

Population, Consumption & the Environment

Alex de Sherbinin

Center for International Earth Science Information Network (CIESIN),
the Earth Institute at Columbia University

Population-Environment Research Network



Why is this important?

- Global GDP is 20 times higher today than it was in 1900, having grown at a rate of 2.7% per annum (population grew at the rate of 1.3% p.a.)
- CO2 emissions have grown at an annual rate of 3.5% since 1900, reaching 100 million metric tons of carbon in 2001
- The ecological footprint, a composite measure of consumption measured in hectares of biologically productive land, grew from 4.5 to 14.1 billion hectares between 1961 and 2003, and it is now 25% more than Earth's "biocapacity"
- For CO2 emissions and footprints, the per capita impacts of high-income countries are currently 6 to 10 times higher than those in low-income countries

3

Outline

1. What kind of consumption is bad for the environment?
2. How are population dynamics and consumption linked?
3. Who is responsible for environmentally damaging consumption?
4. What contributions can demographers make to the understanding of consumption?
5. Conclusion: The challenge of "sustainable consumption"

4



What kind of consumption is bad for the environment?

SECTION 2

5

What kind of consumption is bad?

"[Consumption is] human transformations of materials and energy. [It] is environmentally important to the extent that it makes materials or energy less available for future use, and ... through its effects on biophysical systems, threatens human health, welfare, or other things people value."

- Stern, 1997

- Early focus on "wasteful consumption", conspicuous consumption, etc. (Pew GSI, President's Council on SD)
- Current recognition that all forms of consumption entail some environmental costs
- Recent focus on production-consumption systems, product lifecycles, cradle-to-grave assessments, material flow analysis, and displaced impacts through trade

6

Production-consumption system

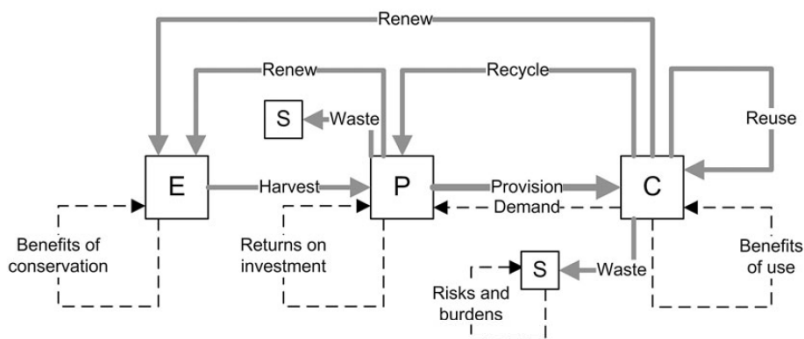


Figure 1

Material flows and derived utilities in a generalized production (P) and consumption (C) system that draws on environmental resource (E) and adds waste to sinks (S). Solid lines are flows. Dotted lines are derived utilities.

Source: Lebel & Lorek, *Annual Reviews*, 2008

7

Household consumption

- Three consumption clusters account for nearly 70% of an economy's material extraction and energy consumption, and 90% of land use:
 1. Construction & housing – 50% of HH energy consumption, but appear to be saturating
 2. Food & nutrition – 20-30% of HH energy consumption, and largest portion of land use
 3. Transport & mobility – 20-30% of HH energy consumption; about 50% of transport is leisure related, and percentage is increasing
- In China there is a transition from food & housing HEIs to transport & housing impacts (Liu et al. 2009)

8

Energy

- Energy has been most studied (consistent units, well defined environmental impacts)
- World consumes the 77 *trillion* barrels of oil energy equivalent per year
 - *Fossil fuel* consumption (oil, coal, natural gas) is 66 trillion barrels of oil energy equivalent

