

# What does climate change mean to me?

Carl Palmer

UNESCO-EGU-ESA GIFT workshop: Climate change and human  
adaptation

AEON-ESSRI, Nelson Mandela Metropolitan University  
Port Elizabeth, South Africa  
26-28 February 2014



access

Applied Centre for Climate & Earth Systems Science

# Perspectives: Who is “me”?

- \* Carl Palmer ?
  - \* 30-something with a PhD in Atmospheric Chemistry living in Cape Town
- \* You?
  - \* Who are you?
- \* South African?
  - \* What is an average South African?
- \* African?
  - \* What is an average Africa?



# Overview

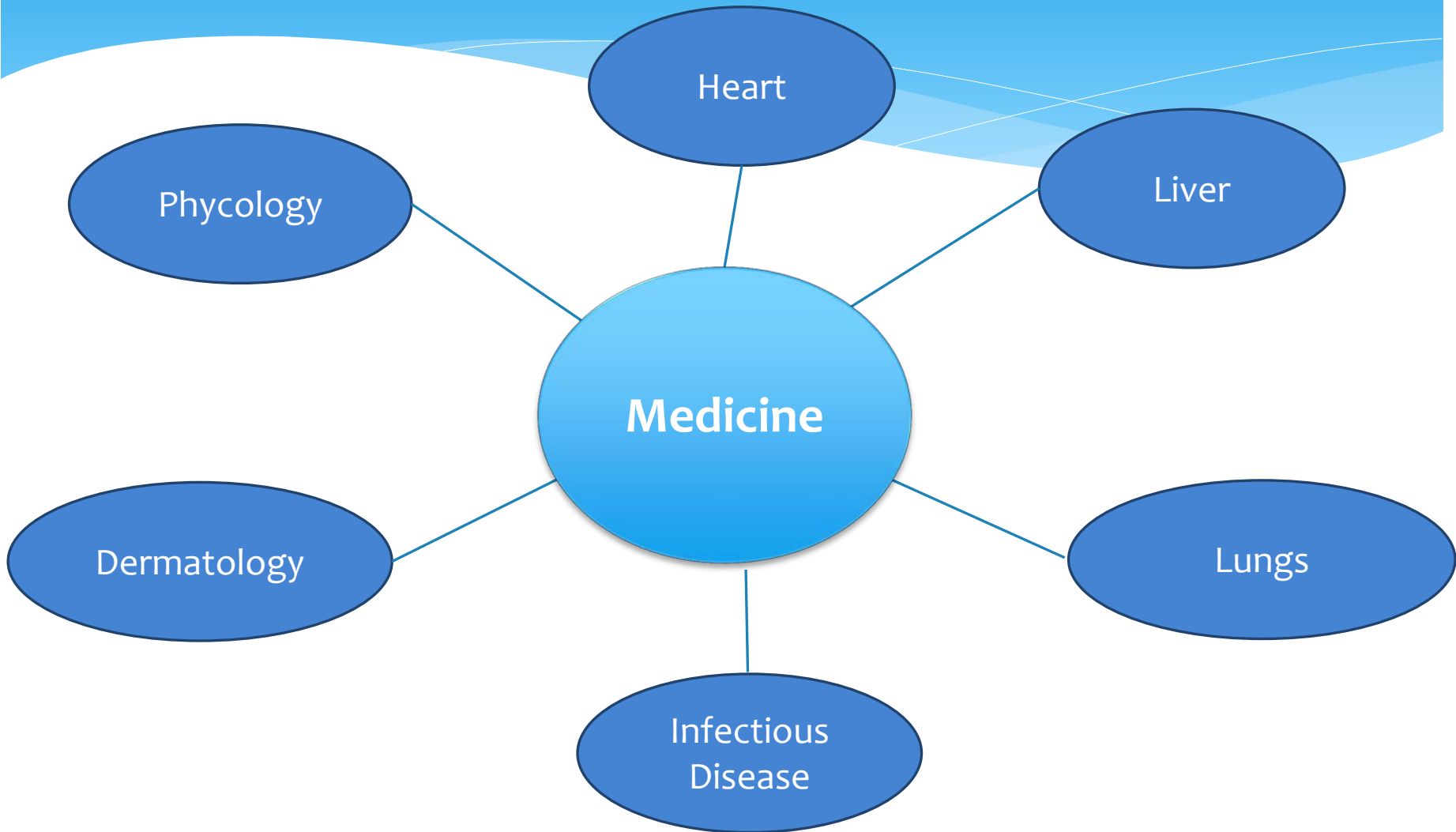
- \* An Epistemological Change: The emergence of Earth Systems Science
- \* Responding to the challenge: Foxy thinking
- \* The importance of the local context: A special time and a special place
- \* Application in Education: The Habitable Planet

An epistemological shift has given rise to

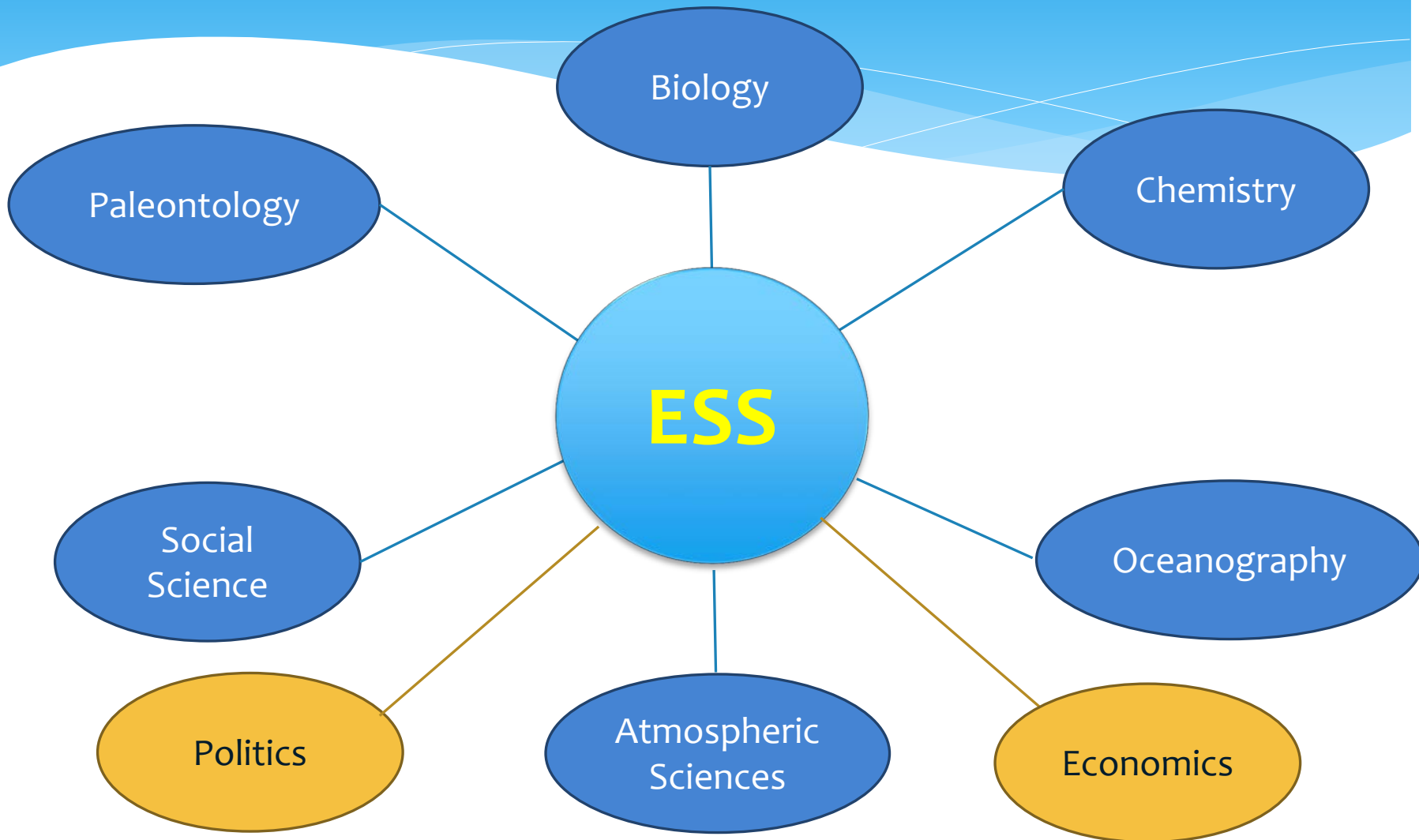
# A New Type of Science



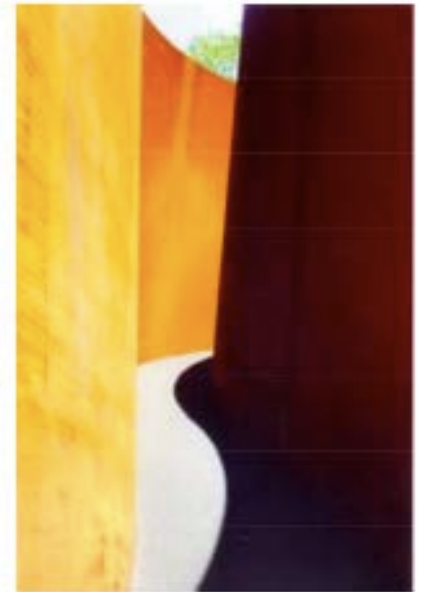
# Human Health



# Planetary Health = Earth System Sciences



# The Hedgehog and the Fox





Shift the way we think

# Foxy thinking 1: Thinking fresh about priorities and the importance of skepticism

# Washing the dishes...



# Peace and Love

- \* Impossible to stand against peace and love – *everyone* is for them
- \* But we can't love everyone (simply due to time pressure!)
- \* Wars are sometimes a necessary evil (I think)
- \* It's about priorities
- \* The same should apply to the environment

