# Carrying Capacity, Globalization and the Unsustainable Entanglement of Nations

**Blue Planet Prize Commemorative Lecture**

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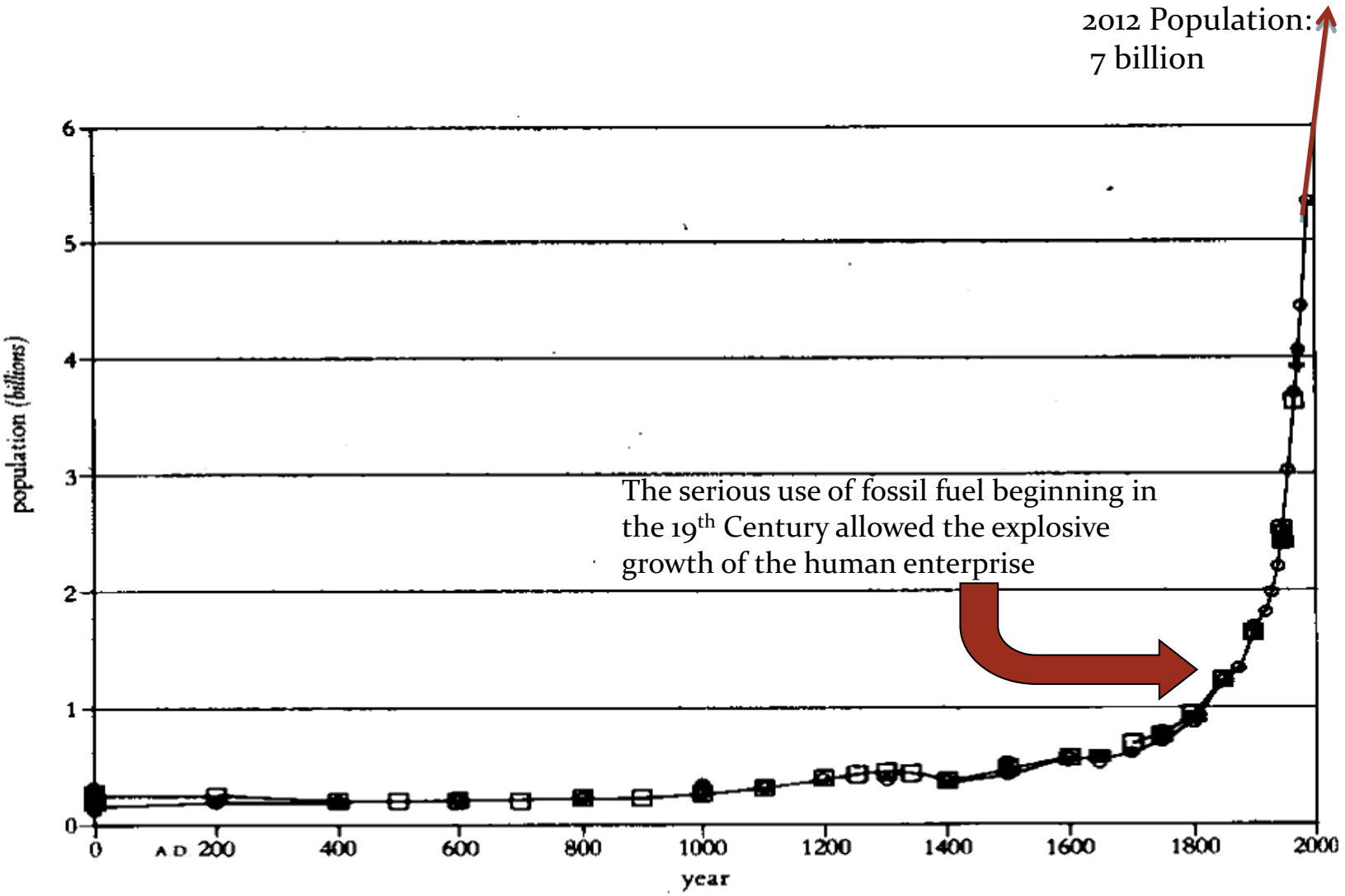
# Context: The Anomalous Unsustainable Expansion of the Human Enterprise




Continuous growth—population and economic—is an anomaly. The growth spurt that recent generations take to be normal is the single most abnormal period of human history.

# Starting premise: Humanity has gone ‘rogue’

- H. sapiens is the dominant species on Earth and the major geological force changing the face of the planet.
- Human ecological dysfunction is destroying the ecosystems that sustain civilization and undermining vital life support functions.  Consider for example:
- Climate change, ocean acidification, fisheries collapses, land/soil degradation, desertification, tropical deforestation and biodiversity loss.
- The human enterprise has exceeded the long-term carrying capacity of Earth; we are in ‘overshoot.’

# This is an old concern

- To Malthus, humanity was caught forever in the grip of the earth's limited carrying capacity.
- "…I say that the power of population is indefinitely greater that the power in the earth to produce subsistence for man." (Rev.Thomas Malthus 1798).

