

# Scientific responsibility

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The views expressed in this presentation are those of the author alone.

# Fraudulent science

We all have a responsibility not to commit generate artificial data - and this is not really the point of this talk.

Scientific responsibility goes beyond this because rarely is scientific data absolute; scientific responsibility lies in the manner in which data is used and presented

Scientific responsibility **One**; to  
research and investigate

# Scientific responsibility for further investigation

Scientific certainty



Scientific responsibility is about how we act in the grey area and use science to map the path towards the edges.

More research  
required

# Further investigation

The well used 'more research required' term is always going to be true because the vast majority of science is in equilibrium with other science. As more is discovered in one area, or technology is further developed, then it is required that previous studies and conclusions be re-investigated.

Further research develops new knowledge



Risk to a population is slight

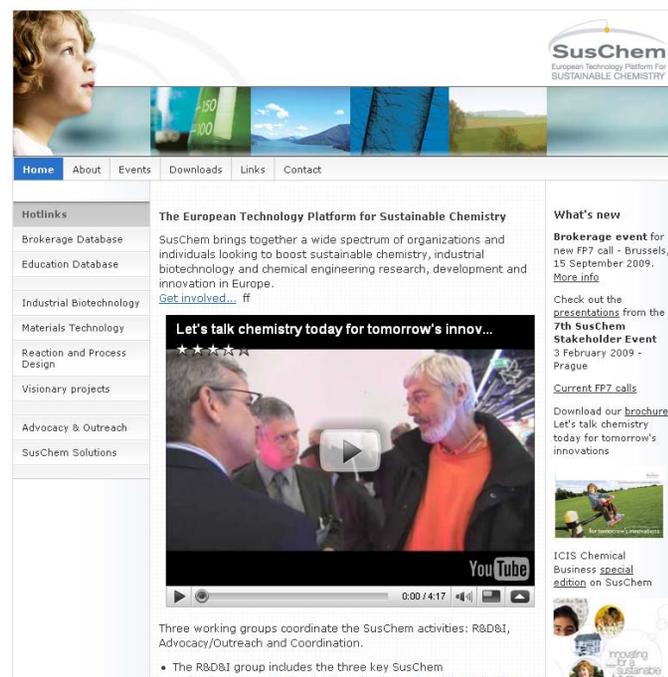
Risk to individuals with a certain genotype is high



Further research – what is the frequency of the risk susceptible genotype.

# CEFIC/LRI; SusCHEM; IMI and other research programs

The need to both develop new knowledge and understand the applicability of new basic knowledge renders programs such as the Long Range Initiative important; and why it is corporately expedient to invest in such programs to the greatest extent that economic conditions allow.

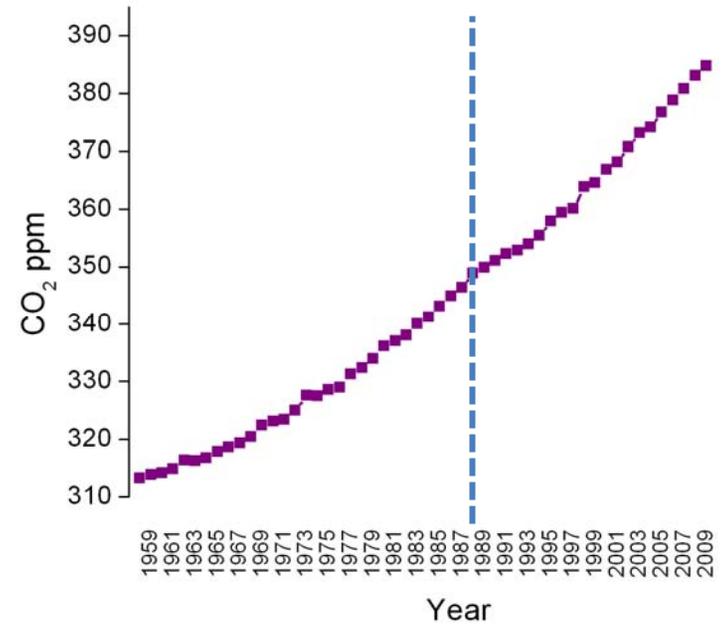
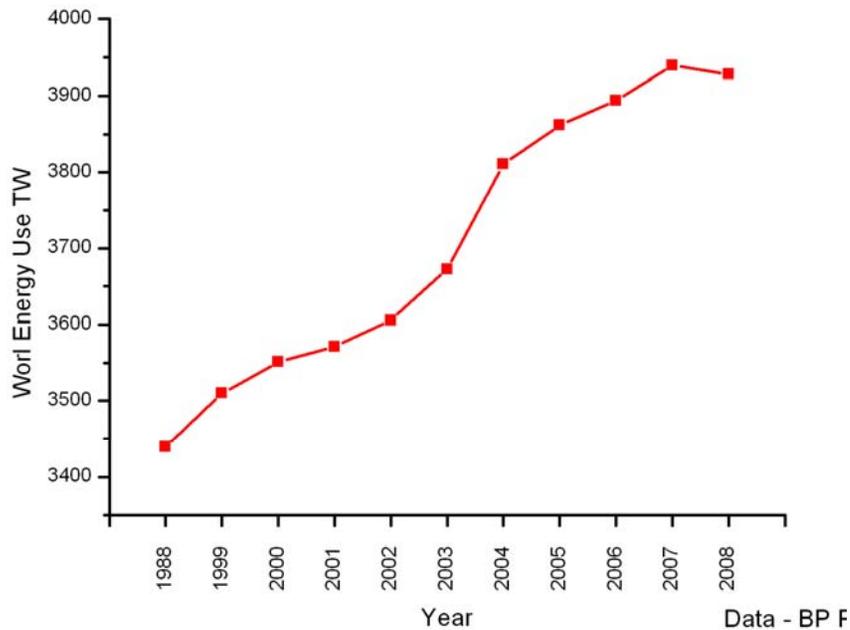


