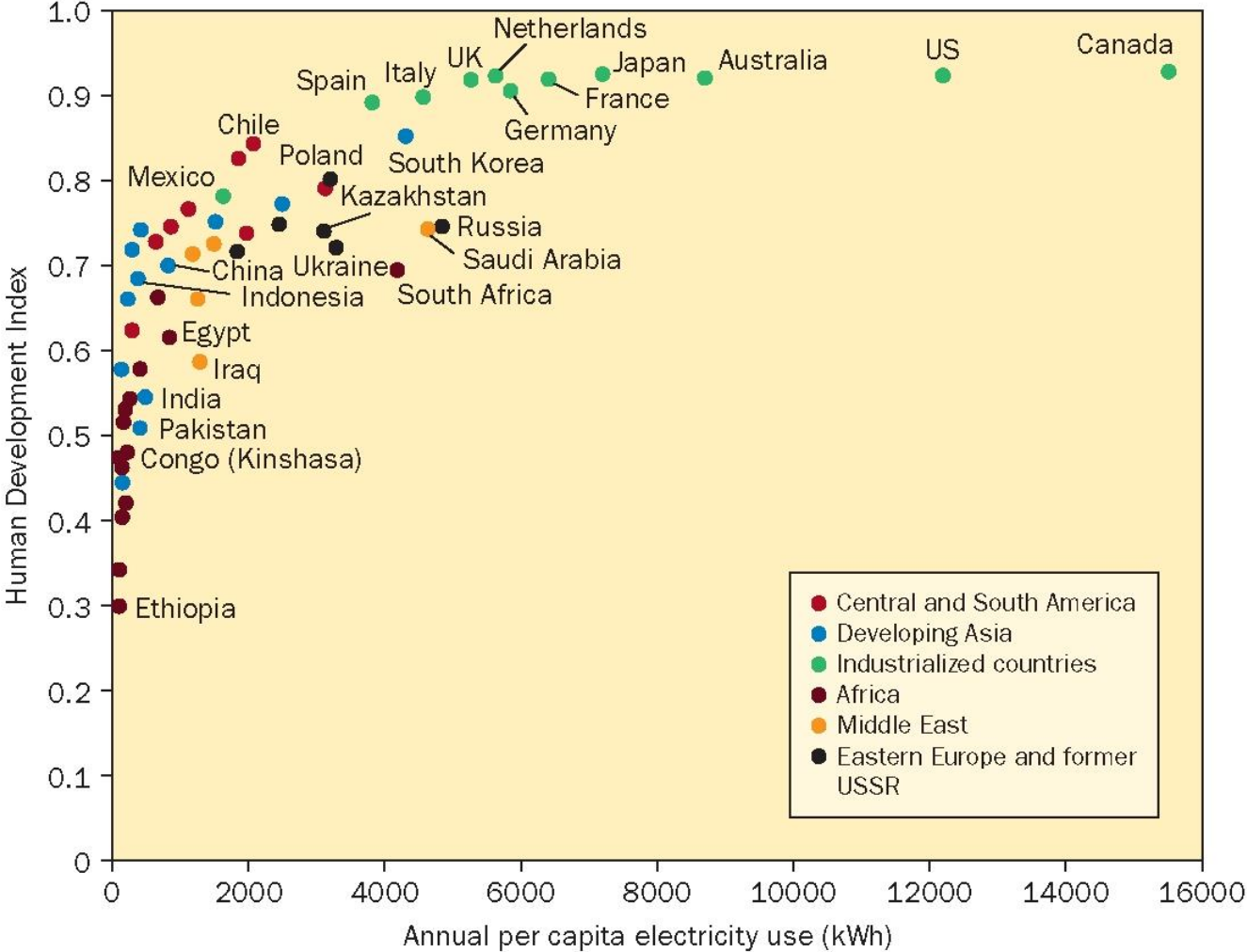


Figure 1.8 | The relationship between energy use and the Human Development Index. Source: UNDP (2005).

Implications of

- 1) overconsumption and the resulting pollution ... AND
- 2) overpopulation the resulting poverty ...

