



# Limits to Growth, Planetary Boundaries, Planetary Health and Health-Earth

Adjunct Prof Colin D Butler

Health Research Institute, University of Canberra; National Centre for Epidemiology & Population Health, Australian National University; College of Humanities, Arts and Social Sciences, Flinders University, Adelaide, Australia

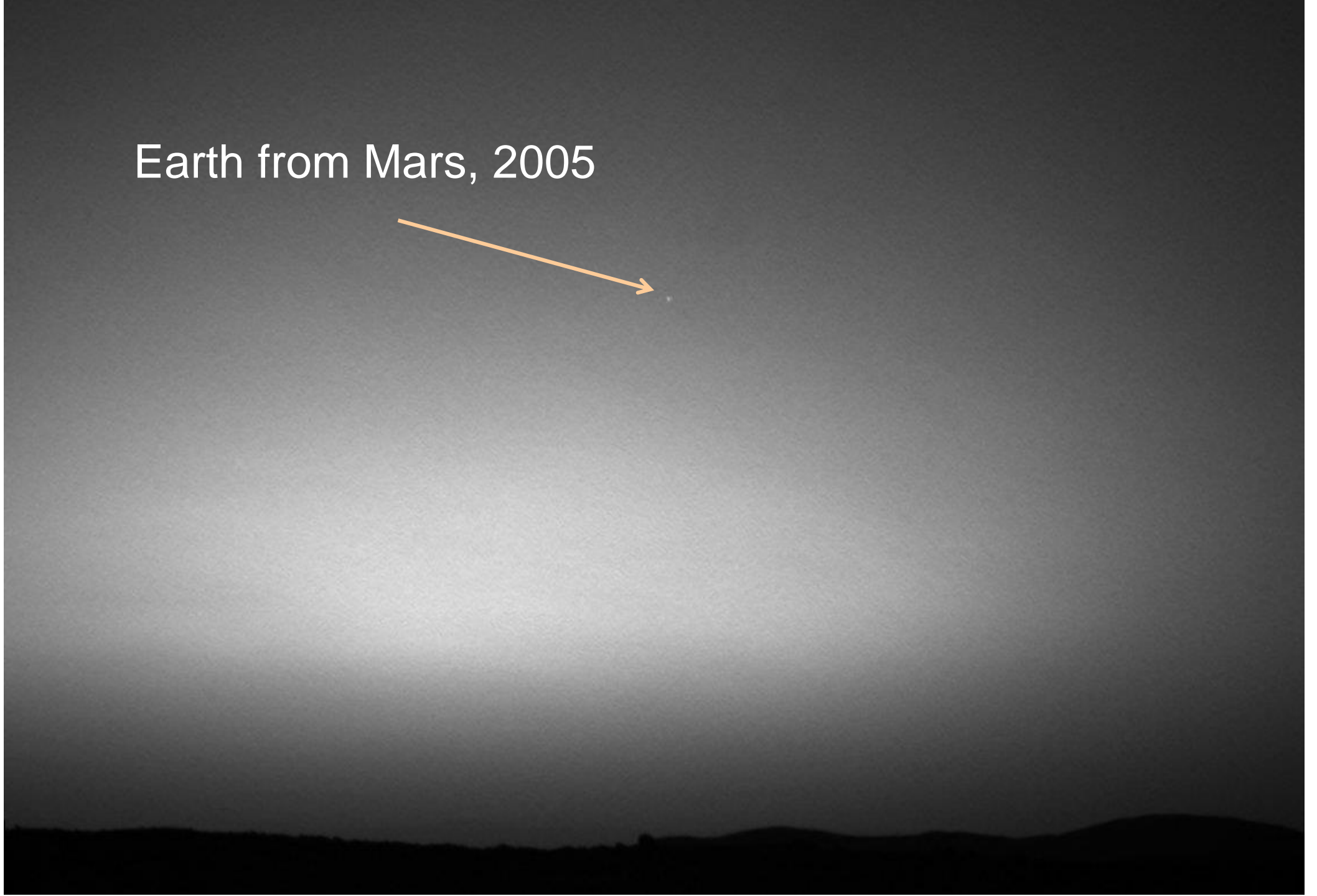
@ColinDavdButler

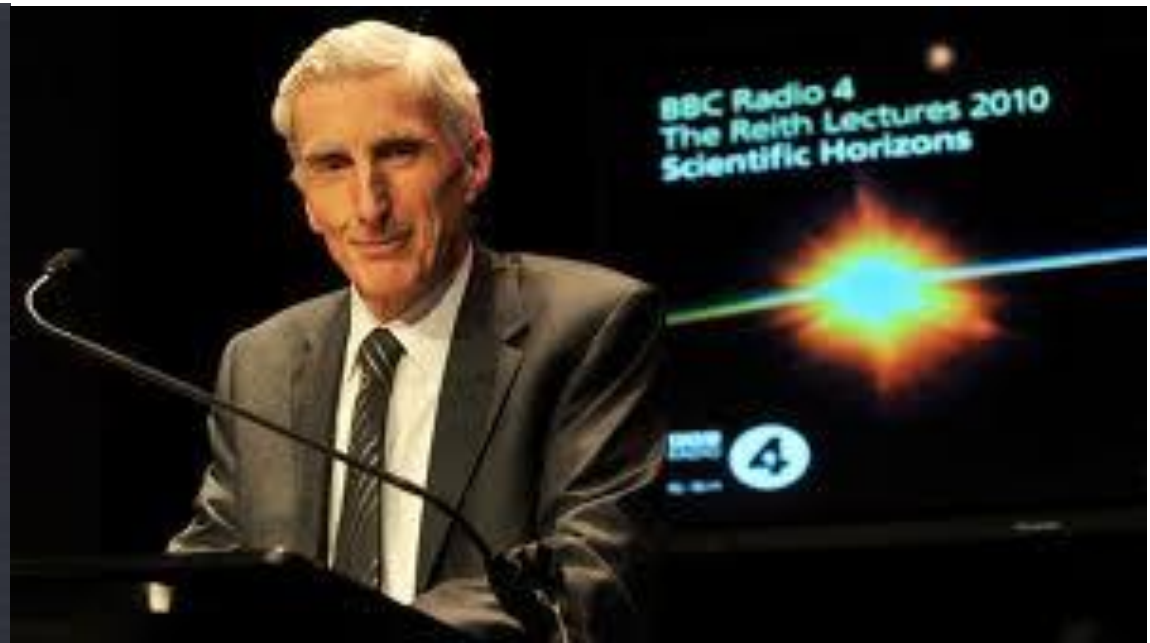
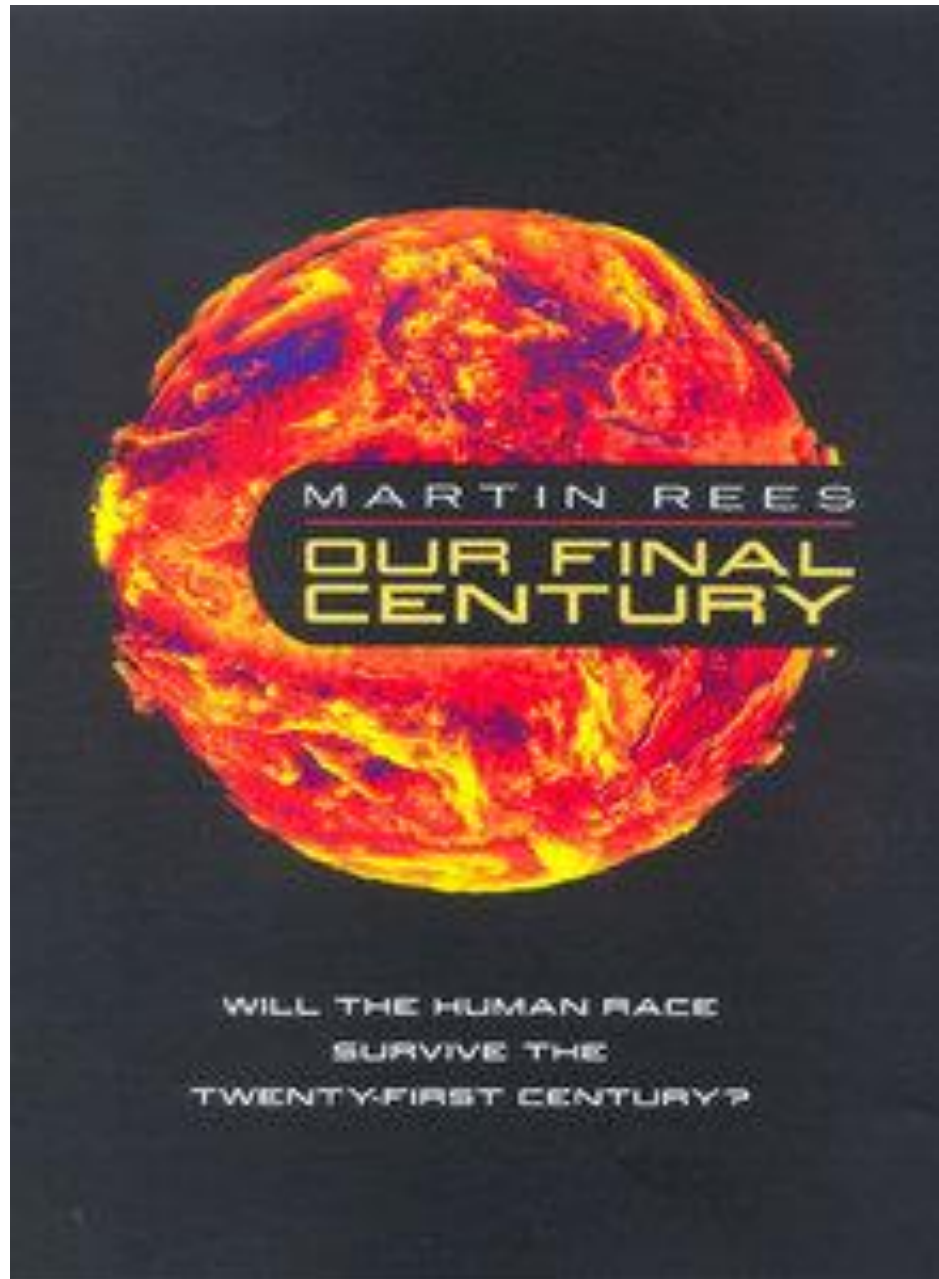
## Basic argument:

These frameworks (Limits to Growth, Planetary Boundaries and Planetary Health) constitute three generations of an intellectual family “born” in 1972, 2009 and 2015 respectively. Their older antecedents include the work of Malthus.

Butler, C. D. (2017 in press) Limits to growth, planetary boundaries and planetary health. *Current Opinion in Environmental Sustainability* Vol 25.