The screenshot shows the homepage of the SusChem website. At the top right is the SusChem logo with the tagline "European Technology Platform For SUSTAINABLE CHEMISTRY". Below the logo is a navigation menu with links for Home, About, Events, Downloads, Links, and Contact. The main content area is divided into several sections:

- Hotlinks:** A vertical list of links including Brokerage Database, Education Database, Industrial Biotechnology, Materials Technology, Reaction and Process Design, Visionary projects, Advocacy & Outreach, and SusChem Solutions.
- The European Technology Platform for Sustainable Chemistry:** A text block stating that SusChem brings together a wide spectrum of organizations and individuals looking to boost sustainable chemistry, industrial biotechnology and chemical engineering research, development and innovation in Europe. It includes a link "Get involved... ff".
- What's new:** A section with three items:
  - Brokerage event for new FP7 call - Brussels, 15 September 2009:** Includes a "More info" link.
  - Check out the presentations from the 7th SusChem Stakeholder Event 3 February 2009 - Prague:** Includes a "Current FP7 calls" link.
  - Download our brochure:** "Let's talk chemistry today for tomorrow's innovations".
- ICIS Chemical Business special edition on SusChem:** A small image of a brochure cover.
- Video:** A YouTube video player with the title "Let's talk chemistry today for tomorrow's innov...". The video shows three men in a meeting. Below the video is a caption: "Three working groups coordinate the SusChem activities: R&D&I, Advocacy/Outreach and Coordination." and a bullet point: "The R&D&I group includes the three key SusChem Technology areas: Industrial Biotechnology, Materials Technology".

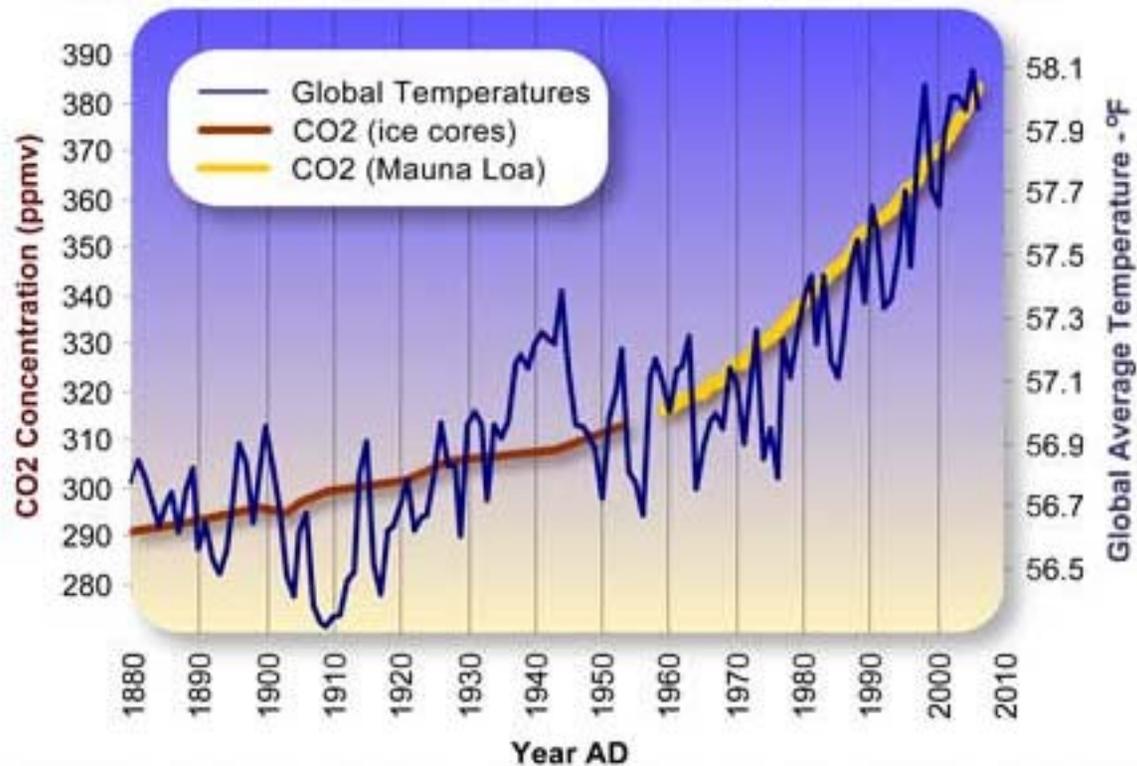
Scientific responsibility **Two**; Do no  
harm

