Population & Consumption
Bill McKibben

1989

2004

2012

Bill McKibben (born 1960)
Population and Consumption

How many are we?

How big are we?
How many are we?
(about 7.5 billion)

How big are we?
As hunter-gatherers: 2500 kcal/day
As modern humans: 31,000 kcal/day
As U.S. citizens: 185,000 kcal/day
Population and Consumption

How many are we?
(about 7.5 billion, and growing…)

How big are we?

As hunter-gatherers: 2500 kcal/day
As modern humans: 31,000 kcal/day
As U.S. citizens: 185,000 kcal/day

How big is the earth?
Is There a Problem?

Malthusians: YES!

At the point where population reaches its limit of food supply there will be war, famine and disease.

Essay on the Principle of Population (1798)

Thomas Malthus
(1766-1834)
Is There a Problem?

Cornucopians: Nah!

The Green Revolution (1960s)

Ester Boserup: The more people, the more resources!

Julian Simon: We will always find substitutes for depleted resources!
But surely there are limits…

Biologist Peter Vitousek (1986): humans use 38.8% of the earth’s “primary productivity.”

Biologist David Pimental on our wasteful ways: one head of iceberg lettuce is 95% water and contains 50 kcal of energy. Yet we spend 400 kcal to grow the lettuce in California, and 1800 kcal to ship it to the east coast.

The largest world harvest of grain was in 1984.
The regularities that we have learned and relied upon during the past 10,000 years of agricultural practice are disappearing. That was Earth1.

We are depleting resources.

We are depleting sinks.

Local Pollution vs Global Pollution
In 2004:
U.S. population grew by 3 million.
Indian population grew by 16 million.

The U.S. added 15.7 million tons of CO2 to the atmosphere, while India added only 4.7 million tons.

(Per capita pollution in the U.S. is 17x that in India.)
(With less than 5% of global population, the U.S. burns 1/4th of the world’s fossil fuel resources.)
Population and Pollution

The Right to Pollute?

Do we have the **right to pollute** as much as we want?

Is there a **limit** to this right?

If so, **how much** is too much?
Property Rights
(1) **use**: the right to use the property (and to consume the renewables…).

(2) **exclusion**: the right to prevent others from trespassing on your land or otherwise making use of your property.

(3) **transfer/alienation**: the right to transfer the property to others.

(4) **compensation**: the right to reparation for damage or use by others.

[Renters have rights 1+2, but not 3+4, to the rented property.]
A right is always a right *to something* and *against someone*.

“To what do I have the right?”

*positive*: an action / *negative*: an omission

“Against whom do I have the right?”

*in personam*: against an individual or group / *in rem*: against everyone

<table>
<thead>
<tr>
<th>Rights</th>
<th>Positive</th>
<th>Negative</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>in personam</strong></td>
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<tr>
<td><strong>in rem</strong></td>
<td>Rights of Beneficence</td>
<td>Rights of Liberty</td>
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<td>Rights of Security</td>
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</tbody>
</table>

Waiving Rights and Forfeiting Rights
Classifying Property Rights

(1) use: the right to use the property.
(2) exclusion: the right to prevent others from trespassing on your land or otherwise making use of your property.
(3) transfer/alienation: the right to transfer the property to others.
(4) compensation: the right to reparation for damage or use by others.

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</tbody>
</table>
What do you think?

Are there, or should there be, limits to these property rights?

(1) **use**: the right to use the property.  
(2) **exclusion**: the right to prevent others from “touching” your property.  
(3) **transfer/alienation**: the right to transfer the property to others.  
(4) **compensation**: the right to reparation for damage or use by others.
Property Rights

(1) **use**: the right to use the property.
(2) **exclusion**: the right to prevent others from trespassing on your land or making use of your property.
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**Some Limits to Use**

**The Harm Principle**

**Nuisance Law**: cease or compensation for loss of use
- High social value (of the cause of the nuisance): defendant pays reparations to the plaintiff.
- Low social value: defendant must **cease and desist**.
“The sole end for which mankind are warranted, individually or collectively, in interfering with the liberty of action of any of their number, is self-protection.” [John Stuart Mill, *On Liberty* (1859), Ch. 1, §9]

This principle holds that liberty (autonomy in the sense of “liberty of action”) is a fundamental good to be compromised only with good reason; coercion is justified only when it prevents an evil greater than the coercion itself.