Earth from Mars, 2005





**President Royal Society 2005-2010**





# THE LIMITS TO GROWTH



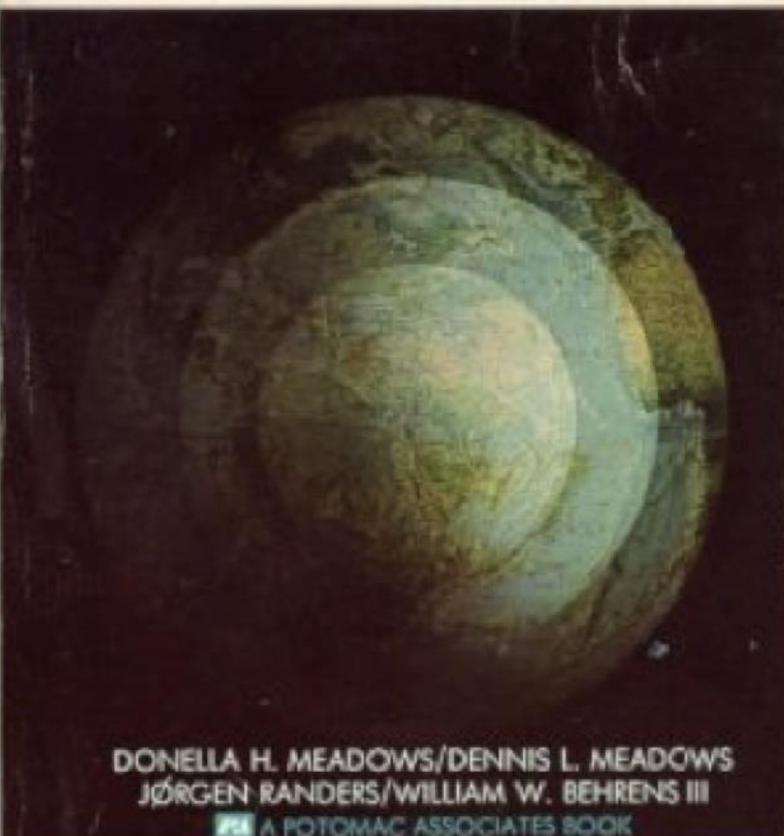
Donella H. Meadows   Dennis L. Meadows  
Jorgen Randers   William W. Behrens III

A report  
for the  
**CLUB OF ROME'S**  
project on the  
predicament of mankind.

ISBN 0-14-000000-0 \$1.95

# THE LIMITS TO GROWTH

The headline-making report on the imminent global disaster facing humanity—and what we can do about it before time runs out. "One of the most important documents of our age!" —Anthony Lewis, *The New York Times*



DONELLA H. MEADOWS/DENNIS L. MEADOWS  
JØRGEN RANDERS/WILLIAM W. BEHRENS III  
A POTOMAC ASSOCIATES BOOK

# THE LIMITS TO growth

Donella H. Meadows  
Dennis L. Meadows  
Jørgen Randers  
William W. Behrens III

*A Report for THE CLUB OF ROME'S Project on the  
Predicament of Mankind*



A POTOMAC ASSOCIATES BOOK

# The Club of Rome's *Limits to Growth* (LTG) (Meadows et al)

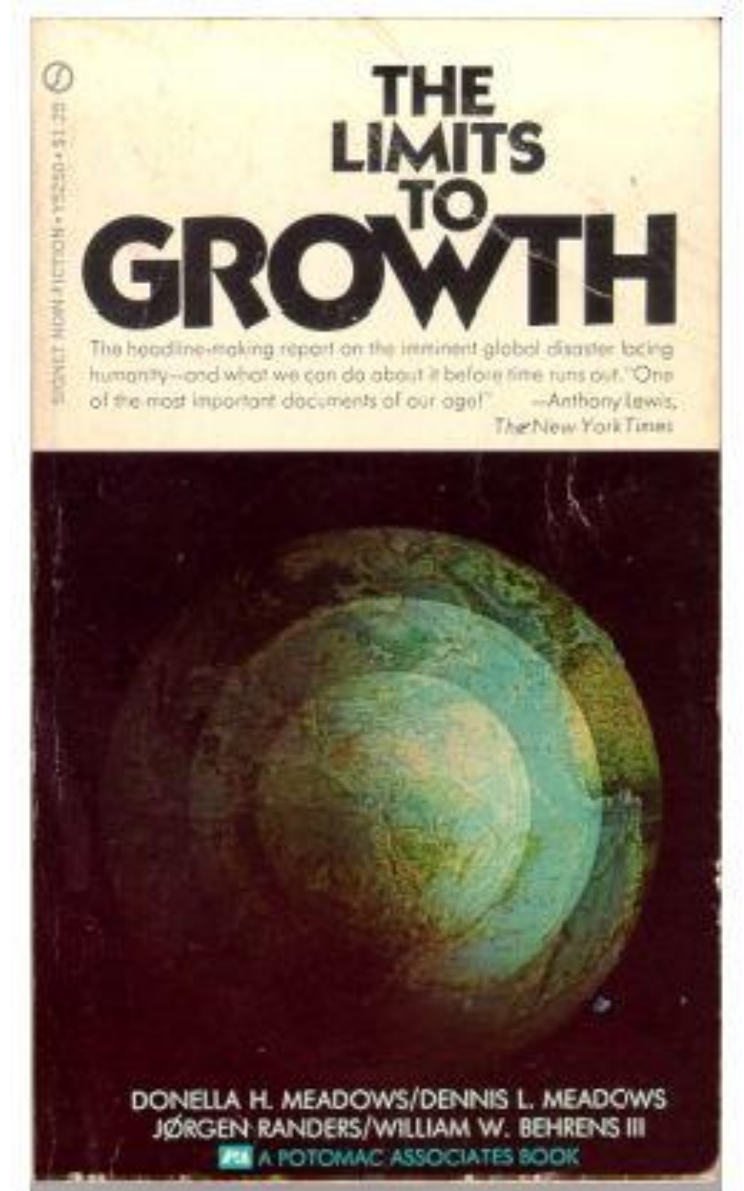
Best selling environmental book of 1970s

Modelled world economy and environment

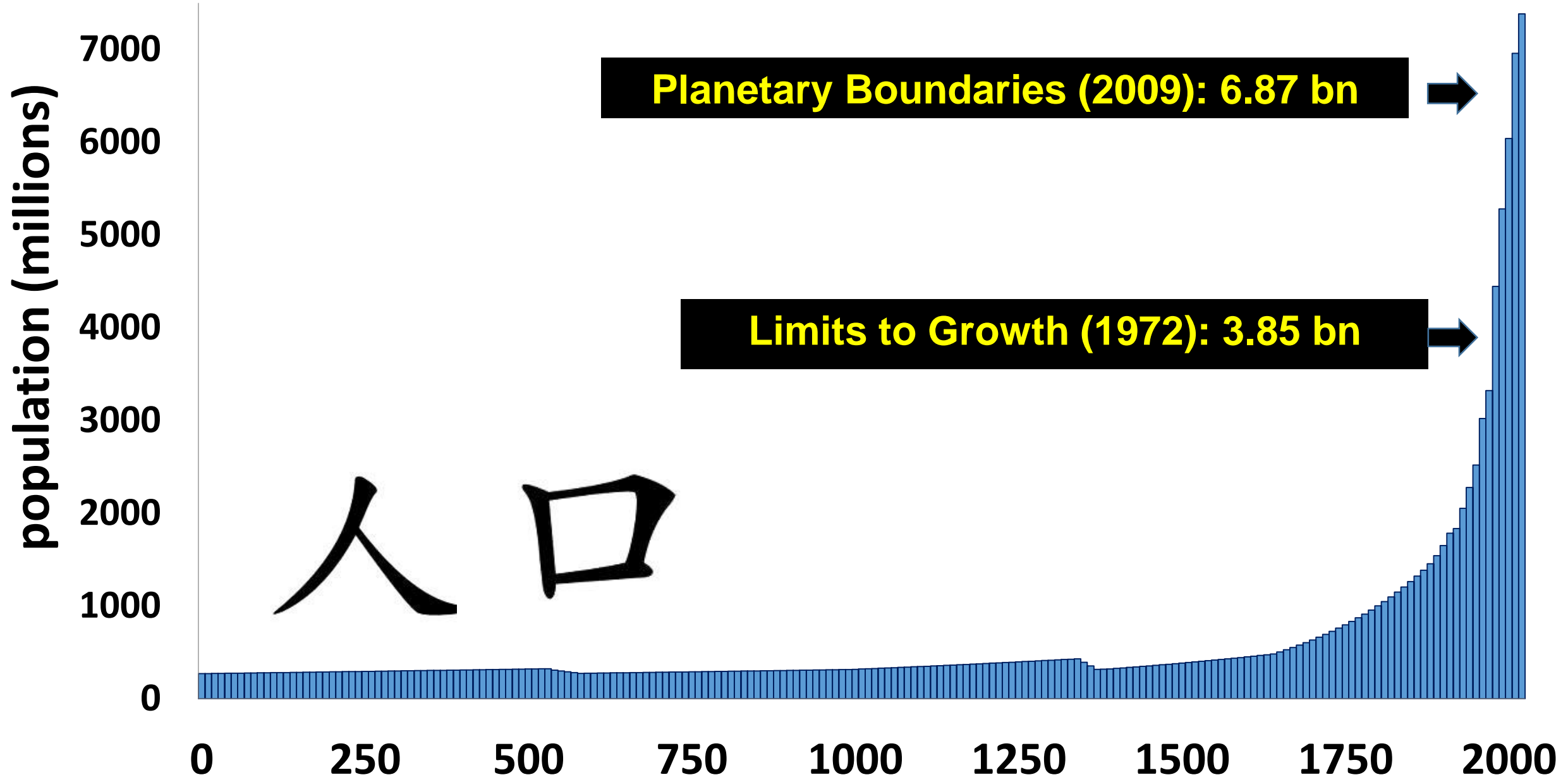
- Many scenarios modelled from 1900 to 2100
- Most lead to “overshoot and collapse”

Widely believed to forecast resource scarcity and collapse by year 2000

- leading to false claims that it was wrong



# global population: 0-2015



人口

These are the Chinese characters for human being and mouth – together they mean human population

Humans need food, and also other resources. This insight is ancient, not only in China, but all cultures.

However, this understanding is often suppressed, including because it disguises the purpose of colonisation, invasion, forced migration, “ethnic cleansing” and other euphemisms for genocide. All humans are, to varying degrees, descendants of migrants and the victors of conflict. We all need resources. There are currently about 7.5 billion people on the planet. At some point this number will stabilise or fall. It would be far more humane to avoid malignant Malthusian checks (to be explained) to do this.



