

What if 'Can Do' Can't?

The Vulnerability and Resilience of Cities

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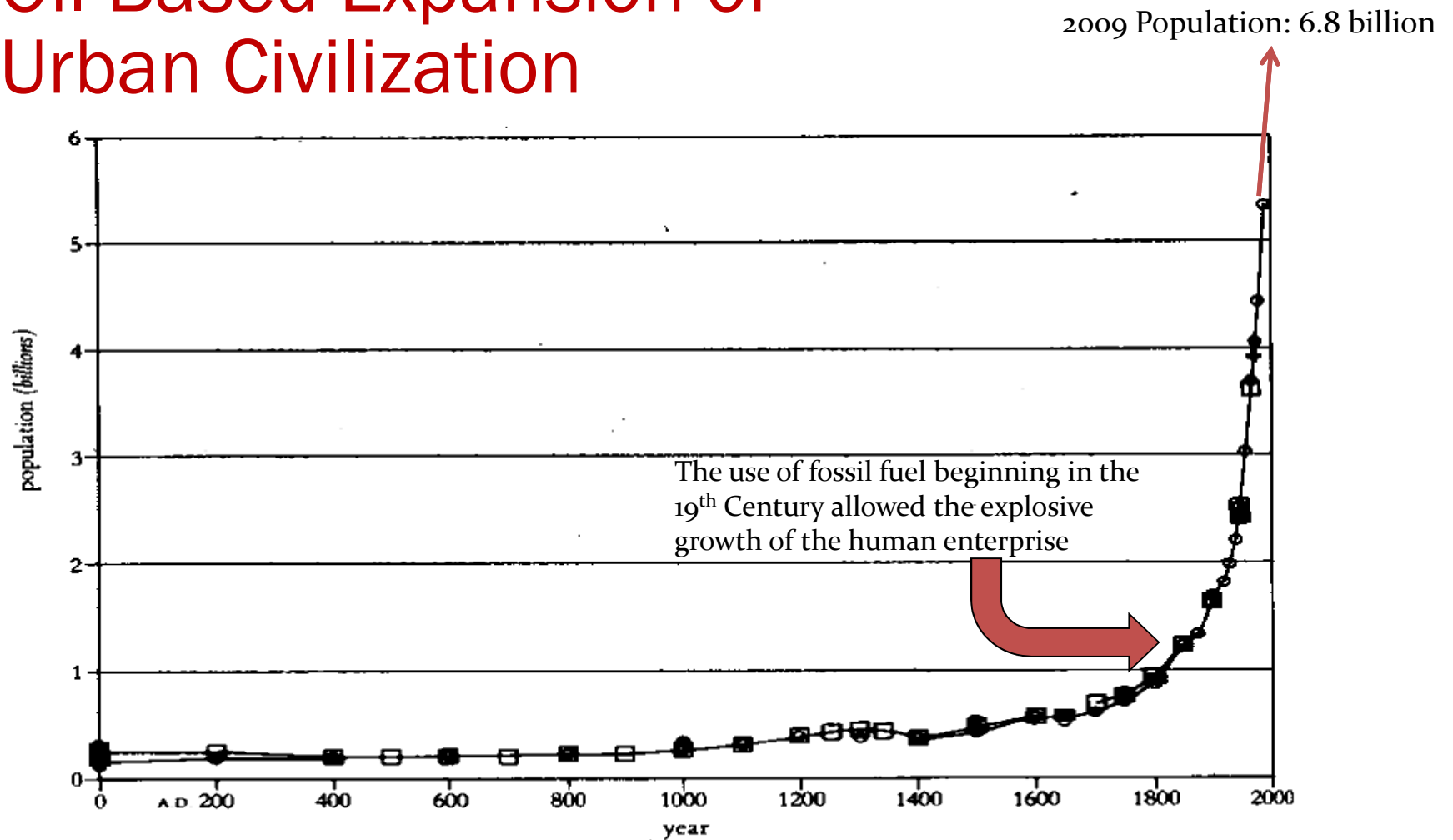
Gaining Ground – Resilient Cities

Vancouver, BC, 20 - 22 October 2009

Main 'Takeaways'

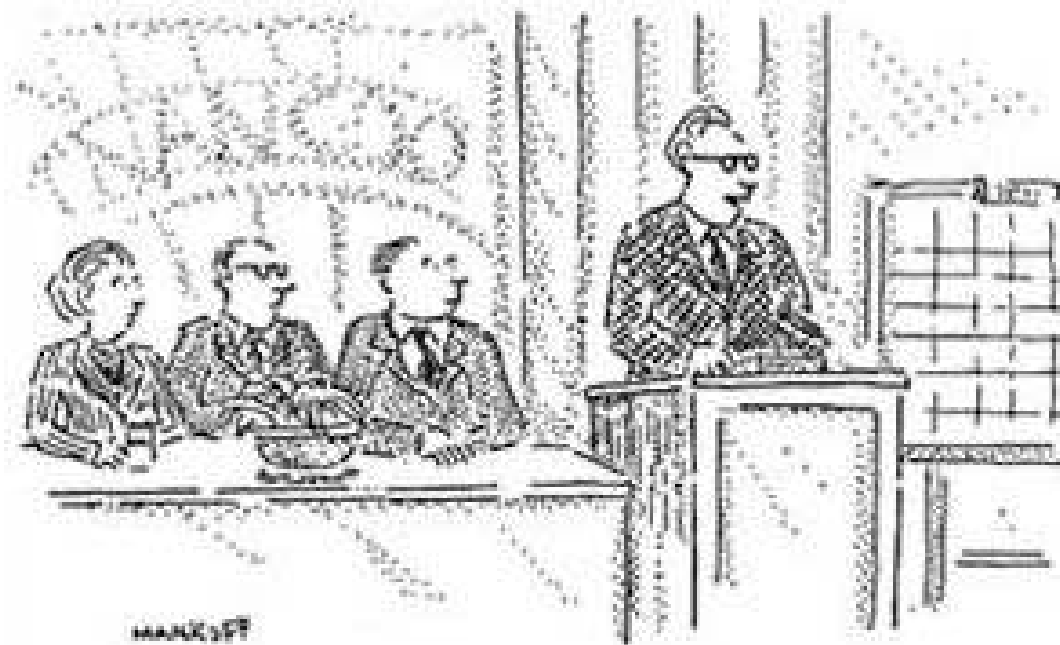
- Perception is *everything*. Our mental models determine how we 'act out' in the world.
- Cities are 'emergent' phenomena. Their structure and function reflects the mental models—the beliefs, values and assumptions—of the society that creates them. If a society is unsustainable its cities will be unsustainable.
- Techno-industrial society is a 'dualistic reductionist' society. Modern cities have therefore 'emerged' as fractured, incomplete ecosystems that parasitize the ecosphere.
- For sustainability, cities must become self-reliant, self-producing, complete, regenerative ecosystems—e.g., urban centred eco-regional city states.

