



Between a Rock and a Hard Place

communicating contested geoscience



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Blackpool tremor

April 1, 03.34: A small earthquake shook homes in north-west England. No damage has been reported



Press Association Graphic



hydraulic fracturing *noun* also called fracking; a process in which fractures in rocks below the earth's surface are opened and widened by injecting chemicals and liquids at high pressure: used especially to extract natural gas or oil.

dictionary.com



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Fracking technique proposed for South Wales was 'probable' cause of Blackpool earthquake, report finds

David Fisher 08:00 AM 22 Oct 2012

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Kirby Misperton Village Hall



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Price: £2 per adult with child and £1 per additional child
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For further info please call:
Joanne – 01653 669703

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NIMBY ?

“Not In My Back Yard.” A term for a person who resists unwanted development, such as manufacturing plants, prisons, power companies, or chemical companies in his or her own neighborhood or town.



Interviewee 1: It's the foundation of this country and if that happens all over the country... it worries me and I think it would make them very unstable or I'd have that feeling...

Interviewee 2: Yeah. Well, fracture means break, doesn't it.

Interviewee 1: Absolutely.

Interviewee 2: You're breaking something



(Williams 2013)



Act I - The Underworld

Geo-cognition - mental models



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Hydrology and
Earth System
Sciences  Open Access

A “mental models” approach to the communication of subsurface hydrology and hazards

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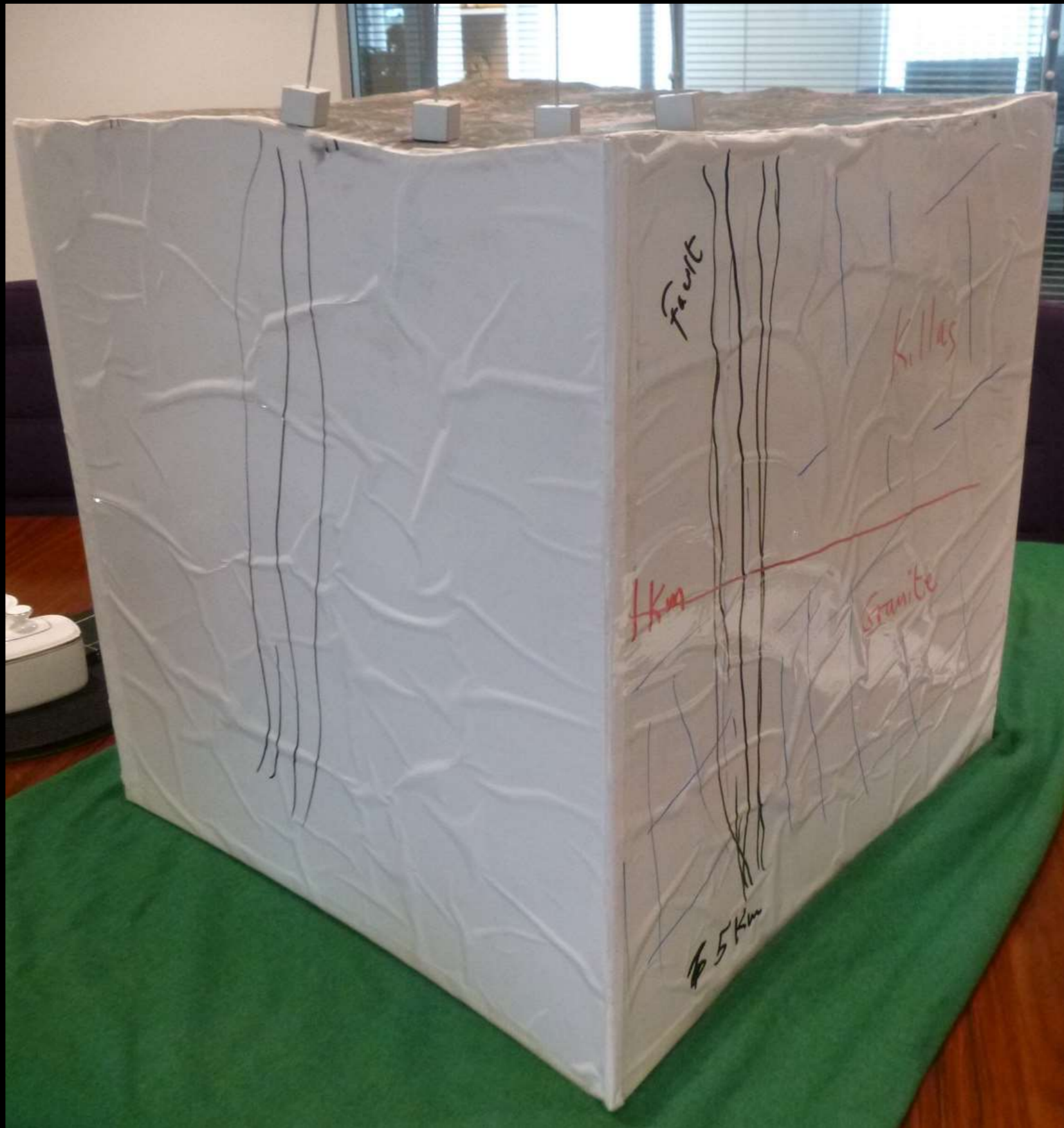
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Abstract. Communicating information about geological and hydrological hazards relies on appropriately worded communications targeted at the needs of the audience. But what are these needs, and how does the geoscientist discern them? This paper adopts a psychological “mental models” approach to assess the public perception of the geological subsurface, presenting the results of attitudinal studies and surveys in three communities in the south-west of England. The findings reveal important preconceptions and misconceptions regarding the impact of hydrological systems and hazards on the geological subsurface, notably in terms of the persistent conceptualisation of underground rivers and the inferred relations between flooding and human activity. The study demonstrates how such mental models can provide a basis