# Energy use and environmental CO<sub>2</sub>?

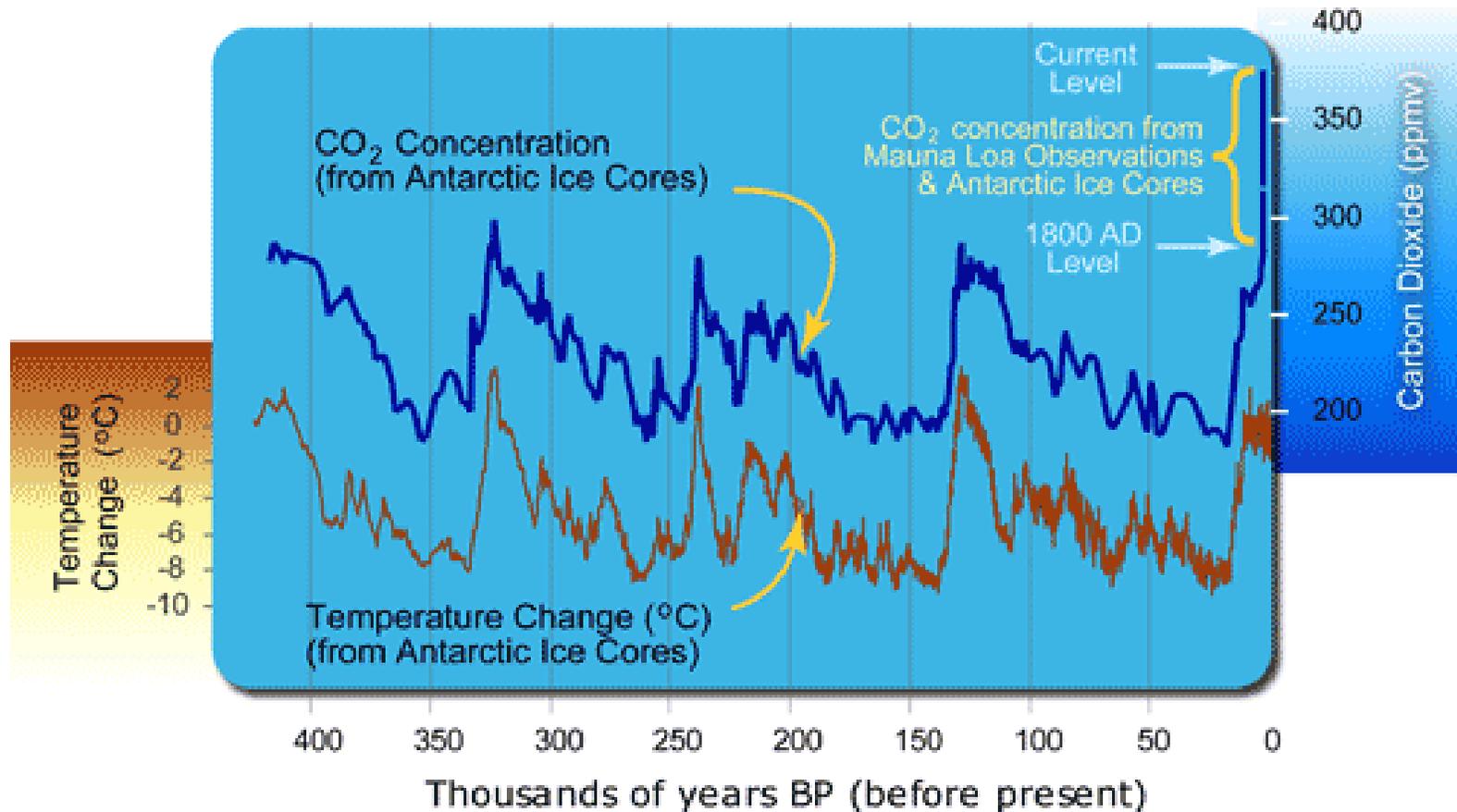


Most of our energy is derived from oxidative processes.

