

# Why Place-Based Food Systems? Food Security in a Chaotic World

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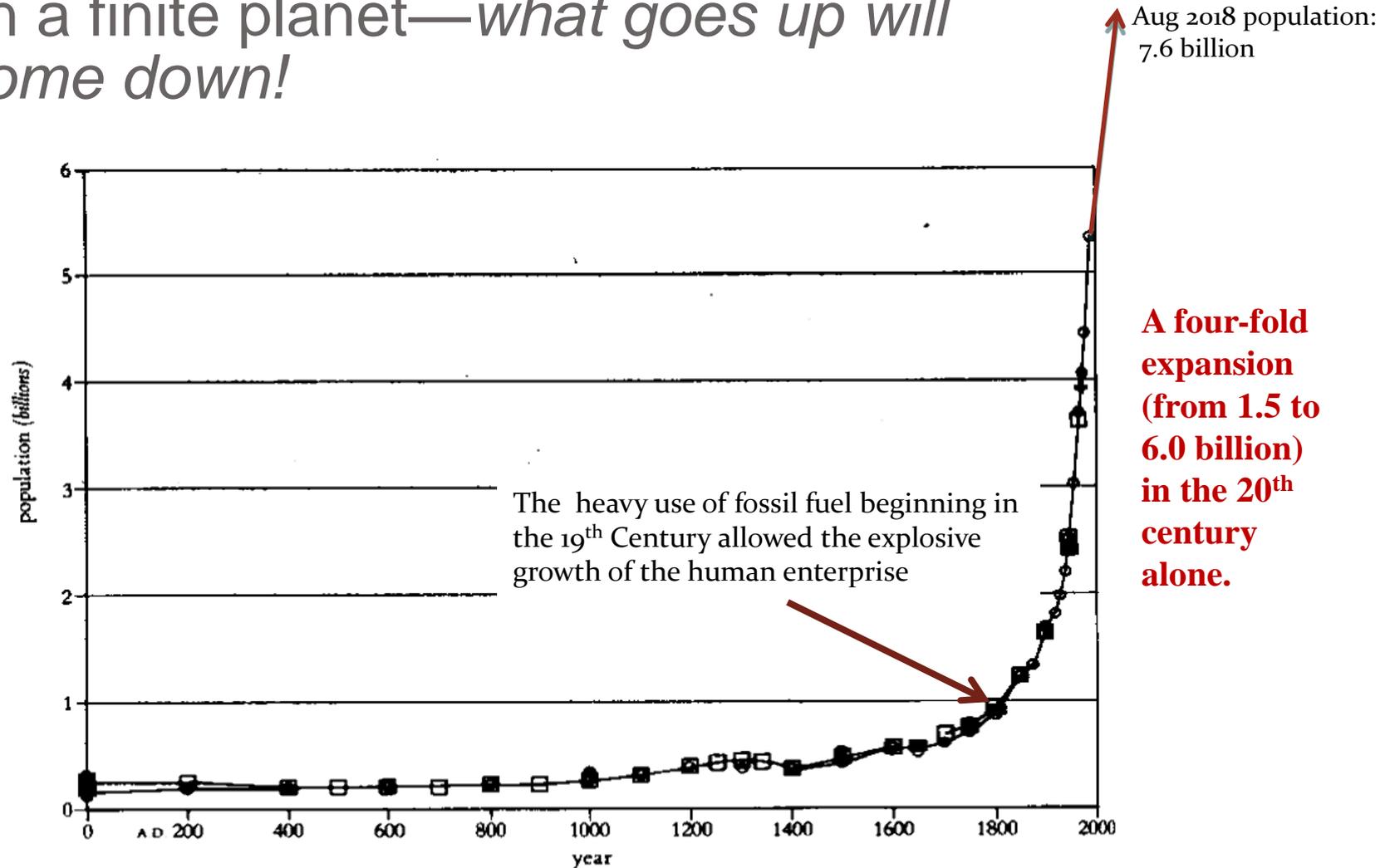
Place-Based Food Systems:  
Making the Case, Making It Happen  
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## Context: The mind-blowing rate of change implied by geometric (exponential) growth

- ❑ It took 200,000 years for the human population to hit one billion in the early 1800s.
- ❑ The population expanded an additional seven-and-a-half-fold in just the next 200 years to reach 7.6 billion in 2018, *1/1000<sup>th</sup> as much time required for the first billion!*
- ❑ Meanwhile, real gross world product increased 100-fold and per capita incomes (consumption) increased by a factor of 13 ( 25 in rich countries).

**But Earth didn't get any larger.**

The unsustainable, **oil-based** exponential expansion of the human enterprise on a finite planet—*what goes up will come down!*



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.

# Exceeding carrying capacity: A world in overshoot

- ❑ GHGs are accumulating
- ❑ climate is changing
- ❑ soils are eroding
- ❑ deserts are expanding
- ❑ tropical forests are shrinking
- ❑ oceans are acidifying
- ❑ sea levels are rising
- ❑ fresh waters are toxifying; marine 'dead zones' are expanding
- ❑ the seas are over-fished
- ❑ biodiversity is plummeting
- ❑ numbers of environmental refugees are increasing, (etc., etc.)