ing many hazard messages to fall into the largely now-rejected “deficit model” of communication (Sturgis and Allum, 2004). That model assumes people need to be educated about those areas of knowledge in which they are seen to be deficient, and it ignores their existing knowledge structures and wider concerns or values. Moreover, the responsibility for tailoring the communication to the target audience is often placed on the public, requiring them to “ask the right questions” (Rosenbaum and Culshaw, 2003). This emphasis on the public’s requirement to ask the right questions misses a bigger issue in communicating geological hazards, namely the influence of intuitive judgments, such as heuristics (Gilovich et al., 2002), in how people may interpret information, especially unfamiliar scientific and technical data.



Fault

Kullas

Granite

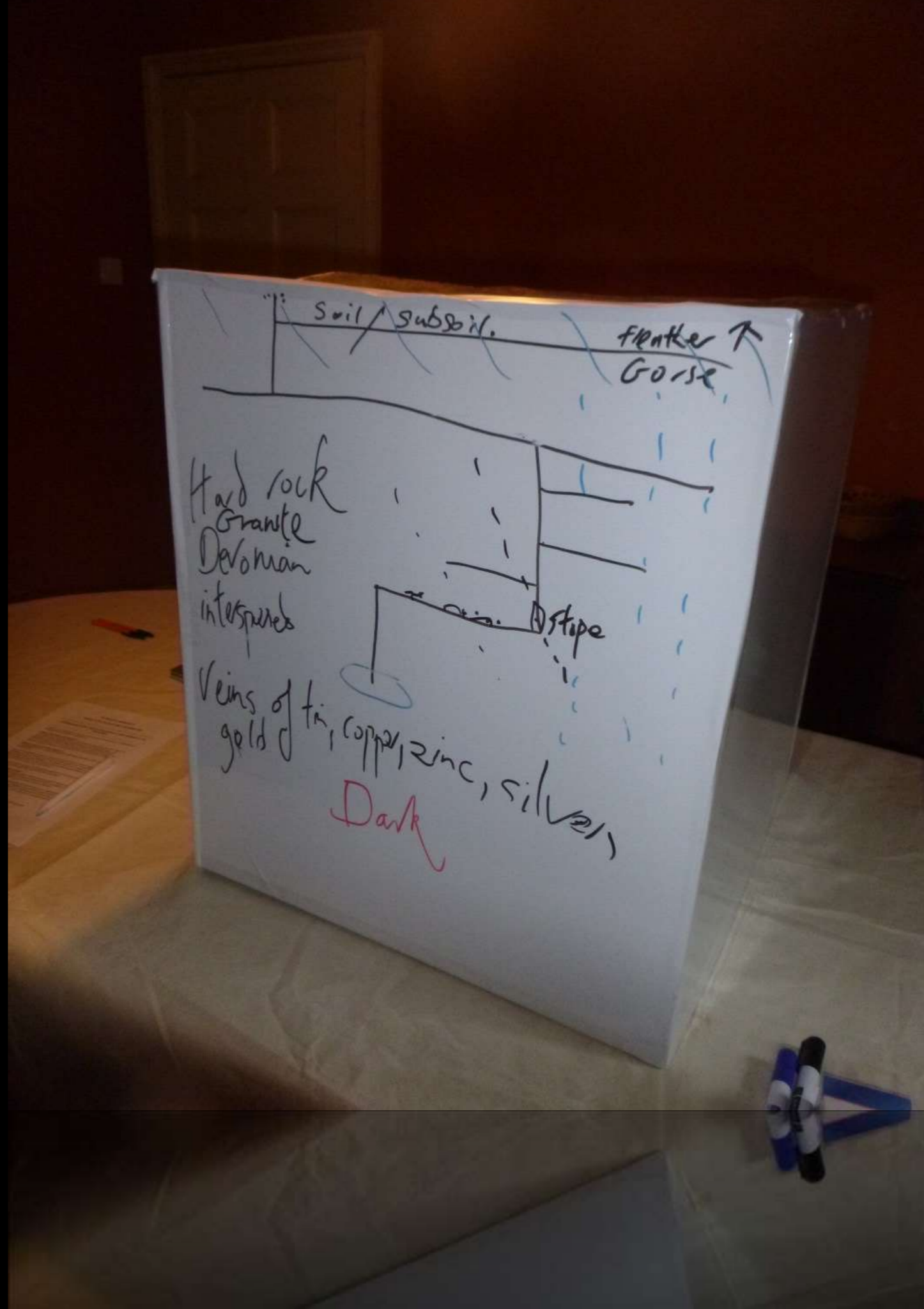
1 km

5 km

“And you keep going down and down until you eventually hit, I take it, very hot rocks and the coal there.

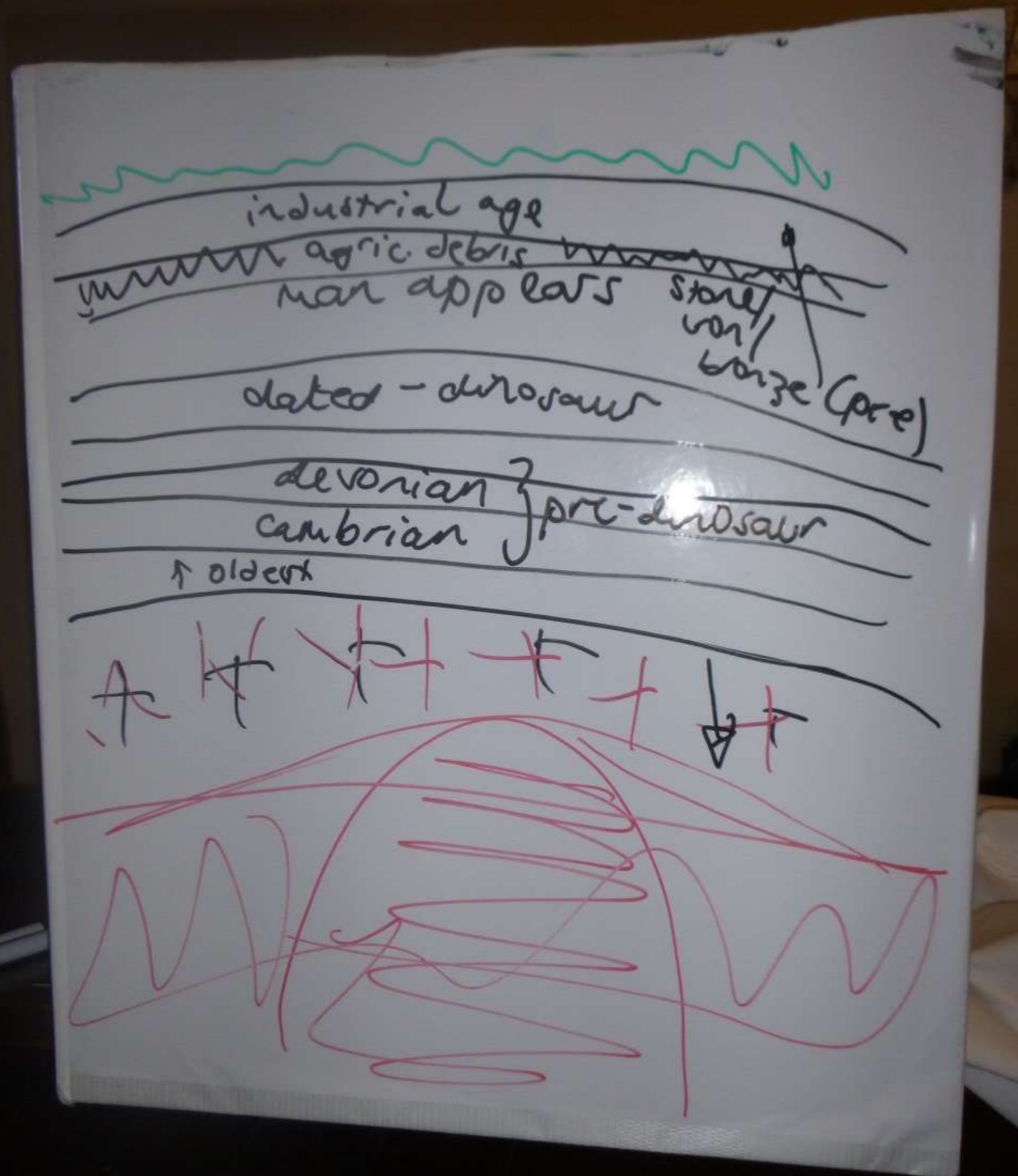
If it's not from the heat being radiated, it's from being enclosed, I'm sure it will get hotter.

