



Sustainable Development

What does it mean, and can we really
do it, and how do we try?

“THE OLDEST TASK IN HUMAN HISTORY”



“We end, I think, at what might be called the standard paradox of the twentieth century: our tools are better than we are, and grow better faster than we do. They suffice to crack the atom, to command the tides. But they do not suffice for the oldest task in human history: to live on a piece of land without spoiling it.” (Aldo Leopold 1938)

COLLAPSE

HOW SOCIETIES CHOOSE
TO FAIL OR SUCCEED

JARED DIAMOND

Author of GUNS, GERMS, and STEEL

Winner of the PULITZER PRIZE



Sustainable Development

- **Sustainable** means that a resource activity can be continued in the **long term** without harming the environment
- **Development** refers to changes in the interaction between the economy, society, and environment that **improve human welfare**
- **Sustainable development** meets the needs of the present through development without **compromising the ability of future generations to meet their own needs.**

Balancing human prosperity and the preservation of the natural world



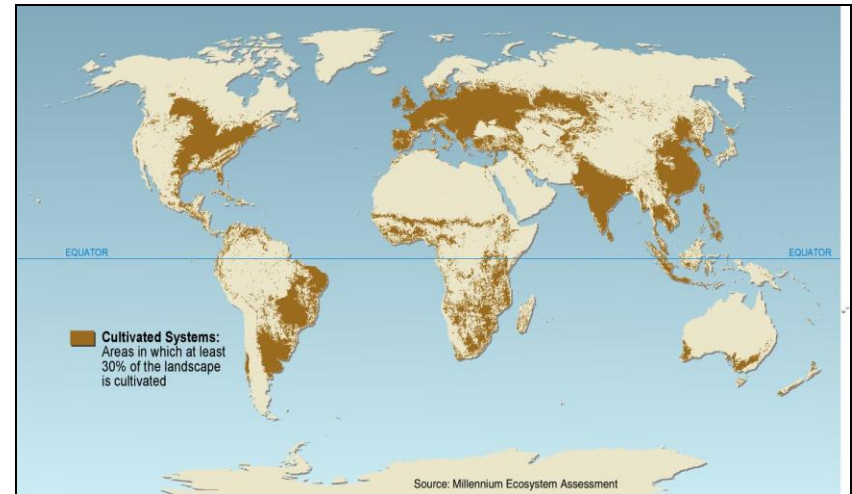
Types of Resource Use

- Some resource uses affecting biodiversity:
 - Agriculture/livestock
 - Fisheries
 - Forestry
 - Energy Production
 - Mining
- All take place in many different ways, can be sustainable or unsustainable



Unsustainable Agricultural Practices

- Expansion into remnant natural areas and use of marginal lands
- Heavy use of pesticides and fertilizers
- Cultivation methods, e.g., slash-burn and monocultures



Sustainable Agricultural Practices

- There is no single approach to sustainable agriculture - methods must be adapted to each individual case.

- Integrated pest management
- Mixed crop farming
- Planting nitrogen fixers
- Organic farming