# Confirmation Bias

- \* What do people do when confronted with data that conflicts with their deeply held views?
- \* Often they will try to ignore it, intimidate it, buy it off, sue it for libel or reason it away.
- \* The classic paper on the last of those strategies is from Lord, Ross and Lepper in 1979.
- \* Each group found extensive methodological holes in the evidence they disagreed with, but ignored the very same holes in the evidence that reinforced their views(!).

# Confirmation Bias

- We therefore need to be exceedingly careful when we consider data that impacts on our deeply held views.
- We need to train ourselves to always be skeptical.
- Think again about what we assume is true.

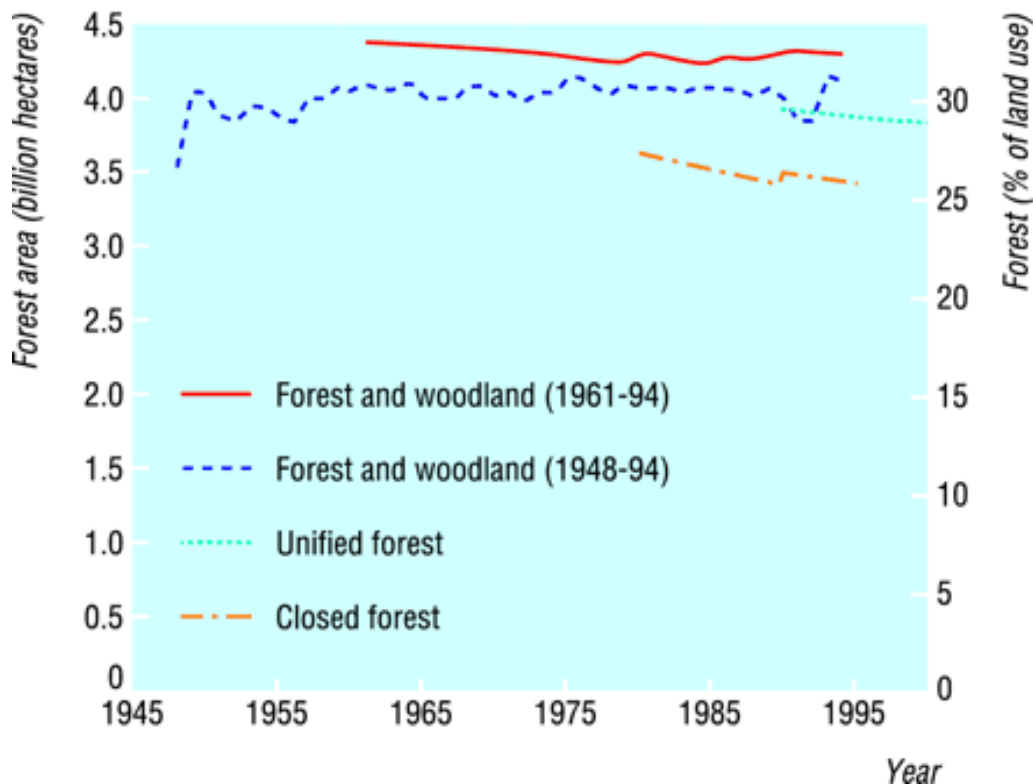


# The importance of skepticism

- \* Differentiate Scientific Skepticism from Climate Denialism
- \* Scientific skepticism at the core of the scientific method and peer review
- \* Essential to remove possible bias
  - \* Human propensity for nostalgia?
- \* Critical thinking key skill

# Deforestation

Year	% Land Cover = Forest
1950	40.24 million
1994	43.04 million



**UN Food and Agriculture Organization** estimates of global forest cover: forest and woodlands, 1948-94 (from FAO Production Yearbook) and 1961-94 (from FAO database), closed forest for 1980-95, and new unified forest definition 1990-2000<sup>1</sup>

# Chemical Cancer

- “Chemicals used in modern industrial and agricultural practices are causing the observed increase in cancer in the developed world. ”
- Age adjusted cancer death rate has dropped from ca. 150 in 100,000 to 100 in 100,000 in this period (despite increase due to smoking).
  - *WHO, 2000.*



The world may be getting better not worse

# Foxy Thinking II: Science vs. Politics and Economics

# Science and politics

**Science** – can measure as long as we use appropriate data.  
e.g. Appropriate sample size, reliable sources and long term records



\* Things are getting better .....  
good enough.

But that does not always mean things are



**Politics** – No fixed answer so  
requires compromise

# Fewer People are Hungry

Year	% Malnourished (Developing World)
1970	35
1996	18
2010	12

- **240 million** fewer people are hungry today than in 1970 (despite the overall population increasing by 3 billion!)
- BUT there are still **680 million** hungry.
- These data tell us that things are **getting better**.
- But we need to decide are things **good enough**?
- Need to compromise and prioritize....

[FAO (1999): 29]

# More People are Literate

Year	Literacy Rate (% developing world)
1915	25
2000	85

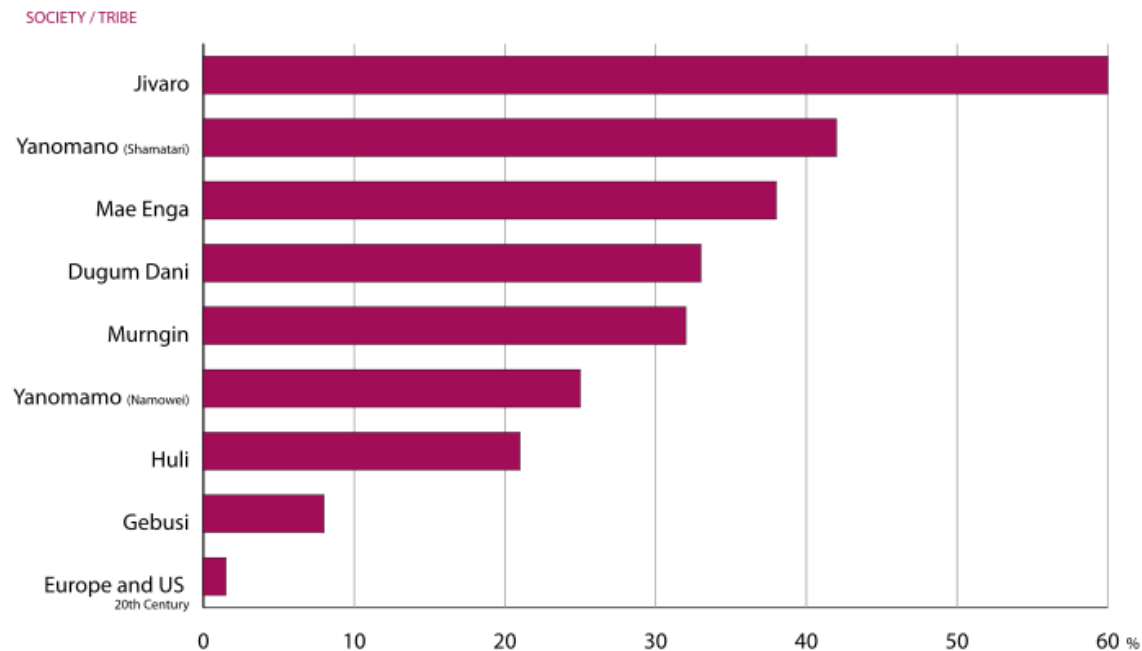
- Better, yes.
- Good enough?

