

Science and Media

a working relationship

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What is coming up...

1. Why are scientists so hard to understand?
2. Certainty and uncertainty
3. Making your science journalism credible

Two cultures or one?

People trained in the humanities and sciences often speak past each other

- **Humanities**

- knowledge is socially constructed
- we change, but make no progress

- **Sciences**

- knowledge can be objective
- progress is possible

In fact, *both* are incomprehensible to the ordinary person

and the differences are less absolute than this caricature suggests

For over a century, even the best-educated person cannot know everything

Are scientists normal?

- Not entirely
 - Only 0.1% of the population are scientists
 - Their personality profile is represented in less than 1/20th of the population
 - In general, they are above average intelligence, but not in the genius range
- The geekiness is for real
 - Strongly 'left-brained'
 - Often socially awkward
 - Absentmindedness is not just a cliché

Why are scientists so hard to understand?

- They speak their own language (jargon)
 - Why use a short word when a long one will do?
 - Sometimes the use of a precise but unfamiliar term is necessary
 - educate your audience
 - But the same thing can usually be said in plain language
 - TLA are the bane of modern technical discourse
- They are not trained or rewarded for communicating effectively with non-scientists
 - ‘Scientific style’ is no longer strictly required, even for technical writing
 - but scientists still tend to write in the passive, 3rd person, past tense form
 - Adjectives, adverbs and metaphors are minimal
 - Understatement is the norm
 - Scientists assume way too much basic scientific knowledge in their audience

How can you tell science from nonsense?

- Strict test: Popper's falsifiability
- Gut feel: Ockham's razor
- Clues:
 - Where is the work published?
 - Is it in a peer-reviewed publication?
 - Is the peer-reviewed publication highly cited?
 - Does the work cite other work in reputable journals, or only itself or ephemeral works?
 - Does the research follow 'scientific method'?
 - Does the experimental design allow other possibilities to be excluded?
 - Are the observations replicated and randomised?
 - Are the outcomes statistically valid?

Mavericks and the Mainstream

- All scientific breakthroughs start out as somebody's crazy idea

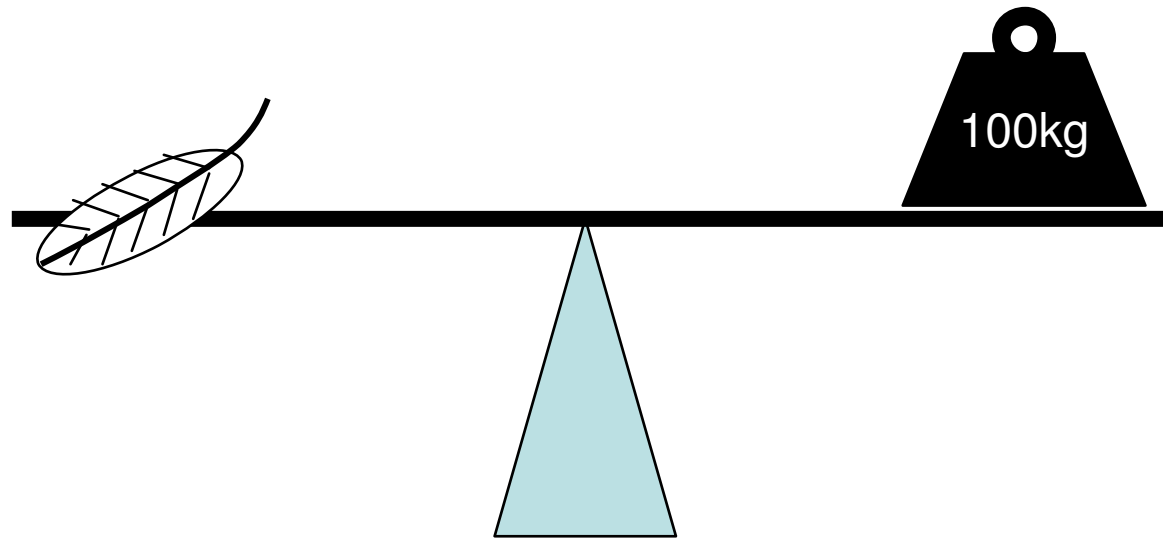
But

...that does not mean that all crazy ideas are breakthroughs!