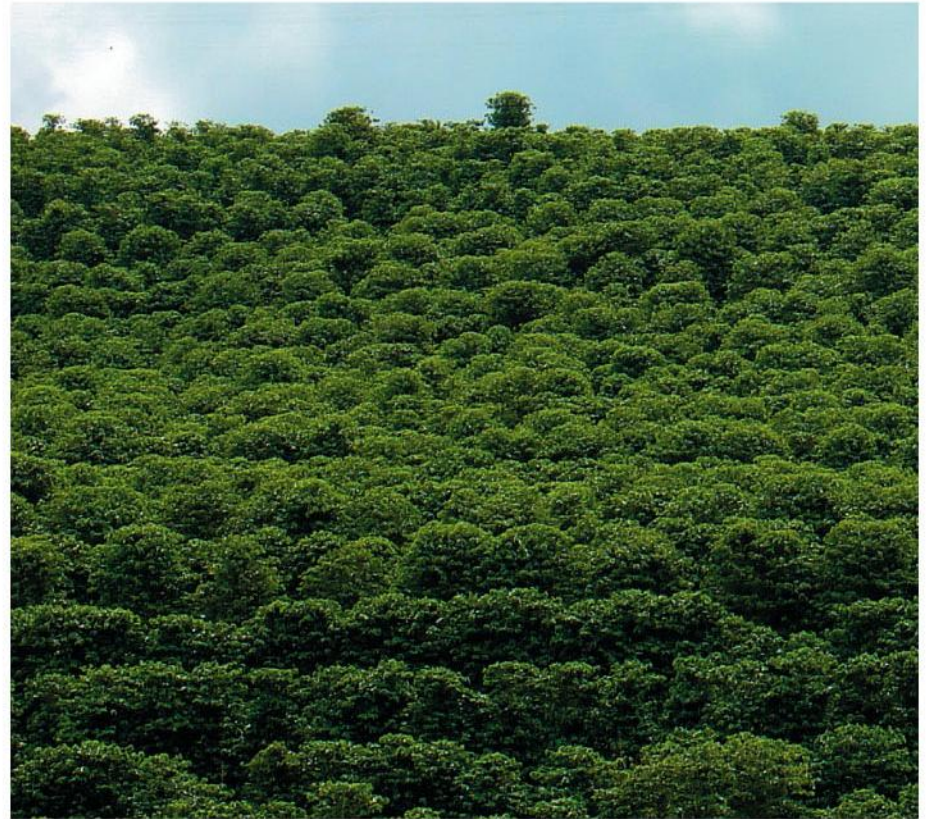
Shade-grown coffee

(A)



A coffee monoculture

(B)



Sustainable Livestock Management

Natural rangeland



Confined feeding operation



Sustainable Livestock Management

Riparian Habitat with Intensive Grazing



Same Riparian Habitat without Grazing



Looming Agricultural Challenges

- Can the world feed everyone without eroding biodiversity?
- Is industrial agriculture incompatible with biodiversity conservation?
- Does sustainable agriculture offer a viable alternative that better protects biodiversity?
- Will the public be willing to pay more for sustainably grown food? Does it have any choice?
- Do we need to alter our diets for the sake of preserving the environment and biodiversity?

Sustainable Forest Management

Even-aged
management



Uneven-aged
management



State of the World's Fisheries

- 70% of fisheries depleted or fully exploited
- In 1900, our oceans contained 6x more fish than they do now
- Global fish stocks declining by >1 billion pounds per year



Sustainable Fisheries

- Reduce harvests in unsustainable fisheries (Chilean seabass) and large fish (bluefin tuna)
- Reduce impacts of bottom trawling
- Minimize by-catch of seabirds, turtles, and marine mammals
- Marine protected areas
- Eliminate subsidies for unsustainable fisheries



Sustainable Energy Production

- The burning of fossil fuels is the primary means in which modern societies meet their energy needs
- Fossil fuels are not sustainable because there is a finite supply and are a cause climate change global instability



Sustainable Energy Production

- Solar energy
- Geothermal energy
- Wind power
- Hydropower
- Biofuels
- Nuclear???



Obstacles to Sustainable Development

- Wealth or the prospect of wealth generates political power that is used to promote over-exploitation of resources
- Achieving consensus among stakeholders is challenging
- Organizations and governments tend to seek to maximize economic growth (short-term perspective) rather than conserve for the future (long-term perspective)

Sustainability and Time Scale

- Greater profits can be made in the short term by logging tropical forests unsustainably
- Sustainable logging can result in greater long-term profits if non-timber values are considered (flood protection and carbon sequestration).