[UNESCO (1990):8]

# Less people meet gruesome ends

## Percentage of male deaths caused by warfare

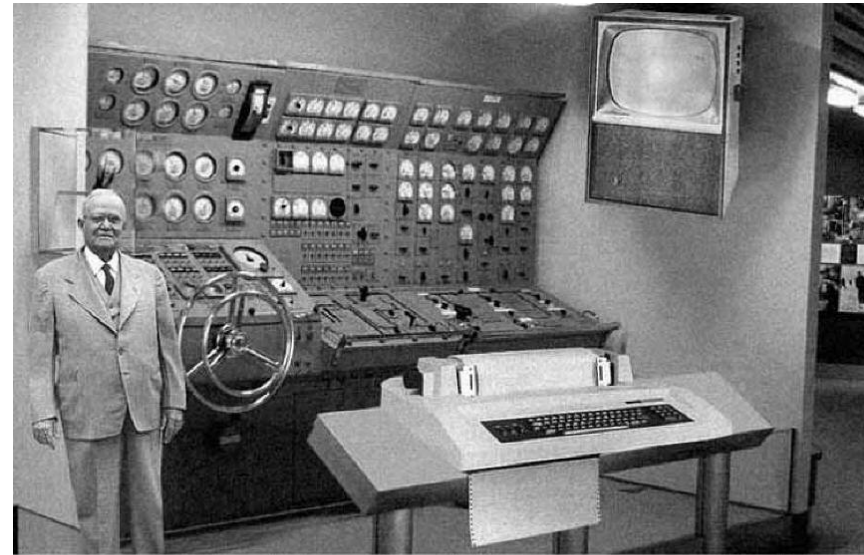
Sources: Keeley, Lawrence (1996). *War Before Civilization: the Myth of the Peaceful Savage*. New York: Oxford University Press. as referenced in Pinker, Steven (2002). *The Blank Slate*. New York: Penguin.



[Lawrence (1996) in “War before civilisation, the myth of the peaceful savage”, Oxford University Press]

# Discount rate

- \* Important economics term
- \* Describes the fact that because humans are continually:
  - \* Becoming richer
  - \* Getting smarter
  - \* Having access to better technology
- \* Problems are easier to solve in the future
- \* The higher the discount rate the more things get better per unit time



*Scientists from the RAND Corporation have created this model to illustrate how a "home computer" could look like in the year 2004. However the needed technology will not be economically feasible for the average home. Also the scientists readily admit that the computer will require not yet invented technology to actually work, but 50 years from now scientific progress is expected to solve these problems. With teletype interface and the Fortran language, the computer will be easy to use.*

A special Time, A Special Place

South Africa offers a unique  
perspective

# Science meets society in the **Copenhagen Consensus (2004)**

	<b>Challenge</b>	<b>Opportunity</b>
Very good opportunities	1. Diseases	Control HIV/AIDS
	2. Malnutrition	Provide Micronutrients
	3. Subsidies and Trade	Trade liberalization
	4. Diseases	Control of Malaria
Good opportunities	5. malnutrition	Develop new agric. technologies
	6. Sanitation and water	Small scale water tech. for livelihoods
	7. Sanitation and water	Community managed water and sanitation
	8. Sanitation and water	Research on water and food production
	9. Government	Lowering cost of starting a new business
Fair opportunities	10. Migration	Lowering the barriers for skilled worker migration
	11. Malnutrition	Improving infant and child nutrition
	12. Malnutrition	Reducing the prevalence of low birth weight
	13. Diseases	Scaled up basic health services
Bad opportunities	14. Migration	Guest worker programs for the unskilled
	15. Climate	Optional carbon tax \$25-\$300
	16. Climate	Kyoto Protocol
	17. Climate	Value-at-risk carbon tax



Poor people have fewer resources with which to cope with natural variability and change



Summer fires

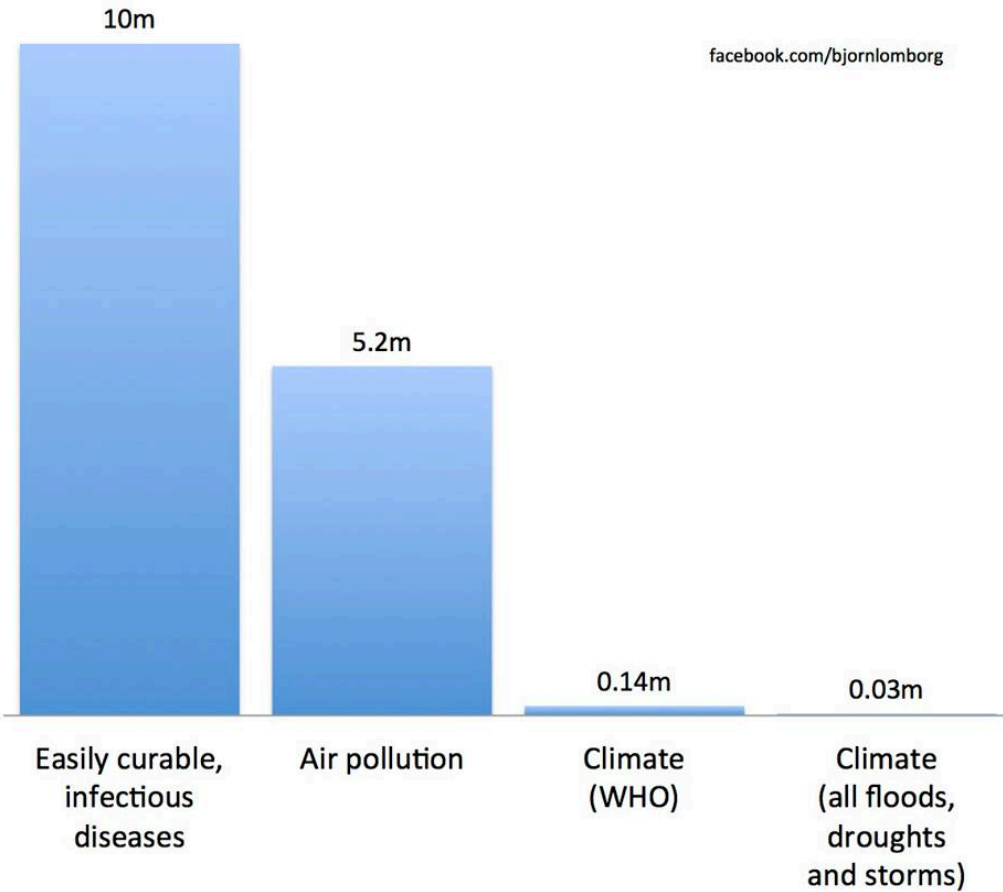


Winter pneumonia



Summer diarrhoea

## Priorities: annual global deaths





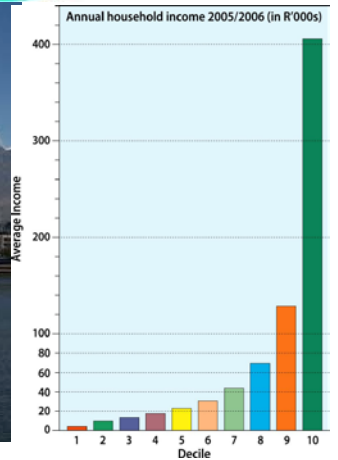
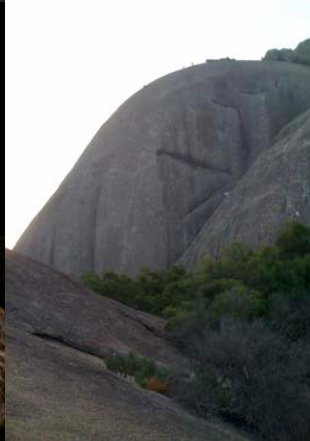
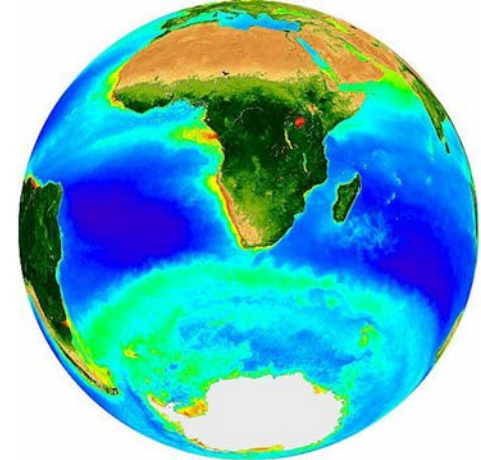
CHEAP +  
PROVEN  
RECORD