Most are just crazy ideas.

Media (im)balance

Controversy sells papers!



Two sides of an argument don't necessarily merit the same weight

When is an academic fight not a disagreement?

- Skepticism and argument are treasured scientific virtues
- Even very acrimonious debates are often about the details rather than the broad principle
 - eg Gould vs Dawkins: does evolution proceed smoothly or in jerks?

Kissinger's Law:

The intensity of academic disputes is inversely related to what is at stake

Scholes' Corollary:

The fight is most bitter where the evidence is most weak

Fallibility

Complex or complicated?

- Lots of things are complicated, but nevertheless soluble
- Some phenomena may be much less complicated but nevertheless insoluble
 - the presence of *bifurcations* (forks in the path) makes them unpredictable
 - except probabilistically

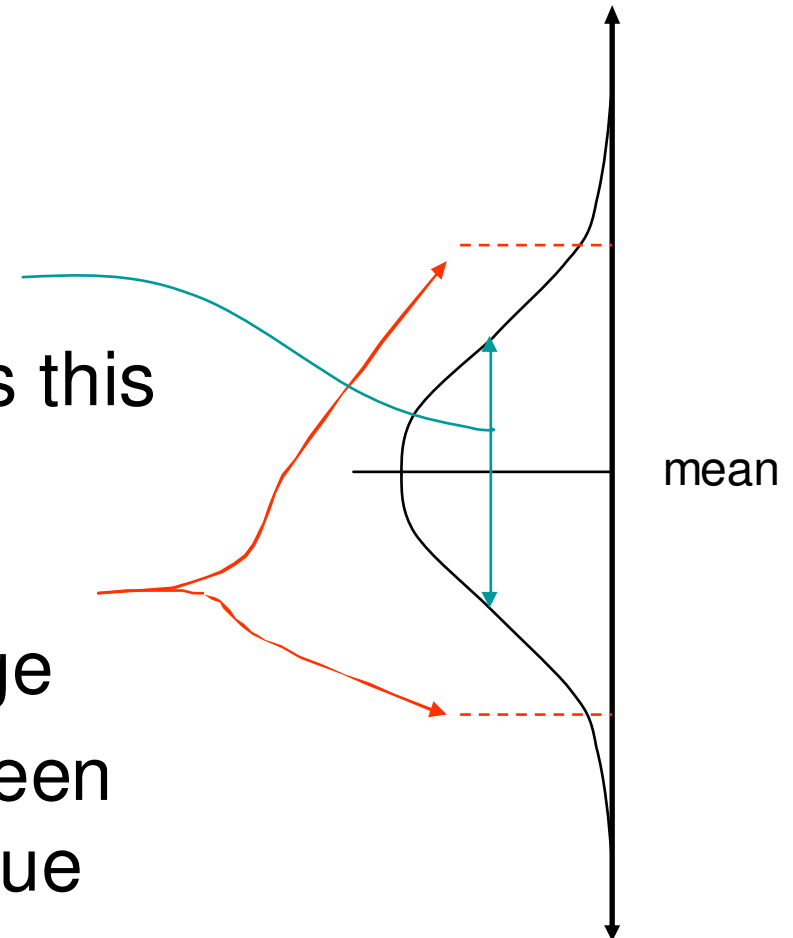
Making policy in the face of uncertainty

- We are seldom completely sure about important decisions. Science usually can't solve that problem, just reduce it.
- Policy should be based on evaluated consensus, not outliers
 - The 'fringe position' may be right, but the more likely case that it is wrong can have dire consequences

Conveying uncertainty

The 'frequentist' approach

- eg $67.4 \pm 5.1 \%$
 - Standard deviation: how variable is the population?
 - Standard error: how good is this estimate of the population?
 - Confidence limits: 1 in 20 chance of being in this range
 - Range: the difference between the largest and smallest value



Conveying uncertainty

The qualitative approach

- ‘almost certain’, ‘very likely’, ‘likely’ etc
- By analogy – ‘more likely to be struck by lightning’
- Round off conservatively
 - ‘two thirds’ rather than $67.35 \pm 5\%$
 - 10 is not the same as 10.0!