Context 1: The Anomalous, Unsustainable Oil-Based Expansion of Urban Civilization



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.

Context 2: *H. sapiens* is a deeply conflicted species



"And so, while the end-of-the-world scenario will be rife with unimaginable horrors, we believe that the pre-end period will be filled with unprecedented opportunities for profit."

Some Evidence: The 'Can Do' Vision

- Yes, there's a problem, but our response springs from our belief in the human mastery of nature, our ebullient unreserved confidence in human technological ingenuity.
- “Technology exists now to produce in virtually inexhaustible quantities just about all the products made by nature...”, and: “We have... the technology to feed, clothe, and supply energy to an ever-growing population for the next seven billion years...” (J. Simon 1995).

Comforting Illusions: AKA Technological (non-)Fixes

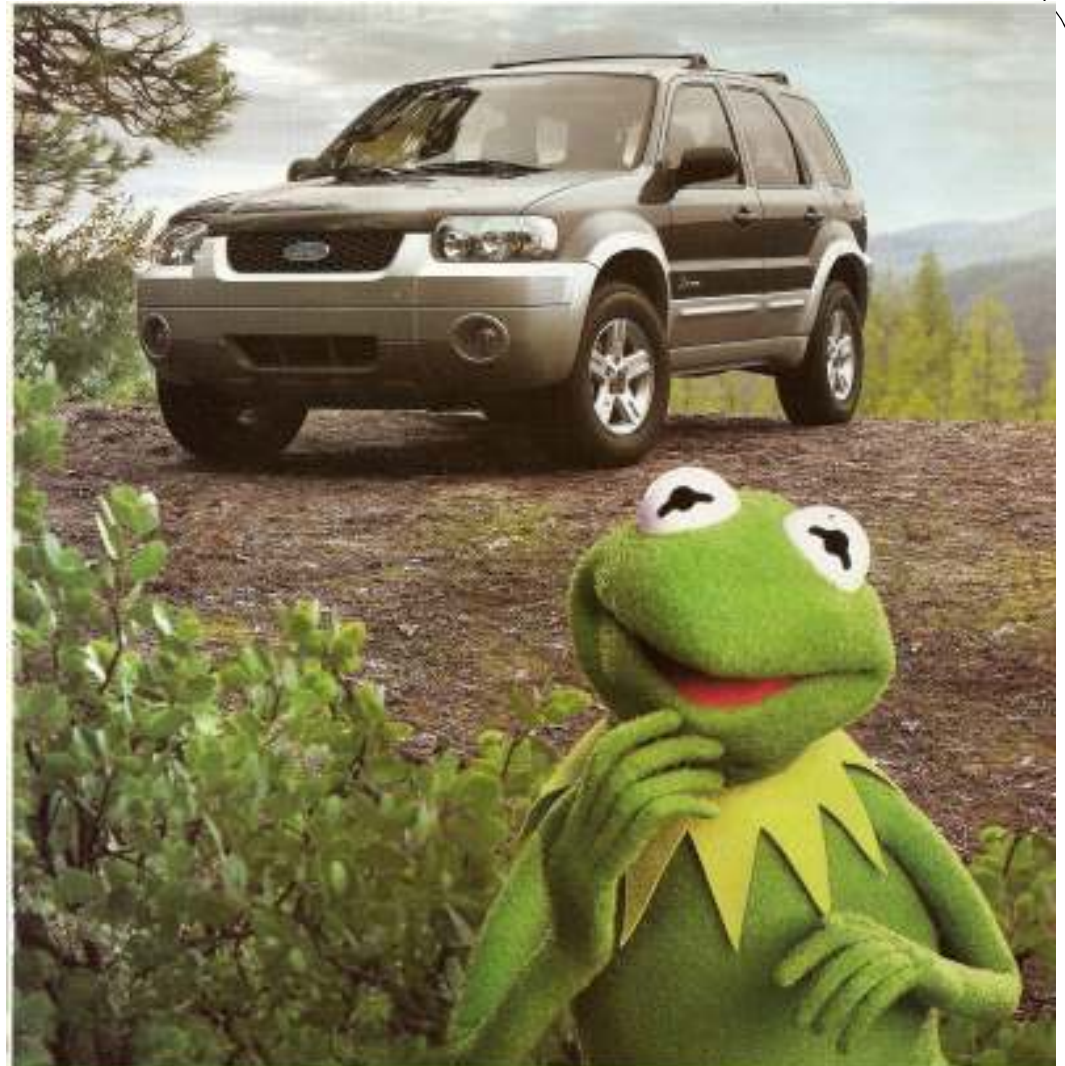
- Most approaches to global change and sustainability today—renewable energy, hybrid cars, green buildings, smart growth, the new urbanism, green consumerism, etc.,—are delusional.
- They assume we can maintain growth through greater material and economic efficiency.
- **If we need an 80% reduction in energy/material throughput by 2050, growing more efficiently does not address the problem. It merely makes us more efficiently unsustainable.**

Corollary: If your 'solution' does not result in **an absolute reduction** in energy and material consumption and waste production, then it is part of the problem.

Examples of Self-Delusion

What have we been sniffing?

- Gasoline is a powerful hallucinatory drug.
- It's habitual users will believe anything to avoid facing reality.
- Since when is a paltry 36 mpg 'green' or remotely sustainable?
- And the delusions only get worse....



"I guess it is easy being green."

Presenting the 36 mpg Ford Escape Hybrid, the most fuel-efficient SUV on Earth.* How green is that?
www.fordvehicles.com

ESCAPE HYBRID



*Based on Automobile News, Transport Canada and US EPA. EPA estimated 36 city/31 hwy mpg, FWD. Actual mileage will vary. ©The Muppets Holding Company, LLC. All Rights Reserved.



Introducing the Green Car of the Year.[™]
 The 2008 Chevy Tahoe Hybrid!
 America's first full-size hybrid SUV.



That's right, Green Car Journal's Green Car of the Year[™] is the full-size Chevy Tahoe Hybrid. The announcement came at the Los Angeles Auto Show.

The award is given for new or significantly revamped, alternative fuel-powered vehicles.

"This is a milestone in many respects," said Green Car Journal editor-in-chief Megan. "People don't think 'green' when SUVs are concerned."