Decent miners, a lot of miners there, they're virtually in the nude because it's so hot.”

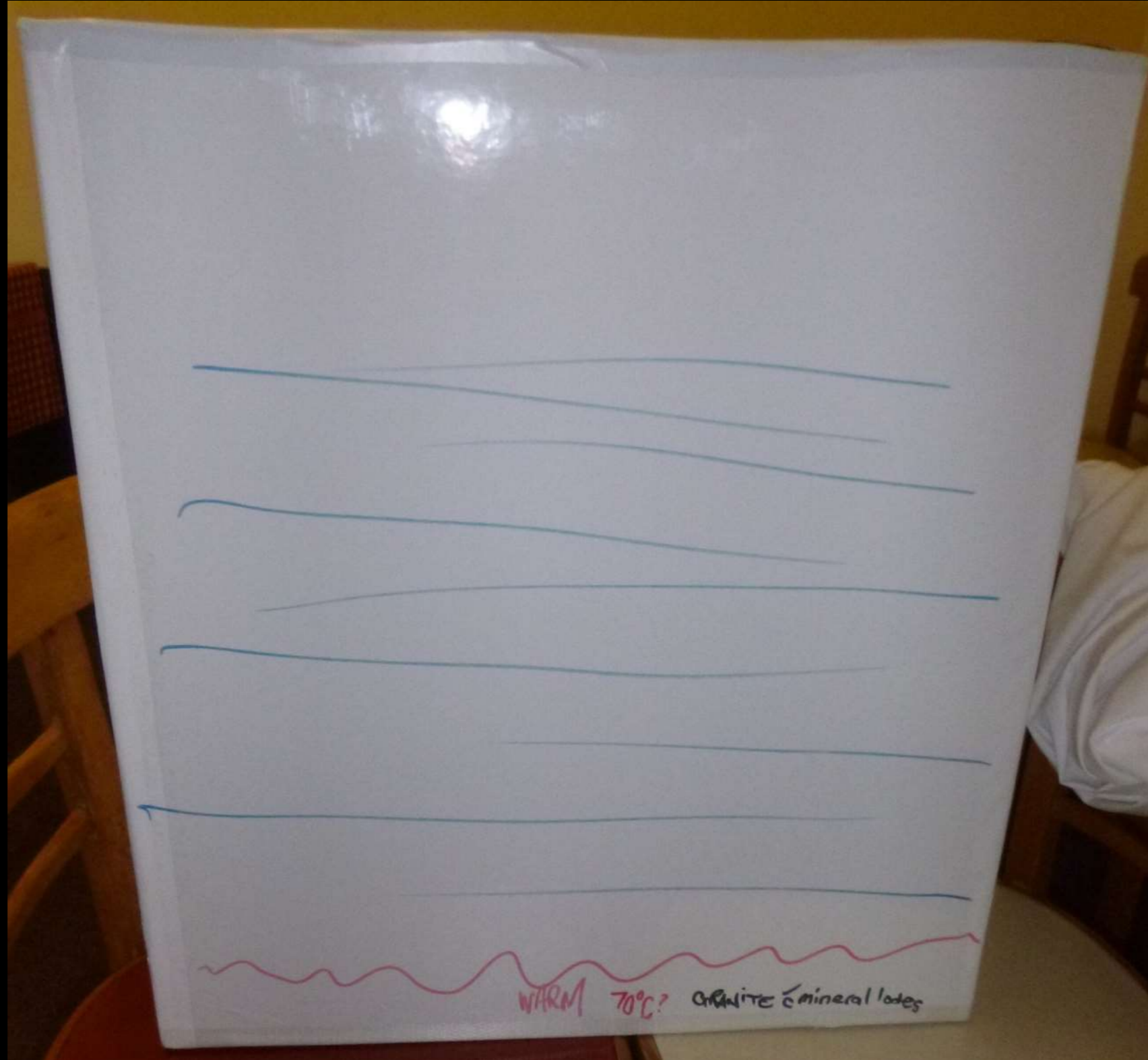


“So down towards the very, very bottom of the Earth.