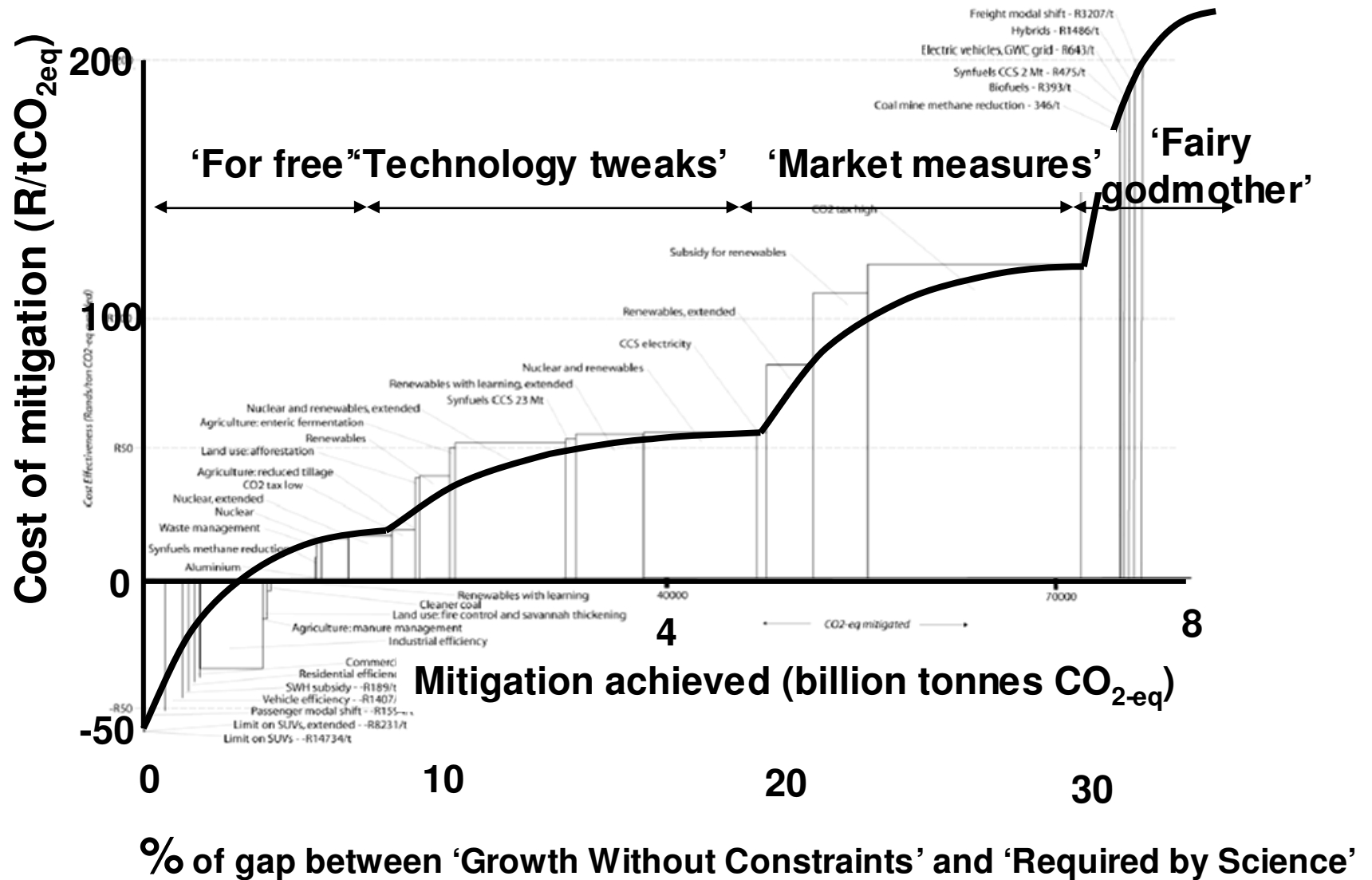
Towards better science reporting

Get the basics right if you want to be credible

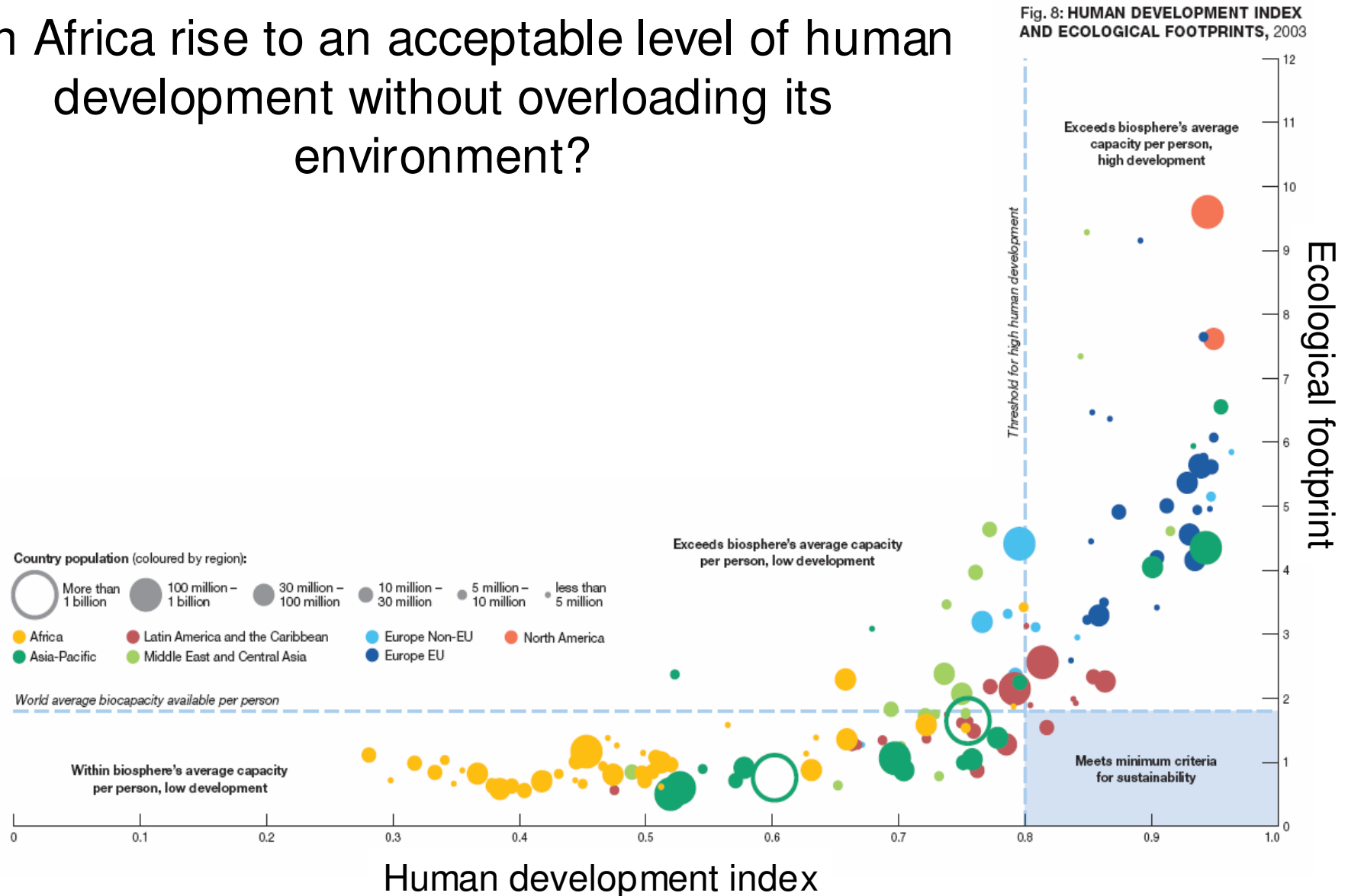
- CO₂ , not CO2 or CO²
- km, not Km
- *Acacia karroo*, not Acacia karroo or acacia karroo or Acacia Karroo or *Acacia karoo*