- **Planetary Carrying Capacity**
- Beyond the boundary (Fig. 1.9)
- Diamond's *Collapse* (2005)

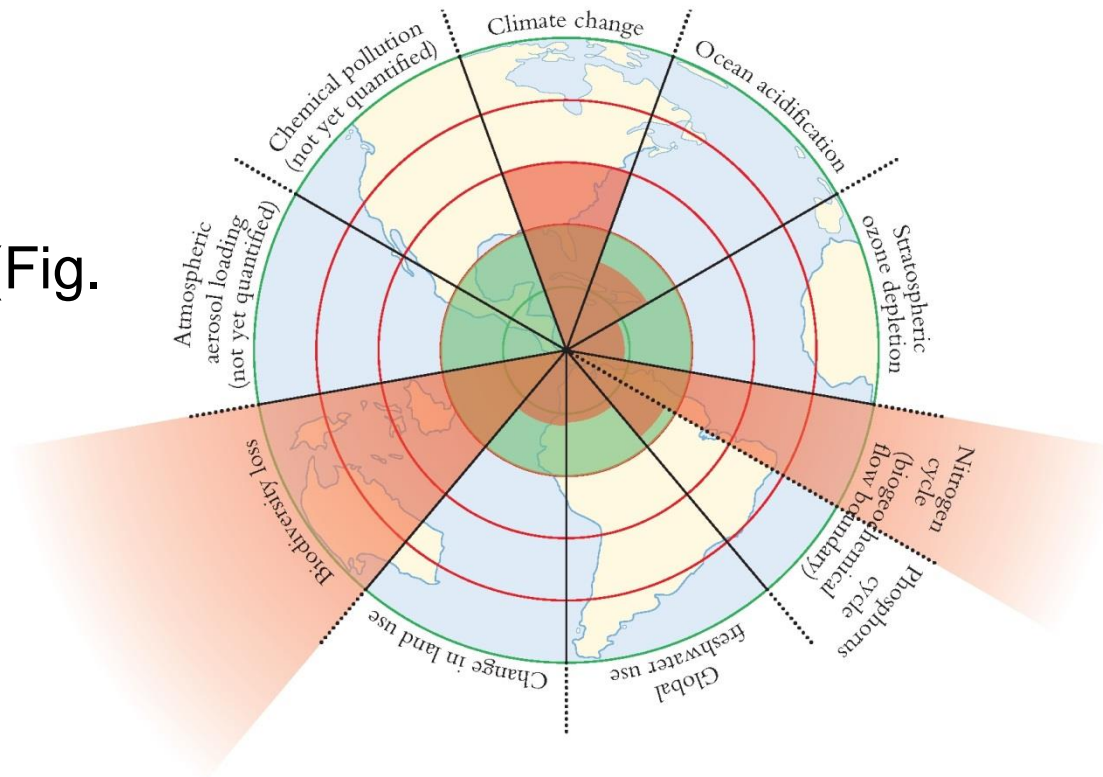


Figure 1.9 | Beyond the boundary. The inner green shading represents the proposed safe operating space for nine planetary systems. The red wedges represent an estimate of the current position for each variable. The boundaries in three systems (rate of biodiversity loss, climate change, and human interference with the nitrogen cycle) have already been exceeded. *Source: Rockström et al. (2009: 427).*