9

Energy use impacts: air pollution

Mean Lower Troposphere Ozone Concentration (PPB) Summer 2006

50 PPB = 100 $\mu\text{g}/\text{m}^3$ = WHO
limit for 8 hour mean

Legend

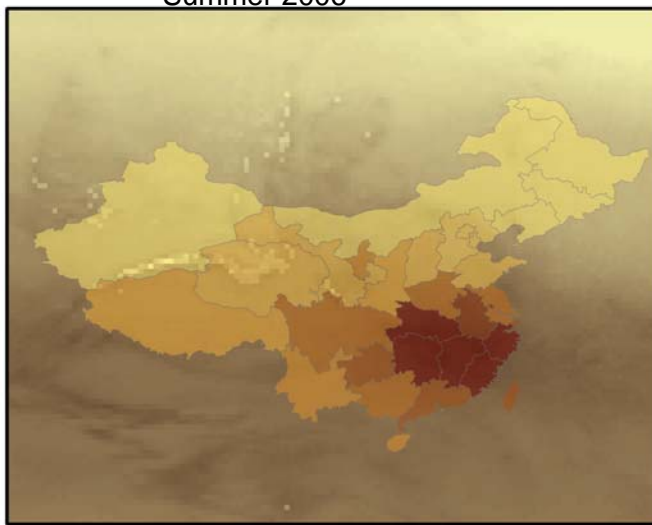
Mean Lower Tropospheric Concentration (PPB)

0.000000
0.000001 - 47.000000
47.000001 - 53.259998
53.259999 - 56.360901
56.360902 - 58.753799
58.753800 - 60.608002
60.608003 - 61.539600
61.539601 - 62.334301
62.334302 - 64.317101
64.317102 - 69.214401