The 2008 Chevy Tahoe already has the best fuel economy in its class.^{**} And now, with its new 140-hp hybrid technology, the Tahoe Hybrid is competitive with much smaller vehicles. While cruising in the city, Tahoe Hybrid (EPA) achieves the same city fuel economy as a 4-cylinder Toyota Camry![†]



Visual feedback of the energy flow lets drivers adjust power levels and use regenerative braking to maximize battery power.

These impressive fuel economy numbers can be attributed to Tahoe's Hybrid Propulsion Electric System that operates in three ways: electric power, engine power, or any combination of electric and engine power. That's one smart hybrid. For more information go to chevy.com/FuelSolutions.

Gas-friendly to gas-free.



AN AMERICAN REVOLUTION 

*2008 EPA 24 city/31 hwy/28 combined mpg. Actual mileage may vary. **2008 EPA 24 city/31 hwy/28 combined mpg. Actual mileage may vary. †2008 EPA 24 city/31 hwy/28 combined mpg. Actual mileage may vary. ©2008 GM Corp. Buckle up, America!

North American 'Starter Castles': (or 'Super-size My Eco-Footprint')

- Between 1950 and 2004, the average new American house expanded by 135%, from 1000 square feet (93 sq m) to 2,349 square feet (218 sq m).
- Everything about new houses is bigger, from their multi-car garages to their industrial-scale appliances.

Meanwhile:

- Average household size fell from 3.7 to 2.6 people.
- Thus, **floor space increased by 236% *per capita*** from 270 square feet (25 sq m) to over 903 square feet (84 m²).
- Despite *efficiency* gains, material and energy use per dwelling and *per capita* continue to increase.

Point: Large new houses and upscale subdivisions are marketed as 'green' or 'sustainable' because they feature thermal windows, superior insulation and geothermal heating/cooling. However, **today's 'green-built' 2300 sq ft house is actually considerably less 'sustainable' than a standard 1000 sq ft 1950s house.**

In the context of global change:

'Today's city is the most vulnerable social structure ever conceived by man'

(Martin Oppenheimer).

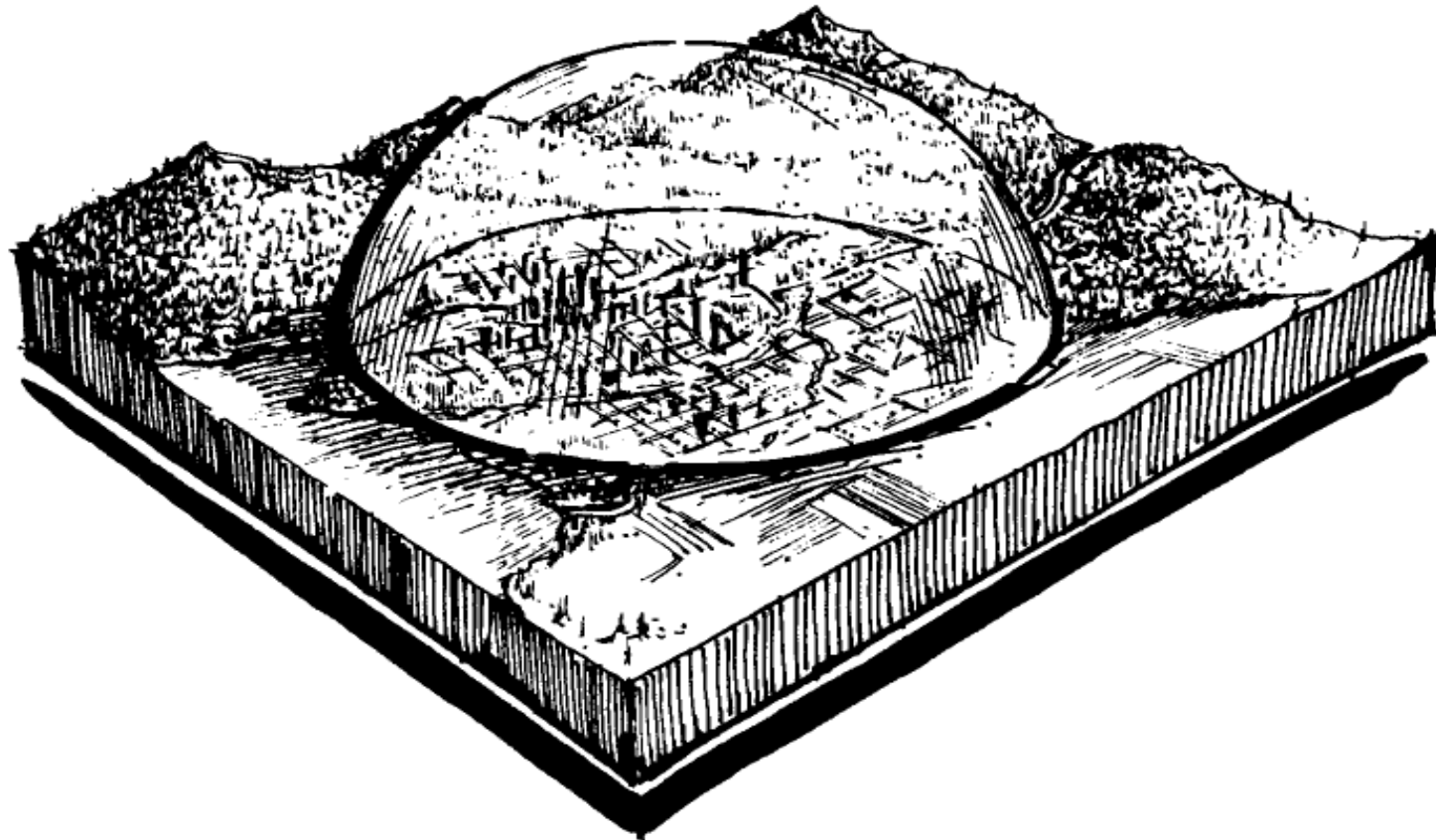
Cities are threatened by:

- Peak oil
- Soil losses and related resources shortages (e.g., peak phosphorus)
- Climate change (e.g., rising sea levels)
- Resultant geopolitical instability



A Major Reason: Cities as presently conceived are incomplete (human) ecosystems

(Enclosed in a bell-jar, modern cities would simultaneously starve and suffocate)



In ecological terms, modern cities are parasites on the global hinterland

- “Great cities are planned and grow without any regard for the fact that they are parasites on the countryside which must somehow supply food, water, air, and degrade huge quantities of wastes.” (Odum 1971)
- All human economic ‘production’ is actually mostly consumption.
- Cities produce the ‘wealth of nations’ only by first consuming and degrading the products and services of nature.