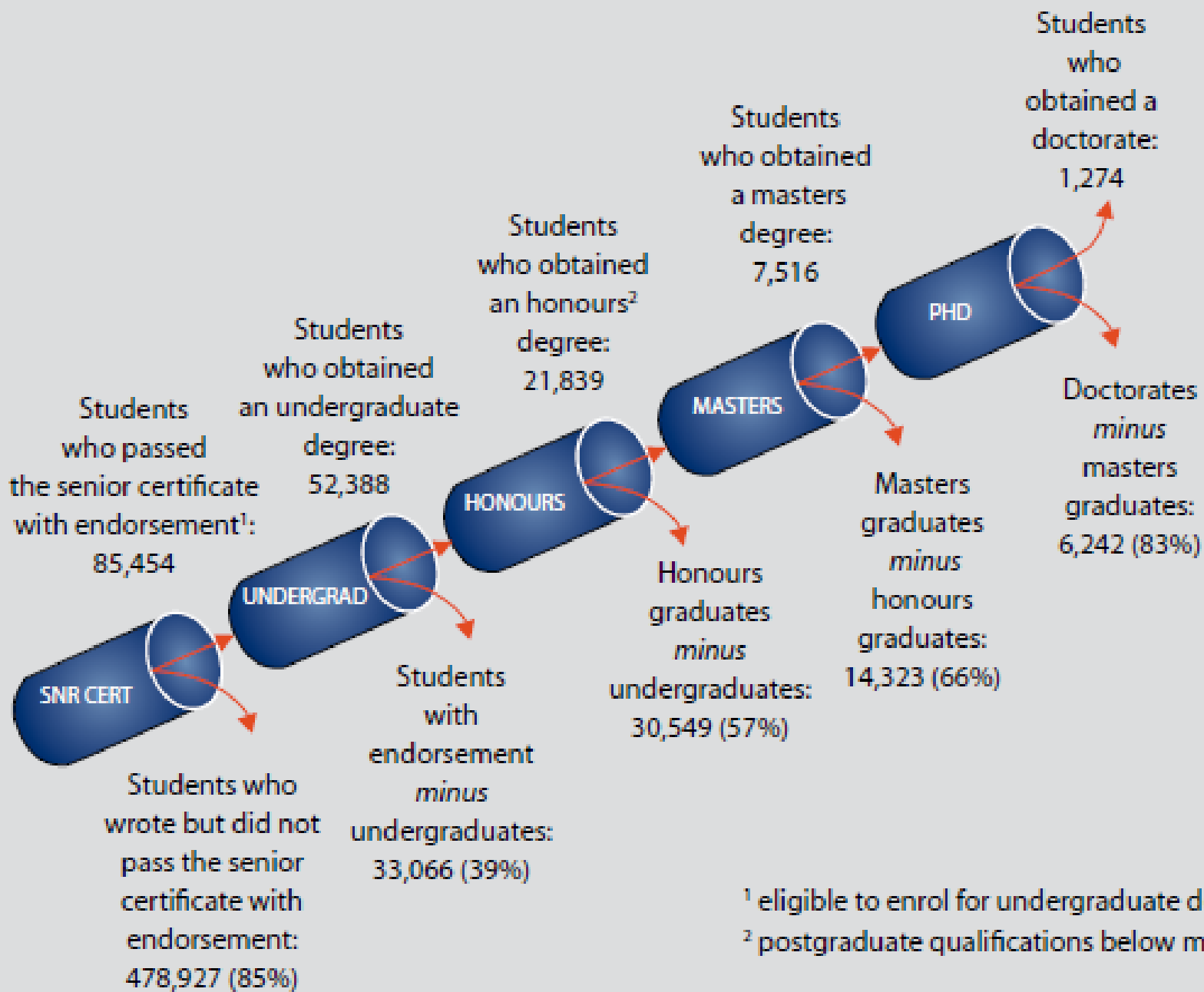


EXPENSIVE  
+ UNTESTED



# The Extended Rainbow Nation





<sup>1</sup> eligible to enrol for undergraduate degree

<sup>2</sup> postgraduate qualifications below masters level

# Discount rate revised

Prioritizing 1-4 helps South Africans today a lot



*Photo: The average south African today is poor and hungry*

Prioritizing 15-17 helps South Africans of the future a little



*Photo: The average south African in 50-100 years is rich and comfortable*

Very good opportunities

1. Diseases
2. Malnutrition
3. Subsidies and Trade
4. Diseases

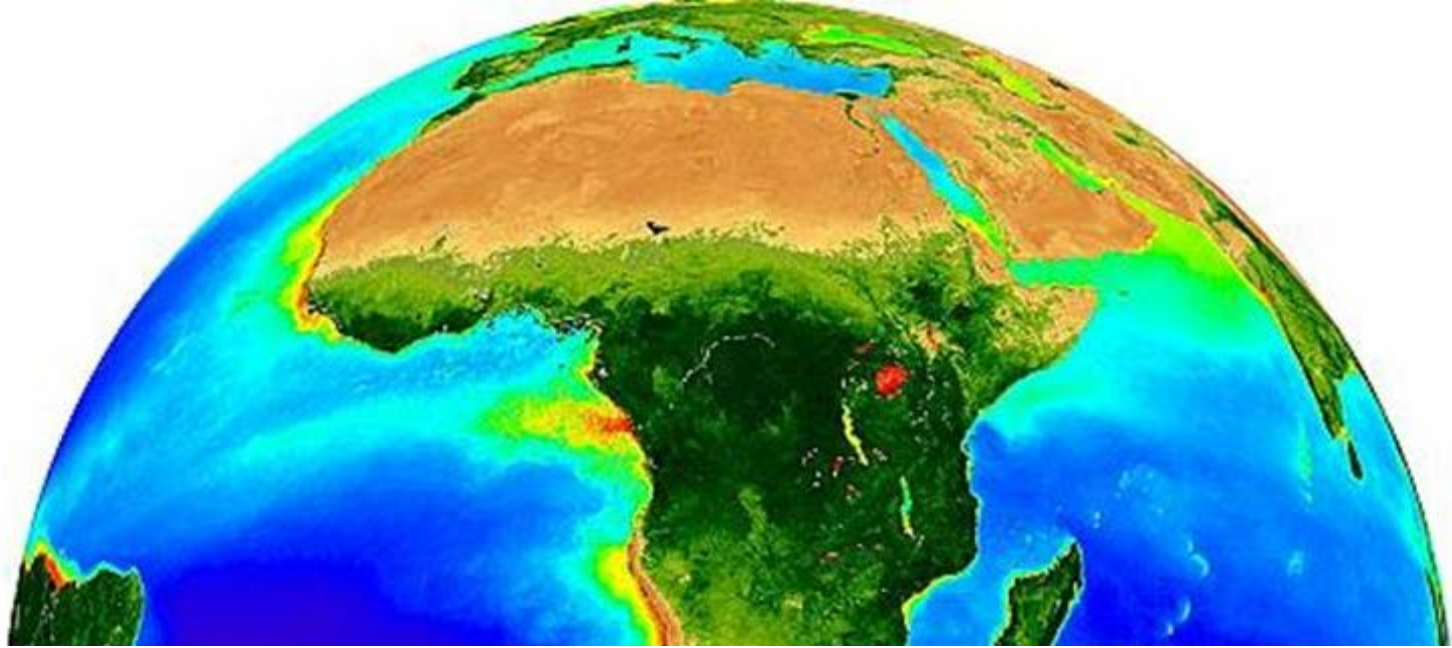
Bad opportunities

15. Climate
16. Climate
17. Climate

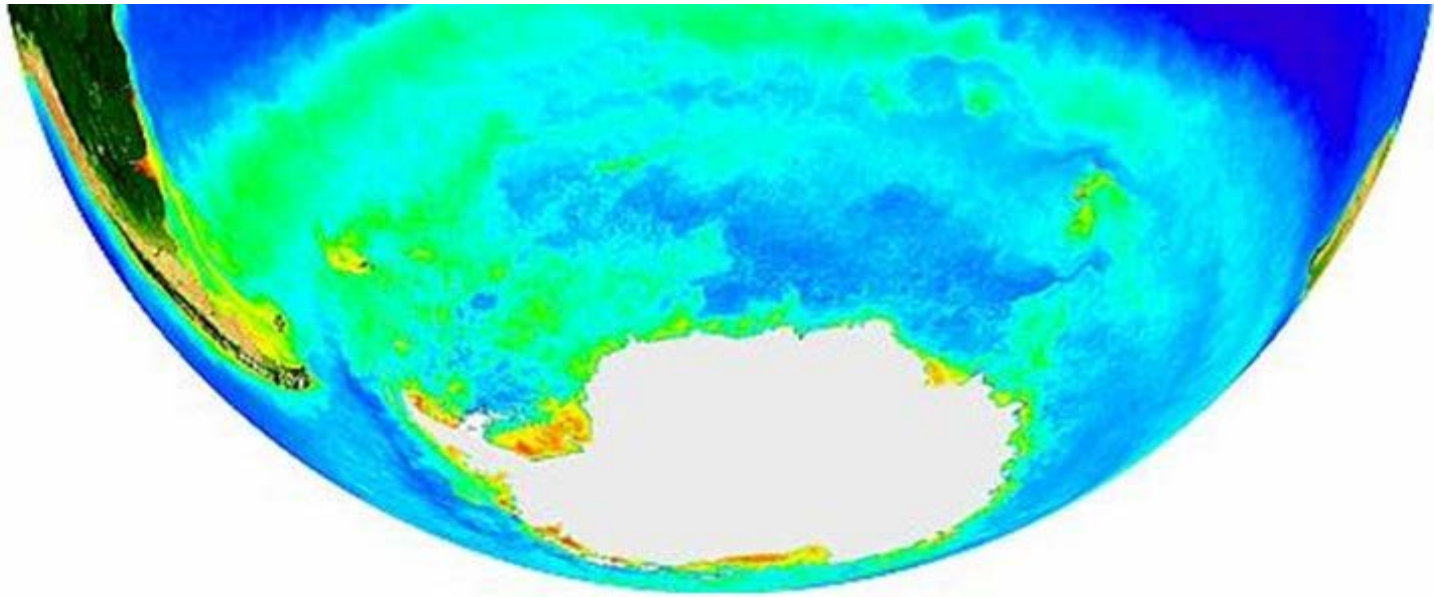
Knowledge tools towards the knowledge economy