# Ecological View: Planet Earth is Like a Ship:
# Carrying Capacity = Plimsoll Mark

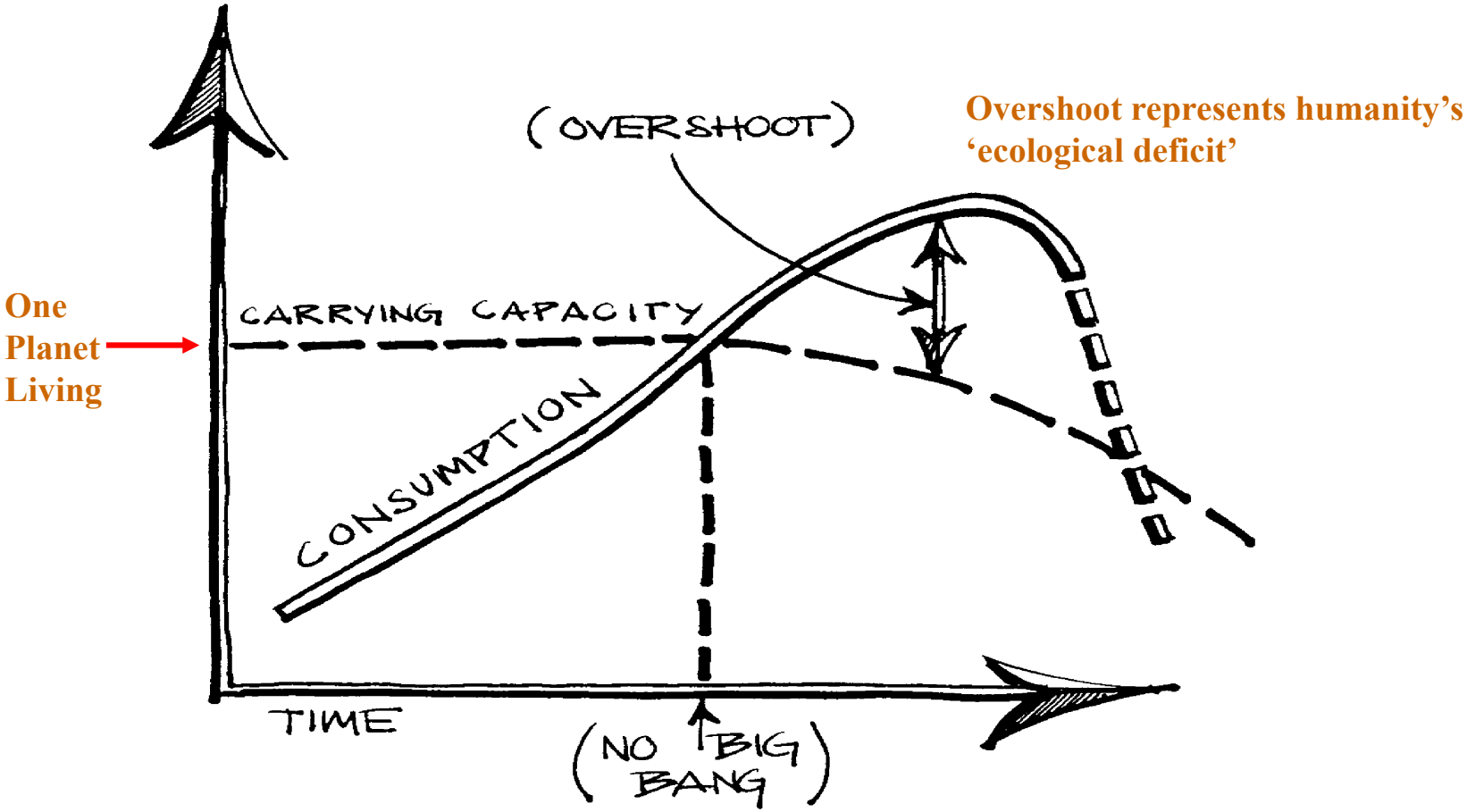

We know enough not to load a ship beyond its cargo capacity as indicated by the Plimsoll mark/line. Why do we think we can get away with overloading the earth?

# Why Modern Overshoot Matters

- The ecosphere and its subsystems are complex systems with multiple possible equilibrium states not necessarily favourable to human civilization.
- Human population growth and rising material consumption; habitat transformation/fragmentation; energy production/consumption; and climate change all exceed in rate and magnitude the forces that were apparently responsible for natural global-scale state shifts in the geological past.
- Given the scale of human impacts, “another global-scale state shift is highly plausible within decades to centuries, if it has not already been initiated” (Barnosky *et al.* 2012)

Even in the simplest case,

# Societies in overshoot invite catastrophic collapse




Whenever a population grows beyond carrying capacity, the environment is degraded. Think: climate change, ozone depletion, sea level rise, deforestation, fisheries collapses, land degradation, etc. This is uneconomic growth that makes us poorer, not richer.

# Leadership in Denial?

- Despite the problems caused by excessive economic scale and the threat of systems failure, the Rio+20 Earth Summit final report, *The Future We Want,* requires no one to do anything and actually equates sustainable development with "sustained economic growth".
- Some see this conference as "perhaps, the greatest failure of collective leadership since the first world war" (Monbiot 2012).
- *The Future We Want* has also been called "the longest suicide note in history" (Naidoo 2012).

The world subscribes to the myth of progress and infinite growth. According to

# Lawrence Summers

then Chief Economist, World Bank (1991)

- "There are no... limits to the carrying capacity of the earth that are likely to bind any time in the foreseeable future… The idea that we should put limits on growth because of some natural limit, is a profound error [with] staggering social costs."
- Theory: As the global economy expands, trade, technology and increased wealth will enable humanity to compensate for the depletion of natural resources and the loss of life-support services. In effect, humans can continuously increase carrying capacity.

# Mechanisms for Growth: Globalization and Trade

- Globalization = dissolution of national boundaries and the horizontal integration of national economies into one.
- Trade rules encourage countries to specialize in those few economic products that they do best, (i.e., most efficiently) and in which they have a ‘comparative advantage’.
- Countries are supposed to export these products to earn the foreign exchange required to import all their other needs.

# Conventional Trade *Theory*: Everybody Wins!

- If each country specializes in products for which it has a comparative advantage, the world can **maximize global production**.
- Because goods are being produced efficiently and for the largest possible market, prices will be lower and demand higher. Producers' incomes increase.
- Higher incomes and lower prices enable people to **maximize their consumption** of goods from all over the world. I.e.,
- More liberal trade facilitates growth in gross world product (production and consumption) and **increases carrying capacity** at *least cost.*

# Assumptions Implicit in Growth-via-Globalization

- Higher income/consumption always increases human well-being.
- There are no ecological impediments to continuous economic growth.
- Incipient resource scarcity can be relieved by enhanced 'factor productivity' (efficiency) or factor substitution.
- Ecological stability and geopolitical security are assured (i.e., there is no threat from climate change or aggressive competition for resources)