That’s because it’s where it’s all broken down even more and I presume that’s where the heat of the Earth is.”

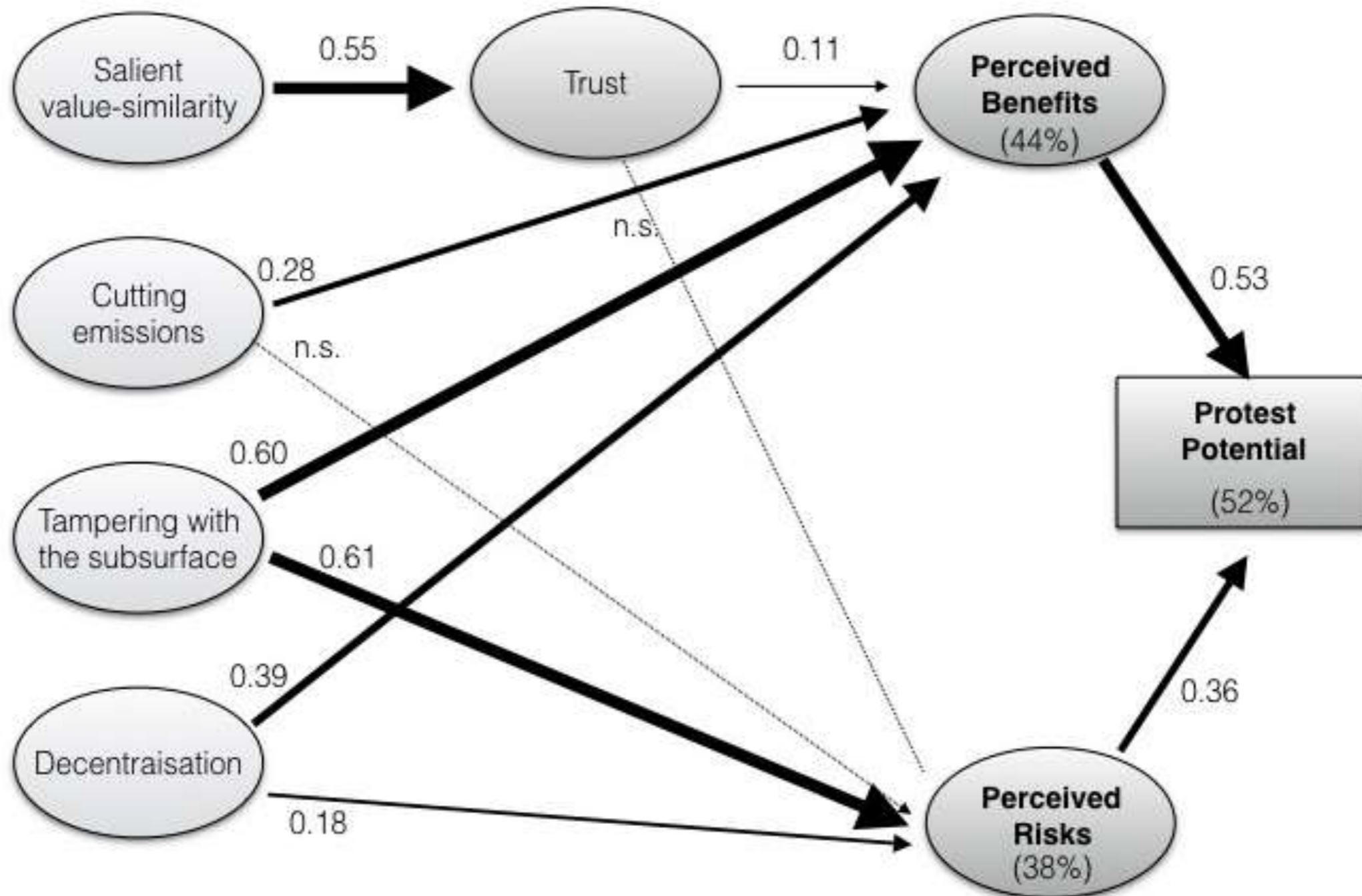






Q: How far until you get to the start of this – where the hot stuff comes in?

A: Just probably a thousand miles deep, I don't know, I can't really visualise it.