# The Habitable Planet Approach





AN AFRICAN PERSPECTIVE  
ON GLOBAL EARTH SYSTEM ISSUES





# HPW Guiding Principles

- The Rainbow Nation does not just extend to people.
- Pride in South Africa, not fear for the future.
  - Need to identify symbols
- Democratise Science
  - Elitist and exclusive → Open and inclusive
- Inspire young disadvantaged South Africans



Date	Phases	Innovations
2007	UCT Phase (NRF Sarchi)	<ul style="list-style-type: none"> <li>• Proof of concept</li> <li>• Brief Course Outline</li> <li>• Field trips – Situated Learning.</li> <li>• Partnership with Ikamva Youth for field trips</li> </ul>
2008		
2009		
2010	RU Phase (NRF Sarchi)	<ul style="list-style-type: none"> <li>• Core Lectures and course structure.</li> <li>• Peer Learning / Critical Pedagogy.</li> </ul>
2011	Road Show Phase (DST) 1	<ul style="list-style-type: none"> <li>• Careers Evening.</li> <li>• Improved outline to incorporate political and social issues.</li> <li>• Teach the Teacher Weekend.</li> <li>• In depth curriculum and greater control over core talks.</li> <li>• Schools Programme.</li> <li>• Special Time, Special Place Talks</li> <li>• Community of Practice created</li> <li>• Red Zebra</li> <li>• Self Organised Learning</li> </ul>
2012	Road Show Phase (DST) 2	
2013	RSP (DST)	Future?

## Our Universe



## Our Solar System

### Core Lectures:

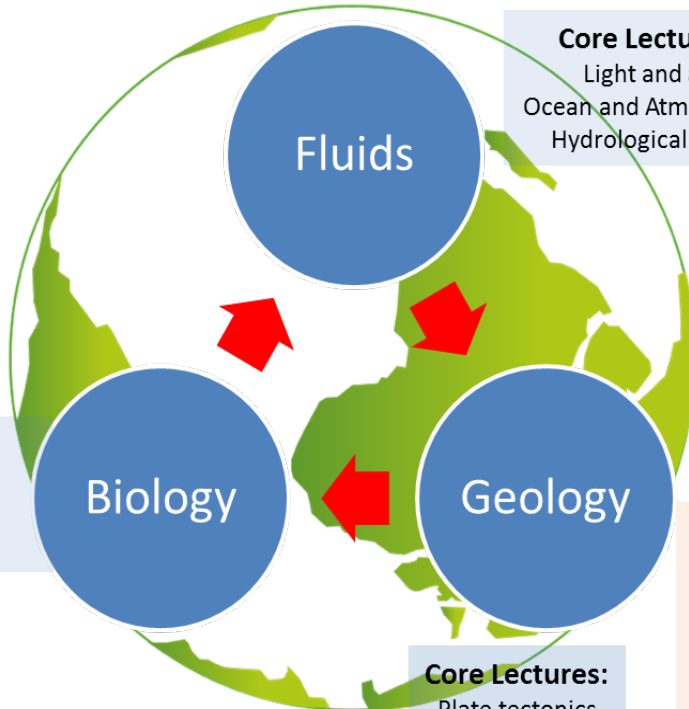
In the beginning  
Not too hot...  
Intro to modelling



## Our Habitable Planet

### Core Lectures:

Light and air  
Ocean and Atmosphere  
Hydrological Cycle



### Core Lectures:

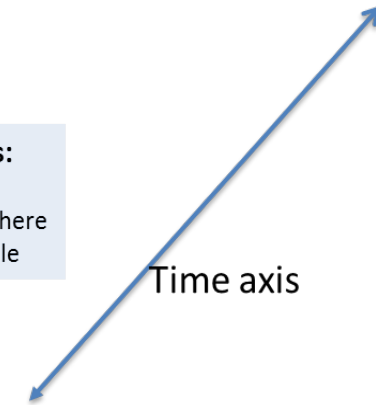
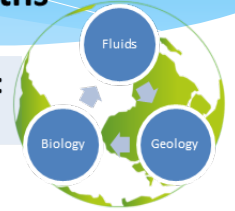
Photosynthesis, Biodiversity,  
Biogeochemical cycles and  
feedbacks

### Core Lectures:

Plate tectonics

## Paleo - Earths

### Core Lectures: Paleoclimate



Time axis



## Our People

### Core Lectures:

Evolution of Humans  
Climate Change  
Human Population  
Sustainable Development  
The Economist, The Statistician and The African

# The Habitable Planet in sound-bites

The [Habitable Planet Workshop] was really amazing..... a great opportunity for me and **the best 10 days of my life**

- *Yonwaba Atyosi (University of Fort Hare)*

*I am now planning to **study up to a PHD** level in order to become environmental scientist  
Tshifhiwa Ramathavha (University of Venda)*

Its mind-blowing ...we learned a lot, you get inspired and motivated, at the same time, you get to meet different people with different expertise...we learned to interact, overcome our fears...we get to be involved, you get to say your mind...overall HPW is the **best workshop ever!!**

*Paseka Seleke (Univeristy of the Free State)*

The workshop is **one place every young scientist needs to go to.....** The workshop gives one a view on what the world of science is about; [in contrast to] the cramming and memorization that happens in schools