# Systems thinking

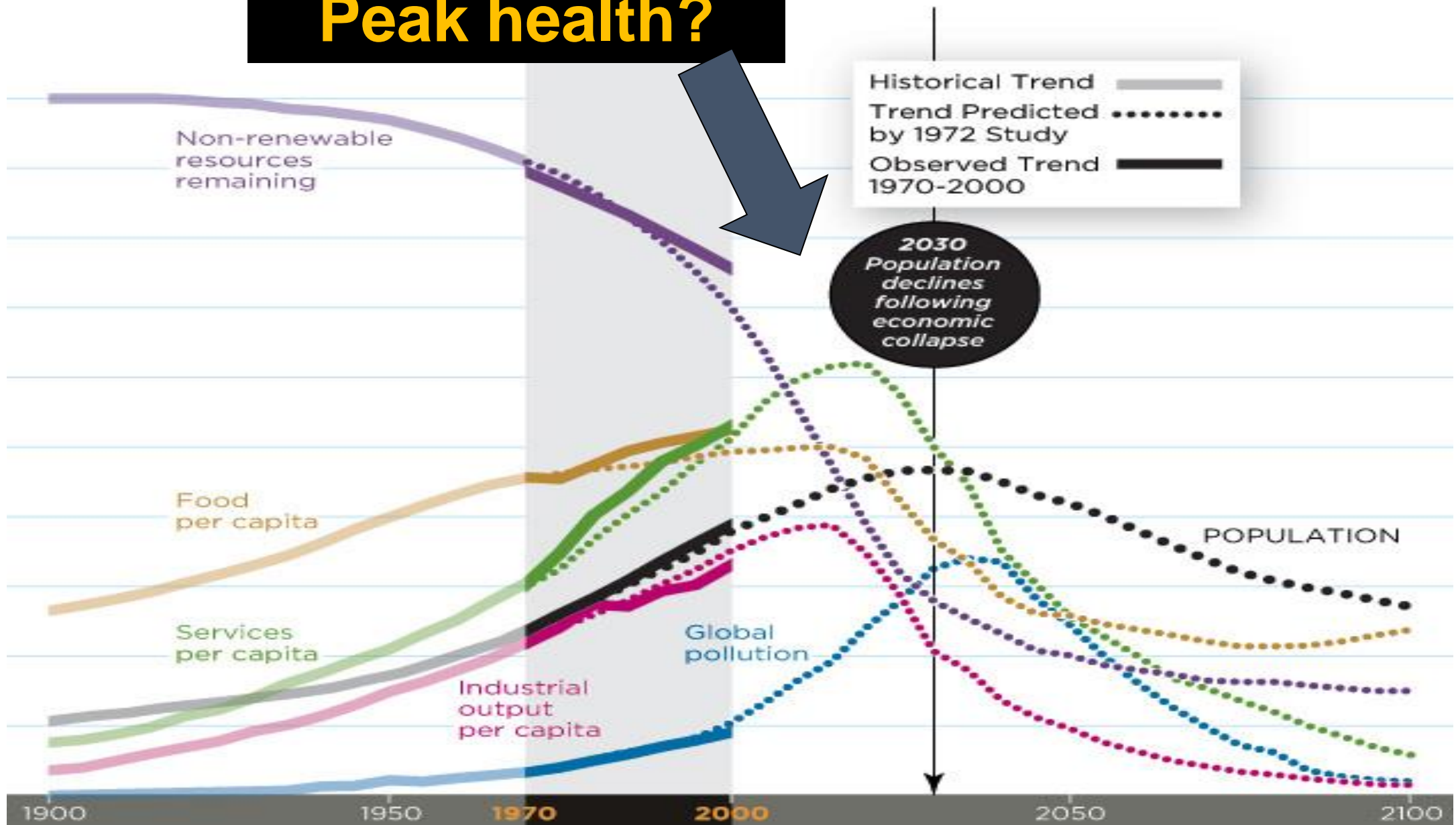
(central to LTG thinking)

integrative

interactive, feedbacks, thresholds

(emergence, phase changes, shocks )

# Peak health?



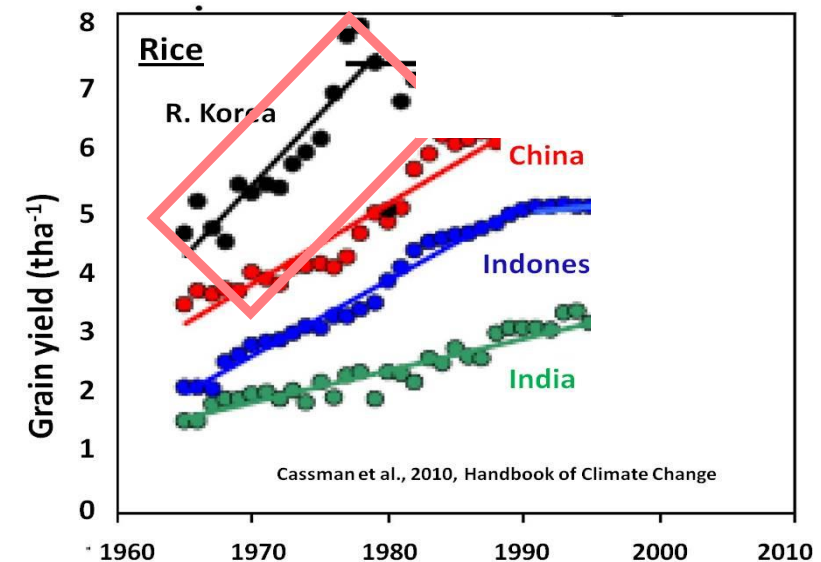
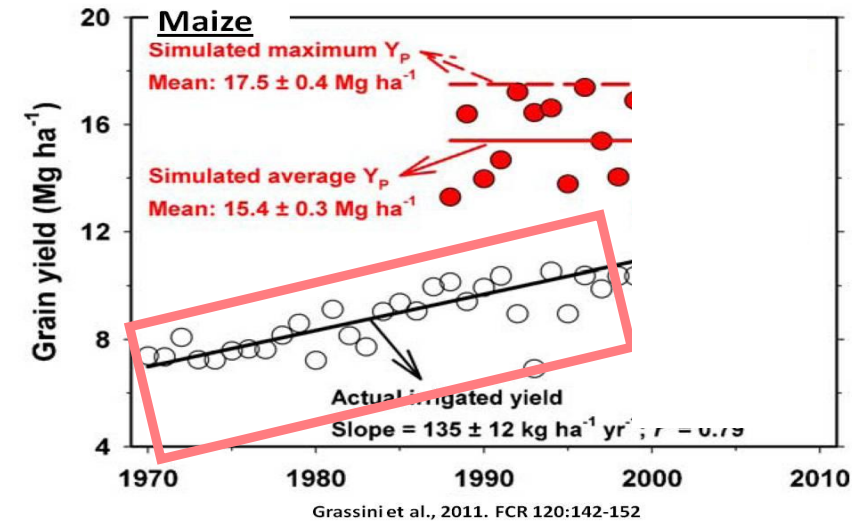
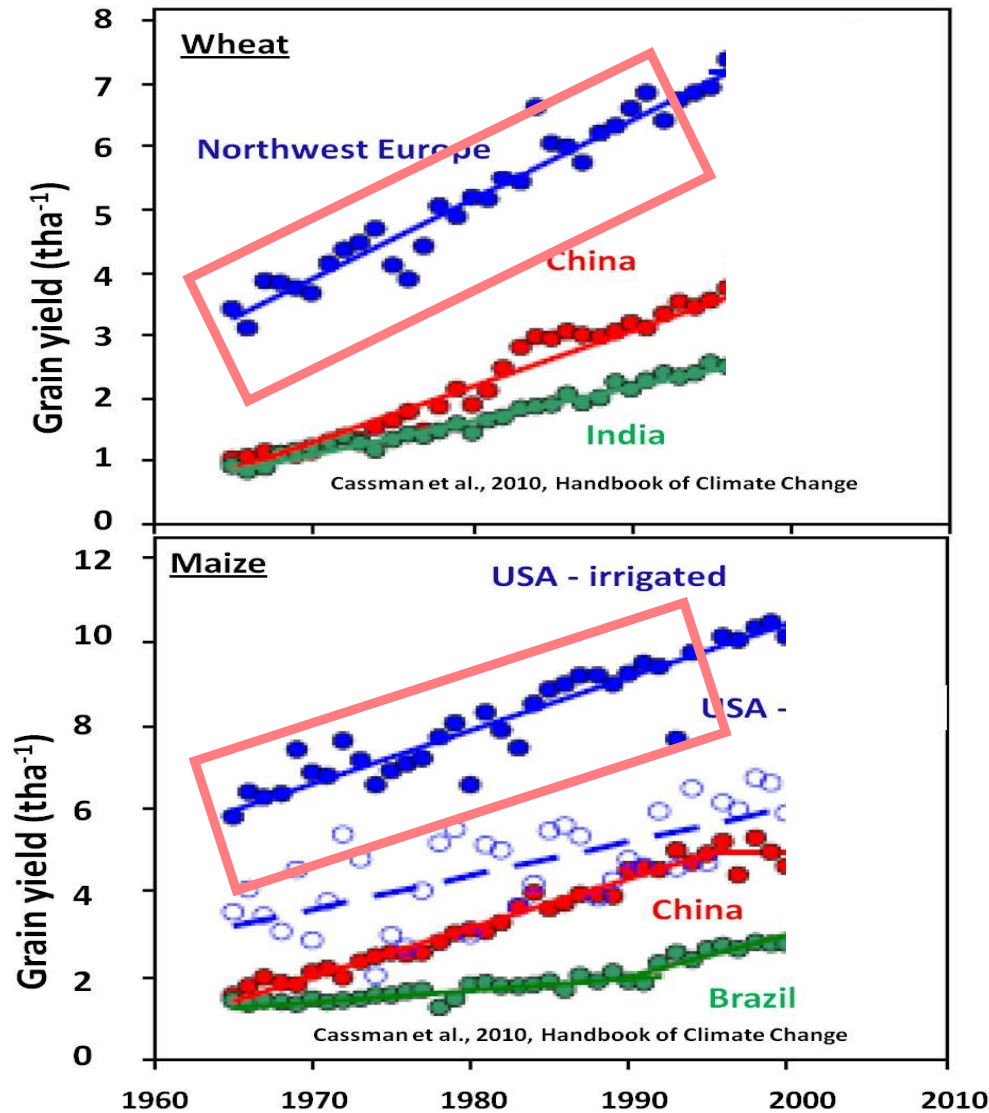
Turner, G. M. (2008). A comparison of The Limits to Growth with 30 years of reality. *Global Environmental Change* **18**: 397– 411.

Brijnath, B., McMichael, A. J. and Butler, C.D. (2012). Rio+20: Don't forget health in sustainability talks. *Nature* **486**: 191.