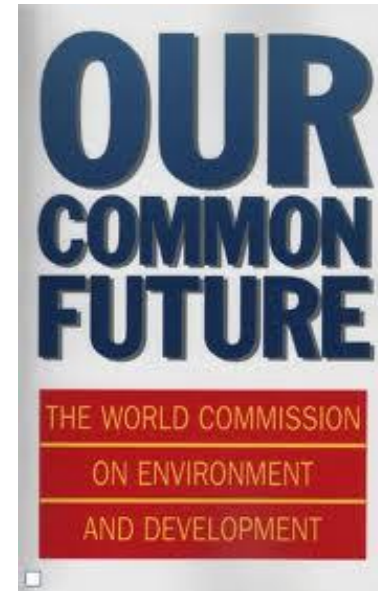
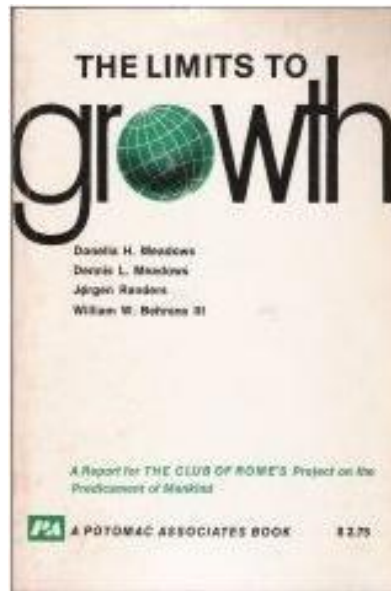
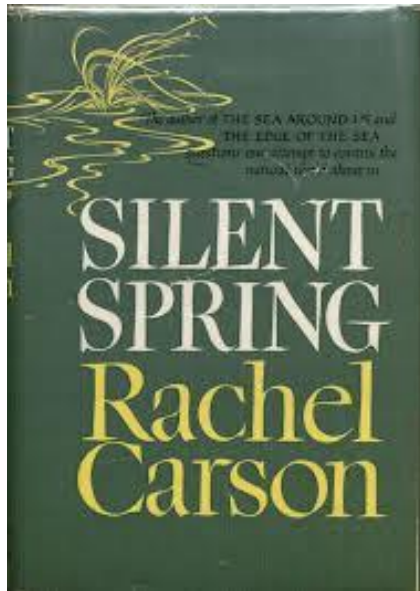
The need for action

- ❑ There is a need to set scientifically determined biophysical preconditions for human development and stay within these boundaries
- ❑ Past civilizations have collapsed due to
 - Not anticipating a problem
 - Anticipating a problem but not its severity
 - Anticipating a problem but not neglecting to address it
 - Anticipating a problem, trying to address it, but failing
- ❑ These societal collapses were often rapid, and caused by environmental degradation

Warnings about environmental degradation and impact on future societies

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- Rachel Carson's *Silent Spring* (1962) – DDT
- Meadow's et al (1972) *Limits to Growth*
- World Commission on Environment and Development (1987) *Our Common Future*



Global efforts thus far....

- Global efforts to recognize problems and negotiate solutions have not been very successful
 - 1987: World Commission on Environment and Development
 - 1992: Earth Summit Rio de Janeiro
- 1997: UN Kyoto Protocol climate change goals not met by Canada, in fact exceeded GHG emission goals by 29%
 - 2002: World Summit on Sustainable Development (Johannesburg)
- 2000: UN Millennium Summit environmental sustainability goals targeted for achievement by 2015; revised in 2007

Monitoring Progress towards Sustainable Development – Canada...

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- 1997 report.... The Commissioner for Environment and Sustainability noted three key aspects requiring improvement:
 1. **implementation gap** between stated objectives and actual performance;
 2. **lack of coordination and integration**, as many pressing issues required shared responsibility amongst government departments and various jurisdictional levels
 3. **Inadequate performance review processes** ... senior managers and parliamentarians did not know what was (not) being accomplished
- Subsequent reports (2008, 2009) by Auditor General report both:
 - Poor progress {species at risk; control of invasive species into the Great Lakes; restoration of heavily polluted areas}
 - Good progress {Air Quality Health Index; Guidelines for Canadian Drinking Water Quality}

Measuring Progress

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- One of the goals of science is to provide understanding of complex problems, and one way of doing this is to use of **indicators**.
- Examples:
 - ▣ **Ecological footprints** allow country to country impact comparisons of productive land needed to support life style of citizens;
 - ▣ **Human Development Index** .. A comparative measure of life expectancy, literacy, education, and standard of living; (developed countries have value greater than 0.8)

Ecological Footprint (vs. biocapacity)