- *Bomikazi Tshingana (Walter Sisulu Univeristy)*



**Cape Town 2011**



**Pretoria/  
Limpopo 2011**



**Eastern Cape 2011**



**Western Cape  
2011**



**Namibia 2012**



**Eastern Cape  
2012**



**Free State 2012**

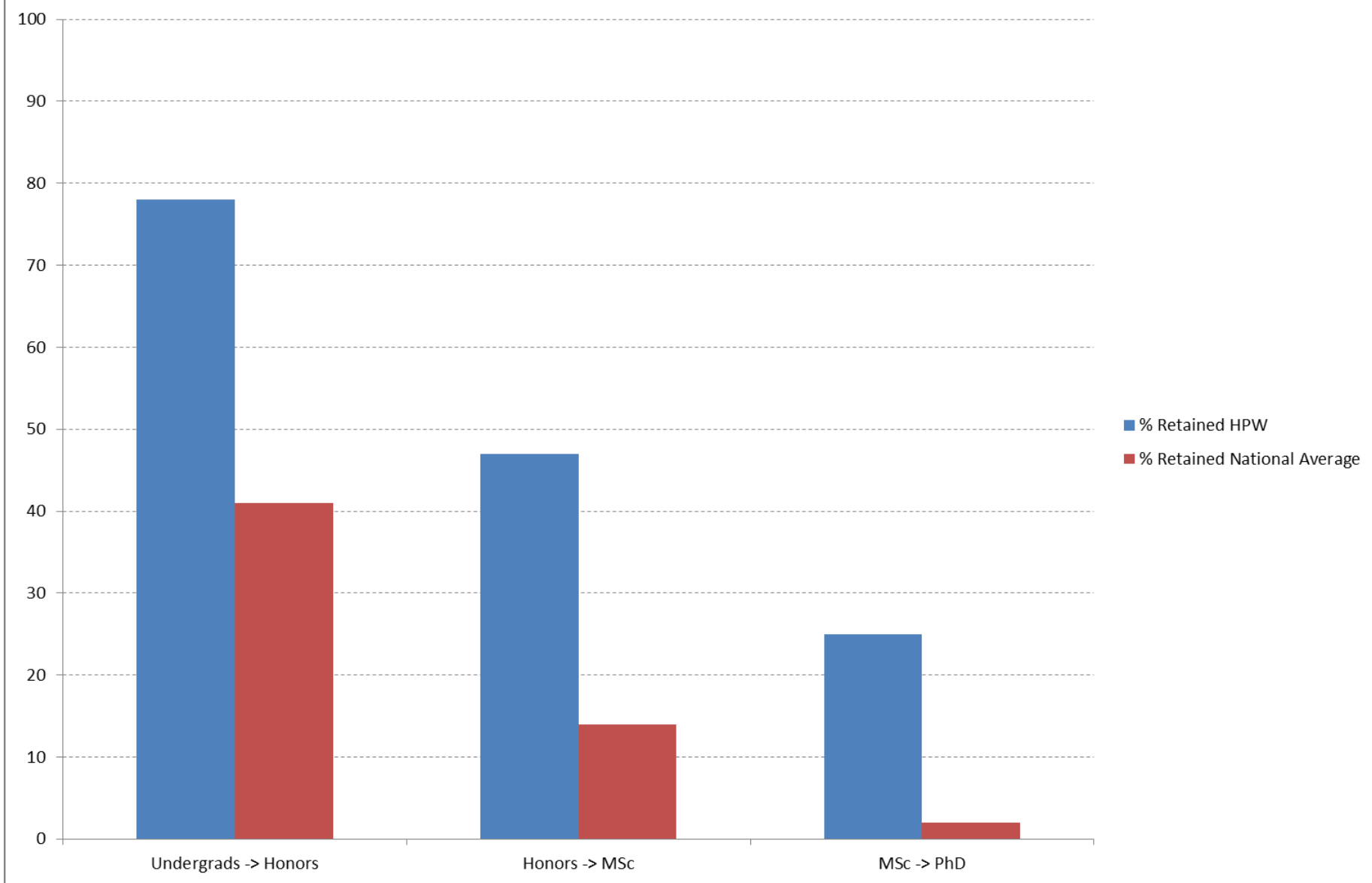


**UWC 2012**



**Wits 2013**







# Two completed schools programmes



**With UP**

In Rural Limpopo



**With Uni. Of Venda**

In Rural Limpopo

...and already have proposals from Uni. Of Zululand, UFS and WSU to repeat

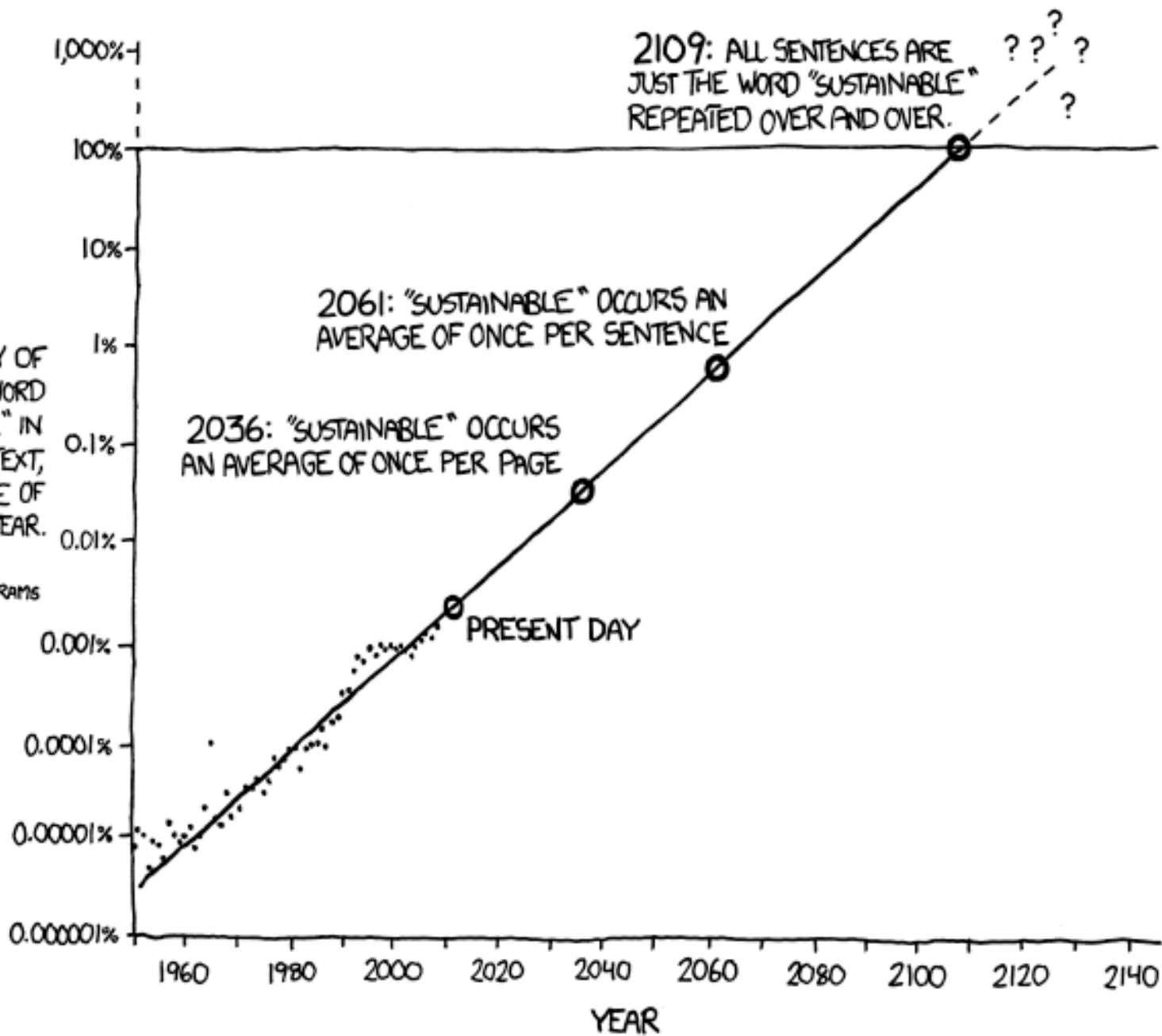
# Summary

- \* The emergence of systems thinking requires a paradigm shift in the way think about an issue such as climate change
- \* Subjective disciplines must be brought in alongside quantitative ones and outcomes must be evaluated knowing the limitations of both
- \* The local context of Southern Africa may thus lead to a different perspective on climate change c.f. Europe/US
- \* One useful perspective looks at climate change not as a threat but as an opportunity to engage the youth with science
- \* Applying this in practice has the potential to (and proven record of) inspire students to study science

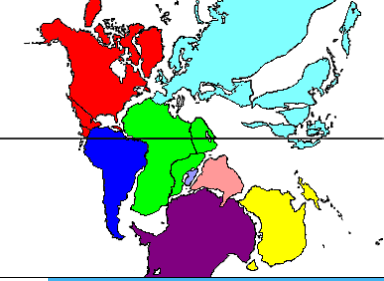


FREQUENCY OF  
USE OF THE WORD  
"SUSTAINABLE" IN  
US ENGLISH TEXT,  
AS A PERCENTAGE OF  
ALL WORDS, BY YEAR.

SOURCE: GOOGLE NGRAMS

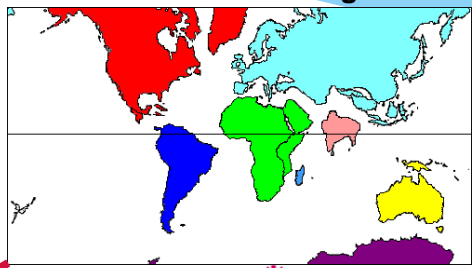
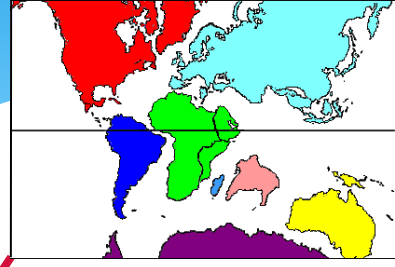


THE WORD "SUSTAINABLE" IS UNSUSTAINABLE.