## Bottom line:

- a) The human enterprise already exceeds the long-term carrying capacity of Earth; that is, material production, consumption and waste generation exceed the regenerative and assimilative capacities of the ecosphere.*
- b) We are 'financing' the growth of the human enterprise by liquidating essential natural capital upon which we depend for long-term survival.*

# Overshoot: The Global Picture

World GDP has increased  
100-fold since 1800

2014 human eco-footprint:

19.0 billion hectares (2.6 gha/cap)

2014 global biocapacity:

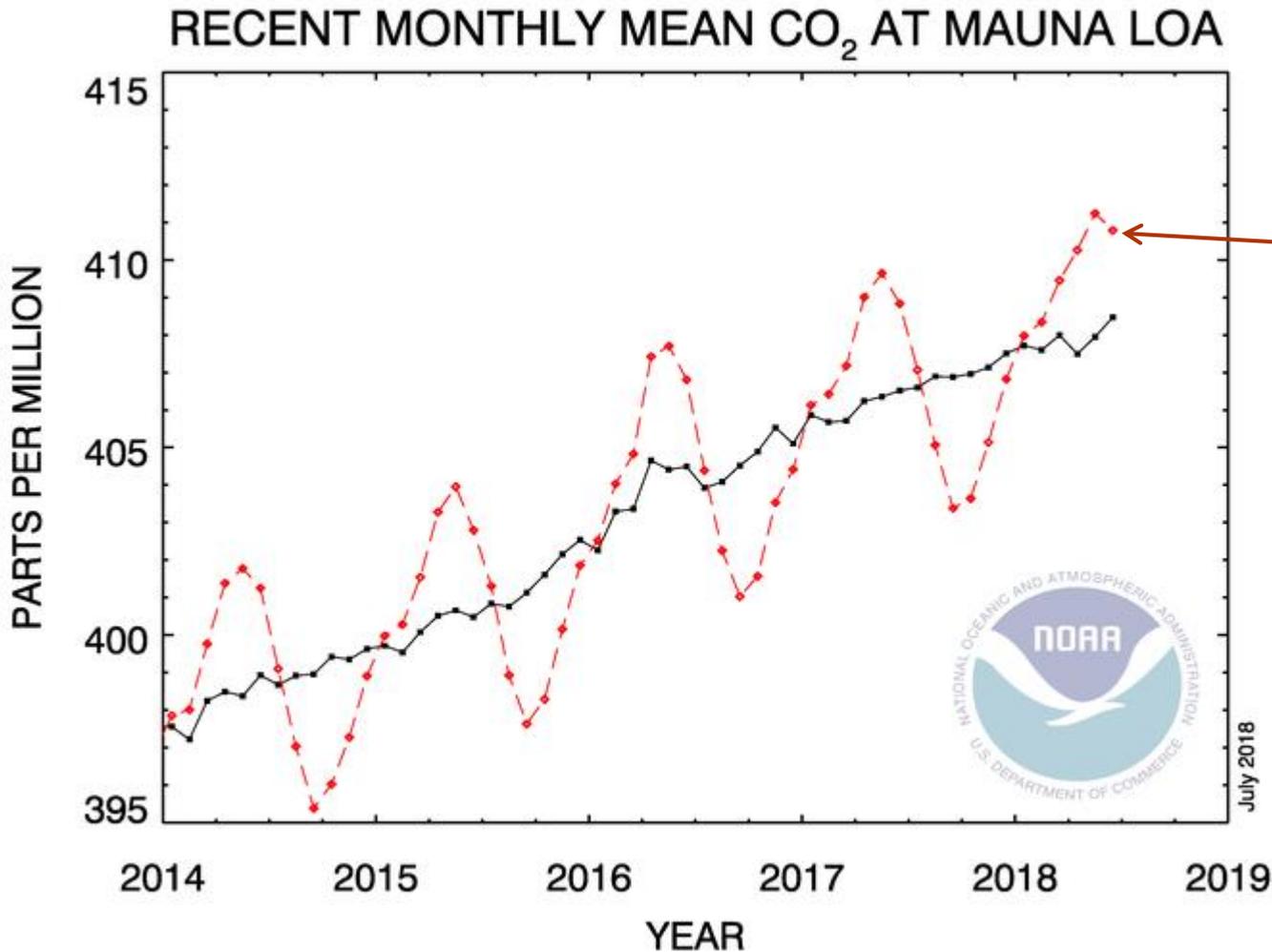
12.0 billion hectares (1.7 gha/cap)

= **58% OVERSHOOT**

Everyone is competing  
with everyone else for  
the shrinking bio-  
capacity of Earth.