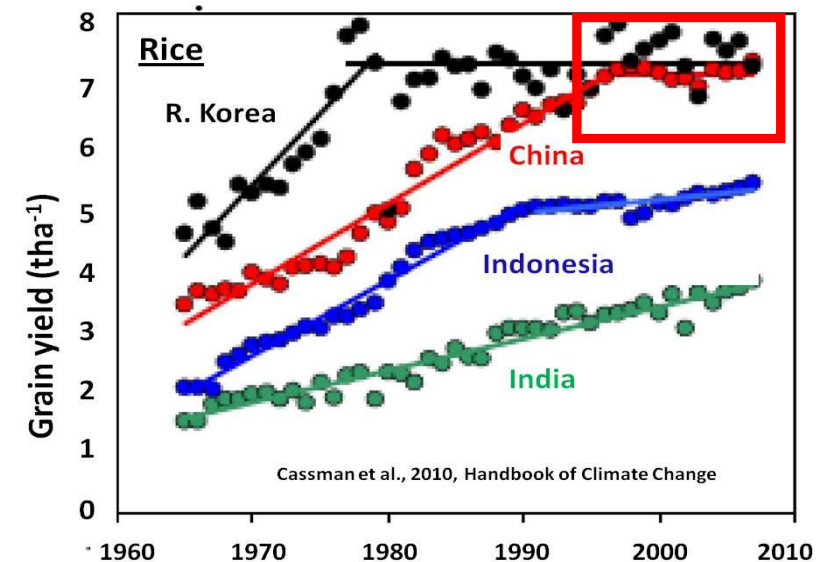
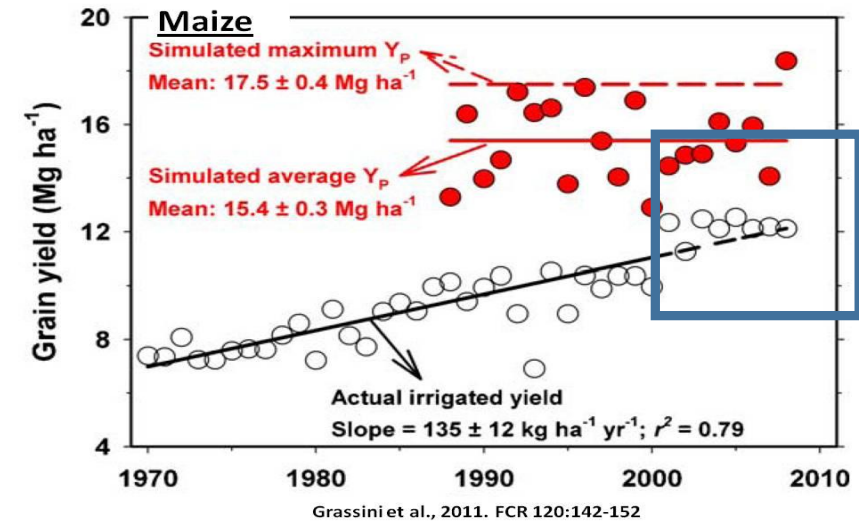
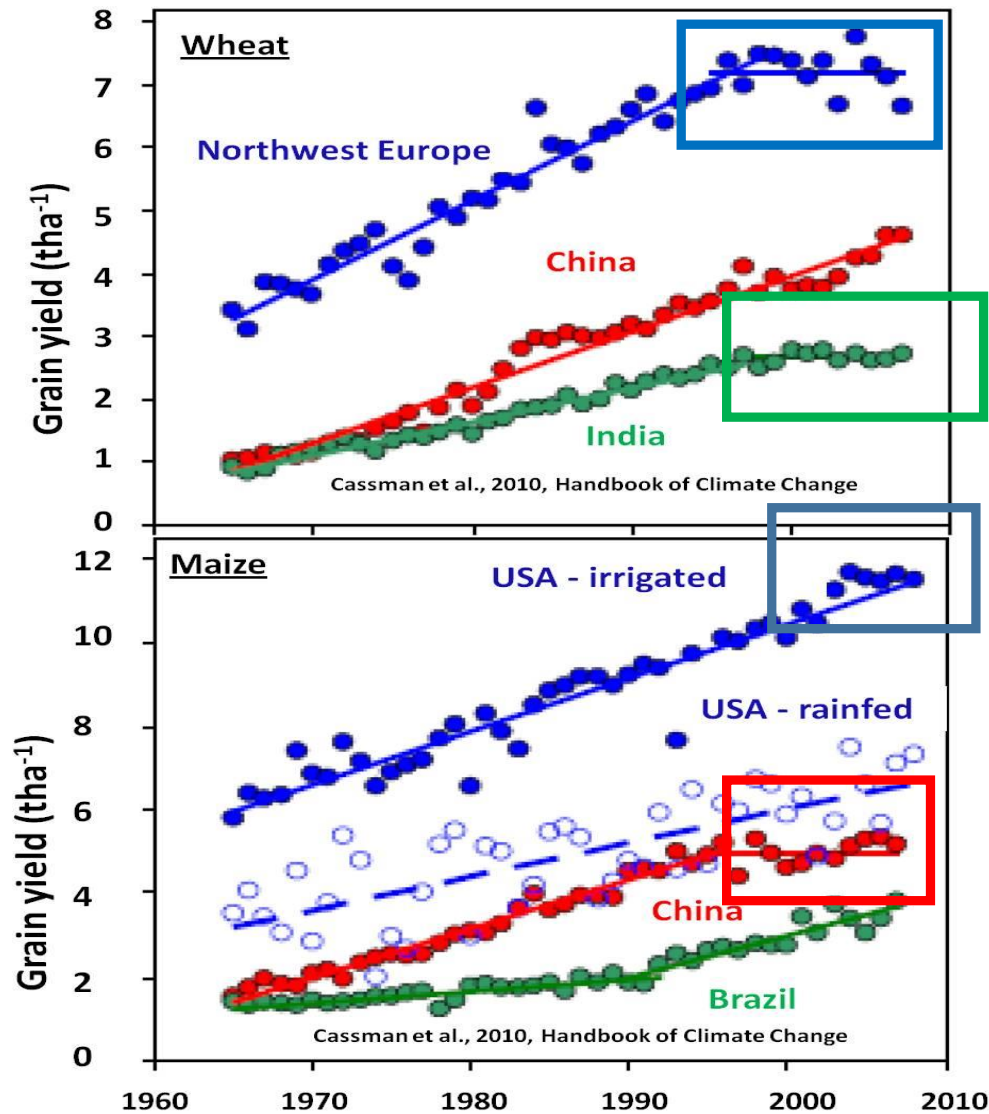
# Rising grain yields in the heyday of the Green Revolution

(various sources, all from papers involving Ken Cassman)

## Green Revolution: 3 main grains



“Yield plateaus are evident: wheat, maize in **China** perhaps irrigated maize in **the USA**., Korea and **China** for rice” (various sources, all from papers involving Ken Cassman)





# Limits to Growth

**Cheap energy**

**Pollution sinks**

**Crop yield increase**

**Biosphere integrity**

**Tolerance & compassion**

**Complexity**

}

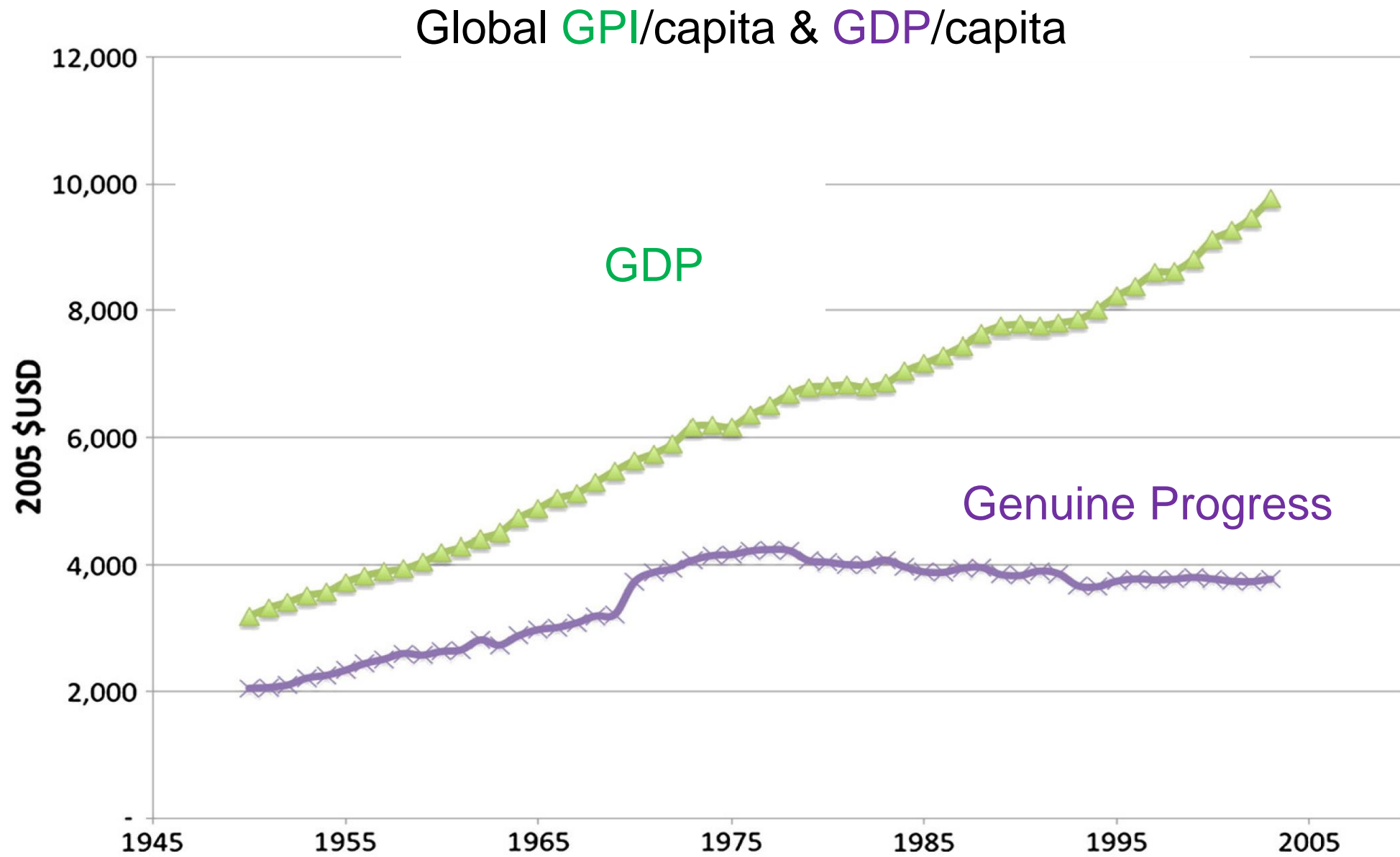
}

}

**all  
limited**

**From** forecasting and models (1970s) **to** abundant data and evidence .. not sufficiently acted on by policy makers, under-appreciated within academia

1. Persistently high energy price
2. Stagnant economic “growth”
3. Flattened genuine progress
4. Return of famines
5. Increasing civil wars
6. Numerous interactions: systemic nature
7. “Health for all” a dream
8. Retreat of civilization and strengthening “fortress world”



Kubiszewski, Costanza et al, 2013 Beyond GDP: Measuring and achieving global genuine progress *Ecological Economics* **93**: 57-68