Sustainability and Time Scale

- In some cases, unsustainable harvesting can be more profitable in the **long term** than sustainable harvesting
- Harvesting all the whales in the ocean and investing the profit results in greater long-term returns than MSY.
- In such cases, **regulation** is critical for sustainable harvesting



Achieving Sustainability

- Sustainable development is the responsibility of everyone involved in resource use
 - Producers: farmers, ranchers, fisherman, developers, energy producers
 - Retailers
 - Managers
 - Researchers
 - Policymakers and the electorate

Consumer Decisions



BEST CHOICES	GOOD ALTERNATIVES	AVOID
<ul style="list-style-type: none"> Abalone (US farmed) Arctic Char (farmed) Barramundi (US farmed) Catfish (US farmed) Clams (farmed) Cod: Pacific (US bottom longline) Crab: Dungeness Halibut: Pacific (US) Lobster: Spiny (US) Mussels (farmed) Oysters (farmed) Rockfish: Black (CA, OR, WA, hook & line) Sablefish/Black Cod (Alaska, BC) Salmon (Alaska wild) Sardines: Pacific (US) Scallops (farmed off-bottom) Shrimp: Pink (OR) Striped Bass (farmed and wild*) Tilapia (US farmed) Trout: Rainbow (US farmed) Tuna: Albacore, Skipjack, Yellowfin (US troll/pole) White Seabass (hook & line) 	<ul style="list-style-type: none"> Basu/Pangasius/Swai (farmed) Caviar: Sturgeon (US farmed) Clams (wild) Cod: Pacific (US trawled) Crab: King (US), Snow Flounders, Soles (Pacific) Halibut: California* Lingcod* Lobster: American/Maine Mahi Mahi (US) Oysters (wild) Pollock: Alaska Rockfish (Pacific hook & line) Sablefish/Black Cod (CA, OR, WA) Sanddabs (Pacific) Scallops: Sea Shrimp (US, Canada) Spot Prawn (US) Squid Swordfish (US)* Tilapia (Central & South America farmed) Tuna: Bigeye, Tongol, Yellowfin (troll/pole) 	<ul style="list-style-type: none"> Caviar, Sturgeon* (imported wild) Chilean Seabass/Toothfish* Cod: Pacific (imported) Cobia (imported farmed) Crab: King (imported) Dogfish (US)* Grenadier Lobster: Spiny (Brazil) Mahi Mahi (imported longline) Marlin: Blue, Striped (Pacific)* Monkfish Orange Roughy* Rockfish/"Pacific Snapper" (trawled) Salmon (farmed, including Atlantic)* Sharks* Shrimp (imported) Swordfish (imported)* Tilapia (Asia) Tuna: Albacore, Tongol, Yellowfin Tuna: Bluefin Tuna: Cannonball