Act 2 - Social Seismic

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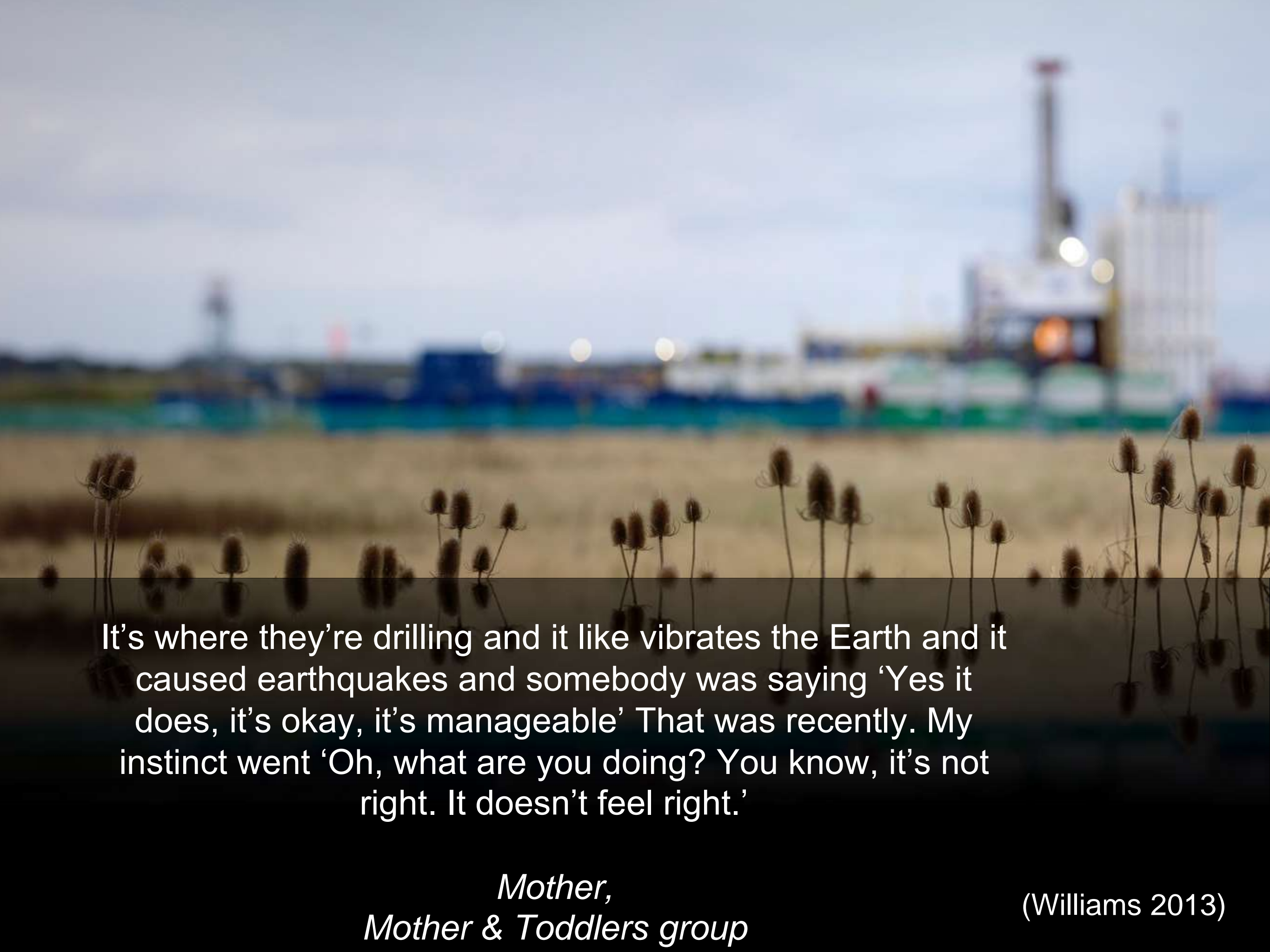
Social Seismic: Petroleum and the Public

Iain Stewart and Hazel Gibson

How do we win the battle for community hearts and minds?

This article appeared in June, 2016





It's where they're drilling and it like vibrates the Earth and it caused earthquakes and somebody was saying 'Yes it does, it's okay, it's manageable' That was recently. My instinct went 'Oh, what are you doing? You know, it's not right. It doesn't feel right.'