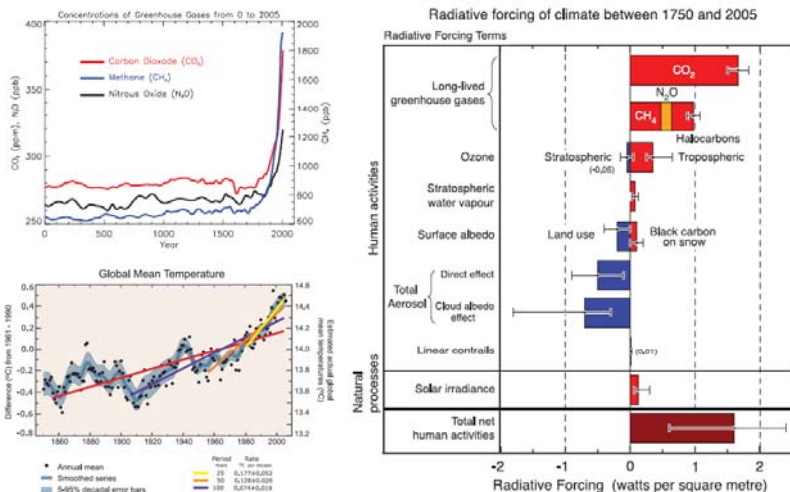
Grid Value

High : 72.806
Low : 0

Dara Preparation:
Malanding Jaiteh, CIESIN

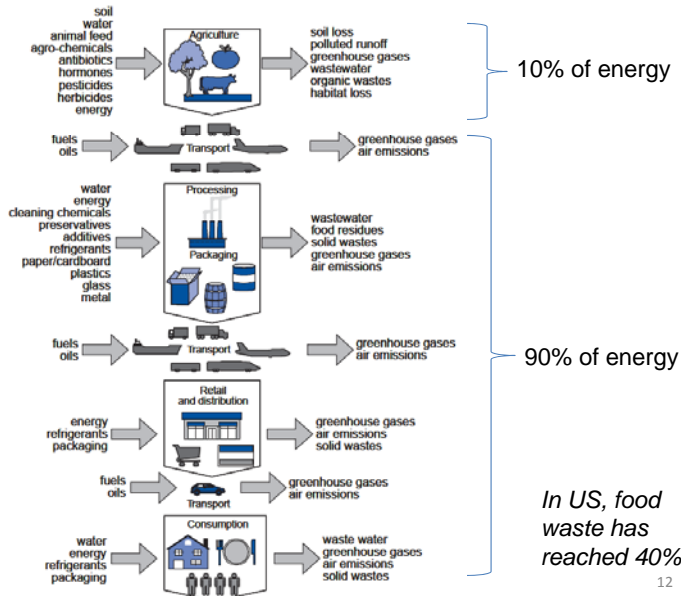


Energy use impacts: climate

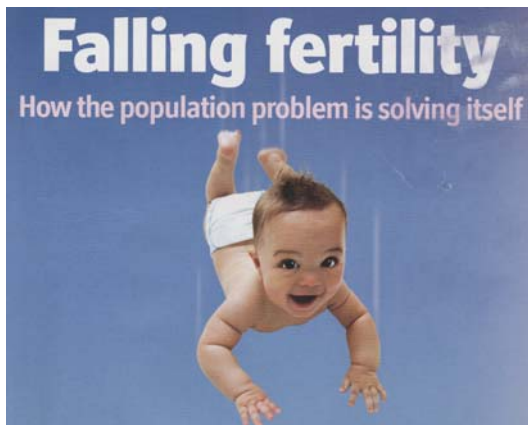


Source: IPCC Fourth Assessment Report (AR4) Working Group I. 2007. *The Physical Science Basis: Frequently Asked Questions*. Cambridge University Press.

Environmental impacts - food sector



Source: OECD 2004



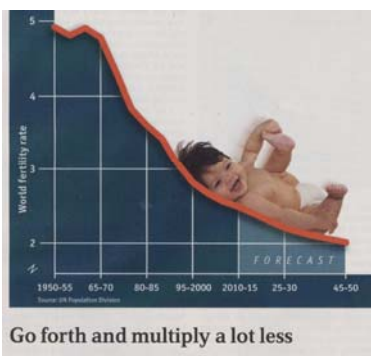
How are population dynamics and consumption linked?

SECTION 2

13

How are population dynamics & consumption linked?

- Consumption levels tend to increase with:
 - Urbanization
 - Income levels
- } Both of which are correlated with lower fertility

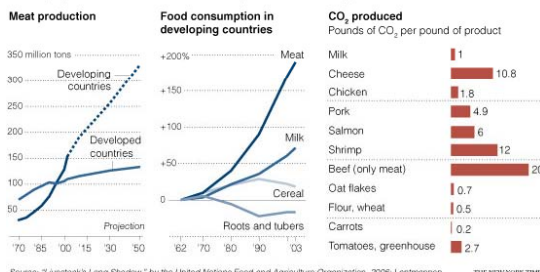


Go forth and multiply a lot less

Source: *The Economist*, 31 Oct. 2009

Meat Consumption and CO₂ Emissions

According to a report by the United Nations Food and Agriculture Organization, livestock generates 18 percent of greenhouse gas emissions. The problem is expected to grow, as developing countries increase their consumption of meat and byproducts.



Household composition & energy use

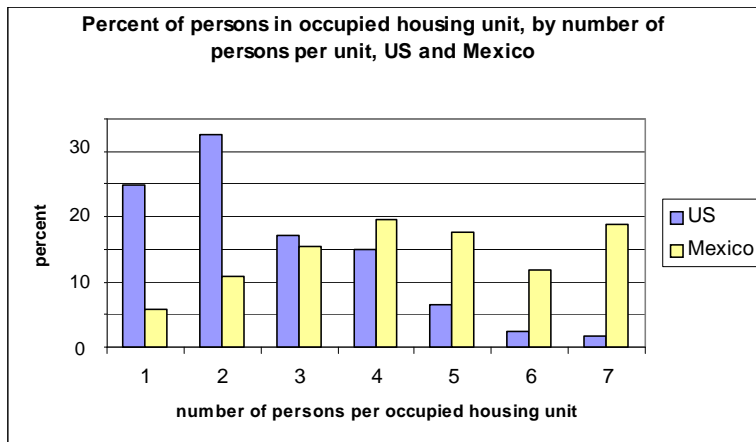
- Energy use goes up with education and income
- Male headed households consume more energy than female headed households
- In U.S. smallest households are growing at fastest rate due to increased age at marriage, aging & divorce
- This increases *per capita* energy use

Sources of growth in energy consumption, 1970-1990

	% inc. in energy consump. (I) =	Due to pop. growth (P)	Due to change in income (A)	Due to change in tech. (T)
Developing Countries	6.7%	2.2%	3.0%	1.5%
Developed Countries	2.1%	0.7%	2.0%	-0.6%