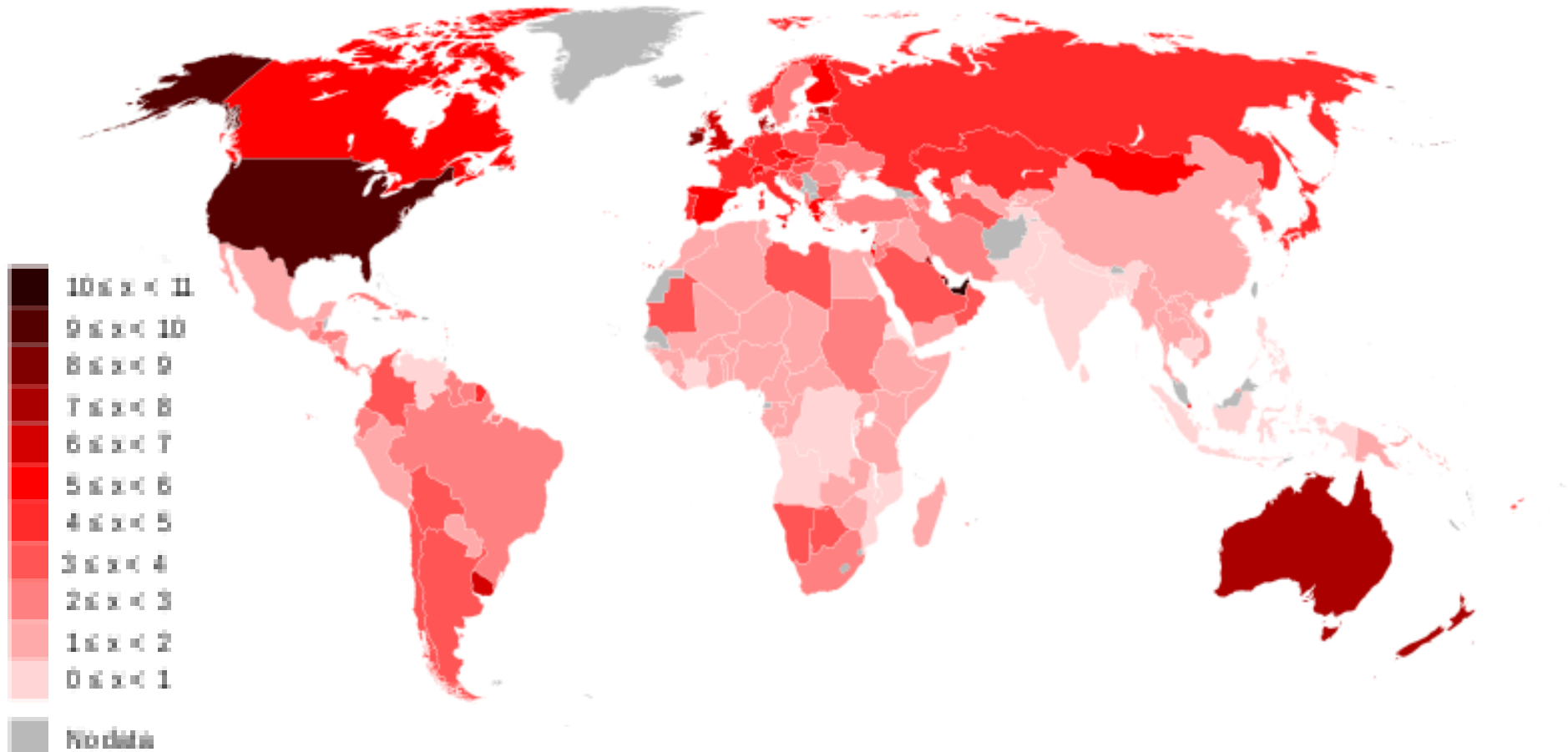


Are We Living Sustainably?

“Ecological Footprints”