# Planetary boundaries



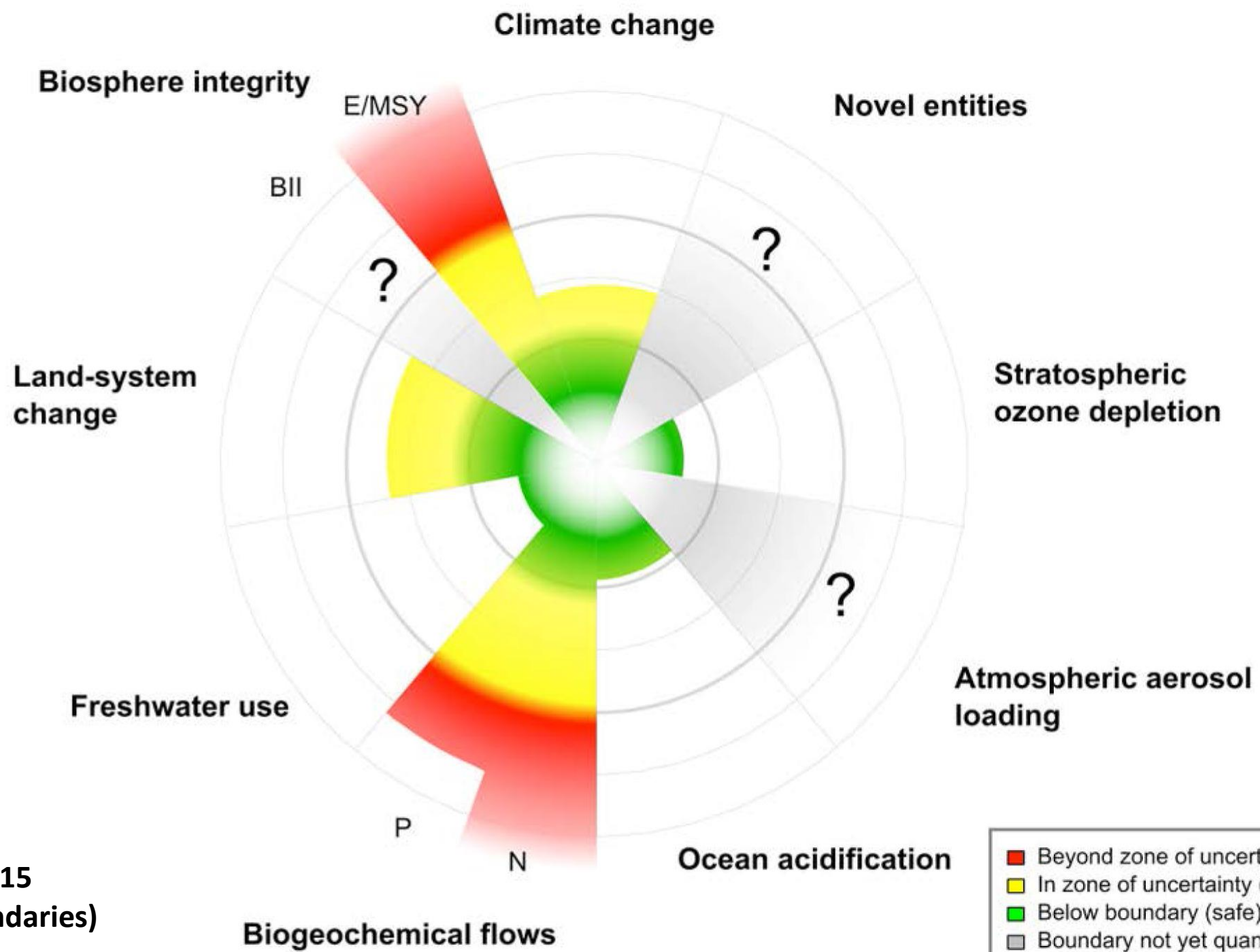
**"Our proposed framework **builds on and extends approaches based on limits-to-growth** (Meadows et al. 1972, 2004)"**

**Rockström, J., W. Steffen, K. et al, (2009). Planetary boundaries: exploring the safe operating space for humanity. *Ecology and Society* 14(2).**

**Limits to Growth not cited in their better known papers:**

**Rockström, J., W. Steffen, K. et al (2009). A safe operating space for humanity. *Nature* 461: 472-475.**

**Steffen, W., K. Richardson, et al (2015). Planetary boundaries: Guiding human development on a changing planet. *Science* 347(6223) 1259855.**



**Steffen et al, 2015  
(Planetary Boundaries)**

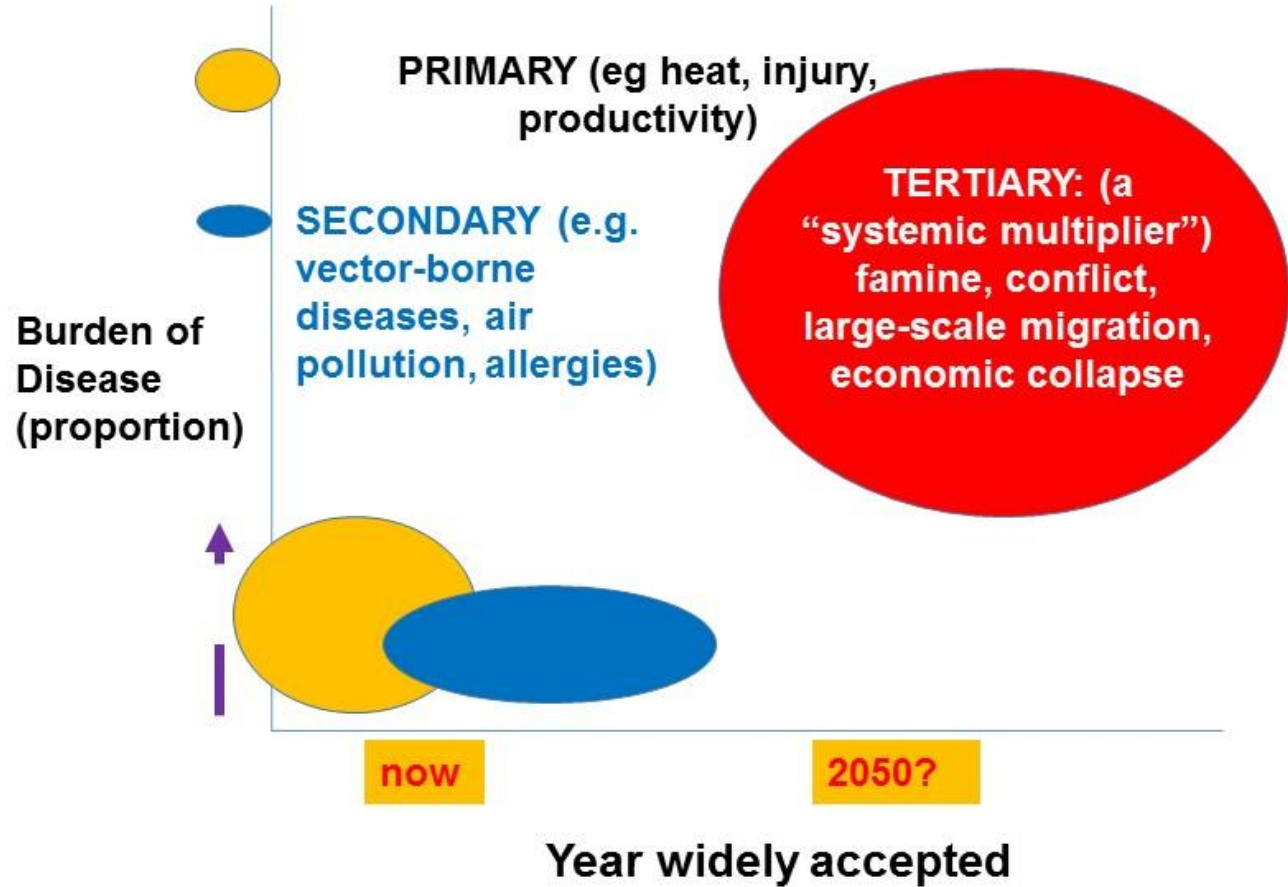
- Beyond zone of uncertainty (high risk)
- In zone of uncertainty (increasing risk)
- Below boundary (safe)
- Boundary not yet quantified

**Planetary boundaries**

**climate change**

# Climate Change and Global Health

Edited by Colin D. Butler



Health effects of climate change, Butler 2014



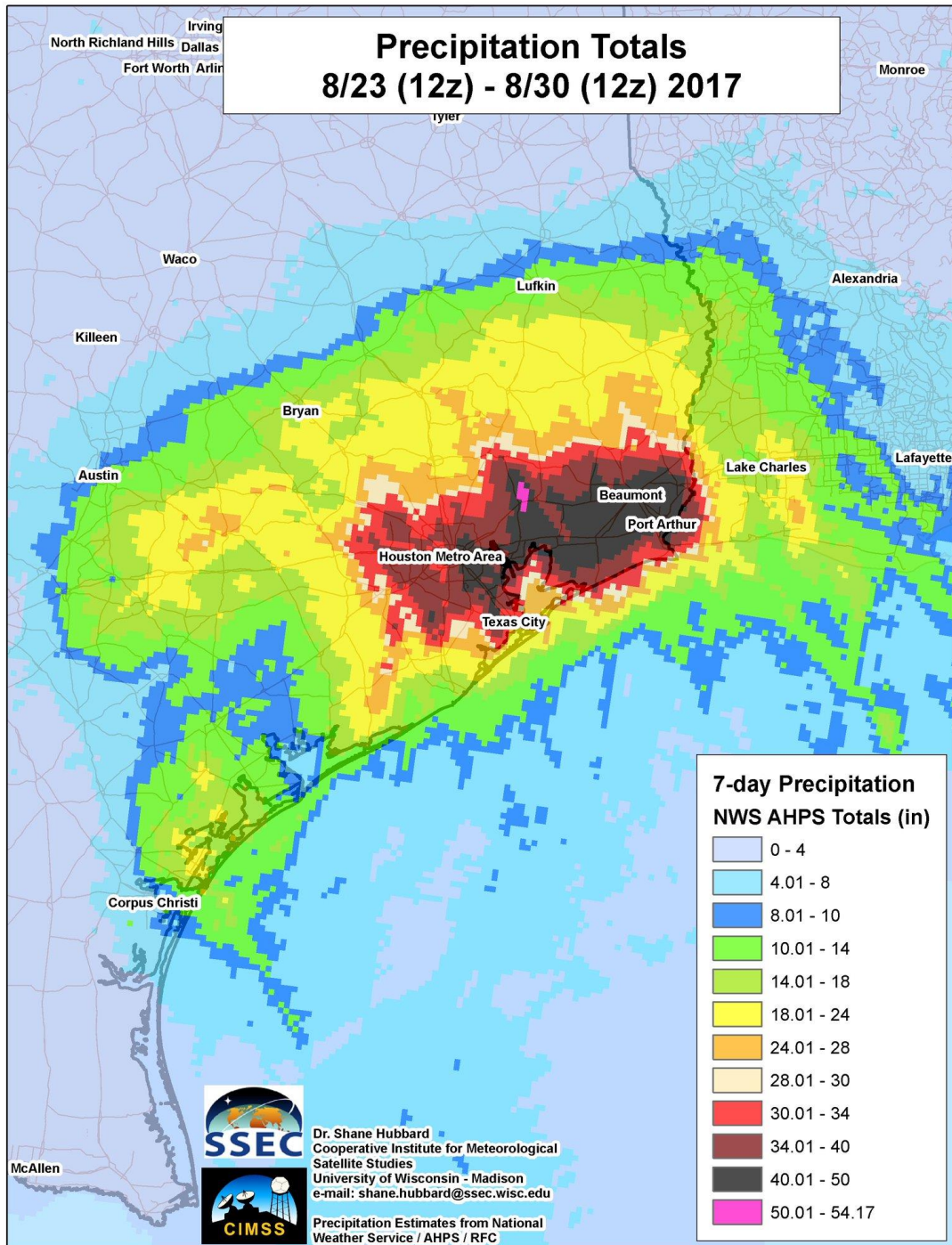
<http://english.alarabiya.net/en/variety/2017/07/05/WATCH-Truck-MELTS-into-road-swelters-in-extreme-heat.html>

VARIETY

## WATCH: Truck MELTS into road as Kuwait swelters in extreme heat



The video, shared widely among social media users on Tuesday, is a remarkable insight into the country's extreme heatwave. (Twitter/Shutterstock)



## Climate change links:

1. Sea level rise
2. Warmer atmosphere, more rain
3. Stalled storm – may be related to wavier jetstream, Arctic ice melt

**Houston, USA – August 2017**  
**Hurricane Harvey**





Climate change because:

1. Sea level rise
2. Warmer atmosphere, more rain
3. Stalled storm – may be related to wavier jetstream, Arctic ice melt



Houston, USA  
August 2017  
Hurricane Harvey

Where are we going? #Biharfloods 2017





**Planetary boundaries**

**silent on social consequences, including  
conflict**

## **Climate change will 'lead to battles for food', says head of World Bank (April 2014)**

(Dr) Jim Yong Kim urges campaigners and scientists to work together to form a coherent plan in the fight against climate change