# Symptom of Overshoot: A 45% increase in atmospheric CO<sub>2</sub> over the Pre-industrial Level of 280 ppm

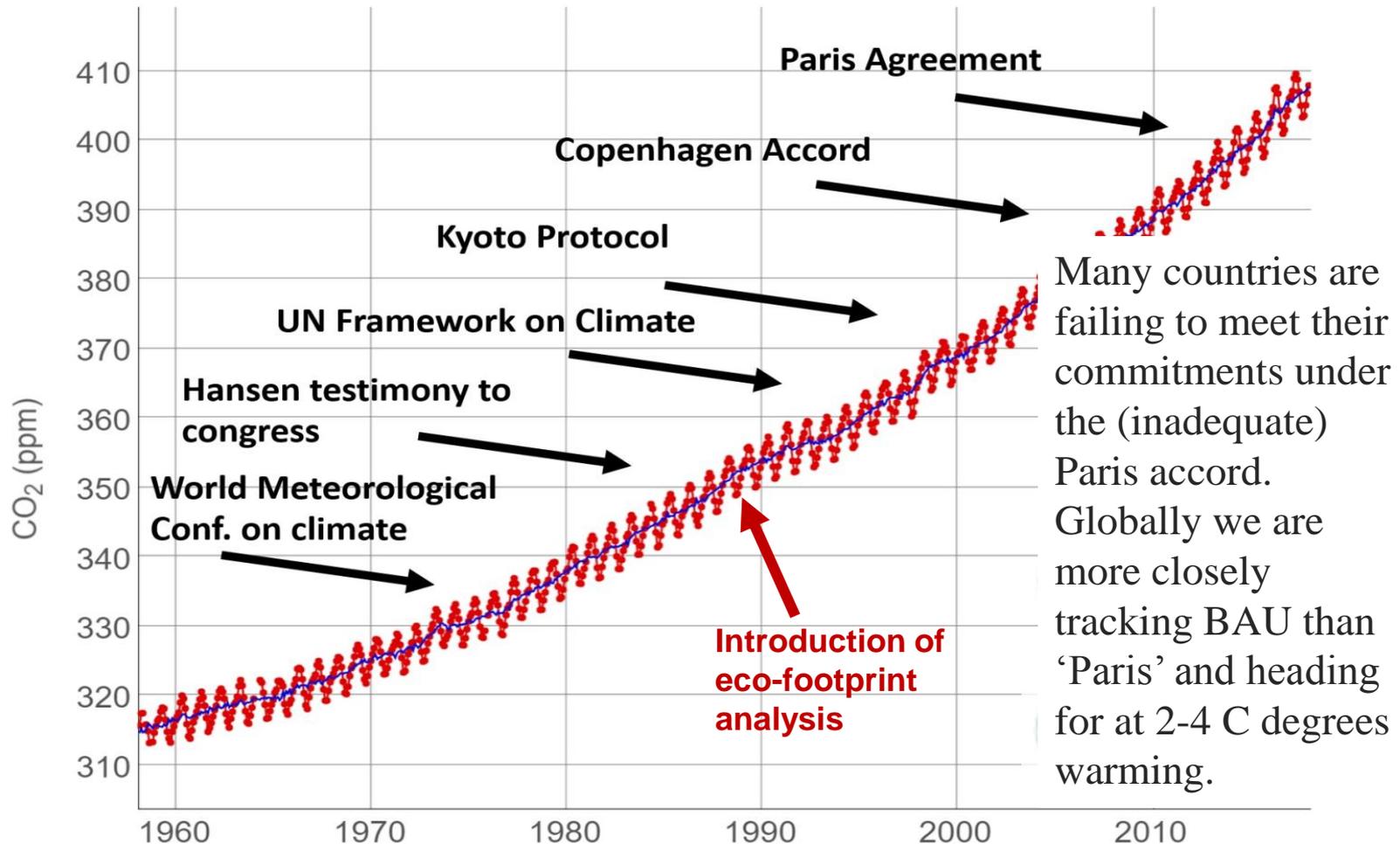


June 2018  
average  
concentration =  
410.8 ppm CO<sub>2</sub>.

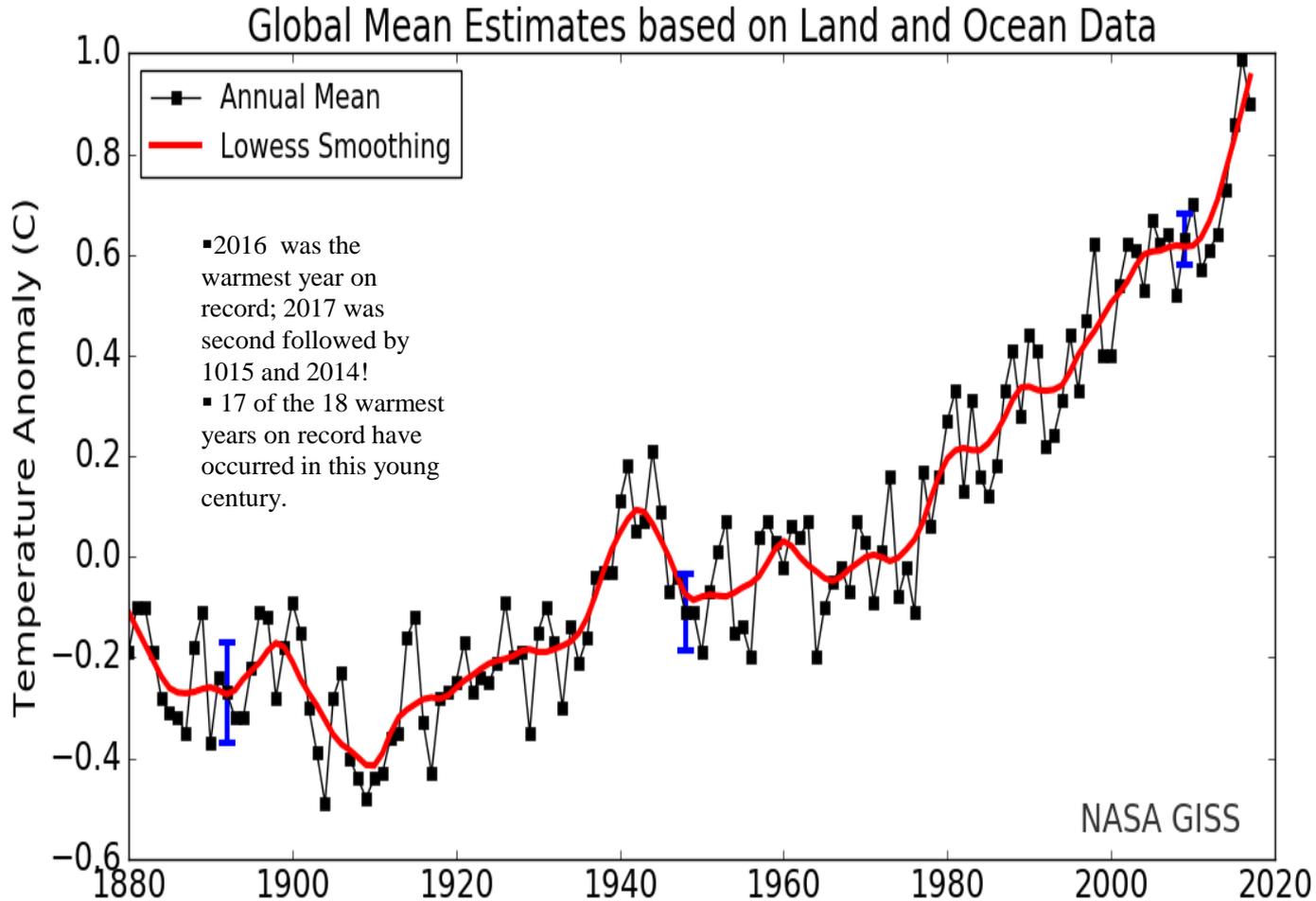
NB: CO<sub>2</sub> is a  
contributing driver to  
climate change.