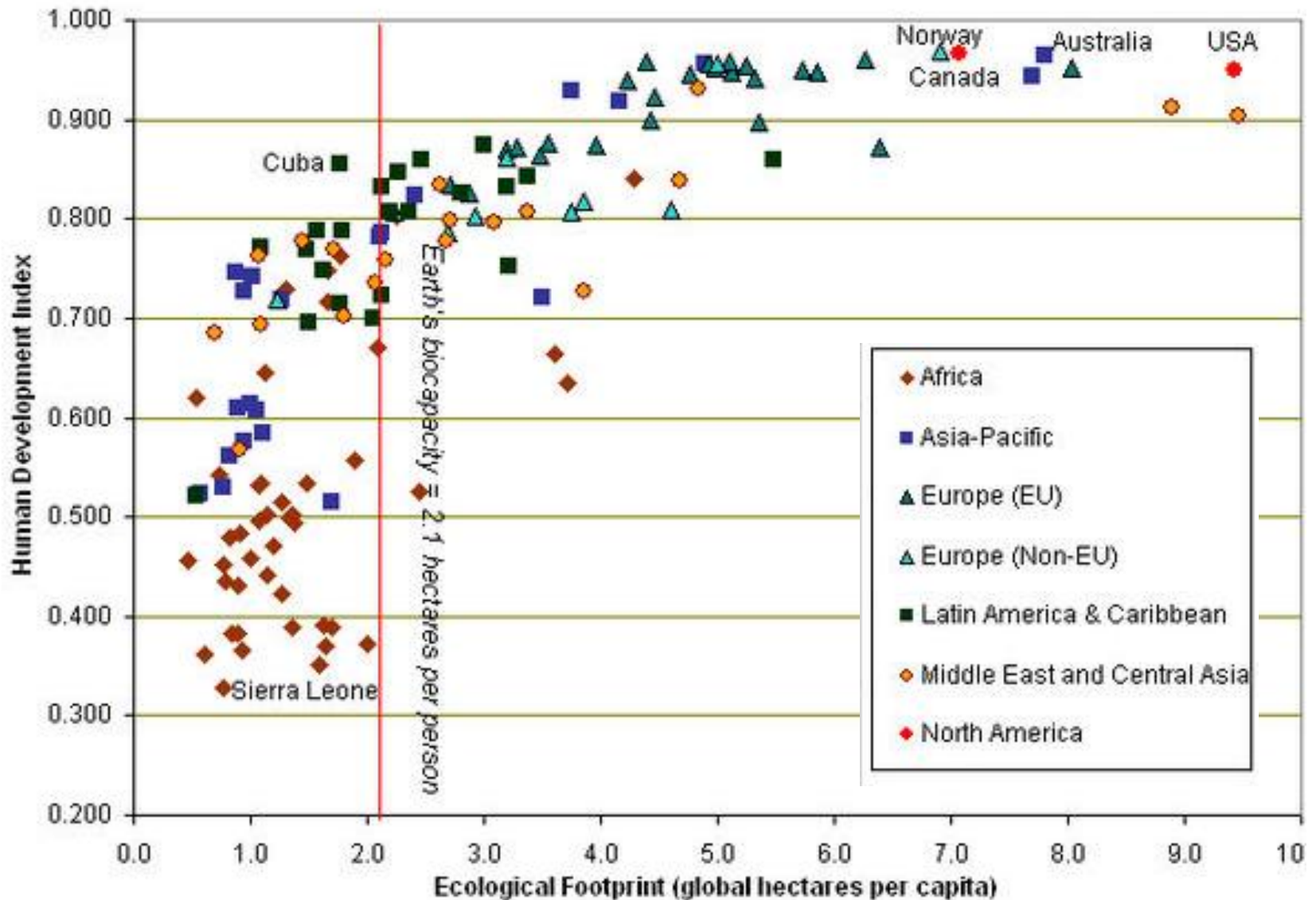
- The **ecological footprint** is a measure of human demand on the Earth's ecosystems; specifically, **the area of “land” needed to support human beings**
- Calculated based on the area of biologically productive land and sea needed to generate the resources humans consumes and absorb the resulting waste.
- Can be calculated **individually, nationally, or globally**.