<https://www.theguardian.com/environment/2014/apr/03/climate-change-battle-food-head-world-bank>

**The far-sighted amongst you are anticipating broader global impacts on property, migration and political stability, as well as food and water security. ...**

**Past is not prologue ... the catastrophic norms of the future can be seen in the tail risks of today.**

**Mark Carney, 2015  
(Governor of the  
Bank of England)**



Carney M. Breaking the tragedy of the horizon – climate change and financial stability.  
<http://www.bankofengland.co.uk/publications/Pages/speeches/2015/844.aspx>

## Thomas Robert (Bob) Malthus

Much reviled, from his own lifetime (1766 – 1834) until today

World's first professor of political economy

Acknowledged by Darwin and Wallace in their theories of evolution

**Malthusian “checks” on population:**

1. Voluntary (eg delayed marriage, contraception, abortion)
2. Famine
3. Conflict
4. Pandemics



# Thomas Robert (Bob) Malthus

Much reviled, from his own lifetime (1766 – 1834) until today

World's first professor of political economy

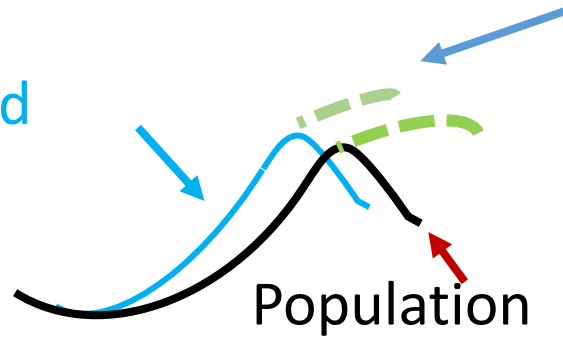
Acknowledged by Darwin and Wallace in their theories of evolution

## Malthusian “checks” on population:

1. Voluntary (eg delayed marriage, contraception, abortion)
  2. Famine
  3. Conflict
  4. Pandemics
- } Malignant checks
- and/or: migration – sometimes



food



Large scale famine relief was not provided, either as food or purchasing power. If it had been, the Irish population is unlikely to have reduced by much, if at all, between 1840 and 1860.

During the Irish famine (1848-1852), population roughly halved, due to famine, death, diseases and migration (3 malignant checks). The proximal cause was the potato blight, but this was exacerbated by minimal famine relief. During the famine, grain continued to be exported from Ireland. This lack of intervention by Britain or other powers does not negate Malthus's central concept.

Malthus's central ideas were not unique, not modern (even then), and not exclusively Western. Their core message remains valid. **Humans cannot expect ingenuity to always trump scarcity.** Numerous contemporary cases of malignant "Malthusian" checks, including Rwanda (1994), South Sudan and Yemen, today



**Planetary boundaries**

**biosphere integrity**



## **Clown fish vivid against bleached coral, 2016**

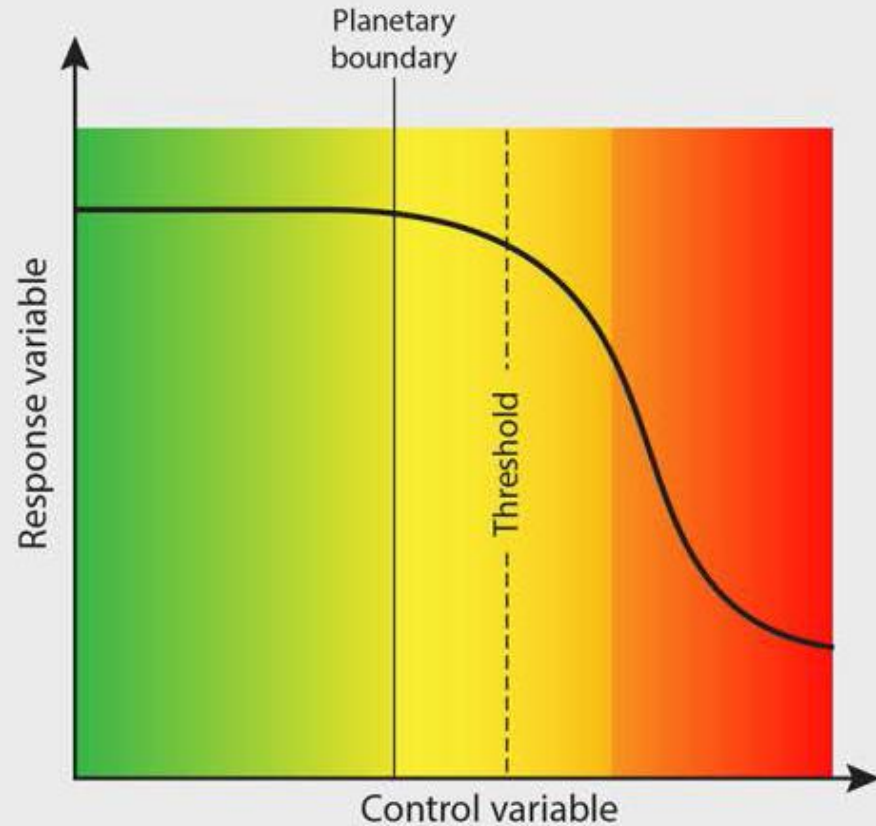
<http://www.theguardian.com/environment/planet-oz/2016/apr/21/mourning-loomis-reef-the-heart-of-the-great-barrier-reefs-coral-bleaching-disaster>

**Planetary boundaries**

**thresholds**

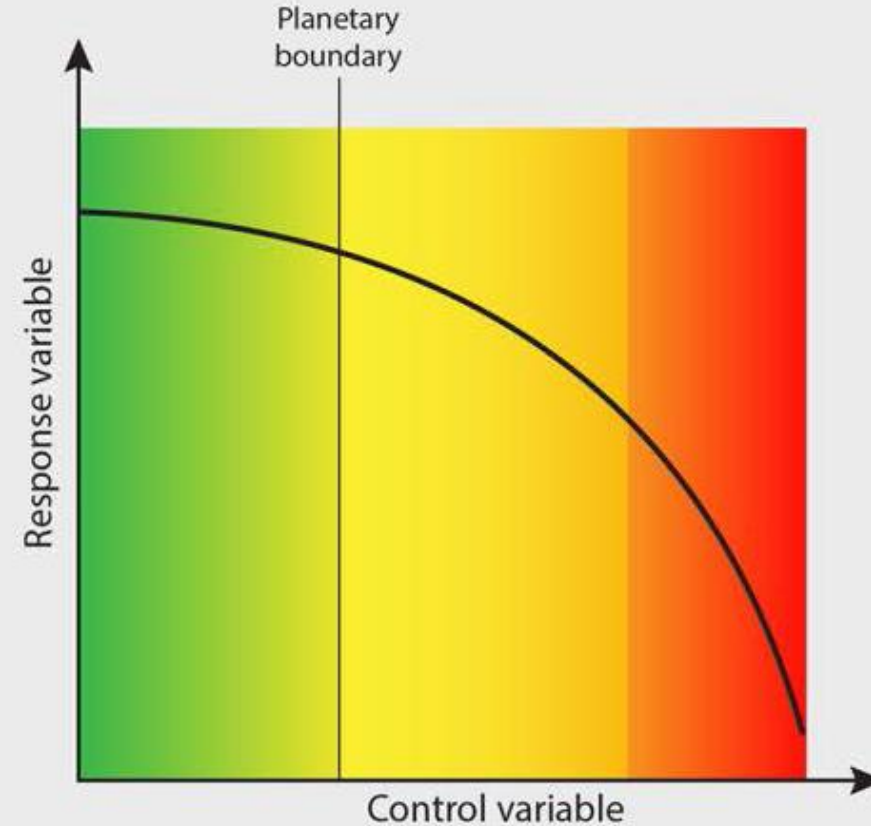
## Process X

*Globally mixed, with continental/global threshold*



## Process Y

*Heterogeneous, with no continental/global threshold*



Global  
feedbacks



Local/regional  
impacts



Local/regional  
thresholds

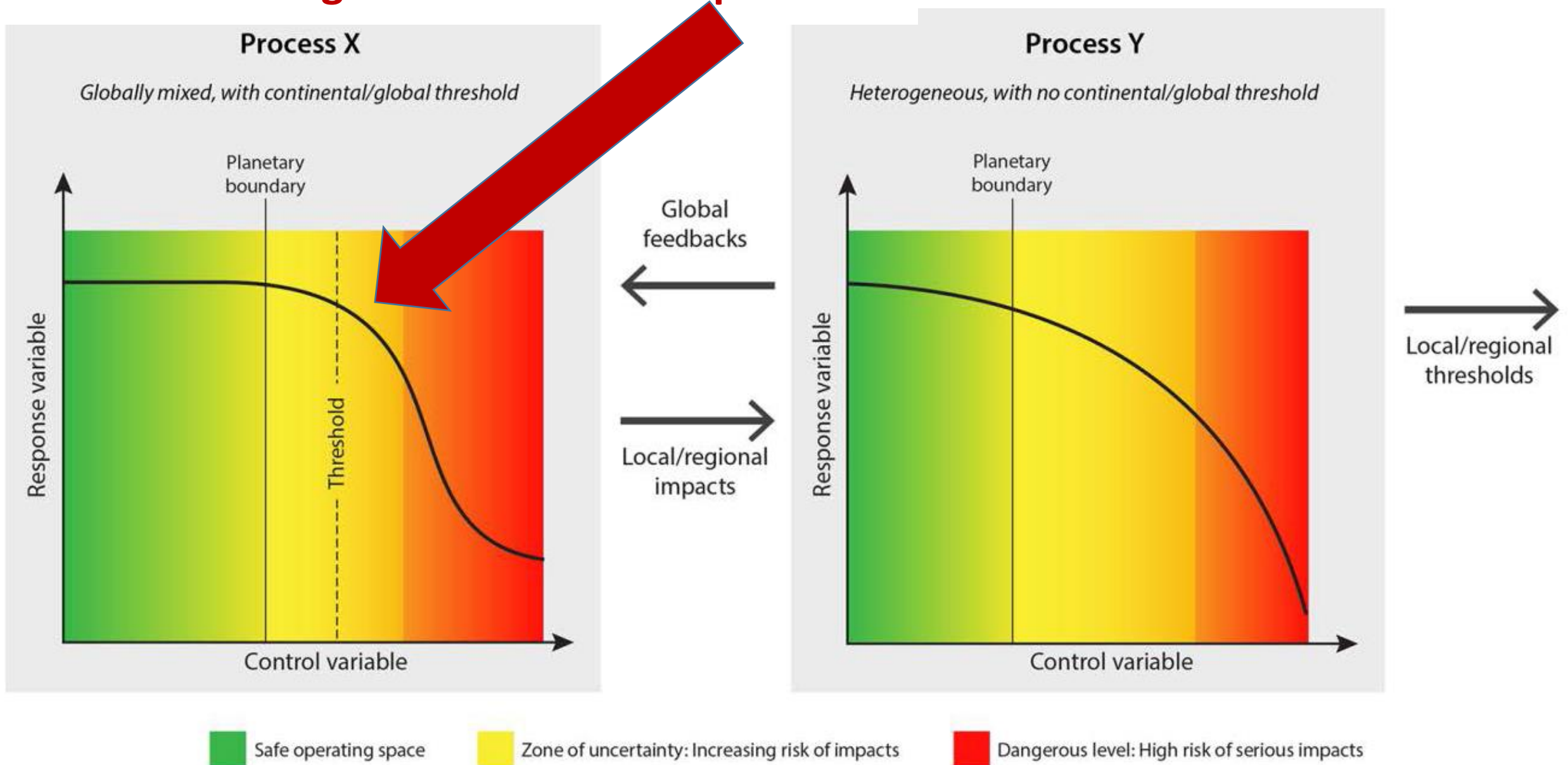


Safe operating space

Zone of uncertainty: Increasing risk of impacts

Dangerous level: High risk of serious impacts

# Much more dangerous ... also more plausible







Whitmee, S., Haines, A. et al (2015). Safeguarding human health in the Anthropocene epoch: report of The Rockefeller Foundation–Lancet Commission on planetary health. *Lancet* **386**: 1973–2028.