Edward Burtynsky—*Oil*

Economic 'production' consumes and dissipates nature

- Think of natural forests, grasslands, marine estuaries, and coral reefs.
- Now contemplate forest clear-cuts, eroding farmlands, depleted fisheries, marine 'dead zones.'
- **The main thing connecting these two states of nature is human economic activity.**

An archetype: Alberta's oil sands—
this used to be boreal forest

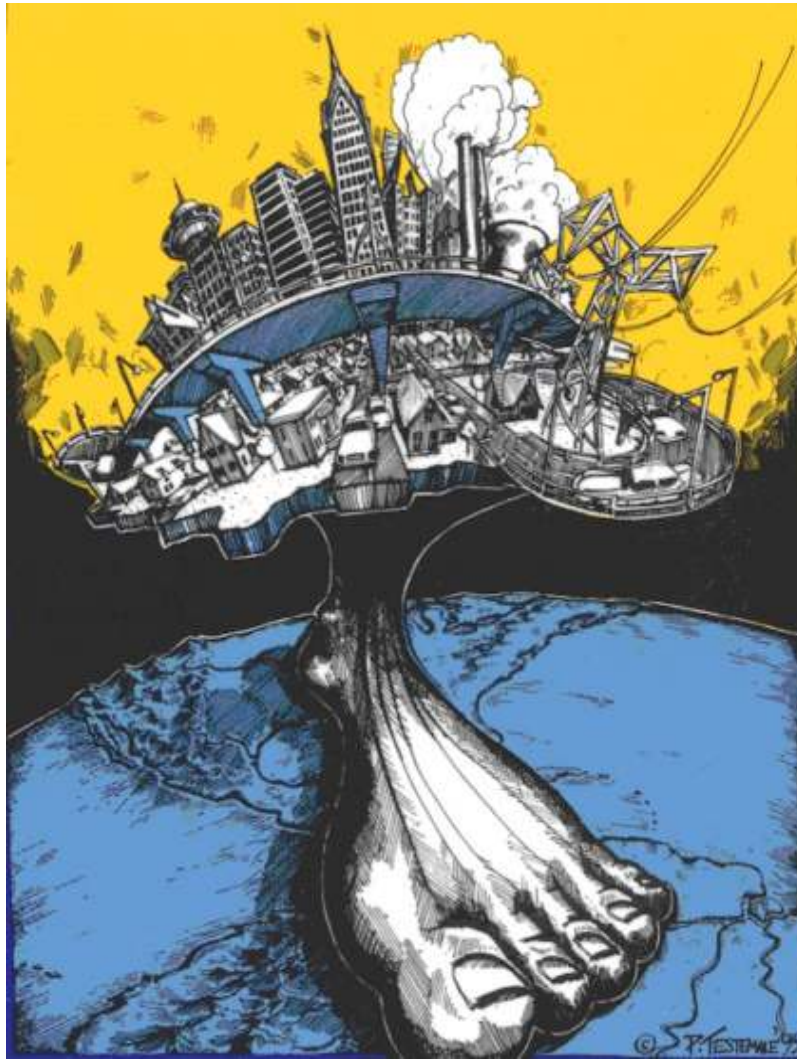
Note the large warehouse or garage



How much of nature do we use? Our 'Ecological Footprint'

- The 'ecological footprint' of a specified population is *the area of land and water ecosystems required to produce the resources that the population consumes, and to assimilate the wastes that the population produces, wherever on Earth the relevant land/water may be located.*
- Eco-footprints are *exclusive areas—people compete with each other for Earth's limited biocapacity.*