# Recent short term link between CO2 and temperature



# More historical link CO<sub>2</sub> and temperature?



# Scientific responsibility: First do no harm

Continued research has pushed the link between  $\text{CO}_2$  from the grey area much more towards the black. However, even in the absence of a absolute defined link between increased  $\text{CO}_2$  and global temperature the consequence of a rise in temperature brings responsibility 'do no harm' into play.

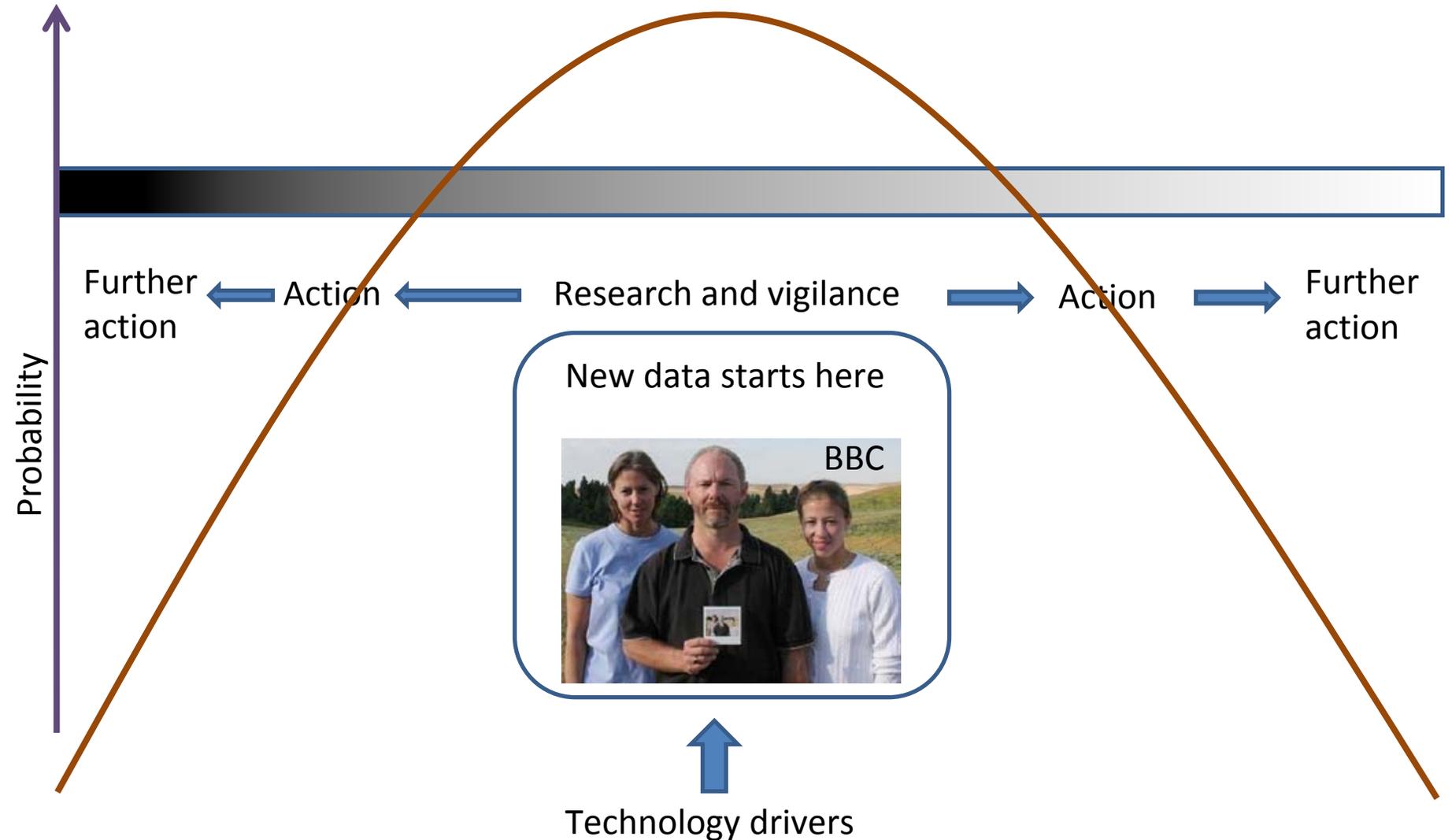


*As an expedition from Chinese state television worked its way across the remote Tibetan plateau earlier this year, the explorers were amazed by what they found.*