# International agreements have made little difference (this looks a lot like BAU)

Mauna Loa Monthly Averages



# Temperatures are rising



The past four years are the four warmest years in the instrumental record.

NB: The global food system accounts for as much as one third of GHG emissions and associated warming.

# Our growth fetish makes it happen: Globalization and 'free' trade = Growth on steroids

- ❑ Globalization = dissolution of national boundaries and the horizontal integration of national economies. After which:
- ❑ If each country specializes in products it can produce most efficiently and at lower cost than others, then trades for everything else, the world can **maximize global production**.
- ❑ Because goods are being produced efficiently everywhere for the largest possible market, **prices will be lower and demand higher**. Production and 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) at *least cost*.**

# Assumptions Implicit in the obsession with growth

- ❑ Higher income/consumption always increases human happiness or well-being.
- ❑ Resource scarcity can be relieved by enhanced 'factor productivity' (efficiency) or factor substitution.
- ❑ There are no ecological or geopolitical limits (i.e., no threat from climate change, ecosystems collapses or competition for resources)
- ❑ There is no serious down-side to inter-regional dependence.

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

# Values sacrificed to the efficiency god

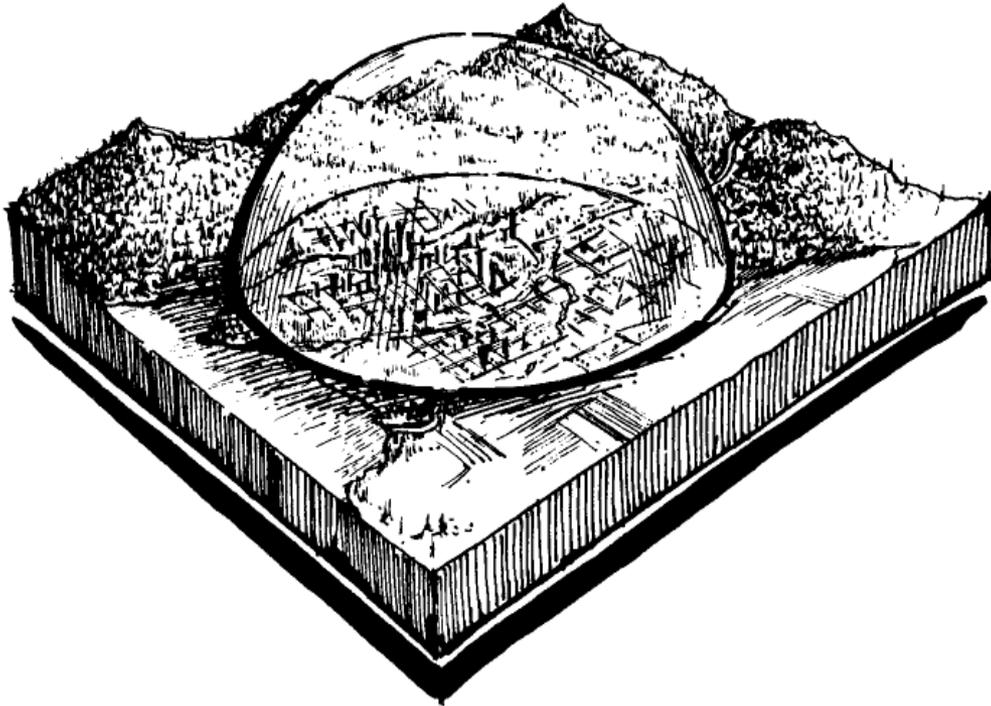
- ❑ Local economic diversity and resilience in the face of market or ecological fluctuations
- ❑ A multi-skilled population
- ❑ Community integrity, cohesion and independence
- ❑ Local (and national) self-reliance in food production and other key sectors
- ❑ Conservation of arable land ('We can always import food from somewhere else!')

Neo-liberal globalization on a finite planet has arguably produced an unsustainable entanglement of interdependent, partially de-skilled nations and regions.