Eco-Footprints Vary with Income

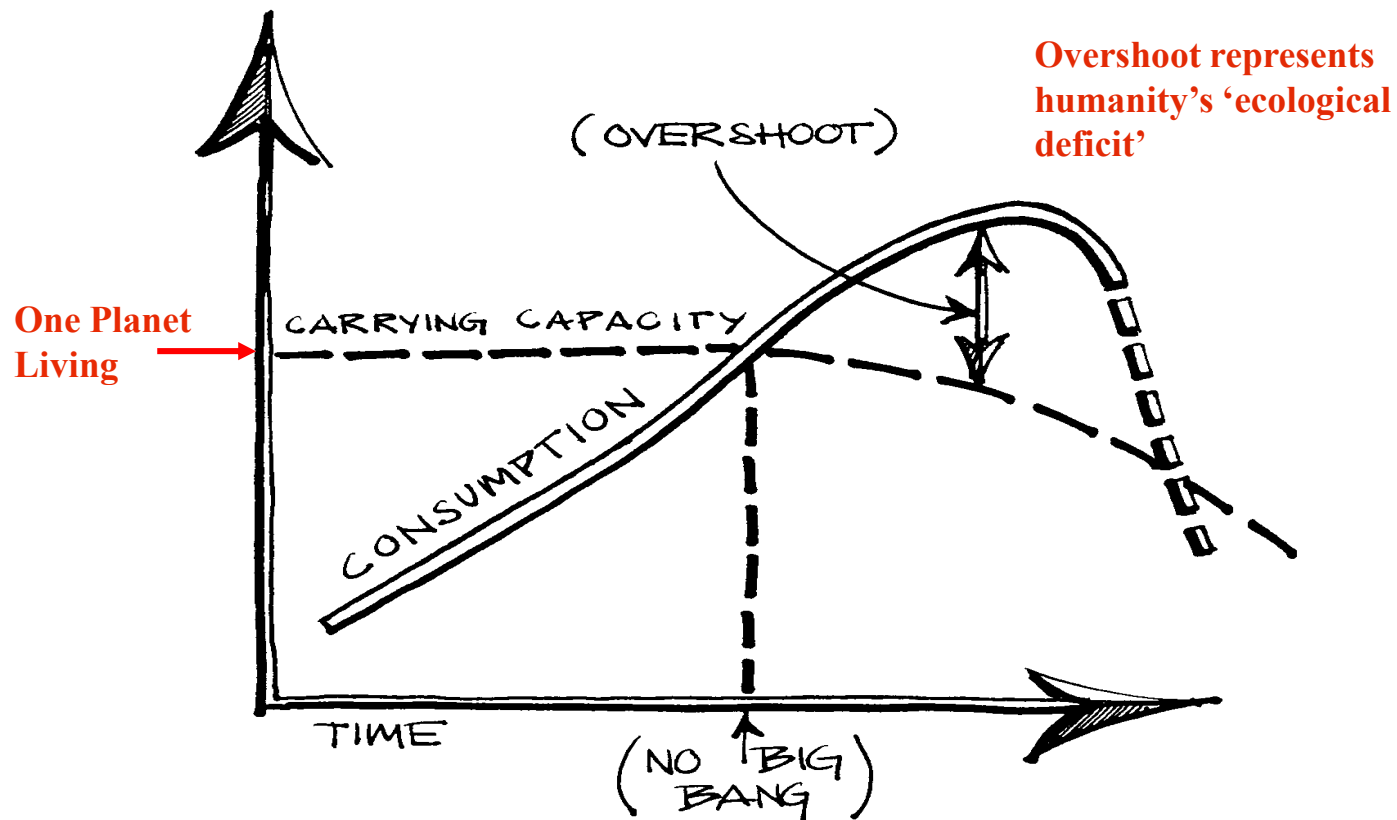


- Average EFs/capita in high-income countries range between four and ten global average hectares (10 to 25 acres).
- The poorest people live on a third of a hectare (.74 ac).
- There are only about two global average hectares per person on earth.
- Canadians use 3-4 times their equitable share.

Ecological Deficits: Living Beyond our Means

- Many countries ecologically ‘occupy’ a land-base *scattered all over the planet* that is *much* larger than their domestic territories.
- Such countries are running ‘ecological deficits’ with other countries and the global commons.
- The human enterprise has already ‘overshot’ global biocapacity by 30%.

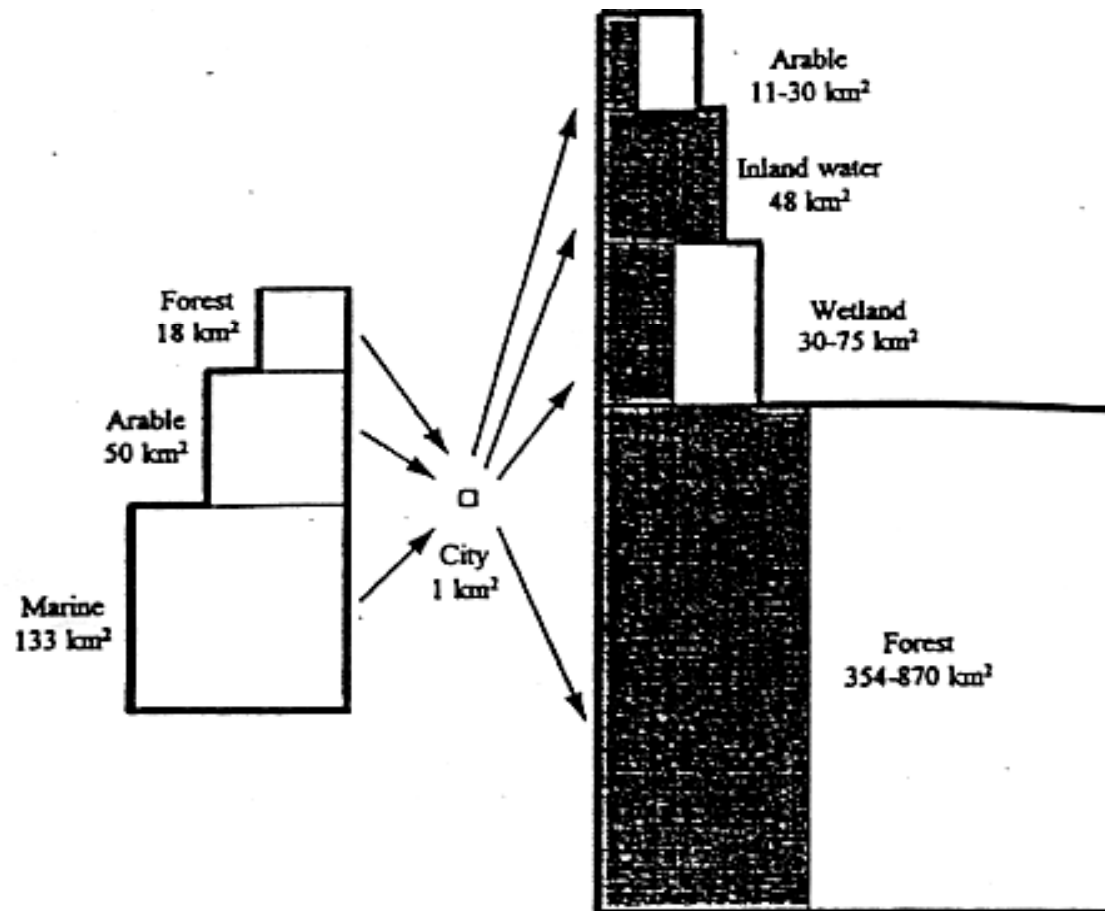
The world is in overshoot depleting future carrying capacity



To bring just the present world population up to North American material standards would require 3-4 additional Earth-like planets.

'Modern' cities are *all* eco-deficit

The twenty-nine largest cities of the Baltic states of Europe have an eco-footprint 565-1130 times larger as the cities themselves



- Blocks on the left represent appropriated productive areas (biocapacity).
- Blocks on the right represent ecosystem area appropriated exclusively for waste assimilation (under two sets of assumptions).

The Ominous (but all too typical) Case of Tokyo

- Population: 33 Million
(approx. 26% of Japanese pop)
- Total eco-footprint at 4.9 global
ha/capita: 161,700,000 ha

Tokyo's eco-footprint is about 344 times larger than the metro-region, 4.3 times the area of Japan and represents 2.1 times the nation's domestic biocapacity.

What would Tokyo (or Japan) do if cut off from its global supportive hinterland?