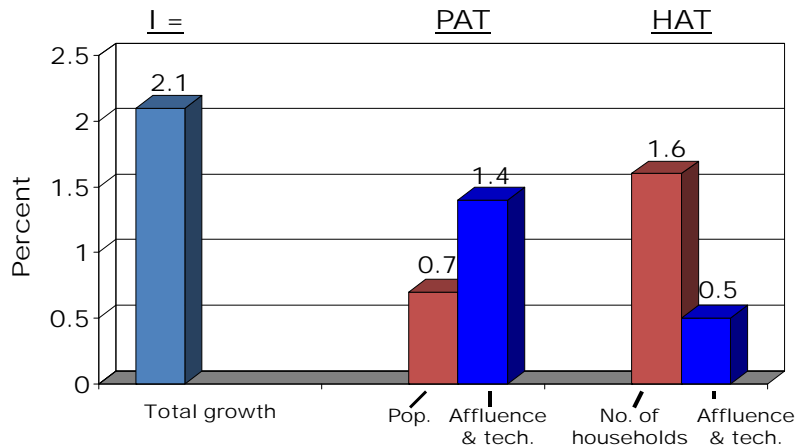
Source: Lutz, "Demographic Change and Environment," Open Meeting of HDGEC, June 1999

Distribution of HH size: U.S. and Mexico



Source: U.S. Census Bureau and INEGI

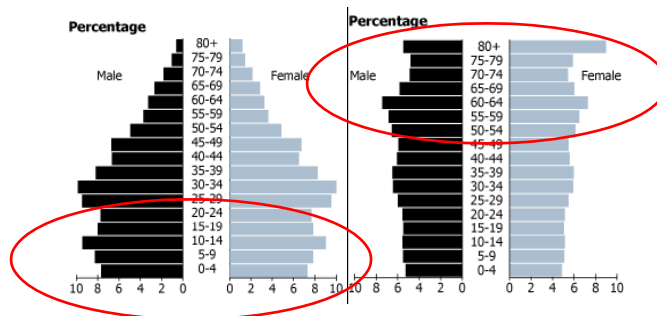
IPAT vs. IHAT: Developed country growth in energy use



Source: Lutz, "Demographic Change and Environment," Open Meeting of HDGEC, June 1999

Age Structure

China Age Structure: 2000 and 2050



19

Migration & consumption

- Migration can be motivated by conceptions of the “good life”
- Recent migrants to the US generally consume less than other Americans, but within a few generations the gap is closed

20



Who is responsible for environmentally significant consumption?

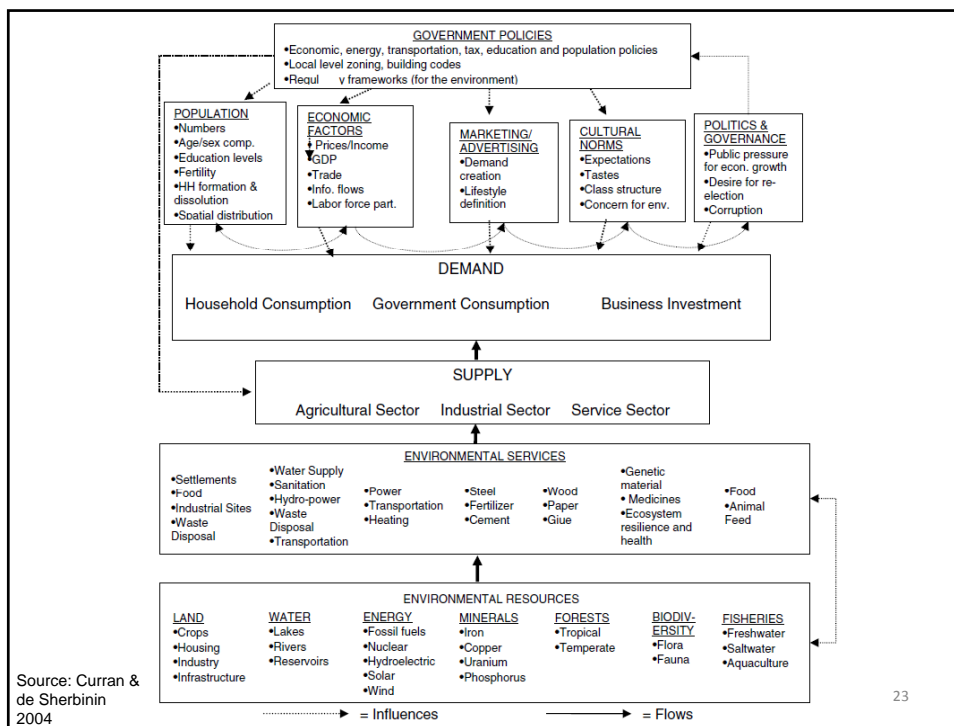
SECTION 3

21

Who is responsible for consumption?