**All these assumptions are proving to be false.**

# Assessing the Biophysical Impact: Ecological Footprint Analysis (EFA)

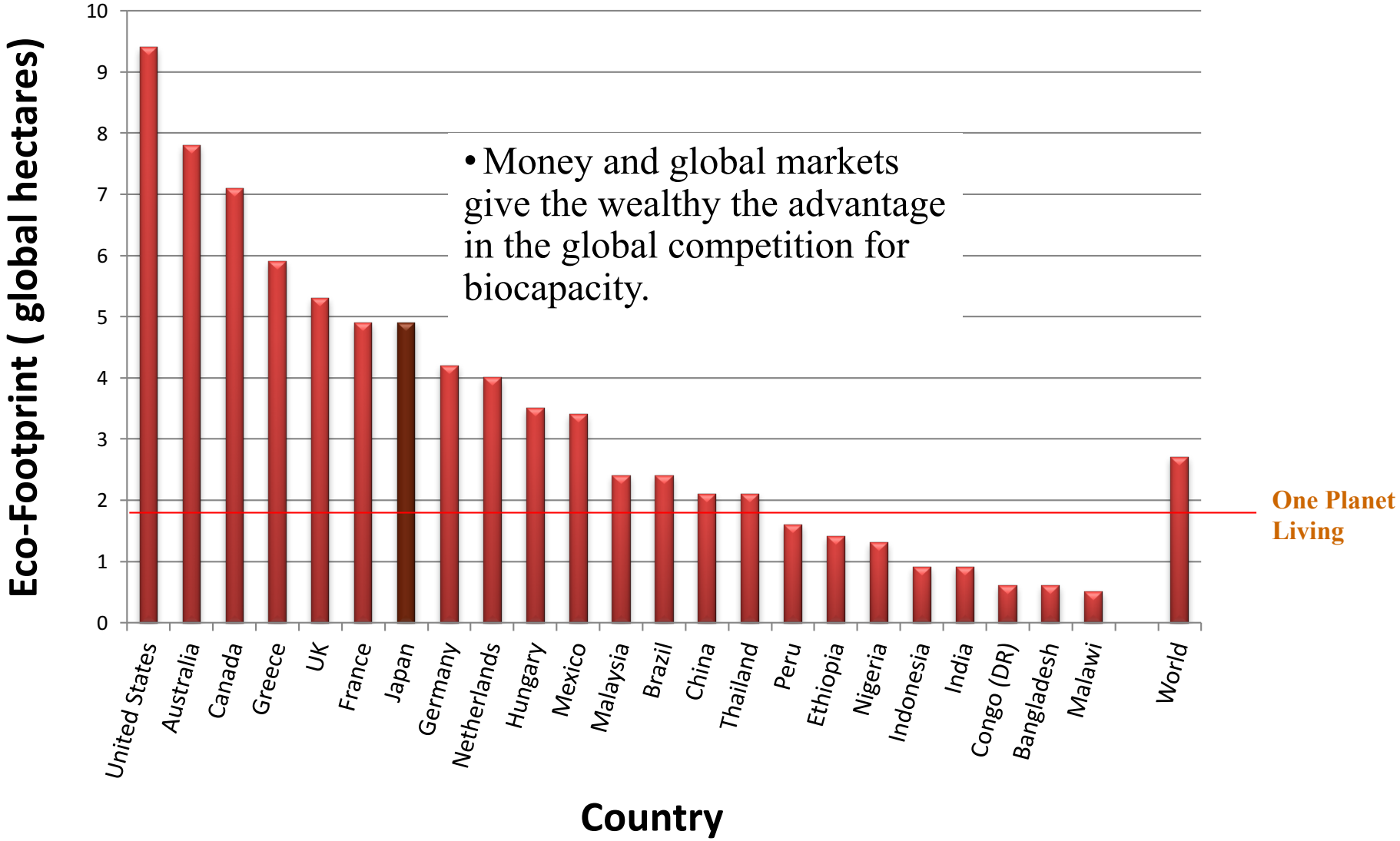
EFA inverts the carrying capacity ratio:

- 'Carrying capacity'(CC) asks how large a population a given area could support without damaging the ecosystem.
- 'Eco-footprinting' asks how large an area of ecosystems is required to support a given human population.

# The Ecological Footprint

- The ‘ecological footprint’ of a specified population is ***the area of land and water ecosystems required*, on a continuous basis**, ***to produce the resources that the population consumes, and to assimilate certain wastes that the population produces, wherever on Earth the relevant land/water may be located***.
- *NB: We are all competing for the world’s limited biocapacity.*