The **private harm principle**: justifies the restriction of one’s liberty to prevent injury to other specific individuals.

The **public harm principle**: justifies the restriction of one’s liberty to prevent injury to institutional practices or regulatory systems that are in the public interest.
I own this bow and these arrows. I like to shoot them in the air. Do I have the right to shoot them where I please?
Limits on Property Use?

Smith built this coal-powered plant to generate electricity in his backyard to run his widescreen TV. Is that OK?
Limits on Property Use?

Smith also sells Jones some electricity for his hog barn, which he built in his backyard. The manure washes into the river. Is that OK?
Miller sells tenderloins from Jones’s hog operation, and powers his restaurant with electricity from Smith. Is that OK?
Animal-Based Foods Are More Resource-Intensive than Plant-Based Foods

PER TON PROTEIN CONSUMED

- Land Use (ha)
  - Pasture
  - Cropland

- Freshwater Consumption (1,000 m³)
  - Rainwater
  - Irrigation

- GHG Emissions (t CO₂e)
  - Land-use change
  - Agricultural production

WRI.org/shiftingdiets

WORLD RESOURCES INSTITUTE
## Protein Scorecard

<table>
<thead>
<tr>
<th>FOOD</th>
<th>IMPACT (GHG emissions per gram of protein)</th>
<th>COST (Retail price per gram of protein)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wheat</td>
<td></td>
<td>$</td>
</tr>
<tr>
<td>Corn</td>
<td></td>
<td>$</td>
</tr>
<tr>
<td>Beans, chickpeas, lentils</td>
<td></td>
<td>$</td>
</tr>
<tr>
<td>Rice</td>
<td></td>
<td>$</td>
</tr>
<tr>
<td>Fish</td>
<td></td>
<td>$$$</td>
</tr>
<tr>
<td>Soy</td>
<td></td>
<td>$</td>
</tr>
<tr>
<td>Nuts</td>
<td></td>
<td>$$$</td>
</tr>
<tr>
<td>Eggs</td>
<td></td>
<td>$</td>
</tr>
</tbody>
</table>

### LOW

- Poultry
- Pork
- Dairy (milk, cheese)

### MEDIUM

- Beef
- Lamb & goat

Sources: GlobAgri-WRR model developed by CIRAD, Princeton University, INRA, and WRI (GHG data); USDA and BLS (2016) (US retail price data).

www.wri.org/proteinscorecard
Beef Is One of the Most Inefficient Sources of Calories and Protein

Percent of "Units of Edible Output Per 100 Units of Feed Input"

- Beef
- Sheep
- Farmed Shrimp
- Milk (cattle)
- Milk (buffalo)
- Pork
- Poultry
- Farmed Finfish
- Egg

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People Are Consuming More Calories

wri.org/shiftingdiets
People Are Consuming More Animal-Based Protein

**Graph Description:**
- The graph illustrates the increase in animal-based protein consumption per capita for various countries from 1961 to 2050.
- Countries represented include the United States, European Union, Japan, Brazil, China, World, Indonesia, Nigeria, India, and Ethiopia.
- The x-axis represents the years from 1961 to 2050, while the y-axis shows the amount of animal-based protein available per capita in grams.
- The data shows a general upward trend for all countries, with some fluctuations and plateaus.
- A notable trend is the increase in consumption in developing countries compared to developed ones.

**Source:**
- wri.org/shiftingdiets

**Key Observations:**
- The United States and European Union show high consumption levels, with the United States maintaining a high and constant consumption rate.
- Japan and Brazil also show significant consumption increases, with Brazil's consumption rate rising sharply in recent years.
- China, Indonesia, Nigeria, India, and Ethiopia have shown substantial increases in consumption, especially in recent years.
- The graph highlights the disparities in consumption between different regions and the potential implications for global resources and sustainability.