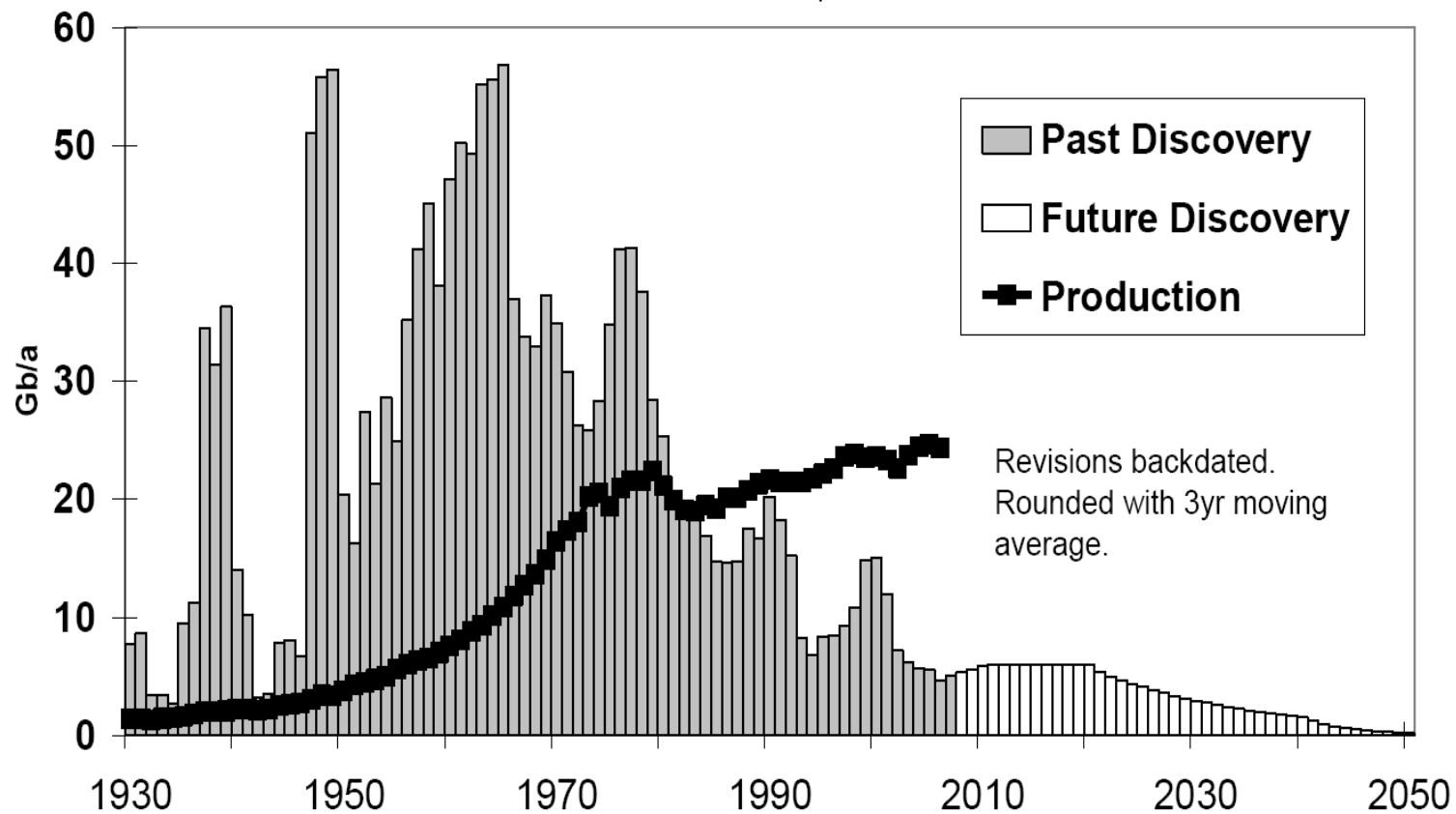
Urban Vulnerability 1: Soil and Landscape degradation

- Globally, topsoil is being “dissipated” 16 to 300 times as fast as it regenerates.
- We don't notice because fossil energy is a soil substitute.
- Since 1967, irrigation, mechanization and chemicals have accounted for 79-96% of the increased yields of wheat, rice and maize production.

Vulnerability 2: The Growing Discovery-Extraction Gap

Regular Conventional Oil

Source: ASPO, Sept 2008

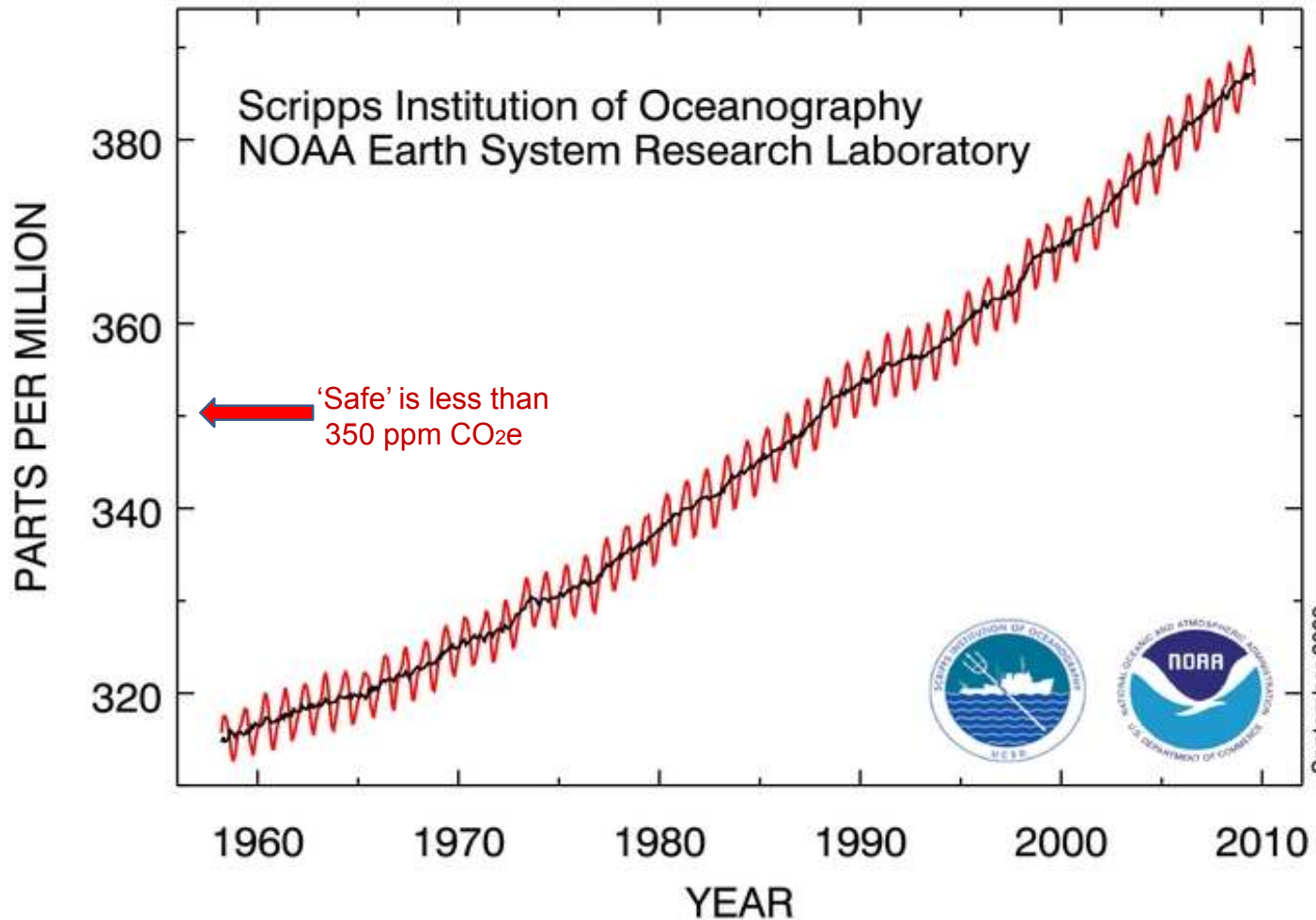


Vulnerability 3: Climate Change

- Carbon dioxide (CO₂) emissions are now growing more rapidly than “business-as-usual”, the most pessimistic of the IPCC scenarios.
- Increases are 35% higher than expected since 2000.