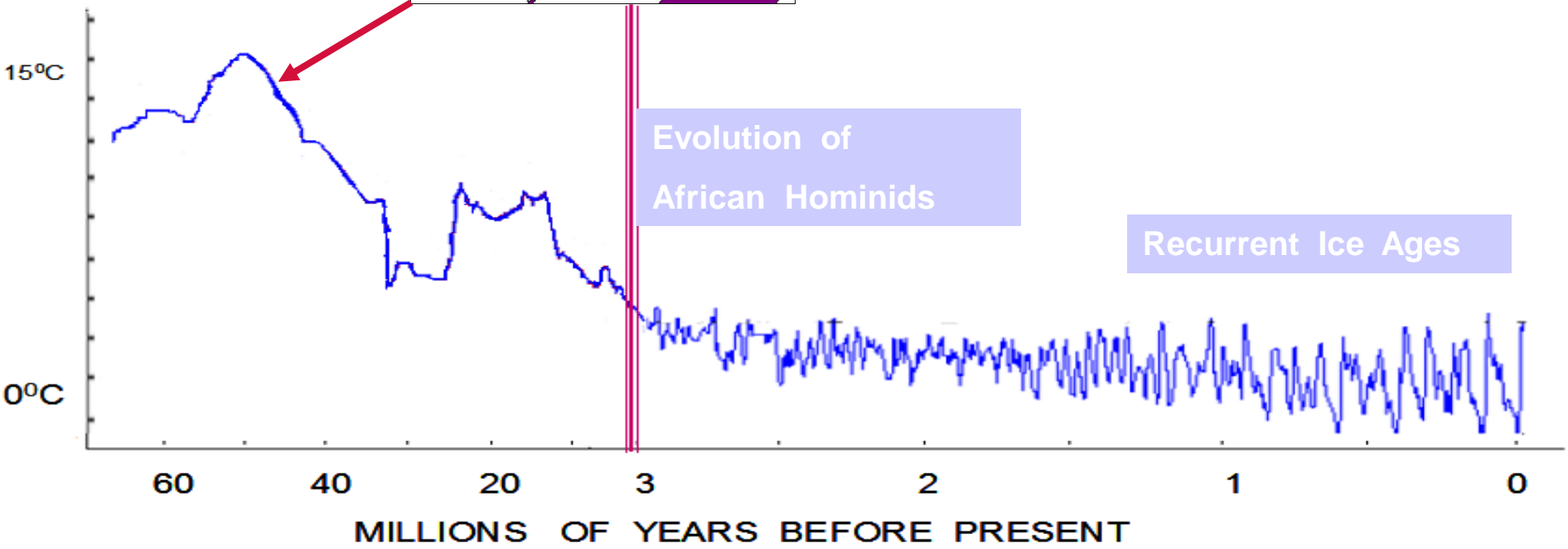
250 Million  
Years Ago

100 Million Years Ago



50 Million Years Ago

Global Cooling since the  
Demise of the  
Dinosaurs 60 Million Years Ago  
Led to Recurrent Ice Ages



Evolution of  
African Hominids

Recurrent Ice Ages

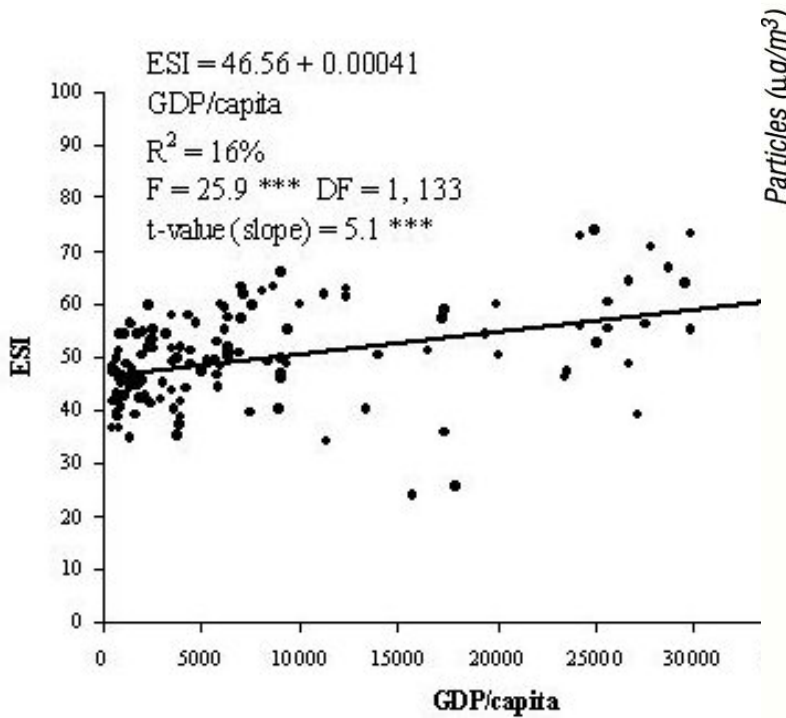
MILLIONS OF YEARS BEFORE PRESENT

Discount Rate

Education

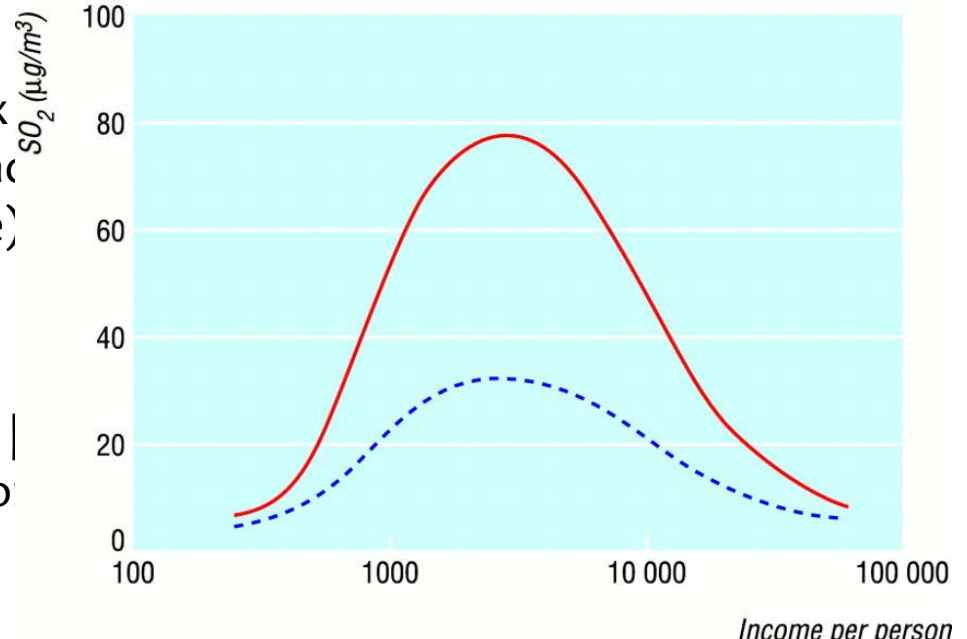
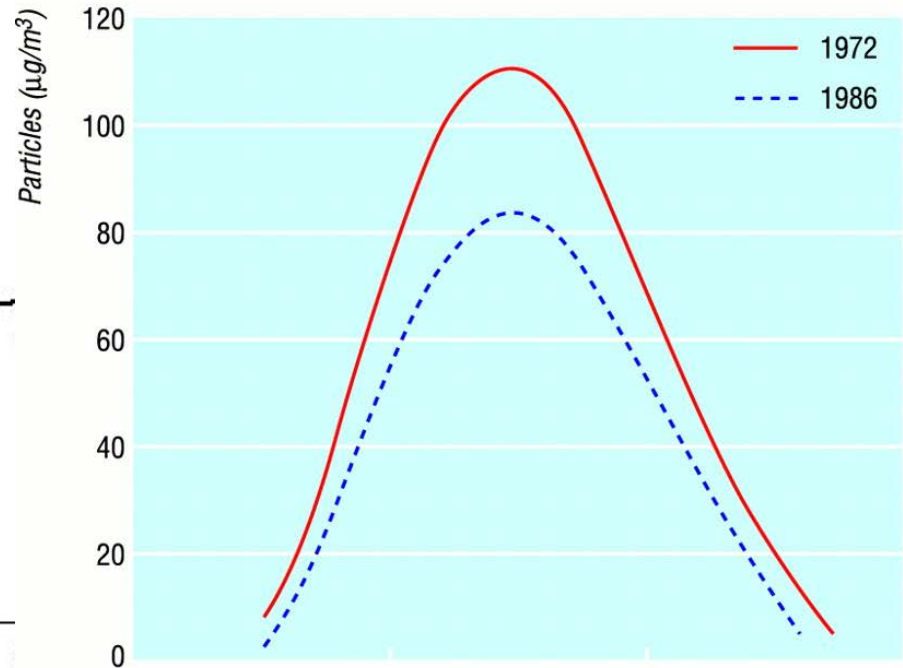
Economy