# Figure 1: Per Capita Ecological Footprints of Selected Countries (2005 data from WWF 2008)

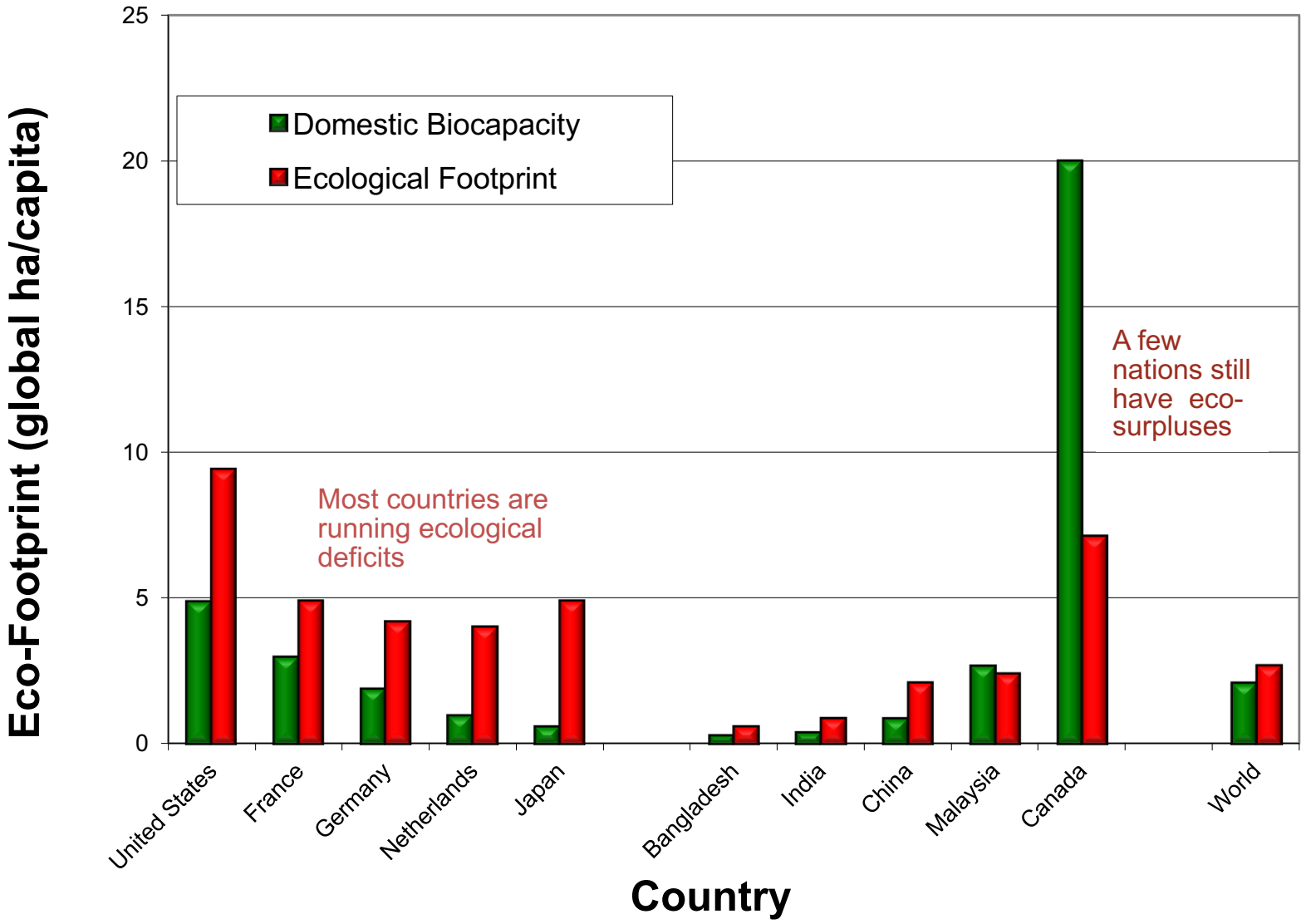


# The Bottom Line: Humanity in Overshoot

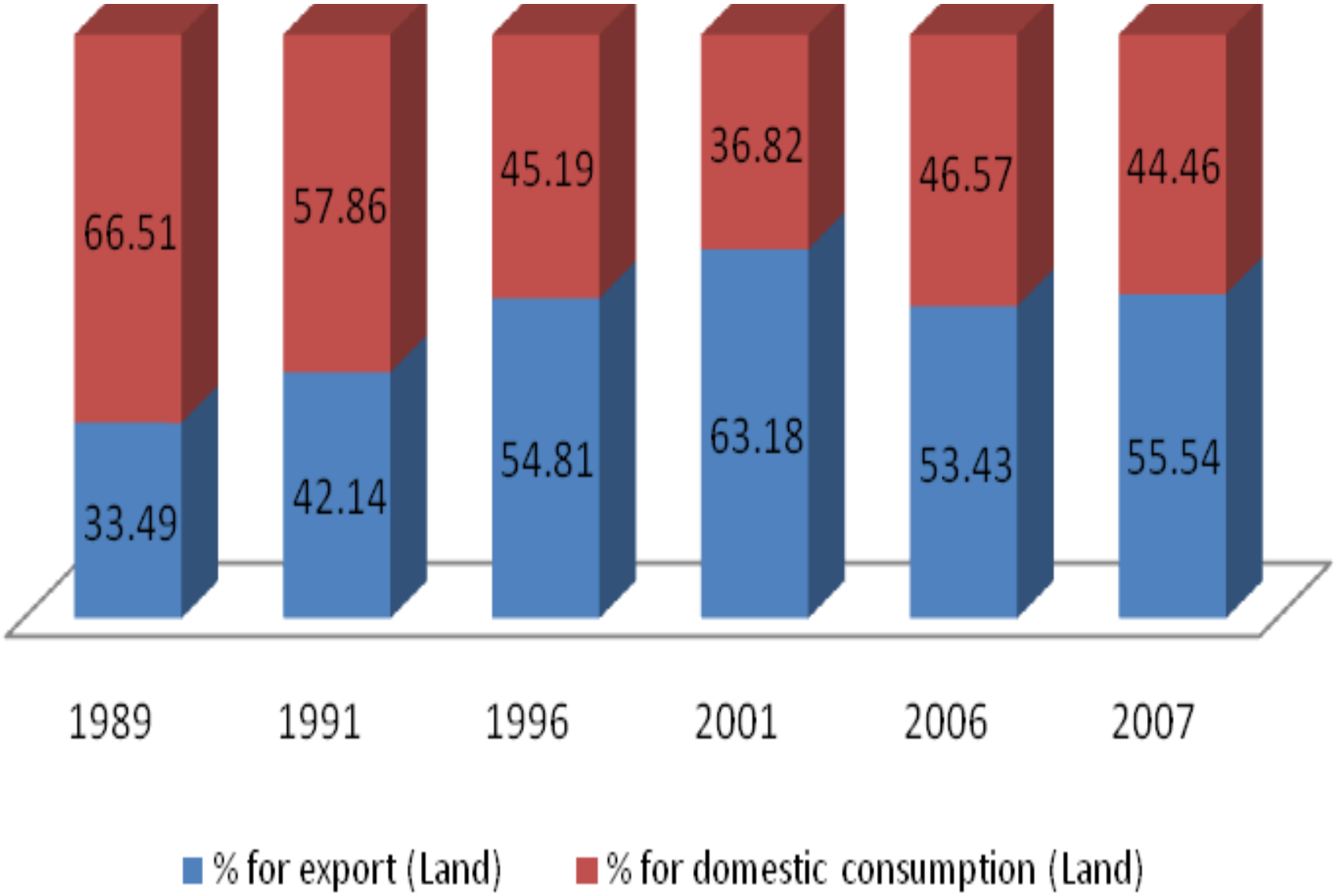
- By 2008, the aggregate human footprint had reached 18.2 billion hectares.
- Total global bio-capacity was only 12 billion ha.
- This meant that the average person was already consuming the output of 2.8 gha.
- However, there are only 1.8 gha of productive ecosystem per person on Earth. In short:
- The human enterprise had over-shot carrying capacity by 50%. This means:
- It would take the ecosphere 1.5 years to regenerate the renewable resources people consumed and assimilate the carbon dioxide they emitted in 2008.