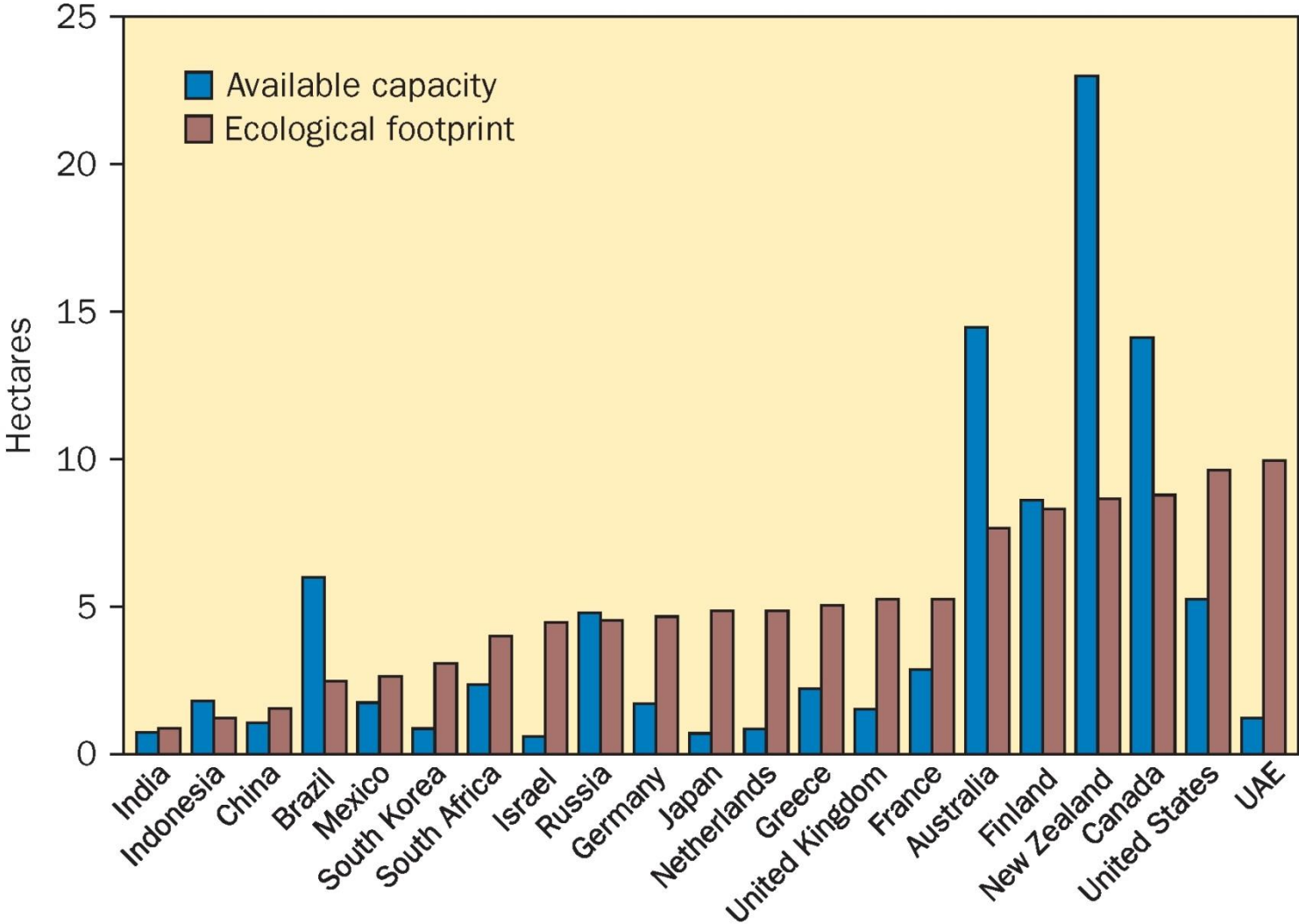


Figure 1.11 | Ecological footprint per person in selected nations, 1999. Source: Worldwatch Institute (2004a).