Poverty



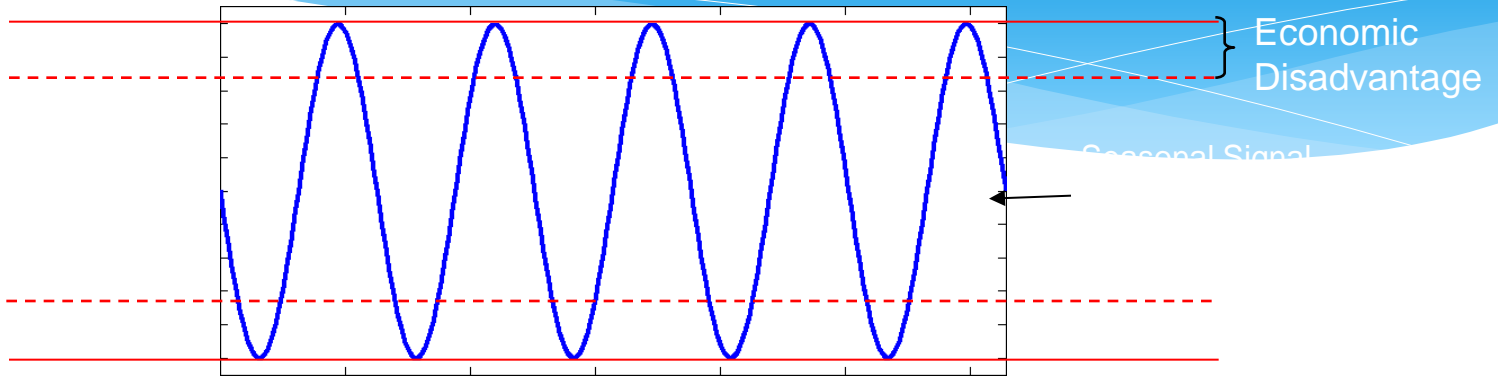
Environmental Sustainability Index function of GDP per capita 2000 (at ESI: scale from 0 (least sustainable) to 100 (most sustainable)).

Ecology and Society 11(1): 22. | <http://www.ecologyandsociety.org>



Income per person

# We are currently mal-adapted to variability and change (particularly among the poor)

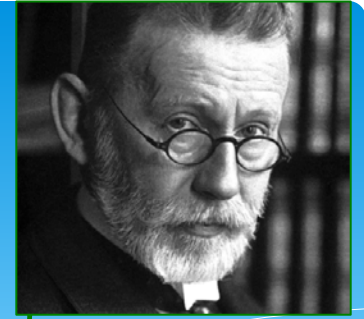


blems

Seasonal Signal



# The Great Resource Bet



VS

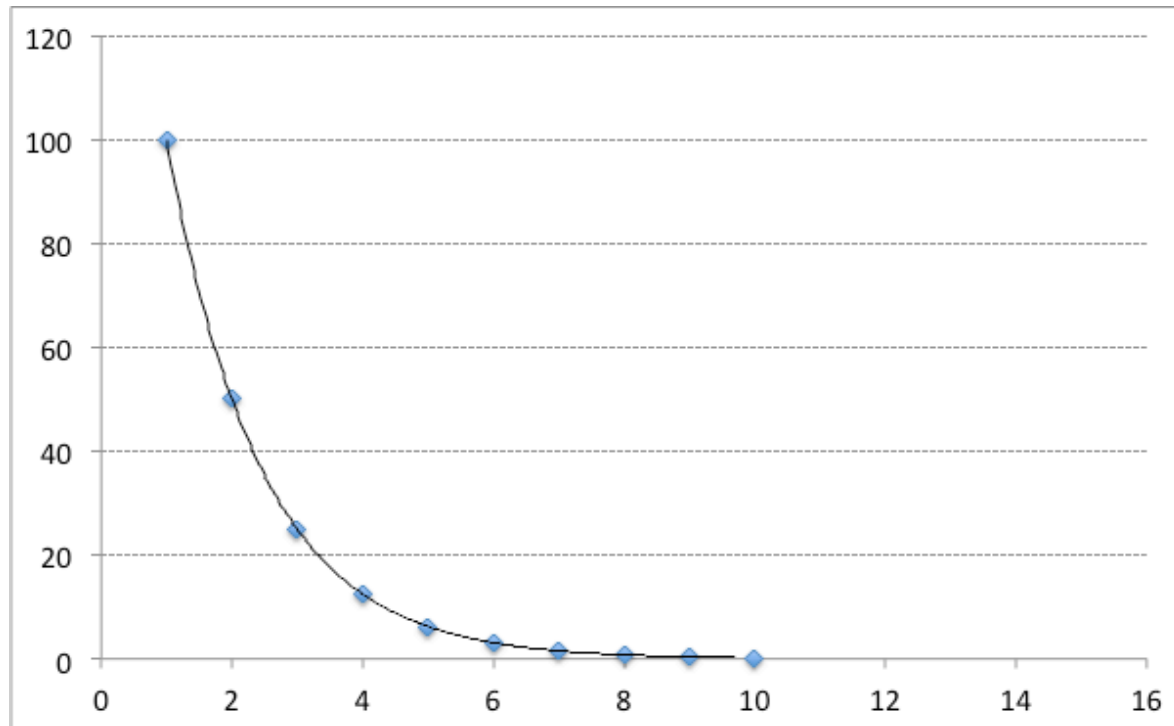
Paul Erlich

## Julian Simon

- \* Economist
- \* Cornucopian
- \* More people = more resources and more prosperity.
- \* “You pick any resources you like and I bet you they will be cheaper in ten years (1980-1990) time!”

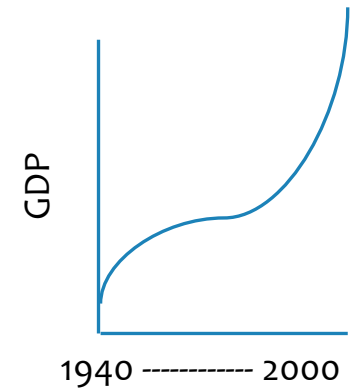
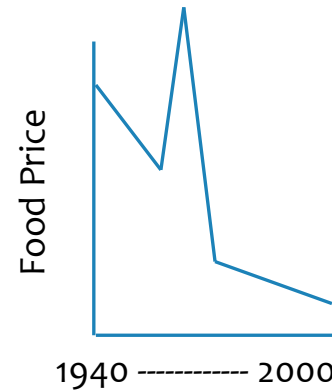
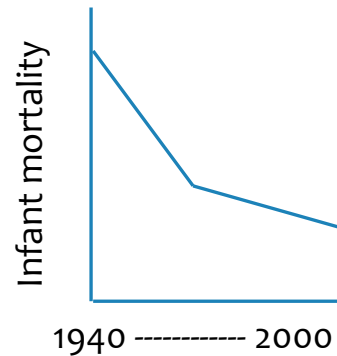
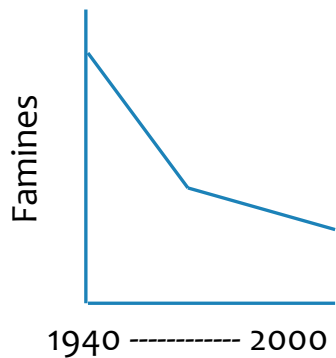
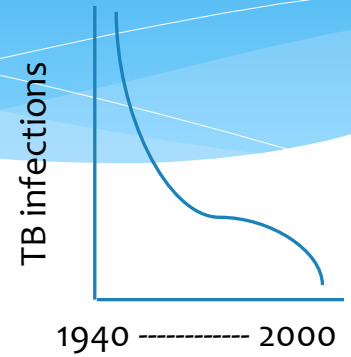
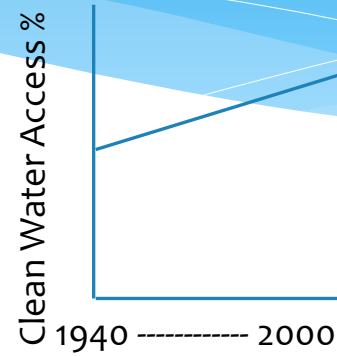
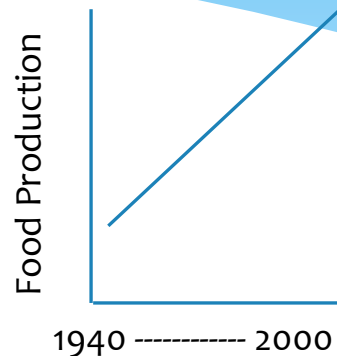
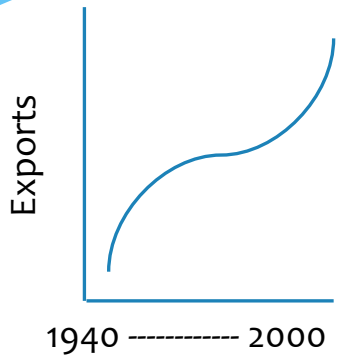
- Scientist, Nobel Laureate
- Discovered the cure for syphilis and coined the term chemotherapy.
- More people = overpopulation = over exploitation leading to high prices, war and famine
- “Your offer is so astonishing I had better take your money before other greedy people jump in”

# When does this curve hit 0?





# 1. The Material Condition for People Keep improving



500 year  
low!