*The plateau has been called the world's third largest ice store after the North and South Poles. Yet according to Chinese scientists, the "third pole" is warming up faster than anywhere else on earth.*

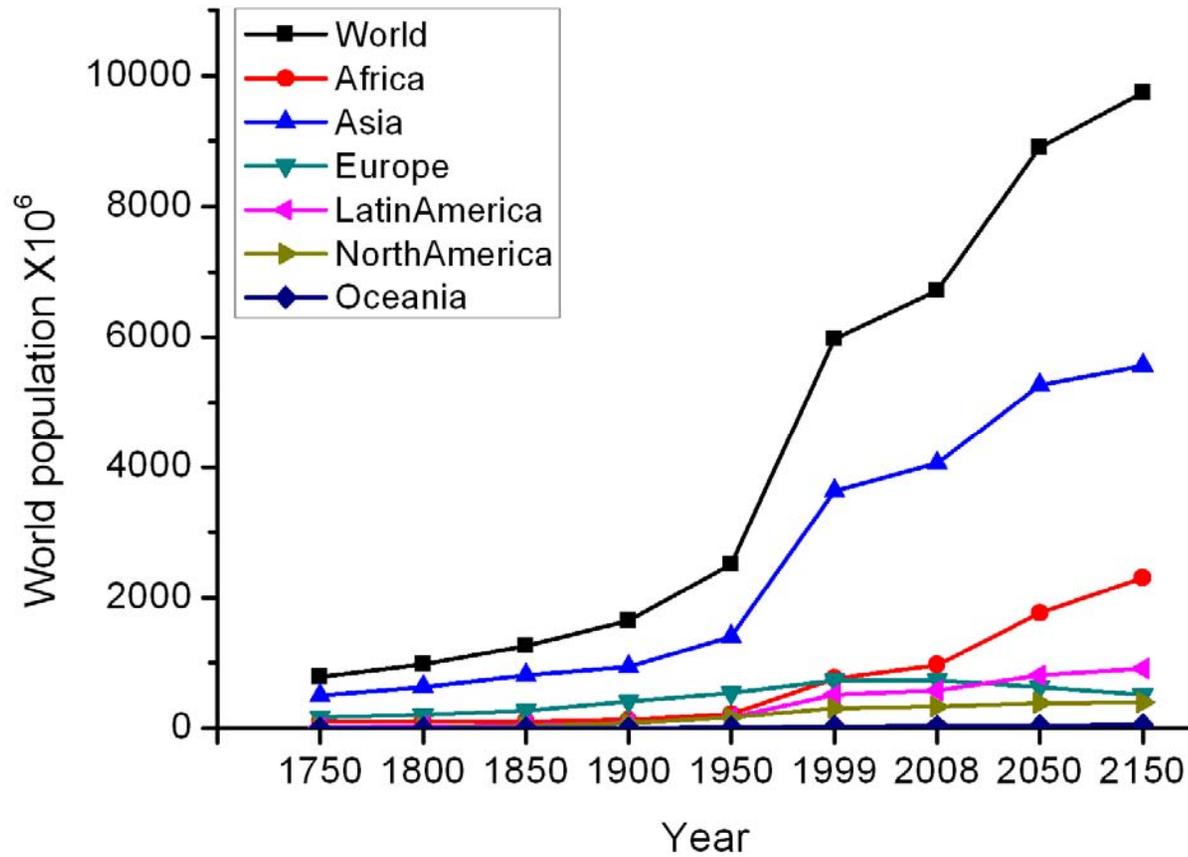
***Sunday Times 8 Nov 2009.***

# Scientific responsibility: research or action



Scientific responsibility **three** ;  
responsible data presentation

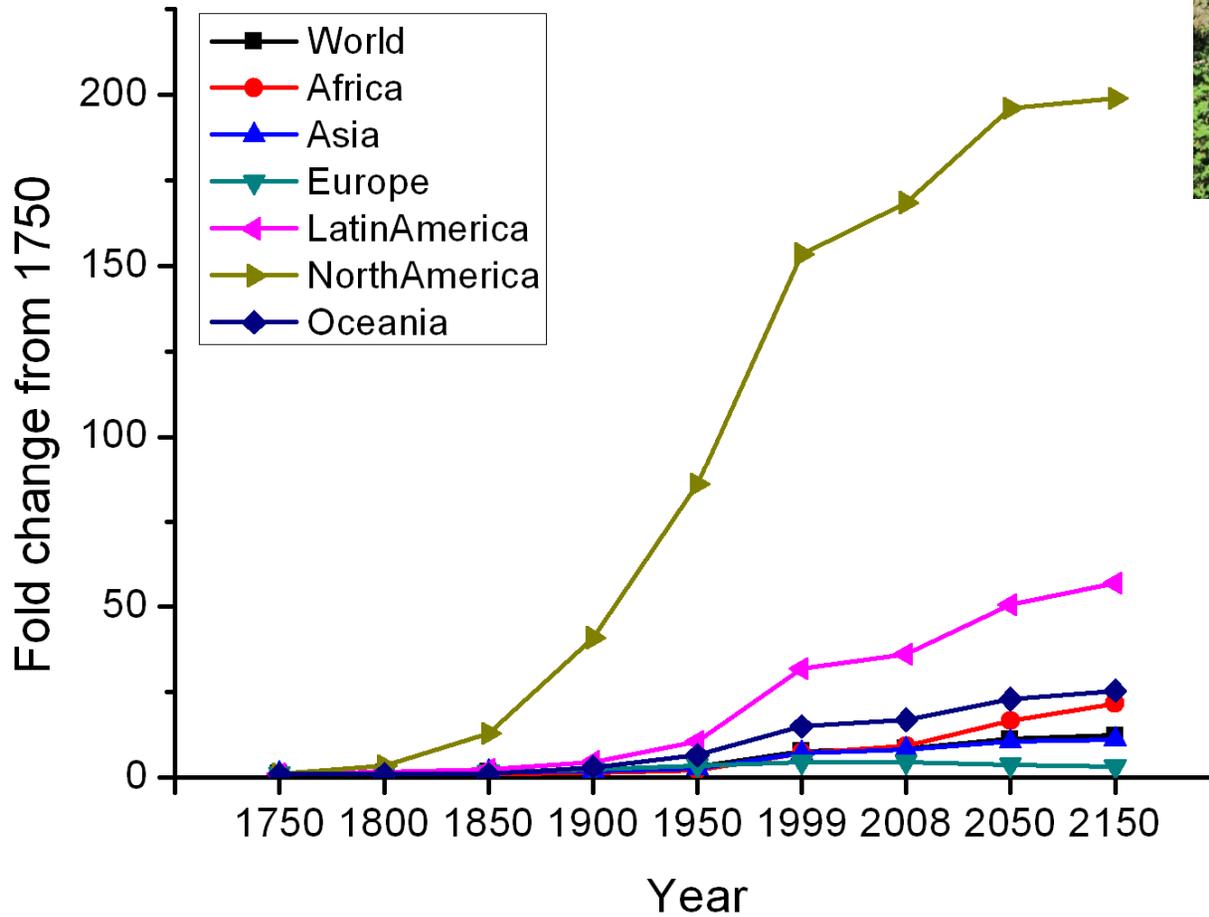
# Absolute world population by region



# **THE DAILY WORLD BLOG**

**TOO MANY PEOPLE IN ASIA—  
AND THE EARTH IS  
OVERCROWDED**

# Fold change in population since 1750

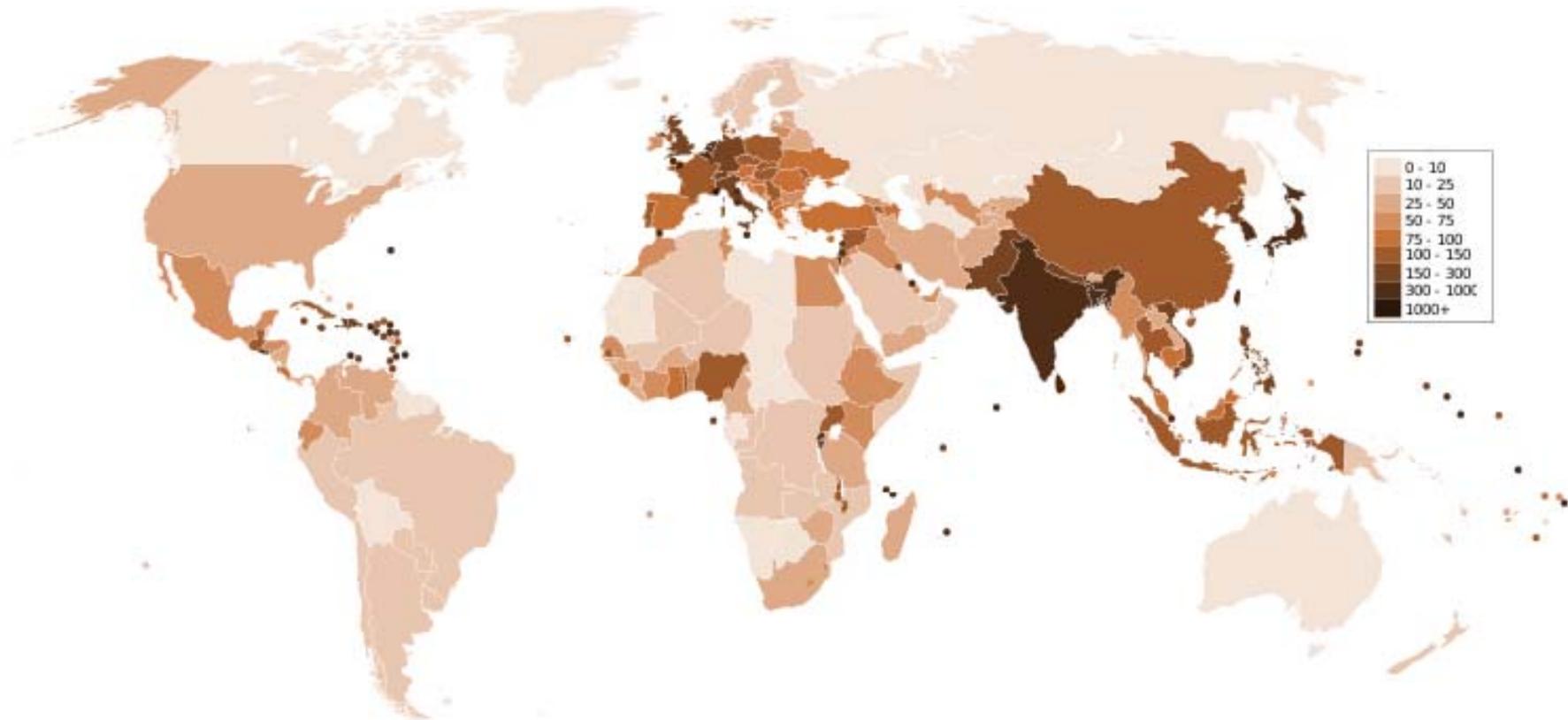


# THE DAILY USA BLOG

## TOO MANY PEOPLE IN THE USA

Incorrect because the graph actually showed rate of change – not numbers.

# Land Area per person



# **THE DAILY BELGIUM BLOG**

**TOO LITTLE SPACE IN  
BELGIUM, INDIA AND  
BERMUDA**

# Responsible presentation

- What probably matters in this example is actually not even land space per person but rather cultivatable space per person (ie not desert.....)
- There is not always an ideal way in which to present data. What matters though is that data is presented in a manner that makes clear the latitude for interpretation, and sufficient data should be presented to allow re-interpretation. In a sound-bite world this can be challenging.

# Accidentally misleading

A 4°C rise in overall climate temperature does not mean 4°C for everyone. In the arctic it could be 16°C but over the oceans much less.

It is simpler to present an average, **but is simplification misleading?** This has to be assessed on a case by case basis - simplification may be used but take care that it is responsible to simplify.

# The opposite; over precision



Desire - Cradle to grave measurement of  $CO_2$  in a product to give an accurate measure of its impact on the environment

BASF podcast - Chemistry of Innovations - Climate protection with Eco-efficiency 28<sup>th</sup> October 2009.