*Mother,
Mother & Toddlers group*

(Williams 2013)



23%



Fan boys & girls

23%



Mr & Mrs Average

8%



'wish I could understand this'

Attitudes

23%



'too many other issues of concern'

Disengaged

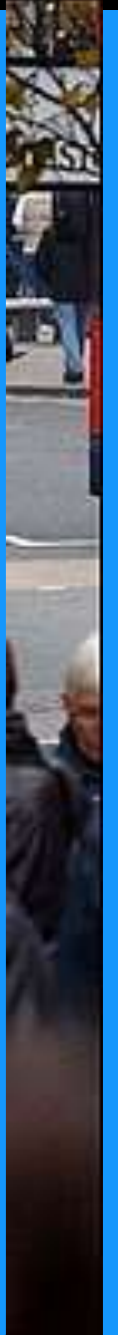
14%



science is a turn off

I know all I need to know

2%





The benefits are greater than any harmful effects

Science is such a big part of our lives we should all take an interest

New technologies excite me more than they concern me

Science creates more problems than it solves

We depend too much on science and not enough on faith

Science tends to benefit the rich more than they benefit the poor

Technological change happens too fast for me to keep up with it



human activities have a significant impact on the planet

i believe everything in the world is connected

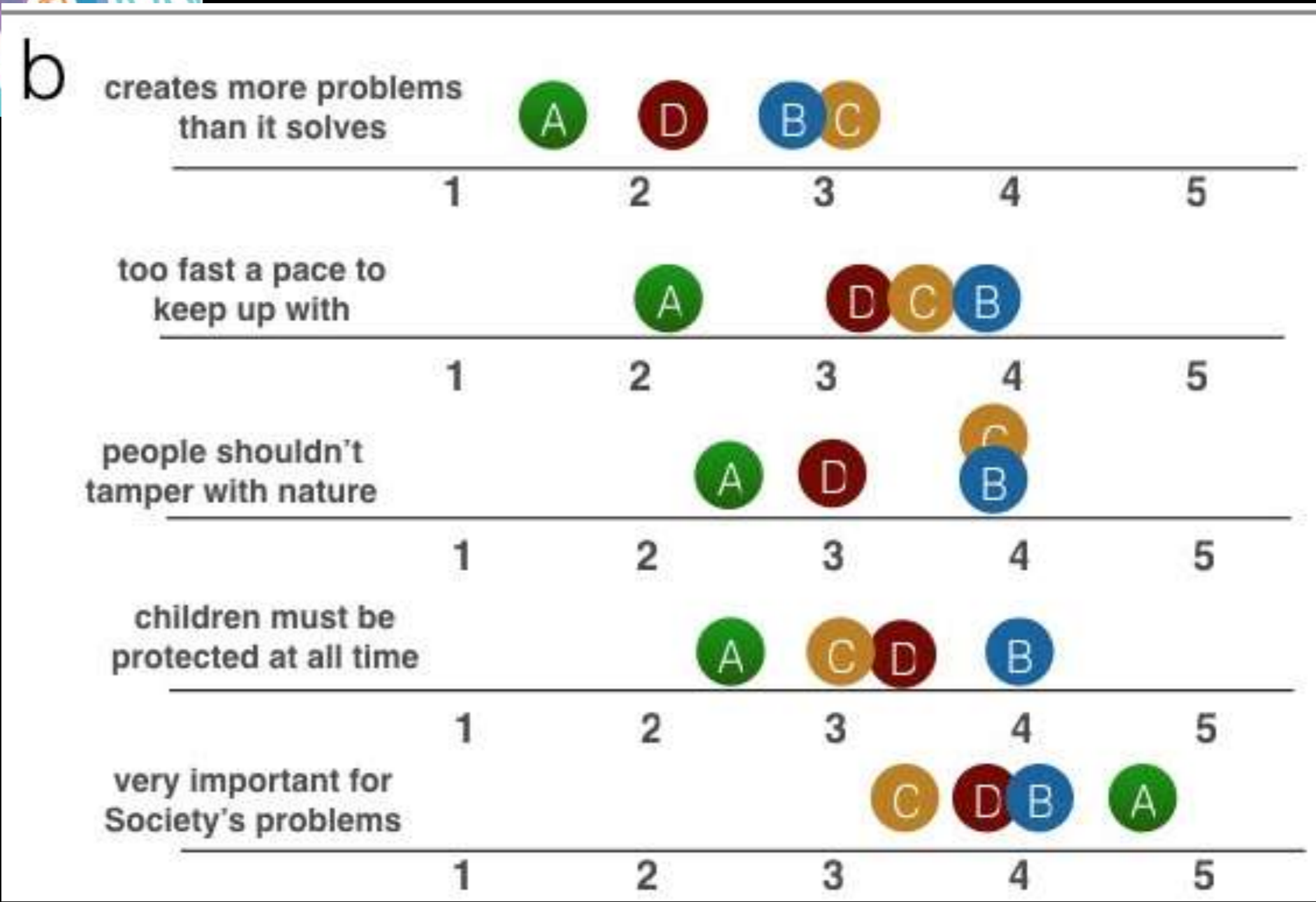
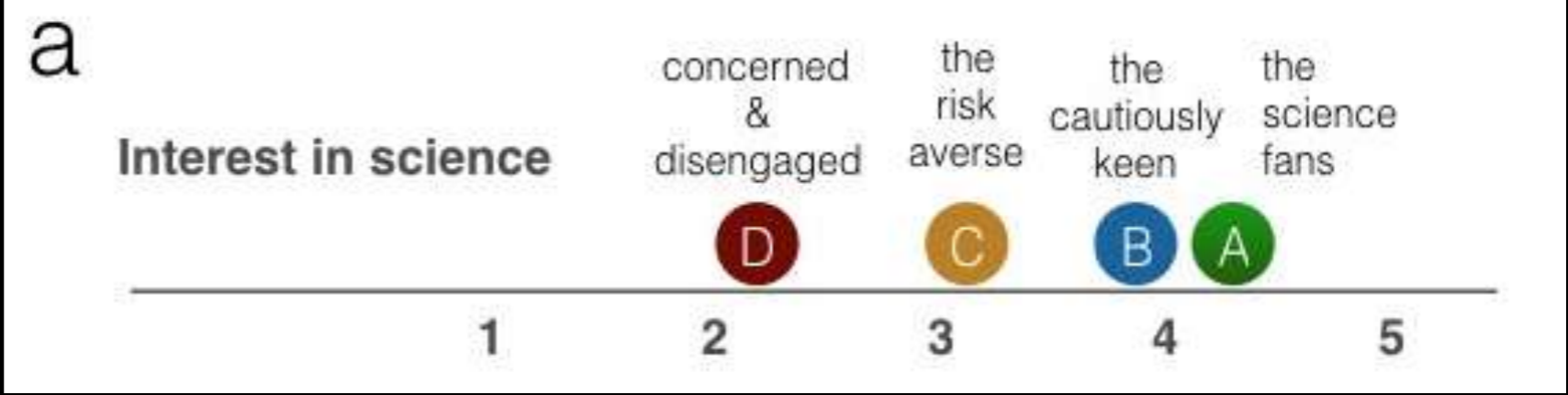
children should be protected at all risks