# Figure 2: Biocapacities and Ecological Footprints of Selected Countries Compared to the World Averages

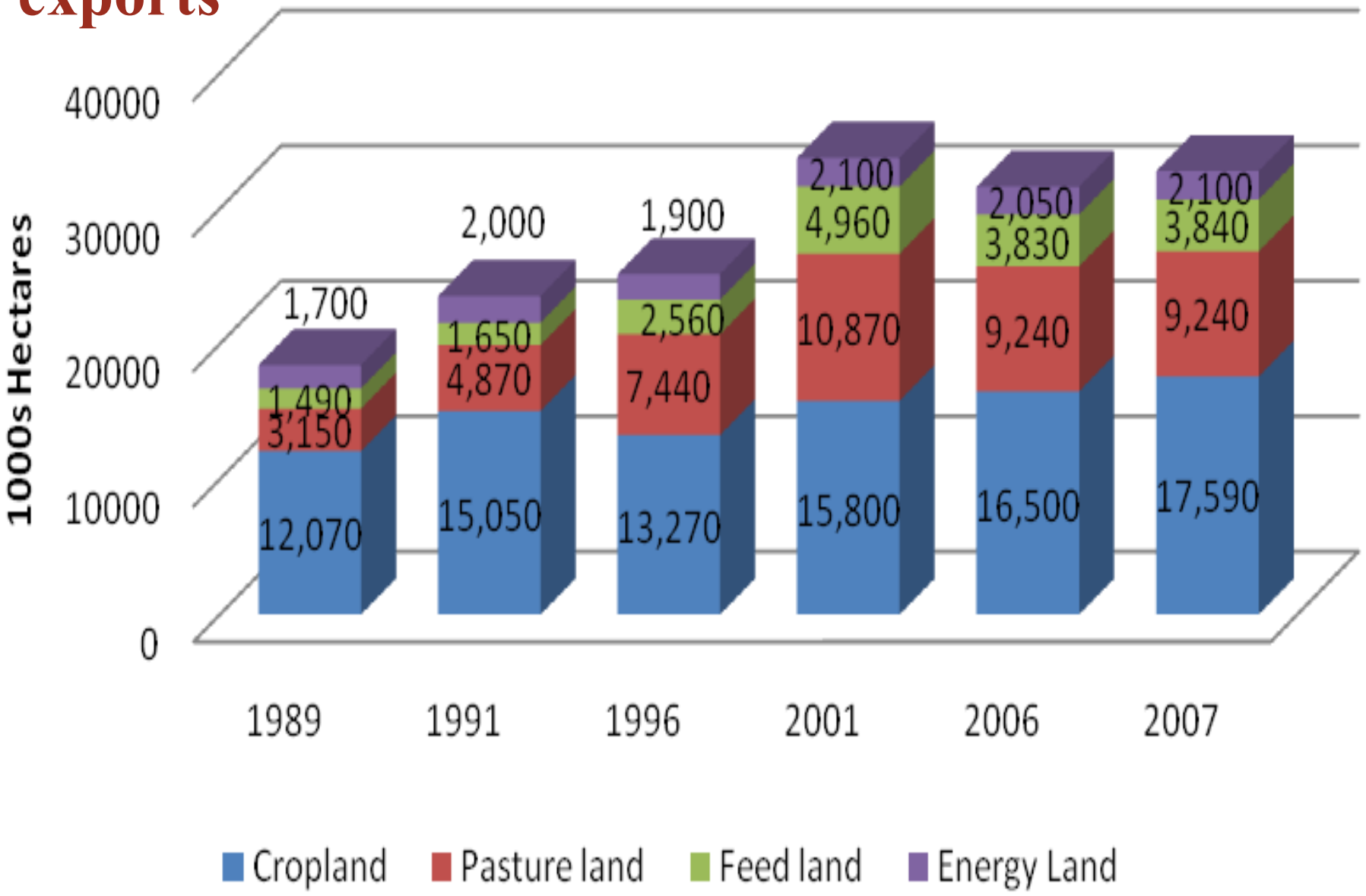
## (2005 data)