# Simplification of variables to improve understanding



Oil discovery

Oil extraction

Refinement

Raw materials

Oil company

Cradle

Manufacture of bottle and shampoo

Chemical company

Use

Consumer

Disposal

Disposal company



Grave

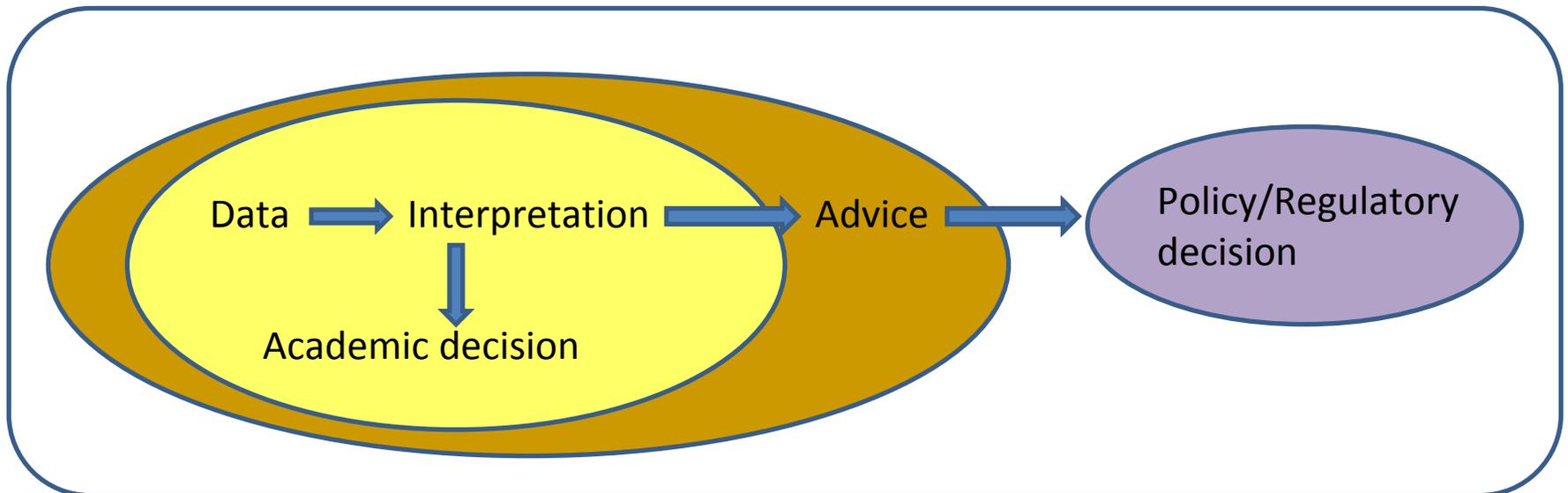


Maybe the consumer represents a variable that cannot be measured. Rather than try to be absolutely accurate in this case **maybe it would be better to include only those variables that can be accurately measured.**

Scientific responsibility **four**; impartial  
advice

# Scientific responsibility to impartial advice

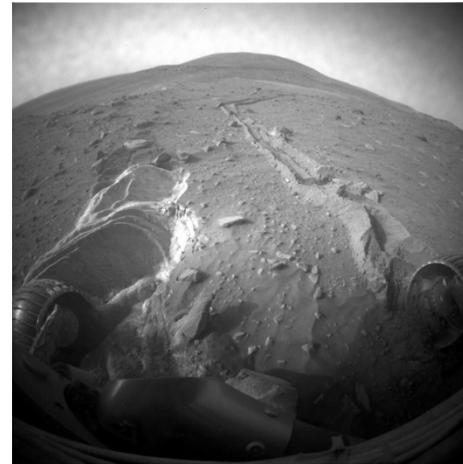
- Scientists have a responsibility to advise when requested. Advice must be impartial and evidence based. Where uncertainty exists this has to be articulated and science must not be ignored for political or economic reasons.
- There must be separation between advice and decision.



Scientific responsibility **five**: Seeking  
advice – sharing the load

# Why have a review team?

A review team drawing the same conclusions builds confidence; and new eyes may see something even an experienced team has missed.



*The attempted drive out of the soft, floury soil that Spirit drove into accidentally in May this year comes after a **seven-member review panel** took a close look at the recovery effort on 28 October. The panel recommended that the rover project team should try to extract Spirit as soon as possible. Time is of the essence — as winter approaches, power from Spirit's solar panels wanes. Nature 5<sup>th</sup> November 2009.*

# How many to review?

How many social scientists does it take to screw in a light bulb?

None, they do not change light bulbs but search for the root cause as to why the last one went out.



Scientific responsibility **six**; to promote  
public engagement and participation  
in science

# Science is hard; not cool

'Math is hard; I don't like science; All scientist are mad/geeks/not cool'

Male, aging, crooked teeth, messy hair, lab coat, spectacles/goggles, dramatic posing — one popular stereotype of mad scientist



Scientific responsibility **seven**; to  
pursue and apply science for the  
greater good

“As a global science head you don’t do any science, you only become a victim of it”.

Prof Lewis Smith (October 2009)

- No one should be a victim of science - science is in service of all.
- Academic scientists have a duty not to generate positive data that is unrealistic for the sake of the next grant application. Likewise commercial science must not ignore positive data for economic or political ends.

# The ultimate scientific responsibility; Service

The greatest responsibility in science is to ensure that science is applied for the greater good. To enhance and enrich life on earth and 'do no harm'. This responsibility requires continued vigilance, investment, research and further understanding. It is the summation of all other responsibilities and ultimately beneficial to all.

One earth; One life; One goal.