<http://www.thelancet.com/infographics/planetary-health>

Health Earth:  
“health for all on a single planet”

<http://health-earth.weebly.com/>

Founded 2014



	Limits to Growth	Planetary Boundaries	Planetary Health	Health Earth
Human health	i	i	e	e
Limits (renewables)	e	e	e	e
Limits (non-renewables)	e	i	i	e
Social limits	i	no	i	e
Earth system thresholds	e	e	e	e
Eco-social thresholds	e	i?	probably	e
Conflict	i	no	e	e
Possibility of civilization collapse	e	i	i	e
Minimum environmental services for human well-being	e	e	e	e
i= implicit, e = explicit (Butler, 2017, in press)				

Cognitive barriers



# The Optimism Bias

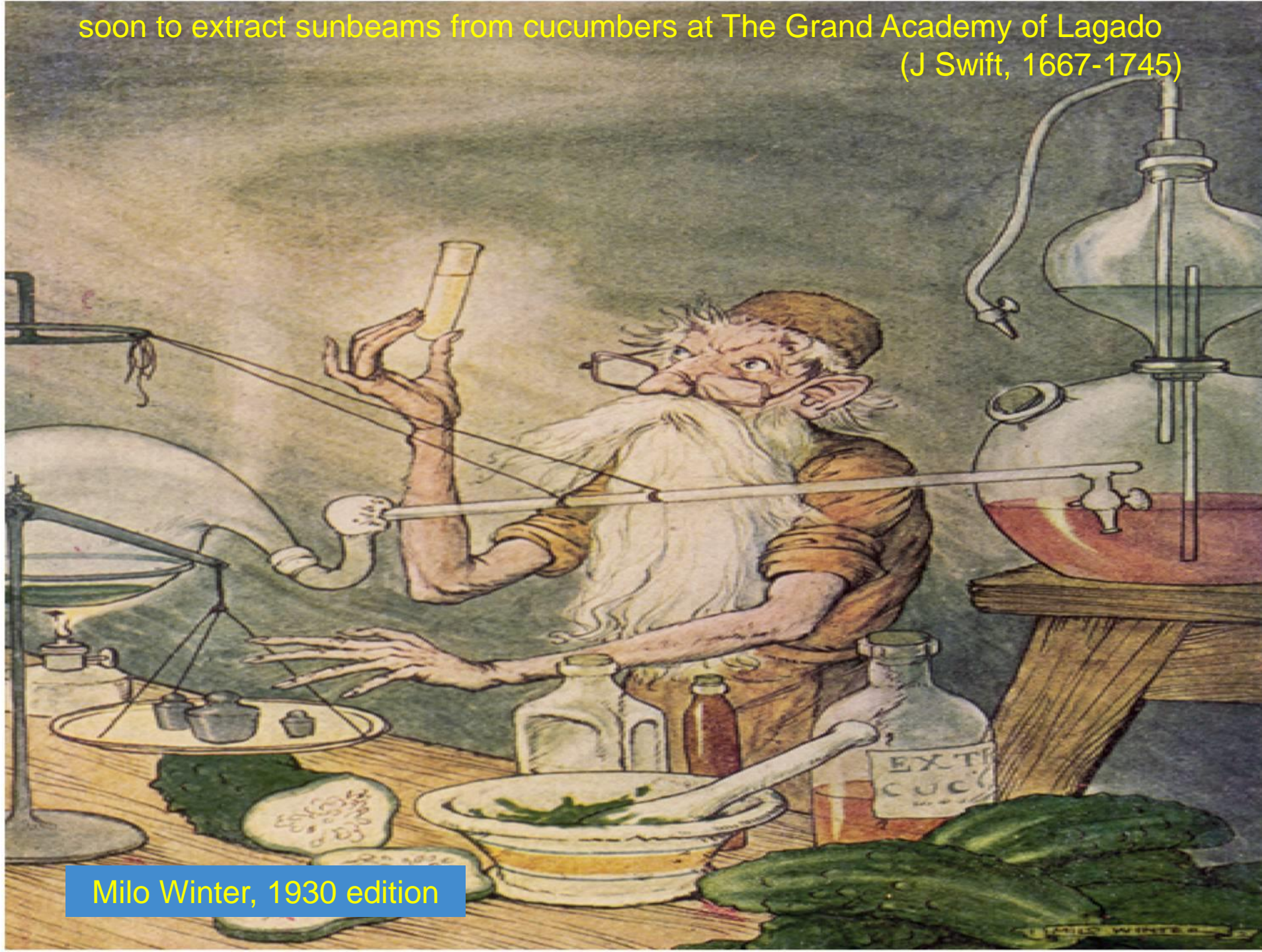


A Tour of the  
Irrationally  
Positive Brain

Tali Sharot



soon to extract sunbeams from cucumbers at The Grand Academy of Lagado  
(J Swift, 1667-1745)



Milo Winter, 1930 edition

# Childhood Origins of Adult Resistance to Science

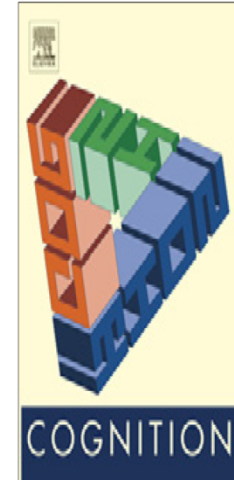
**when learning .. adults and children are sensitive to source “trustworthiness”.. resistance to science exaggerated where nonscientific ideologies are grounded in “common sense” and transmitted by trustworthy sources.**



Contents lists available at [SciVerse ScienceDirect](#)

Cognition

journal homepage: [www.elsevier.com/locate/COGNIT](http://www.elsevier.com/locate/COGNIT)



Scientific knowledge suppresses but does not supplant earlier intuitions

Andrew Shtulman\*, Joshua Valcarcel

*Department of Psychology, Occidental College, 1600 Campus Road, Los Angeles, CA 90041, United States*



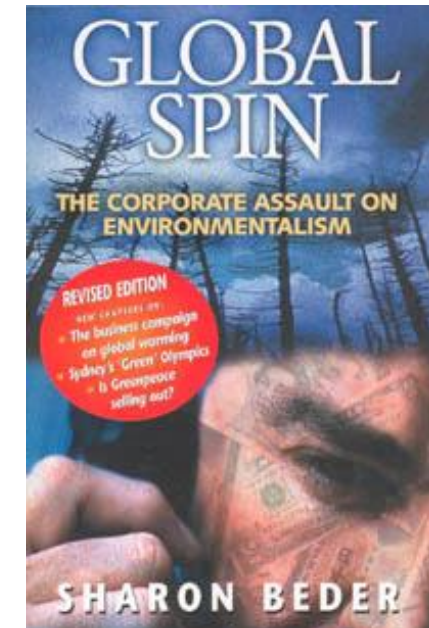
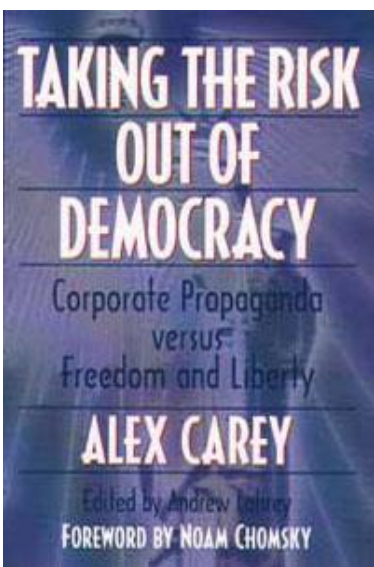
**Double standards**  
**The power of corporations**  
**who shape what we think and are told**



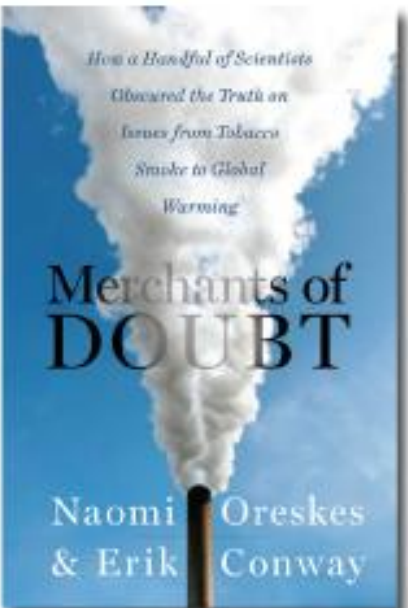


**The Human Titanic**





<https://geddry.com/2016/03/29/turning-point-climate-fight-ags-unite-target-exxon-crimes/>





Solutions -  
multiple methods



# Eroding the social contract

**ADDICTED  
TO DIRTY, CHEAP ENERGY**

**COAL MINING AND POWER GENERATION**

There is a price to pay to maintain our habit  
Burning coal releases dozens of toxic substances

Costly for our health and the environment

- HEART DISEASE
- LUNG CANCER
- ASTHMA
- STROKE
- CLIMATE CHANGE

Coal addiction trades future health for short term gain

**IT'S TIME TO  
QUIT  
NOW**

**COAL IS A HEALTH HAZARD**

**make the switch  
TO CLEAN ENERGY**

**DEA** Doctors for the Environment Australia

for more information, visit [www.dea.org.au](http://www.dea.org.au)



Eroding the social contract



**“THE ARC OF THE MORAL UNIVERSE IS LONG, BUT  
IT BENDS TOWARDS JUSTICE”**



**Theodore Parker, a 19<sup>th</sup> century abolitionist who inspired Martin Luther King**

<https://quoteinvestigator.com/2012/11/15/arc-of-universe/>

▪ NEW ▪  
WORLD  
▪ NEW ▪  
MIND

M O V I N G  
T O W A R D  
C O N S C I O U S  
E V O L U T I O N

**ROBERT ORNSTEIN**  
AND **PAUL EHRLICH**



**After WWII:  
hope humanity  
gained maturity  
from its then  
recent, immense  
suffering**

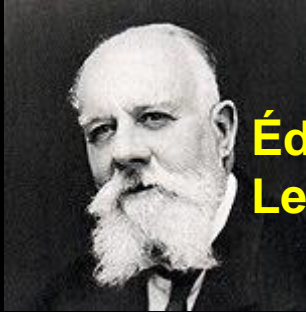


## **UN Human Rights Declaration; Eleanor Roosevelt, 1947**

*Eleanor Roosevelt and John P. Humphrey at the December 1947 Geneva meeting. Humphrey, the director of the UN Human Rights Division, prepared the first draft of the Declaration.*