A good graphic

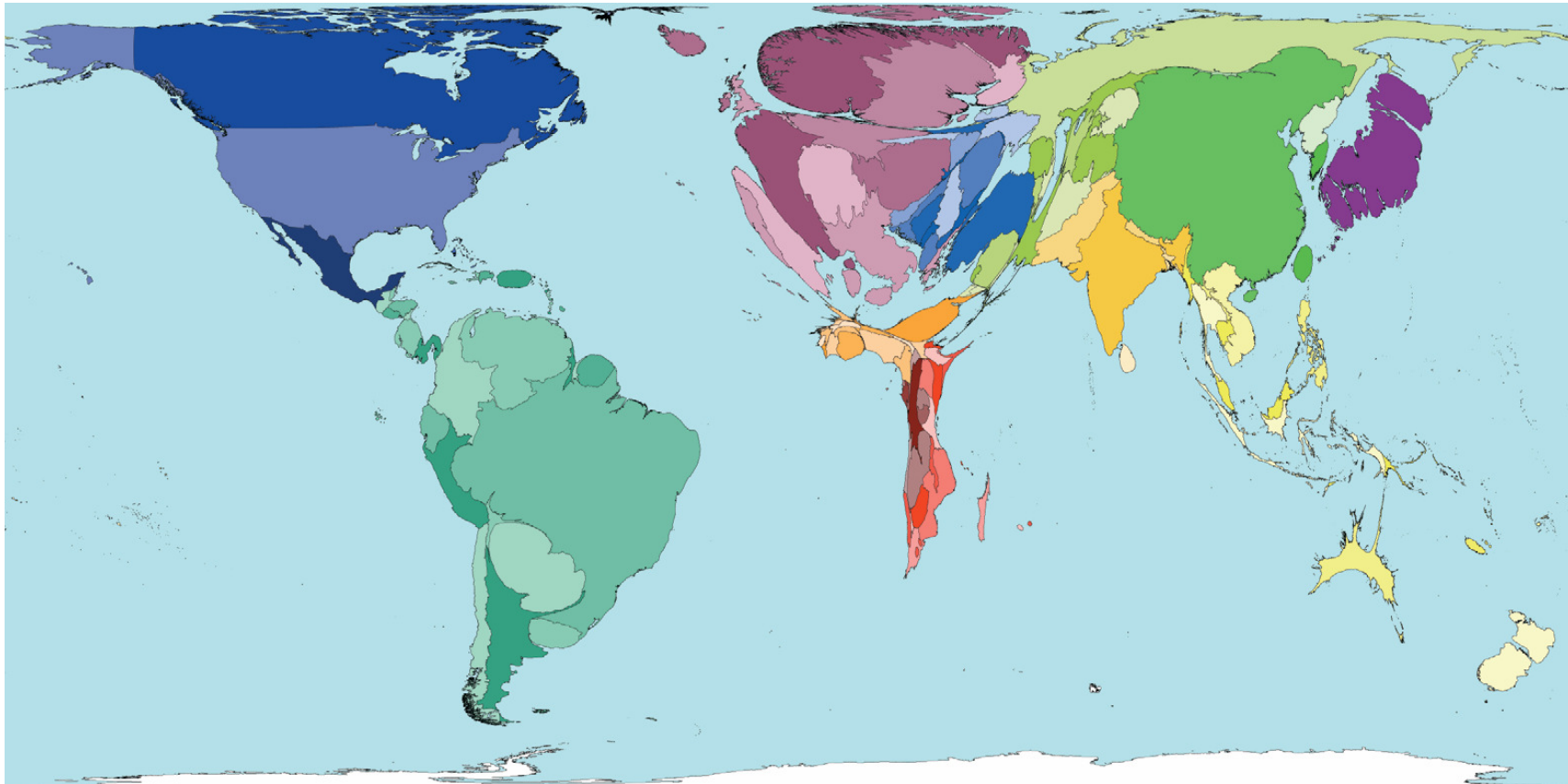
is worth a thousand words!



Can Africa rise to an acceptable level of human development without overloading its environment?



Use of hydroelectric power



Final words

- There is no substitute for doing your homework!
- Look at the *Economist* for examples of how difficult subjects can be elegantly put without dumbing them down
- Don't abandon skepticism and common sense