Ecological Footprint

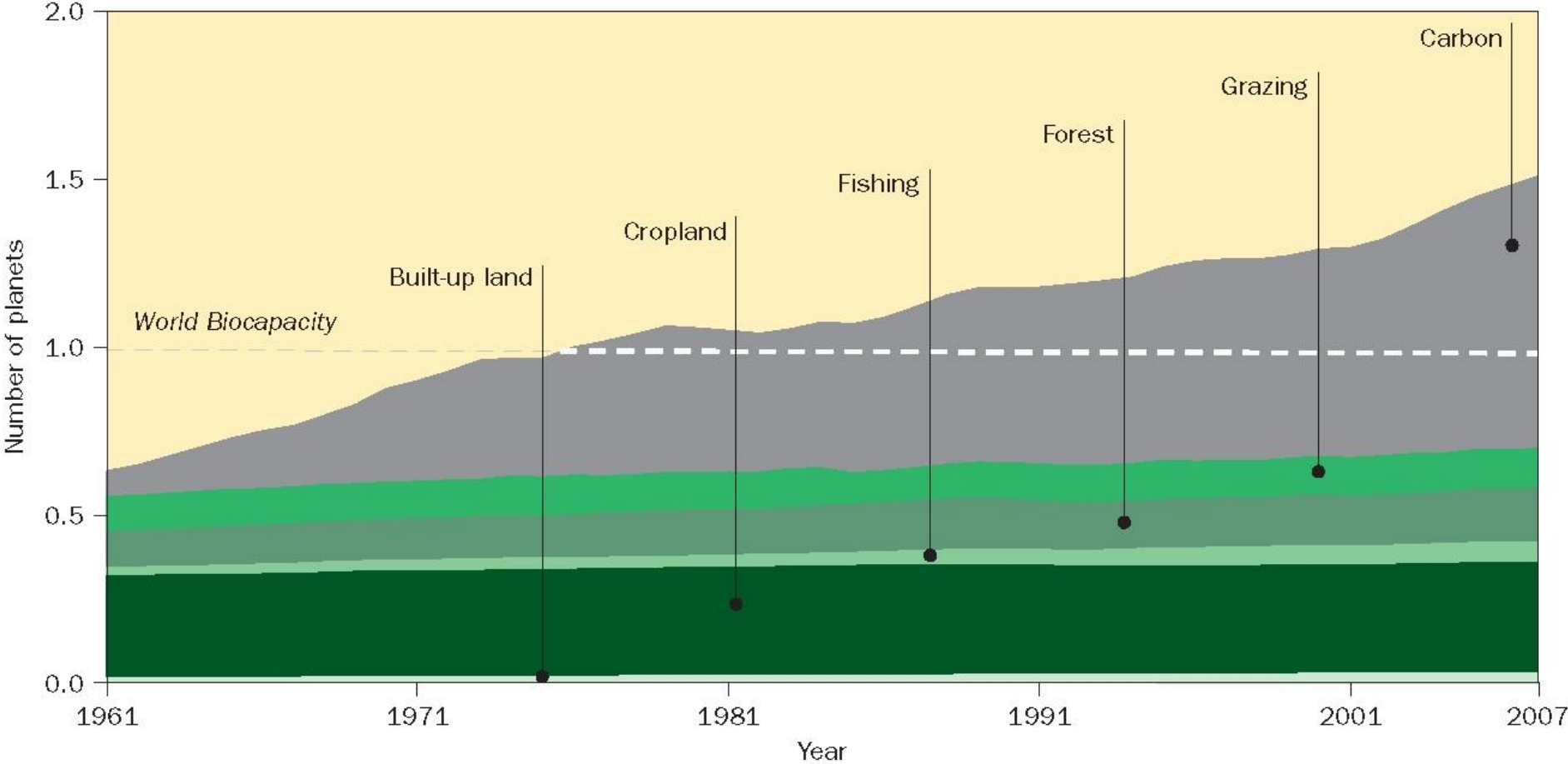


Figure 1.15 | Components of the ecological footprint, 1961–2007. One way of showing the ecological footprint is as the number of planets required to produce natural resources consumed in a single year. Total **biocapacity**, represented by the dashed line on the graph, is the equivalent to one planet Earth, although the biological productivity of the planet changes every year. In 2007, humanity was using the equivalent of one-and-a-half planets. Note that hydroelectric power is included in built-up land and fuelwood in the forest component. Source: WWF (2010: 13), from Global Footprint Network.