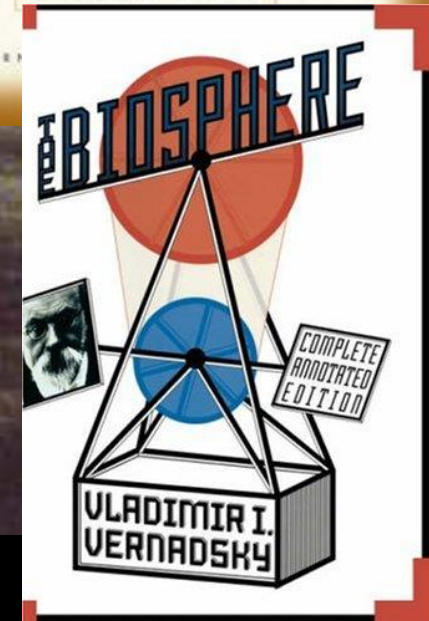
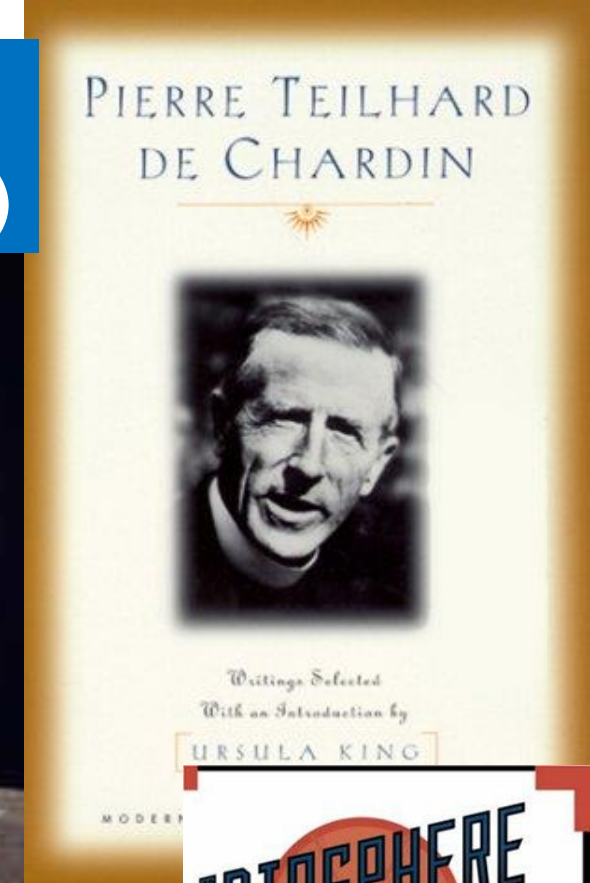
# noösphere (planetary thinking, sharing)

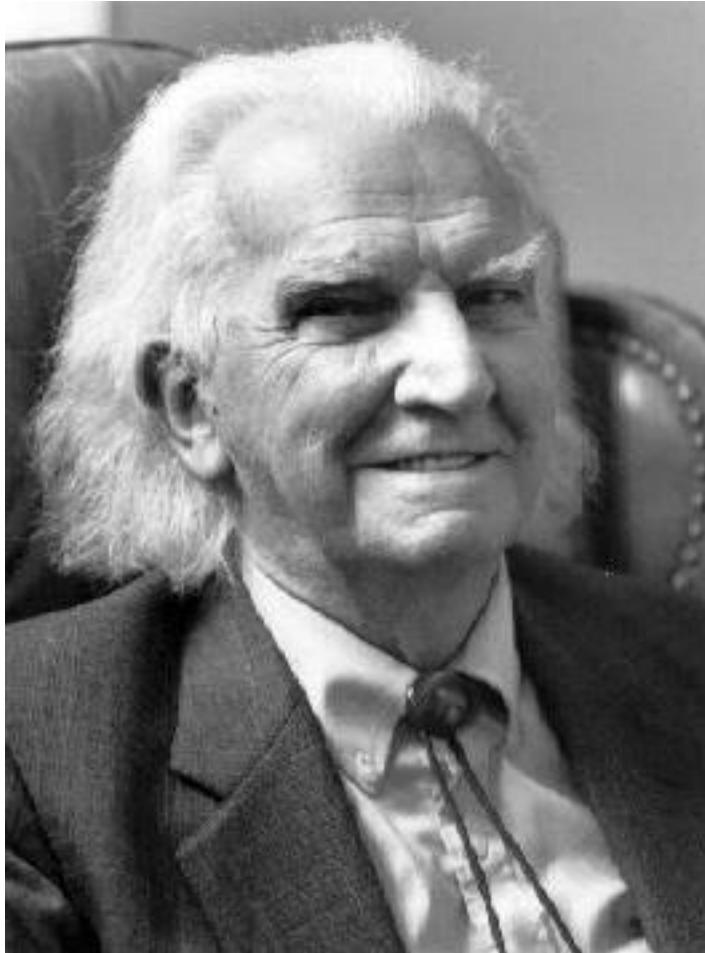


Édouard  
Le Roy



Paul Crutzen





## The Economics of Spaceship Earth

“the only person who believes in perpetual economic growth is either a madman or an economist”

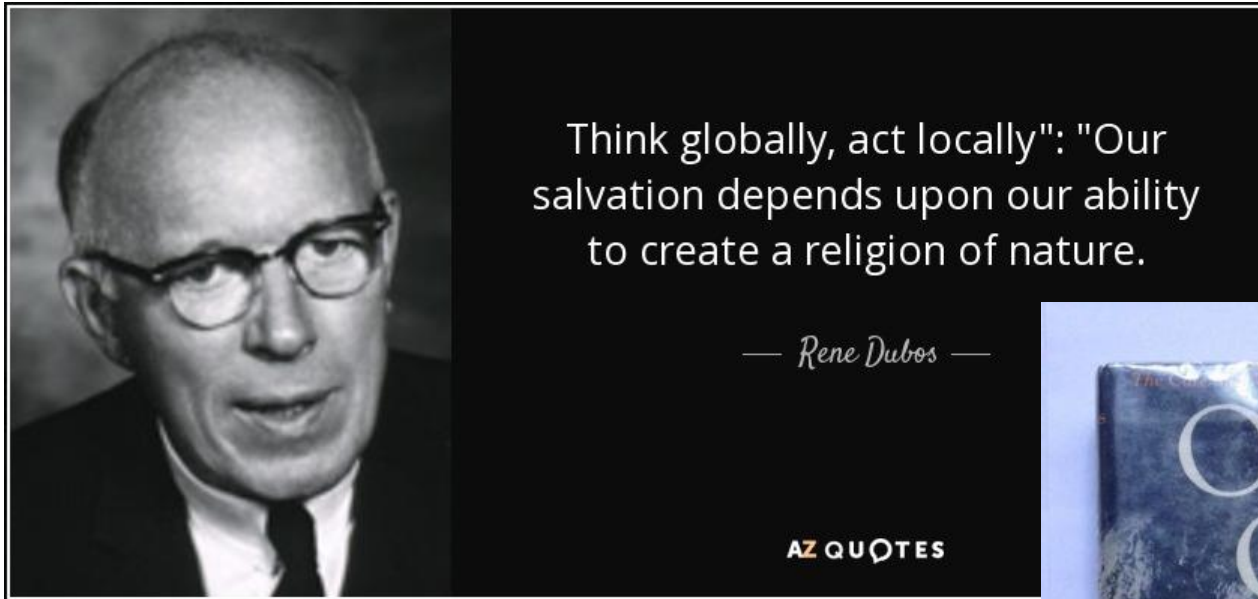
Kenneth Boulding (1910-93)



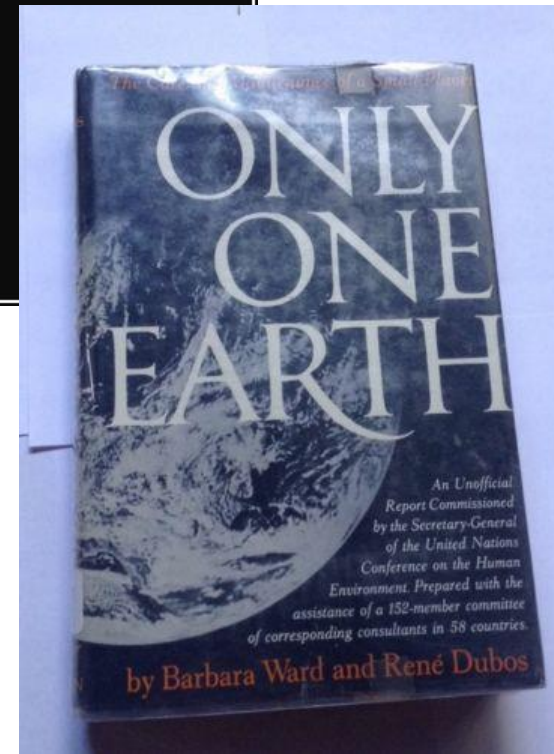
**“the most amazing technical abilities, the astonishing economic growth, unless they are accompanied by authentic social and moral progress, will definitively turn against man”**

Pope Paul VI, 1970

*Address to FAO on the 25th Anniversary of its Institution (16 November 1970)*



**"We do not live *on* the planet earth but *with* the life it harbours and *within* the environment that life creates"**

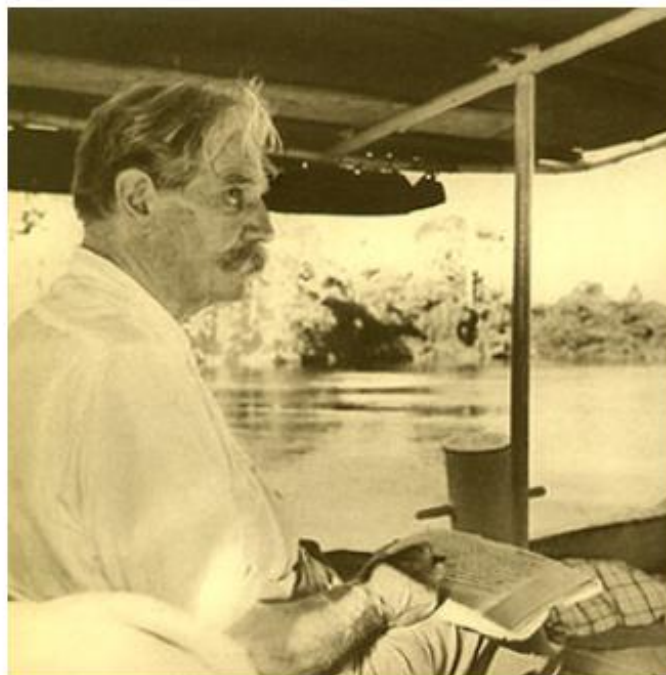


## Reverence for Life

*"The abolition of atomic weapons will become possible only if world opinion demands it. And the spirit needed to achieve this can be created only by Reverence for Life. The course of history demands that not only individuals become ethical personalities, but that nations do so as well."*

Norman Cousins believed that Schweitzer could rightly be called *"the conscience of our age."*

Dr. Schweitzer's discovery of the ethical premise which gave his life full meaning, *Reverence for Life*, happened in 1915 while he was undertaking an errand of mercy from his African hospital on a journey up the Ogowé River.



*"...There flashed upon my mind, unforeseen and unsought, the phrase, 'Reverence for Life' ....now I had found my way to the ideas in which world-and-life-affirmations and ethics are contained side by side."*

From that time on, until his death in 1965, *Reverence for Life* guided Albert Schweitzer in all that he thought