Atmospheric Carbon Dioxide: A 38% anthropogenic increase since the 19th Century

Atmospheric CO₂ at Mauna Loa Observatory



**Rate of increase
(ppm/year)**

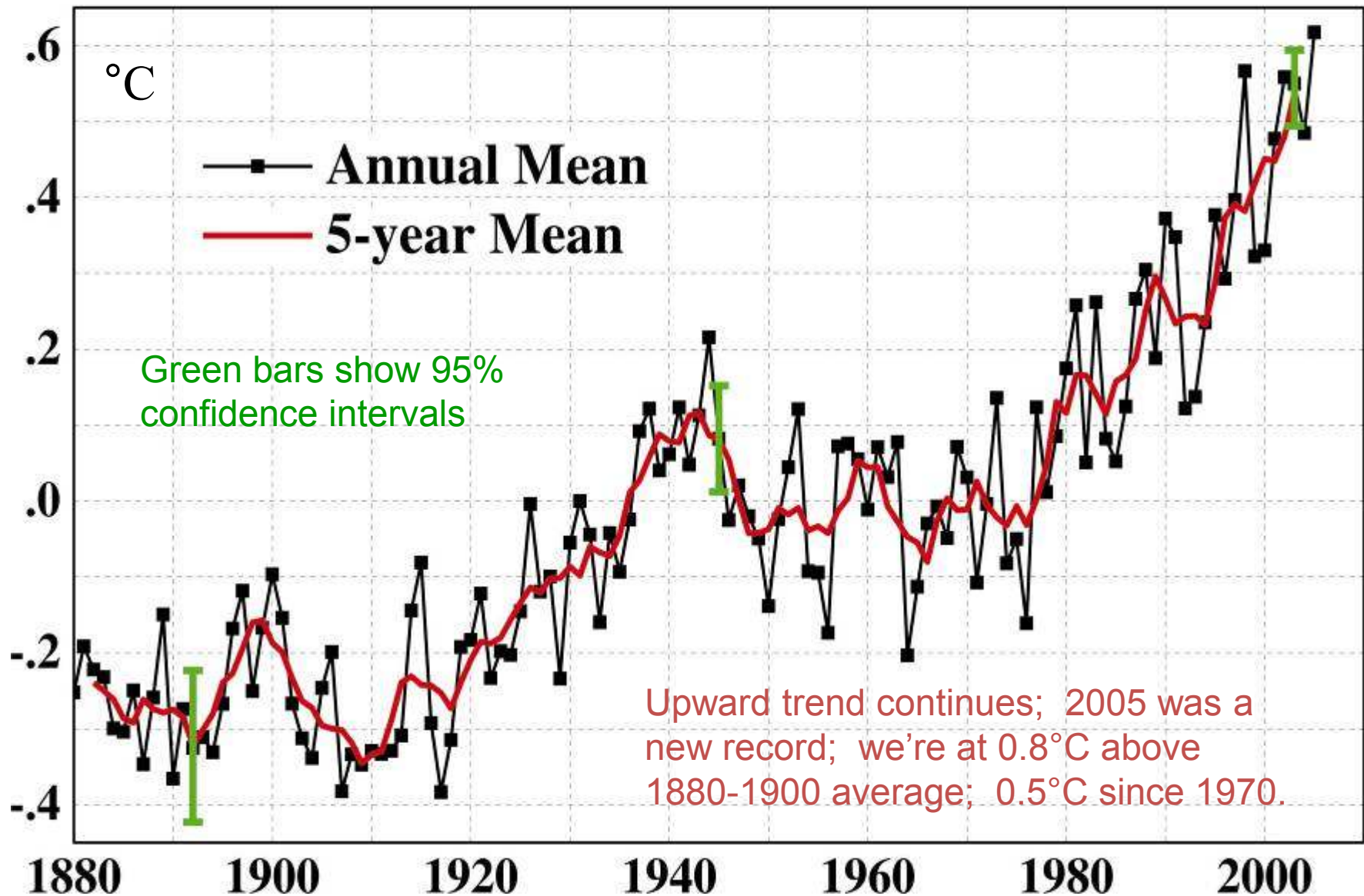
1970-79: 1.3

1990-99: 1.5

2000-07: 2.3

(This exceeds the
IPCC worst case
scenario and is
accelerating!)