# Figure 3: Exporting the 'surplus' – exports as a share of total Canadian prairie crop production



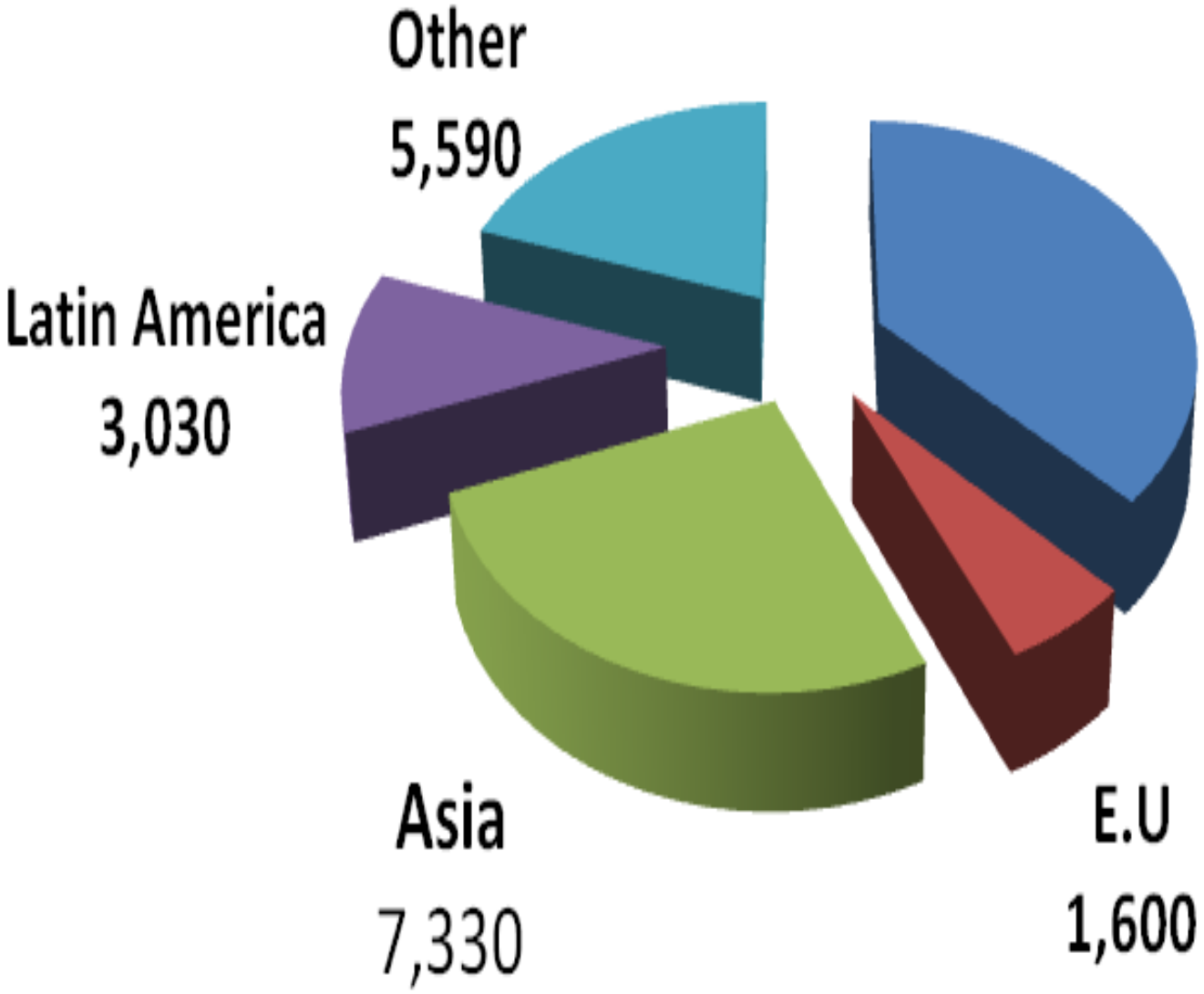
# Figure 4: Foreign eco-footprints on the Canadian prairies associated with agricultural exports



# Summary for Canadian Prairies

- On average from 1989 to 2007, 65% of Canadian prairie cropland was effectively ‘exported’.
- During this period, the total foreign eco-footprint on the prairies increased significantly, reaching almost 34 million hectares, an area equivalent to the area of the United Kingdom, the Netherlands and Denmark combined.

# Figure 5: The Average Area of Agricultural Land (1000s ha) in the Canadian Prairies Devoted to Foreign Consumers, 1989-2007

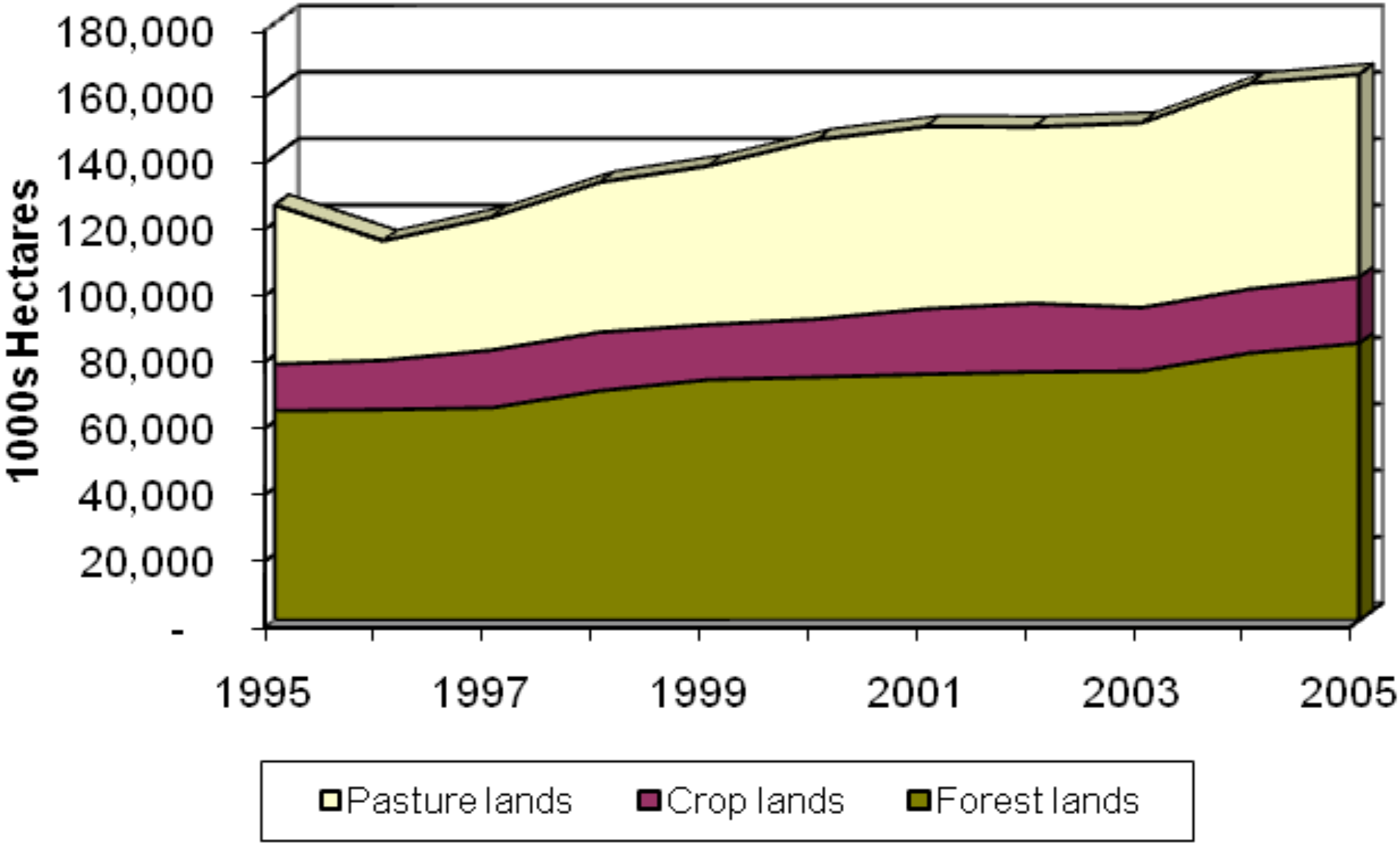



Note the wide geographic distribution of mutual 'entanglement'