# Trade and Food (In)security

- ❑ Globally, at least 34 countries are unable to produce much or most of their own food; 50 countries have some degree of food insecurity.
- ❑ A significant proportion of the global population *already relies on imported food*; about 108 million people are severely food insecure.
- ❑ By 2050 more than half of the world's population is expected to rely in food from other countries—and this assumes every thing else remains 'normal'.
- ❑ The Southwest BC bioregion is only about 40% food self-reliant. If imported animal feed were not been available, total dietary self-reliance would be only 12%. *How secure should we feel?*

# All cities now depend on *distant* hinterlands' making them potentially food insecure



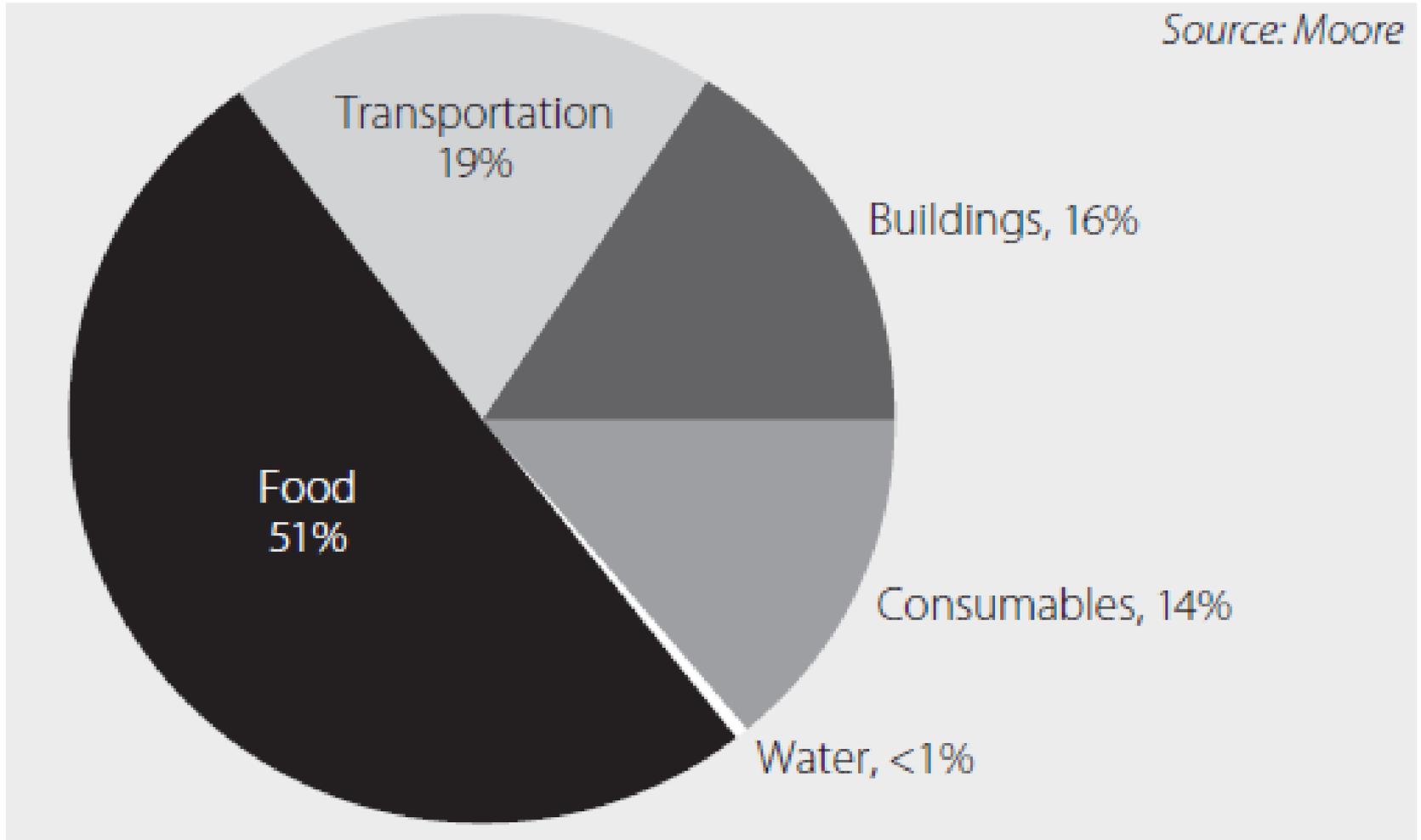
- ❑ Cities are heterogenous ecosystems, the human equivalents of livestock feedlots.
- ❑ Enclosed in a glass bell-jar, any modern city would simultaneously starve and suffocate.
- ❑ Cities are increasingly vulnerable to global change.
- ❑ Climate chaos, energy shortages, geopolitical discord, etc., all have the potential to destroy transportation links and isolate cities from their life-support hinterlands.