- The world's consumer class is disproportionately – but not solely – in developed countries
- Theory of consumer sovereignty
- Yet, marketing stimulates demand
 - The corporate “tail” wagging the consumer “dog”
- Government policy plays a role – through taxation, subsidies, investments, etc.
- Large organizations – governments & corporations – also consume resources directly for institutional purposes

22



What can demographers contribute to the understanding of consumption patterns and processes?

SECTION 4

Role of demographic research

- Study household processes and their relationship to consumption patterns
 - Size, Composition (age, sex, income, education), Lifecycles
- Study different preferences/patterns by age, sex, urban, & rural status
- Exploit consumer demographic databases to identify levers for change
- Identify “consumption transitions” similar to “demographic transition”
- Survey research on “values”:
 - Understanding when and where “green values” translate into action
 - KAP-gap type research: where people express values or desires that are not consistent with their actual behavior

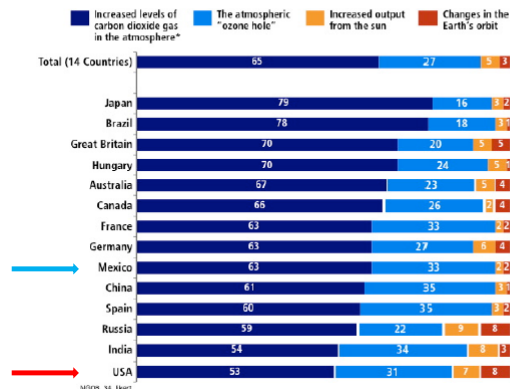
25

Knowledge

What is the Primary Cause of Recently Measured Increases in Earth's Temperature?