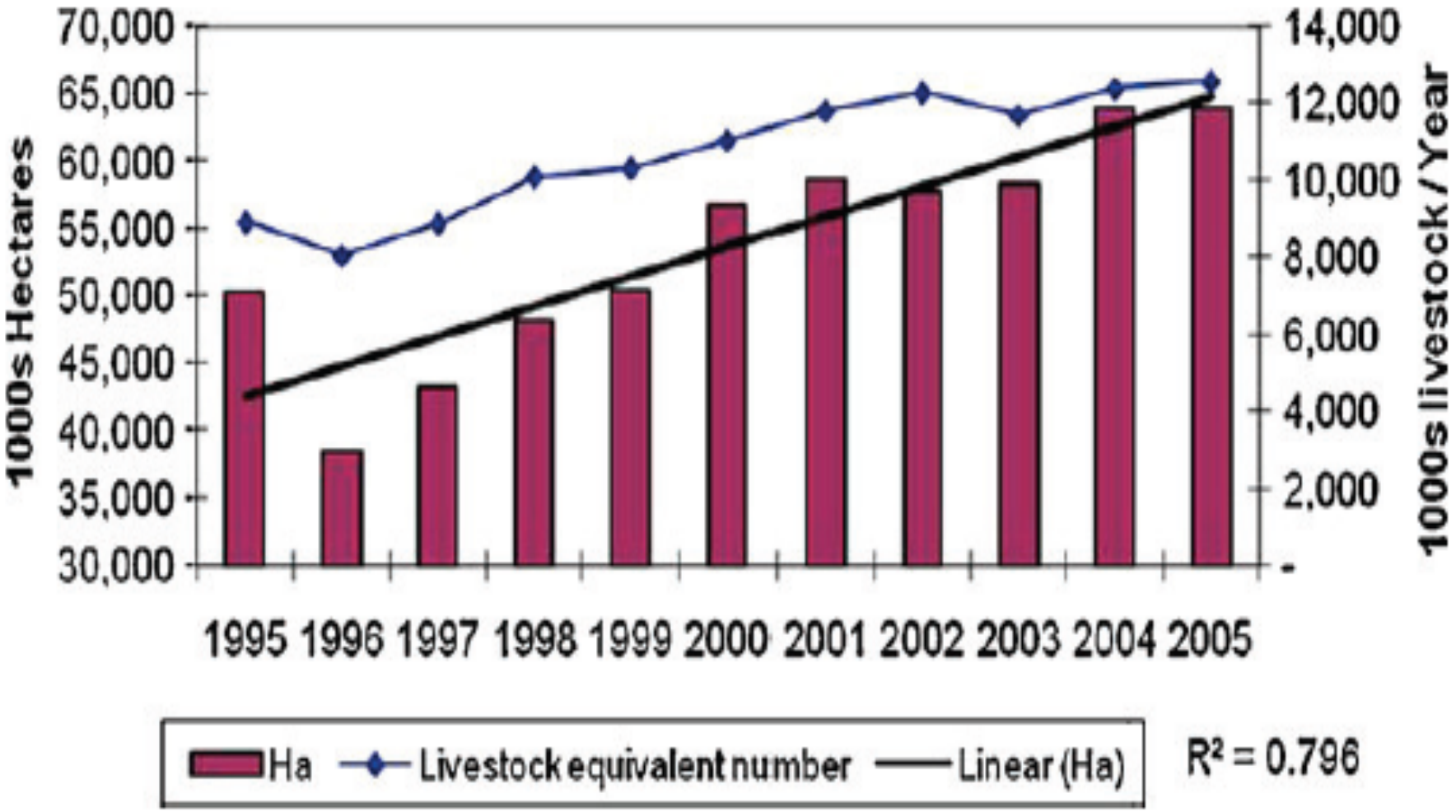
# The flip-side: The US as growing importer

- Between 1995 and 2005, fruit, vegetables, meat and forest product imports to the US steadily increased 'appropriating' an average of 141,000,000 ha in other countries.
- Half of this area is forest followed by pasture and cropland.