# Consider the City of Vancouver

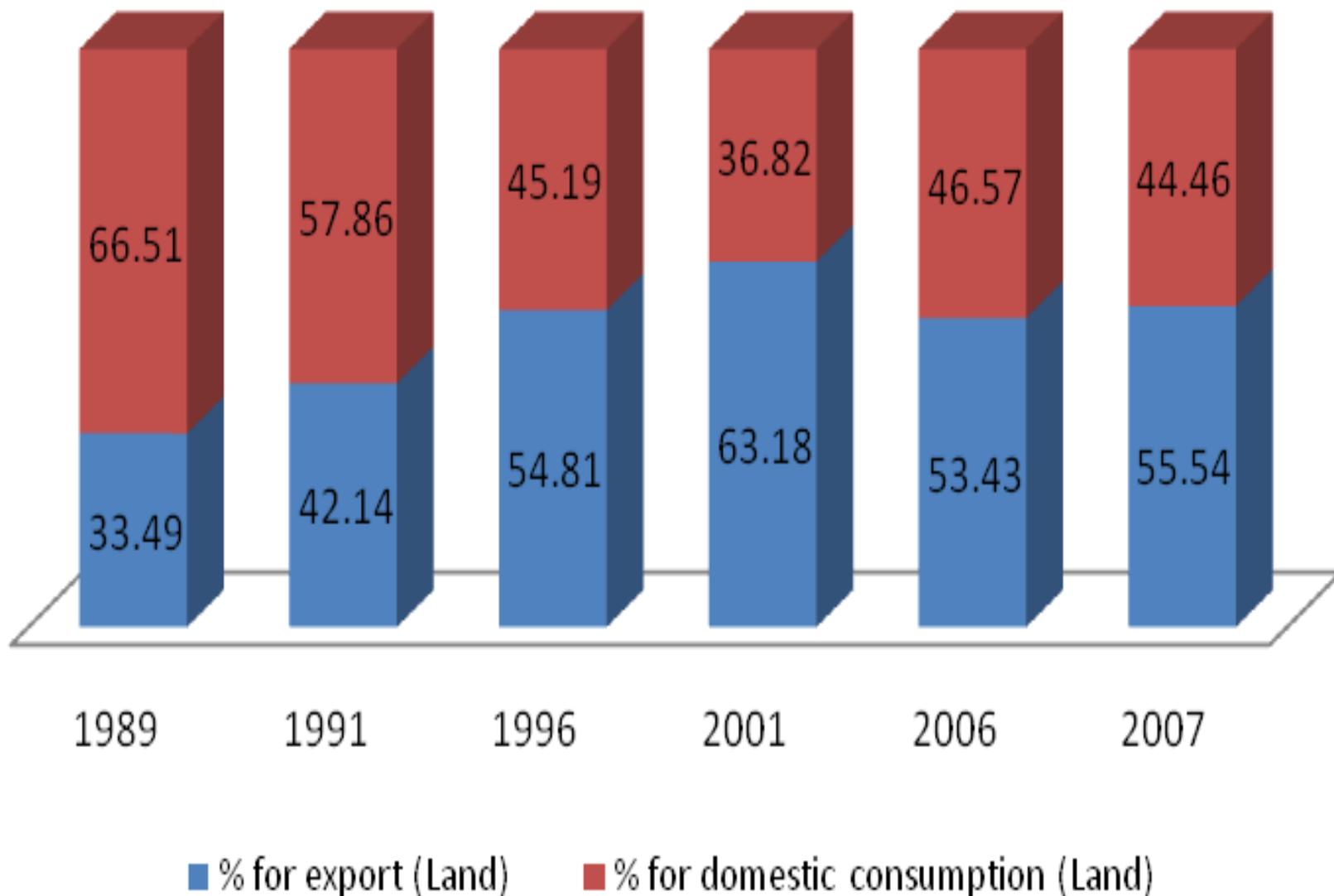
- ❑ Area = 11,500 ha (28,400 ac)
- ❑ Population = 631,500
- ❑ Area of crop and grazing land *in other regions* presently dedicated to feeding Vancouver = 315,750 ha (assuming typical NA diet at ~.5 ha per capita,)
- ❑ This is 27 times larger than the political area of the city.

All in (land, carbon emissions, etc.), the food system makes up half of Vancouver's 5 gha eco-footprint

*Source: Moore*



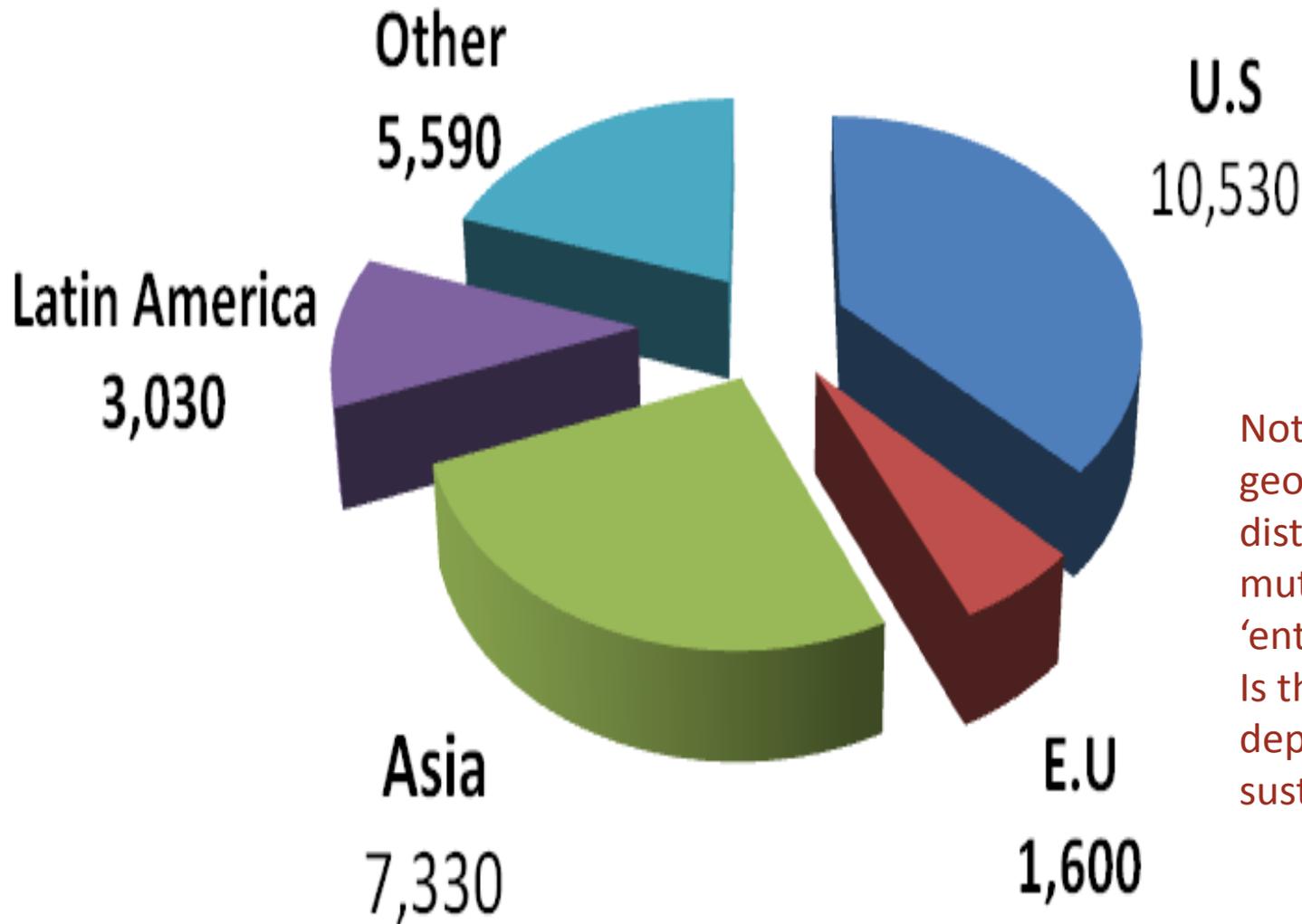
# The other face of Canadian entanglement: Exports as a share of prairie crop production *and land degradation*