Answers by Consumers in Country

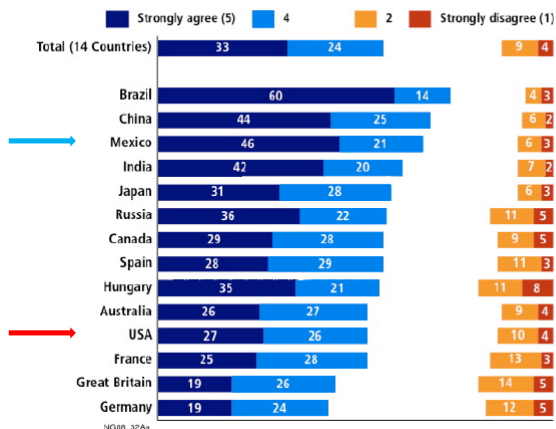


Attitudes

I Am Very Concerned about Environmental Problems



% By Consumers in Country

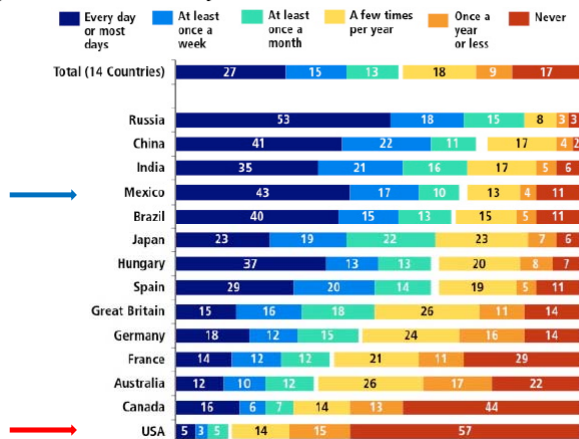


Practice

Frequency of Using Public Transportation



% By Consumers in Country



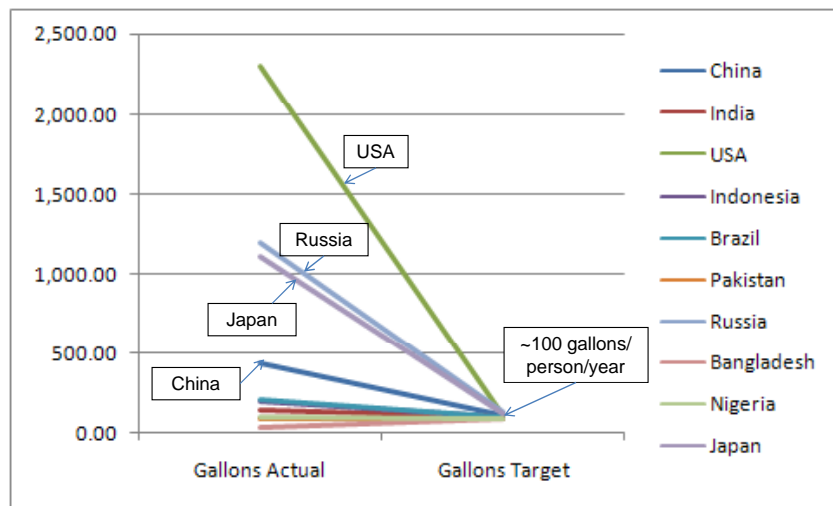


Conclusions – the challenge of “sustainable consumption”

SECTION 5

29

Required Reductions in Per Capita Gasoline-Equivalent Consumption for Climate Stabilization



“Emission reductions on the order of 60-80 per cent of 1990-level emissions would be necessary to stabilize concentrations of carbon dioxide in the atmosphere.” UNFCCC (2006).

Challenges (1)

- Much consumption is “locked in”
 - Housing stock is only renewed every 50+ years & can be improved only marginally
 - >50% of mobility is between home and work place
- Political resistance to policies to reduce, regulate or tax consumption so as to “internalize externalities”
- The scale effects generally overwhelm improvements in efficiency and technology
 - Directly related to population size and growth

31

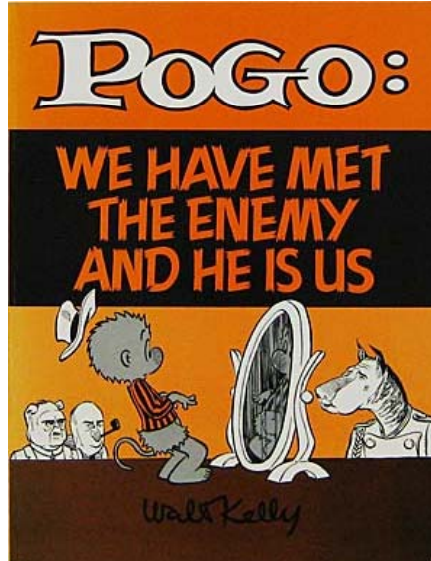
Challenges (2)

- The reduction of population growth had many “win-win” elements – but consumption reduction has few politically powerful proponents
- Values and consumer preferences are hard – though not impossible – to change
- Lack of information for even well intentioned consumers
- “Out of sight, out of mind”
 - Globalization separates the environmental externalities from the site of consumption
 - Urbanization has reduced contact with nature (biophobia among children in Hong Kong)

32

Challenges (3)

- Change is hard!



33

Observations

- Need to move from “normative” to “normal”
 - price signals and consumer options will need to make it “normal” to consume less, not a counter culture decision
- Not just “socialist” vs. “capitalist” models, but also “statist”, and *Other Worlds are Possible* (IPCC)

“We seem to face a number of closely connected processes that reinforce unsustainable patterns of consumption, including individualization, the spread of market values, globalization, urbanization, and the changing nature of risk and our response to it. In some cases, counterforces seem to be emerging – the processes may be self limiting. But it is hard to imagine a way in which the forces supporting consumption patterns could be deliberately altered. Businesses and governments seem to be swept up in these grand societal developments. The best they can do is ride the waves.” - L. Michaelis, Oxford Commission on Sustainable Consumption

34

<http://www.ciesin.columbia.edu>

<http://www.populationenvironmentresearch.org>

THANK YOU
MUCHAS GRACIAS

35