Global Map of Ecological Footprints



Per capita ecological footprint (hectares of land needed per person) by country

Ecological Footprint and Human Welfare

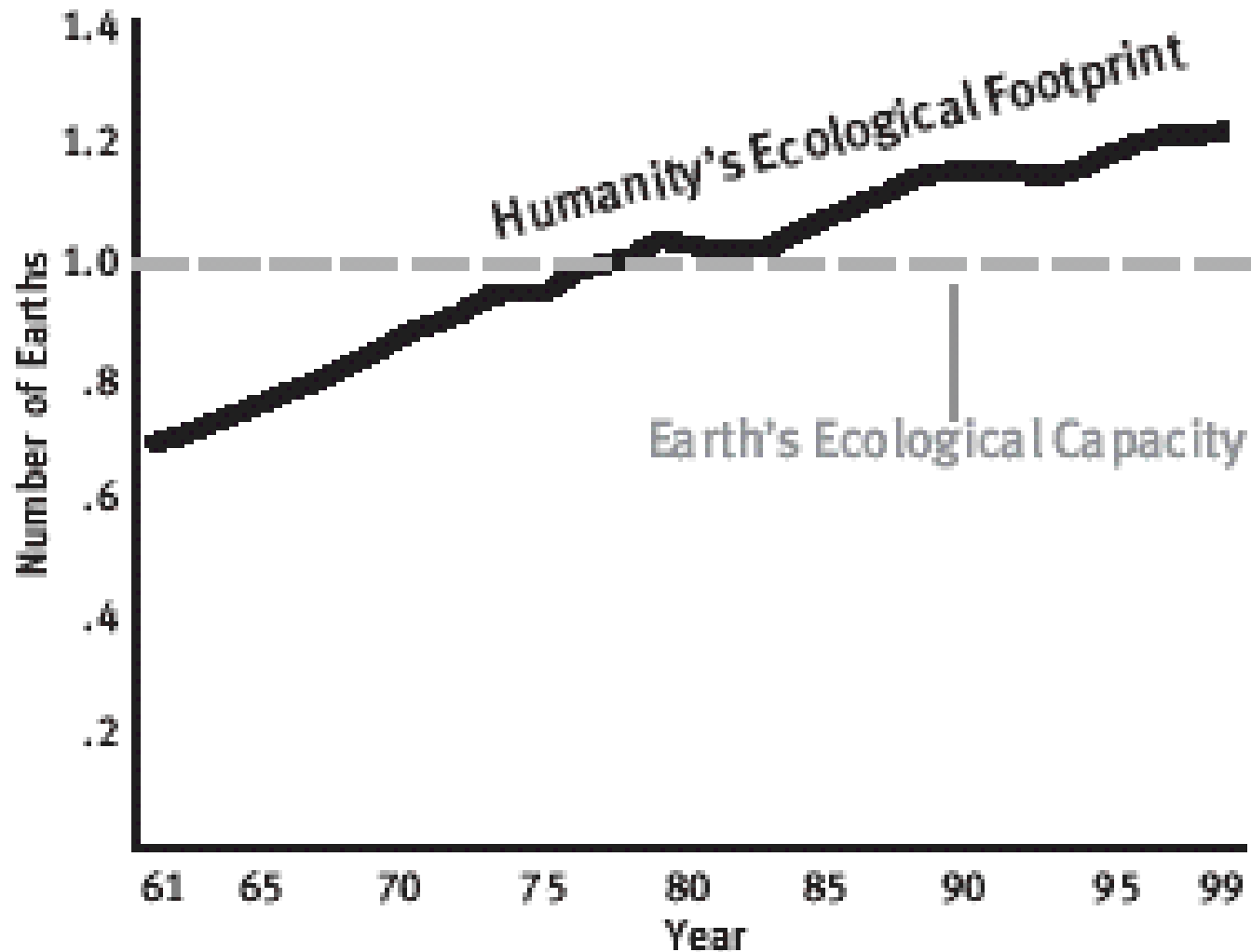


Some National Footprints and Capacity

-Per-person capacity increases with the country's area and decreases with its population size

- USA: about 9.6 hectares (ha) per person
 - national capacity is 6.0 ha per person
- Canada: about 6.9 ha per person
 - national capacity is 15.9 ha per person
- Japan: about 4.6 ha per person
 - national capacity is 0.8 ha per person
- India: 0.8 ha per person
 - national capacity is 0.7 ha per person

Our Collective Ecological Footprint has Exceeded Earth's Capacity



“THE OLDEST TASK IN HUMAN HISTORY”

- Both reductions in the **global population** and **per capita impacts** are essential to achieve sustainability
- Global population projections for 2050 (about 10 billion) and growing affluence mean huge impacts on the environment loom
- **Under “business as usual”, catastrophic biodiversity losses are certain**