Ecological Footprint vs Human Development Index

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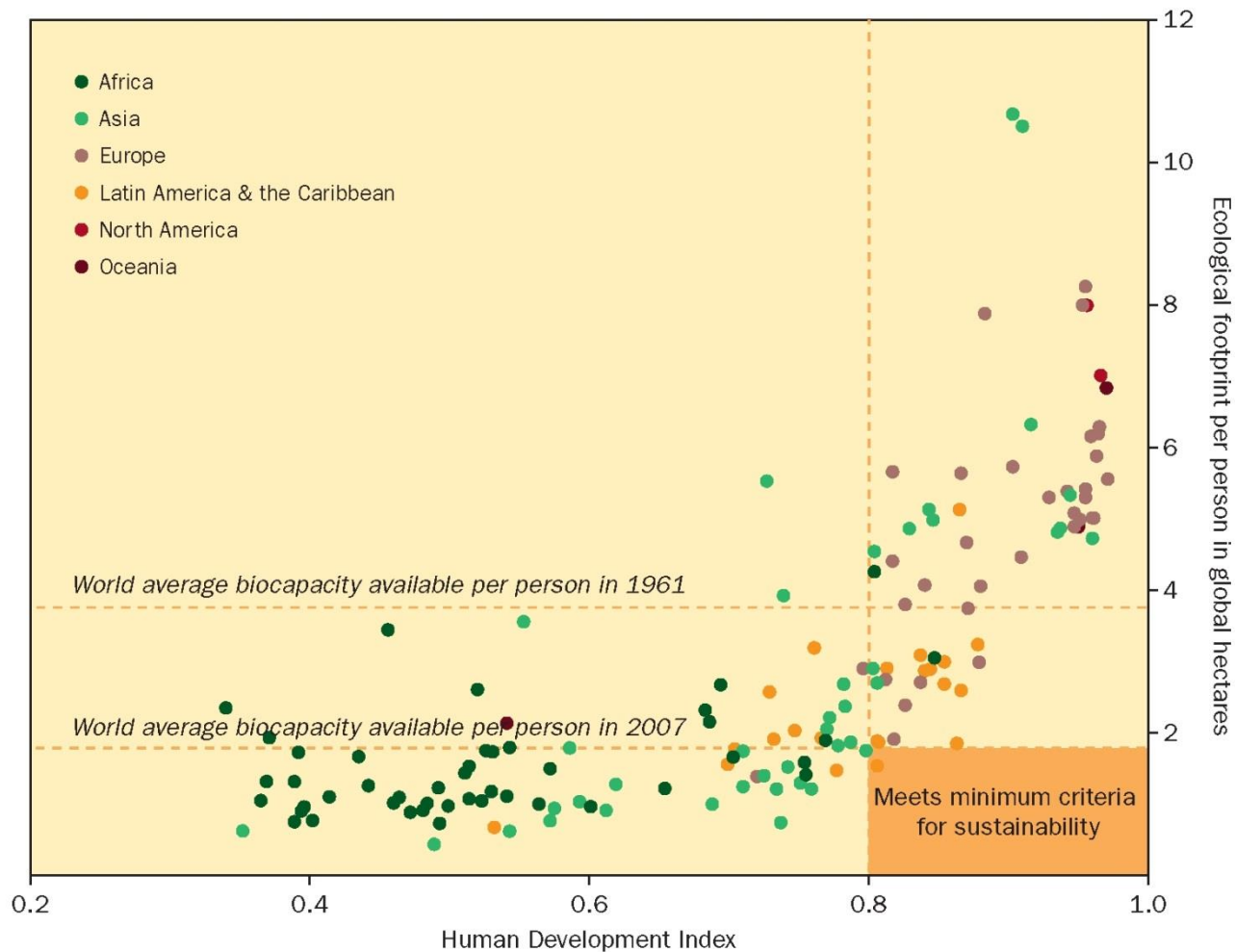


Figure 1.17 | Human Development Index correlated with the ecological footprint. Source: WWF (2010: 21), from Global Footprint Network and UNDP.