# Exporting the Canadian prairies, building insecure dependence

- ❑ On average from 1989 to 2007, 65% of Canadian prairie cropland was effectively ‘exported’ to dependent populations;
- ❑ The total foreign foot eco-footprint increased significantly during this period, reaching almost 34 million hectares;
- ❑ This is equivalent to the area of the United Kingdom, the Netherlands and Denmark combined.

The average area of agricultural land (1000s ha) in the Canadian prairies devoted to foreign consumers, 1989-2007



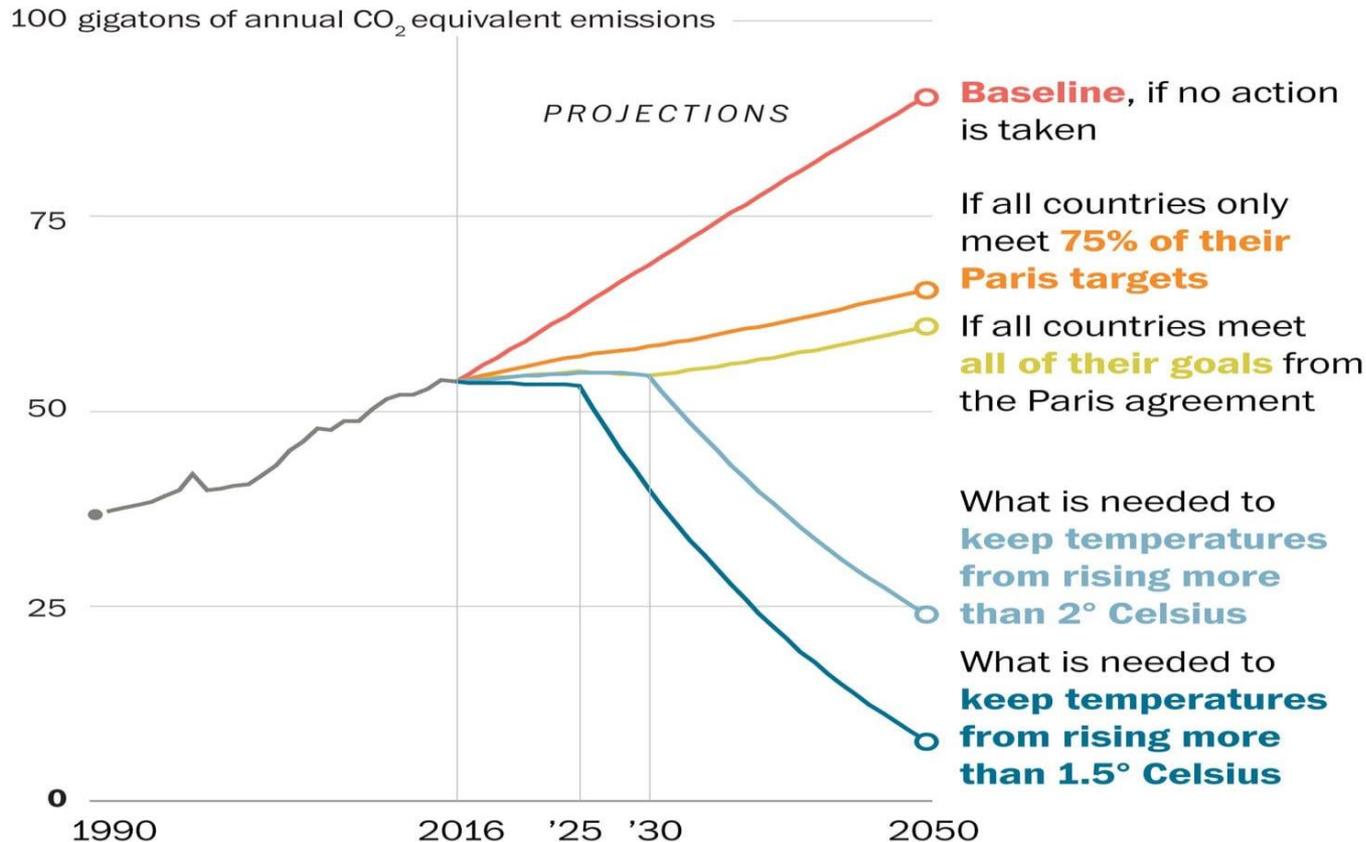
Note the wide geographic distribution of mutual 'entanglement'. Is this interdependence sustainable?