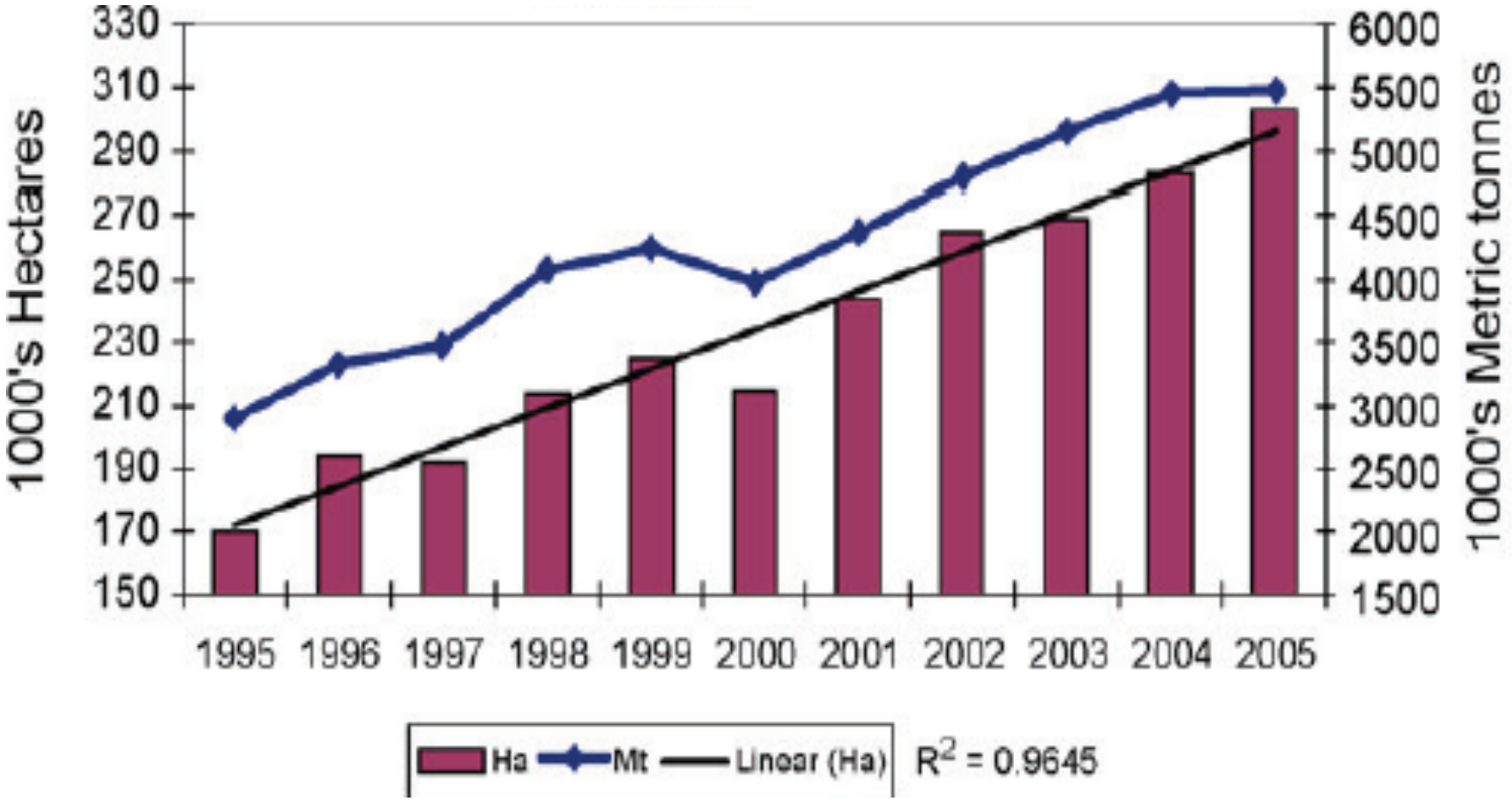
# Fig. 6: Total Agricultural . and Forest Land 'Imported' by US Consumers (1995-2005)



# Fig. 7: US Meat imports – Head of Livestock and Embodied Crop/Grazing Lands



# Fig. 8: US Vegetable Imports – Metric Tons and 'Embodied' Cropland



# The US Footprint on ‘Elsewhere’

- US food and wood-fibre imports represent an extra-territorial land area equivalent to 18% of the lower forty-eight states.
- This is an area approximately the size of Germany, Italy, Spain, and the United Kingdom combined.

# Globalization as Neo-Colonialism

- Globalization enables rich countries to use paper wealth to acquire the real wealth of developing and resource rich countries.
- Rich, powerful nations now achieve through globalization and trade what used to require territorial occupation.

# The Increasing Entanglement of Nations: Security Implications

- Specialization and trade makes every country dependent on others for various essential goods and commodities.
- Trade in bio-capacity stimulates material and population growth, enabling all trading partners to exceed their domestic carrying capacities even as they draw down resource stocks elsewhere.
- This means:
  - Every trade-dependent region is increasingly vulnerable to supply or price shocks.
  - All nations eventually reach global carrying capacity at the same time – and there is no surplus capacity or fall-back position.

# Such trends are unsustainable

- Globalization could be disastrous if key underlying assumptions are violated. For example, consider the effect on the national security of import-dependent nations if growth-driven human-induced climate change:
  - Undermines the productivity of exporting nations directly (e.g., long-term drought).
  - Induces sea-level rise permanently flooding coastal plains (prime agricultural lands).
  - Displaces millions leading to mass migration, local strife and geopolitical chaos
- These events seem virtually inevitable.

# “The Age of Consequences”

Washington, Center for Strategic and International Studies (November 2007)

- “We predict an [inevitable] scenario in which people and nations are threatened by massive food and water shortages, devastating natural disasters and deadly disease outbreaks” (John Podesta, contributing author).
- Rich countries could “go through a 30-year process of kicking people away from the lifeboat” as the world’s poorest face the worst environmental consequences” (Leon Fuerth, contributing author).

# Obvious Questions that Should Have Been Asked as the World Globalized

- What are the economic, ecological and moral implications of encouraging ever more dependent trade relationships that may not be sustainable given global change and resource scarcity?
- Is it wise for any nation to commit its well-being and future development to foreign production and vulnerable imports?
- What risks does a nation assume by committing substantial portions of its limited land-base to extra-territorial consumers?
- How can trade rules be modified to inhibit the overexploitation of critical forms of natural capital?
- What strategies can already trade-dependent countries employ to enhance security of supply?
- At what point do the benefits of self-reliance and enhanced security balance the assumed gains from trade?

# On the potentially positive side

- The sustainability of any region within the global system is increasingly dependent on the sustainability of various other distant regions.
- For the first time in the evolutionary history of *H. sapiens*, short-term individual and 'tribal' self-interest has all but converged with humanity's long-term collective interest.
- Mutual survival requires that short-term interests and competitive relationships give way to long-term interests and international cooperation to salvage what remains of essential natural capital.

# Our mission, should we choose to accept it…

- Global society must organize to abandon its socially-constructed perpetual growth myth in favour of a more equitable ‘steady state’ economy operating well within the means of nature.
- We must script a new cultural narrative that shifts the values of society from competitive individualism, greed, and narrow self-interest, toward community, sharing, cooperation, and our collective interest in restoring the life-support functions of the ecosphere.

# The cost of failure

Failure to achieve ecological sustainability with social justice would be the failure to exercise the very qualities that distinguish modern *H. Sapiens* from all other species:

- high intelligence (e.g., reasoning from the evidence);
- the ability to plan ahead;
- the capacity to exercise moral judgement;
- Empathy/compassion for other people and other species.

If we cannot rise to the challenge of being fully human, what then would be the prospects for global civilization?