Global T has risen 0.8°C in 125 yrs



Recent findings turn the screws

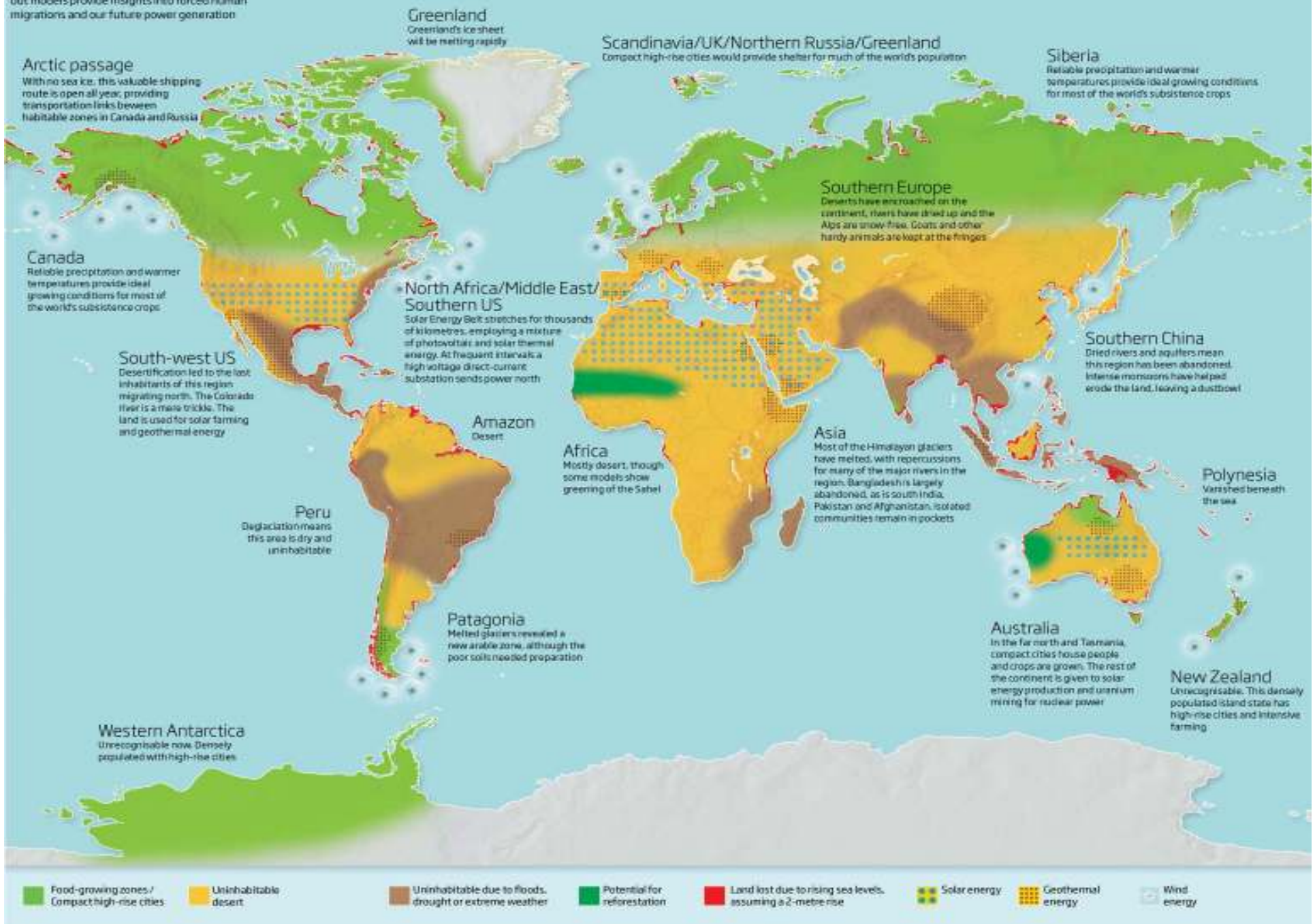
“Reframing the climate change challenge in light of post-2000 emission trends”

- To stabilize GHGs at even 650 ppmv CO₂e, **the majority of OECD nations must begin to make draconian emission reductions soon (within a decade).**
- Unless we can reconcile economic growth with unprecedented rates of decarbonization (in excess of 6% per year), **this will require a planned economic recession.**
- 650 ppmv CO₂e implies a *catastrophic* 4 degree C mean global temperature increase.

(Anderson and Bows. 2008. *Phil. Trans. R. Soc. A* doi:10.1098/rsta.2008.0138)

The world: 4°C warmer

No one knows exactly what this world will look like, but models provide insights into forced human migrations and our future power generation



Socio-Political Implications

The Age of Consequences (November 2007). Washington, Center for Strategic and International Studies

- “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).

Global Trends 2025 – A Transformed World. Washington, US National Intelligence Council

- Global demand for energy, food and water could easily outstrip available supplies over the next decade or so, thus triggering trade-disrupting international conflicts.

The *really* 'inconvenient truth': Sustainability means giving up material growth in rich countries

- “Industrialized world reductions in material consumption, energy use, and environmental degradation of over 90% will be required by 2040 to meet the needs of a growing world population fairly within the planet’s ecological means.”
(BCSD 1993; ‘Getting Eco-Efficient’)
- North Americans should be taking steps to reduce their ecological footprints by at least 80% from about 9 global average ha to an equitable Earth-share (1.8 gha) (Rees 2006).

There will be life-style changes. Get used to it!

The Urban Sustainability Multiplier

Cities have an advantage – gains from densification

- A high proportion of multiple-family dwelling units which reduces per capita consumption of building materials, operational inputs and service infrastructure.
- A greater range of options for recycling, reuse and re-manufacturing, and a concentration of the skills needed to make these things happen.
- Greater possibilities for electricity co-generation and the use of waste process heat from industry or power plants to reduce the *per capita* use of fossil fuels.
- Great potential for reducing (mostly fossil) energy consumption by motor vehicles through walking, cycling, and public transit— **car-free cities are possible.**

Efficiency is not enough: The resilient city is a more self-reliant eco-regional city state (whither provinces?)

- Cities must be reconceived and redesigned to incorporate as much of their supportive ecosystems within their own political jurisdictions as possible (trade as necessary but not necessarily trade).
- Bioregionalism and permaculture provide pre-formed philosophical and conceptual models for reintegrating heartland and hinterland.

The Bioregional City State: Ultimate Design Goals

- Achieve ‘quasi-sustainability’ by facilitating the reduction of residents’ ecological footprints to a globally equitable two hectares *per capita*.
- Reintegrate living-space with economy, re-balance production and consumption, and erase the distinction between city and hinterland.
- Transform the city-nature relationship from parasite-host to symbiotic partnership by:
 - Re-conceiving ‘the city system’ as complete human ecosystem (this is the ultimate in bio-mimicry). In particular:
 - Re-configure the city from a resource-depleting throughput system to a self-sustaining circular-flows system.
- Not a new idea—the regional eco-city, “... rather than being merely the site of consumption, might, through its very design, produce some of its own food and energy, as well as become the locus of work for its residents” (Van der Ryn and Calthorpe 1986).
(With a tip of the hat to P. Geddes, L. Mumford and E. Howard)

If the global change science is right, which vision is 'gloom and doom'?

Staying the course (BAU)

- Resource depletion and accelerating global change. (e.g., climate chaos)
- Greater systemic pollution
- Economic uncertainty
- Widening income gap
- Increasing civil unrest
- Potential geopolitical chaos
- Possible cultural collapse

Eco-transformation

- Conservation and restoration of essential natural capital
- Cleaner air, soil and water
- Economic security
- Narrowing income gap
- Greater social capital and sense of community
- Greater geopolitical stability
- Possibility for personal and cultural development



Our Contemporary Conundrum: Is Eco-Transformation Possible?

‘The ecologically necessary is politically unfeasible but the politically feasible is ecologically irrelevant.’

An aerial photograph of Earth from space, showing a large, swirling cyclone or hurricane over the ocean. The text is overlaid on the image.

Be the change!

Thank You
(and good luck!)