# Back to the carbon/climate picture

- ❑ More carbon has been released into the atmosphere since the 1980s than in the entire previous history of civilization; other GHGs are increasing even faster.
- ❑ The world is on track for 3-5 Celsius degrees warming.
- ❑ Five degree warming would be catastrophic, perhaps fatal to civilization. Three-degree warming implies wide-spread disaster: accelerating desertification, melting permafrost, sea ice-free Arctic summers, rising sea levels, disrupted agriculture, mass migrations and the loss of most coastal cities.
- ❑ Robert Watson, a former director of the United Nations Intergovernmental Panel on Climate Change, has asserted that *three-degree warming is the realistic minimum*.

# Official emissions targets are not enough to cool the planet

Even if all countries hit their targets under the Paris agreement, global carbon dioxide emissions will still far exceed what is needed to keep temperatures from rising above 1.5 or 2 degrees Celsius.



We are still tracking BAU--only four of 38 economic sectors are on target to meet Paris accord.

Data is based on scenarios from Climate Interactive.

Source: Climate Interactive

THE WASHINGTON POST

# Breaking News

- ❑ Even if the carbon emission reductions called for in the Paris Agreement were met, there is a growing risk of Earth entering “Hothouse Earth” conditions.
- ❑ “Hothouse Earth” would stabilize over the long-term at a catastrophic global average of 4-5°C higher than pre-industrial temperatures with sea levels 10-60 m higher than today.
- ❑ The drivers? Positive lesser known feedback mechanisms such as **permafrost thaw, loss of methane hydrates from the ocean floor, weakening land and ocean carbon sinks, increasing bacterial respiration in the oceans, Amazon rainforest dieback, boreal forest dieback, reduction of northern hemisphere snow cover, loss of Arctic summer sea ice, and reduction of Antarctic sea ice and polar ice sheets.**

Trajectories of the Earth System in the Anthropocene. *PNAS*, 2018  
DOI: [10.1073/pnas.1810141115](https://doi.org/10.1073/pnas.1810141115) (6 Aug 2018)

The conundrum: Urban techno-industrial society *including production agriculture* is a product of, and remains dependent on, abundant cheap energy—mostly fossil fuels. The food system consumes ten times as much energy as is contained in the product.

*Energy is civilization's Achilles' heel.*

# Global primary energy consumption by source (2017)

- ❑ **Fossil fuels 85.5%**
- ❑ Wind 1.9%
- ❑ Solar 0.7%
- ❑ Hydro, biomass and nuclear approx 12%

Despite the world's (alleged) commitment to decarbonizing by mid-century, the move away from fossil fuels is extremely slow.

- ❑ Of the substantial increase in energy consumption in 2017, 70% was provided by fossil fuels;
- ❑ Wind and solar together accounted for only 25% of the increase.

# The Energy-Emissions Conundrum

- ❑ Despite progress in renewable energy for electricity generation, there are as yet no adequate substitutes for fossil fuel in key areas essential to modern urban life—e.g., most heating and cooling, inter-city transportation, heavy construction, **agriculture**.
- ❑ An insufficiently rapid transition to renewable energy implies that the world will remain reliant on fossil fuels, exceed the two Celsius degree warming limit and experience *potentially disastrous climate change in this century*.
- ❑ However, in the absence of adequate substitutes, if we abandon fossil fuels (or if they become too scarce/expensive) *the world will face major energy shortages*.

# Between an emissions rock and an energy hard place

- ❑ CO<sub>2</sub>-induced climate change implies longer heat waves, extended droughts, reduced agricultural productivity (food shortages), desertification, sea-level rise, coastal flooding, mass migrations and geopolitical instability; regional populations are at risk. Urban life in particular may become untenable in parts of the world.
- ❑ But abandoning fossil fuels implies significant energy shortages, reduced trade, falling GDP, food and other resource shortages, geopolitical instability, and difficulty in maintaining international and inter-city transportation links. Again, urban populations in particular are at risk.

# The bottom line

- ❑ In coming decades, the world may not be able to provision the existing human population or maintain its cities let alone accommodate an expected additional 2.5-3.5 billion people. (Just building-out cities to accommodate immigration would use most of the remaining carbon budget leaving little for everything else ).
- ❑ Any society is only three square meals away from anarchy or revolution (anon).
- ❑ ***Place-based food systems everywhere become an essential buffer, an insurance policy against the worst aspects of global change.***

# Steps needed *now* to reduce cities' EFs and their food-dependence on distant sources

- ❑ Reshape city form and governance into more self-reliant urban-centred bio-regions (eco-city states) that incorporate as much as possible of their extended eco-footprints.
- ❑ Re-localize food production/processing; conserve regional farmland; encourage food co-ops ('trade if necessary, but not necessarily trade').
- ❑ Densify urban development to reduce demand for arable land and increase the efficiency of urban infrastructure—transportation, water, sewage, electrical and recycling systems.
- ❑ Adopt 'One Earth' lifestyles—this implies a 66% reduction in energy and material consumption by Vancouverites, 75% in most of North America.

# Additional actions to manage the energy-emissions crunch and societal contraction

- ❑ Implement serious energy conservation measures to reduce consumption, reduced carbon emissions to 'safe' levels, and conserve fossil fuels.
- ❑ Ramp up investment in renewable energy and infrastructure beyond the current total investment in energy.
- ❑ Develop an implementation strategy to allocate/ration the remaining fossil fuel budget to essential uses only (e.g., food production, inter-city road transport).
- ❑ Prepare for reduced GDP/capita including strategies for income redistribution (climate justice).
- ❑ Plan for economic and population contraction.

What the world community  
refuses to acknowledge

To act consistently  
with our best science  
may well require a  
planned economic  
contraction.

Can humanity learn to live more  
equitably within the means of  
nature?

# Nobody said it would be easy!

Where we're headed!