Implications

- Global thresholds related to the global carrying capacity are being violated;
- Key changes need to be made in the way we view and interact with nature (not just talked about)
- These changes must happen at all levels

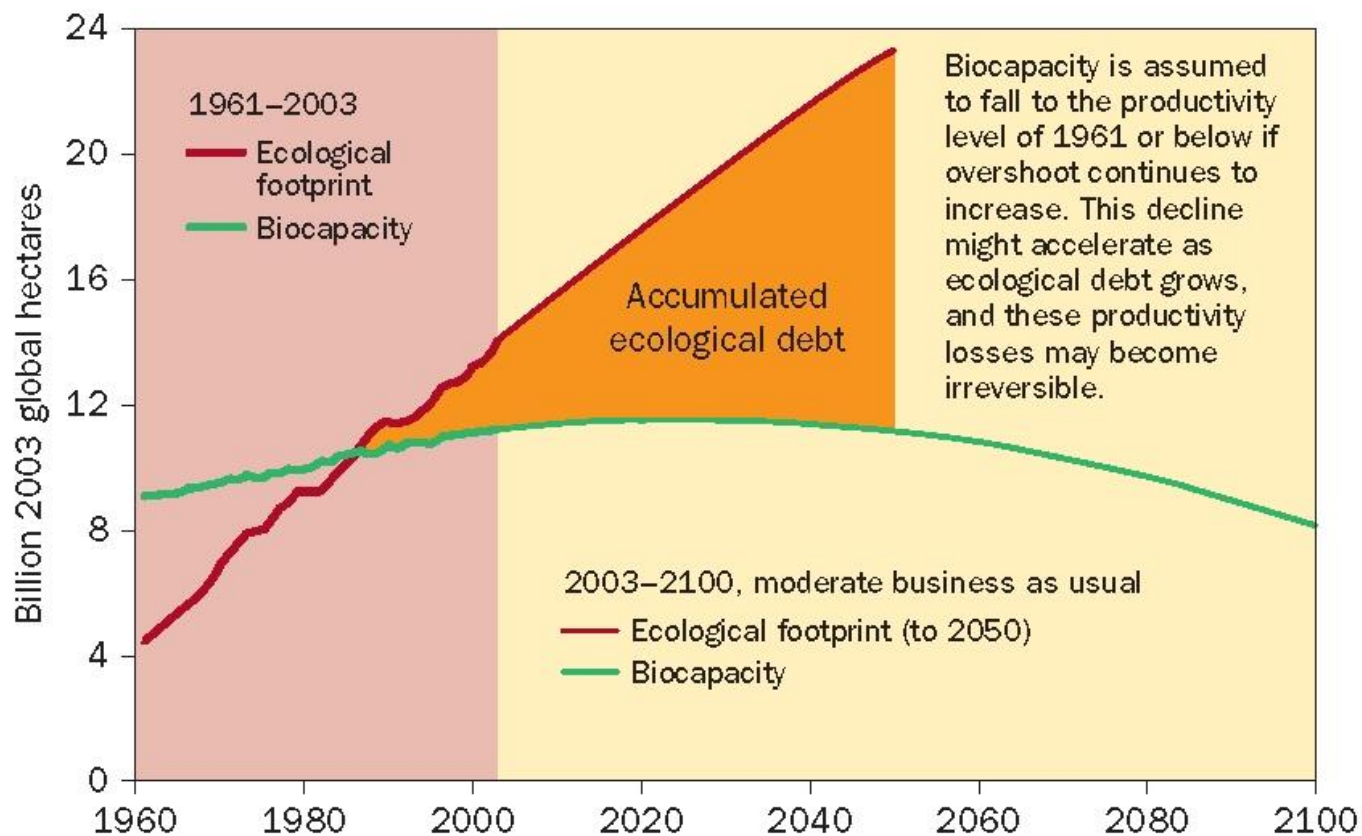


Figure 1.18 | Business-as-usual scenario and ecological debt. Source: WWF International, *Living Planet Report 2006*.

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Looking Ahead to the next lectures

Wednesday May 7th:

“Energy Flows and Ecosystems:

Energy Flows in Ecosystems, Food Chains”

Read ahead (Chpt. 2, pp. 48 →)

References

- Dearden, P and Mitchell, B. 2012. *Environmental Change and Challenge*, Fourth Edition, Don Mills, Ontario: Oxford University Press {Chapter 1: 'Environment, Society and Resources'}