we should use more natural ways of farming

people shouldn't tamper with nature

people have the right to modify the natural environment to suit their needs

not vaccinating children puts others at risk



When information is complex, people make decisions based on their values and beliefs



People seek affirmation of their attitudes (or beliefs), no matter how fringe. They will reject any information that are counter to their attitudes



People most trust those whose values mirror their own.



Attitudes that are not formed by logic (nor facts) are not influenced by logical (nor factual arguments)



Public concerns about contentious science or technologies are almost never about the science - and scientific information therefore does little to influence these concerns.





Act III - A Question of Outrage



Corrib, western Ireland

“We underestimated the level of community concern and unrest...Inadequate engagement led to decisions that, in hindsight, were too legalistic in approach rather than really understanding what the concerns were, and in spending some extra time working those through...

What we ended up doing to rebuild relations and trust was what we should have done in the first place – that was having local community people engaged as liaisons, working at the very start of the project to understand what the concerns were, rather than be driven by a project schedule, which is what essentially happened...

We didn't have what we might have called social licence”.



2 elements in a typical risk controversy...

1. People over-estimate the hazard

2. People are outraged

'The public often misrepresent the hazard. The experts often misperceive the outrage. But the overarching problem is that the public cares too little about the hazard, and the experts care too little about the outrage.'

(Sandman 1993)



If people are outraged because they overestimate the hazard, the solution is....

explain the hazard better



If people overestimate the hazard because they are outraged, the solution is...

‘why are they outraged?’



Increases outrage if...

PRIMARY

exposure coerced
 agent industrial
 agent exotic
 agent memorable
 consequences dreaded
 consequences catastrophic
 true hazard unknowable
 hazard controlled by others
 exposure fair
 assurances, control efforts
 morally relevant
 sources untrustworthy
 process unresponsive

SECONDARY

affects vulnerable population
 effects delayed
 substantial risk to future
 populations
 victims identifiable
 not preventable / few benefits
 substantial media attention
 opportunity for collective action

Reduces outrage if....

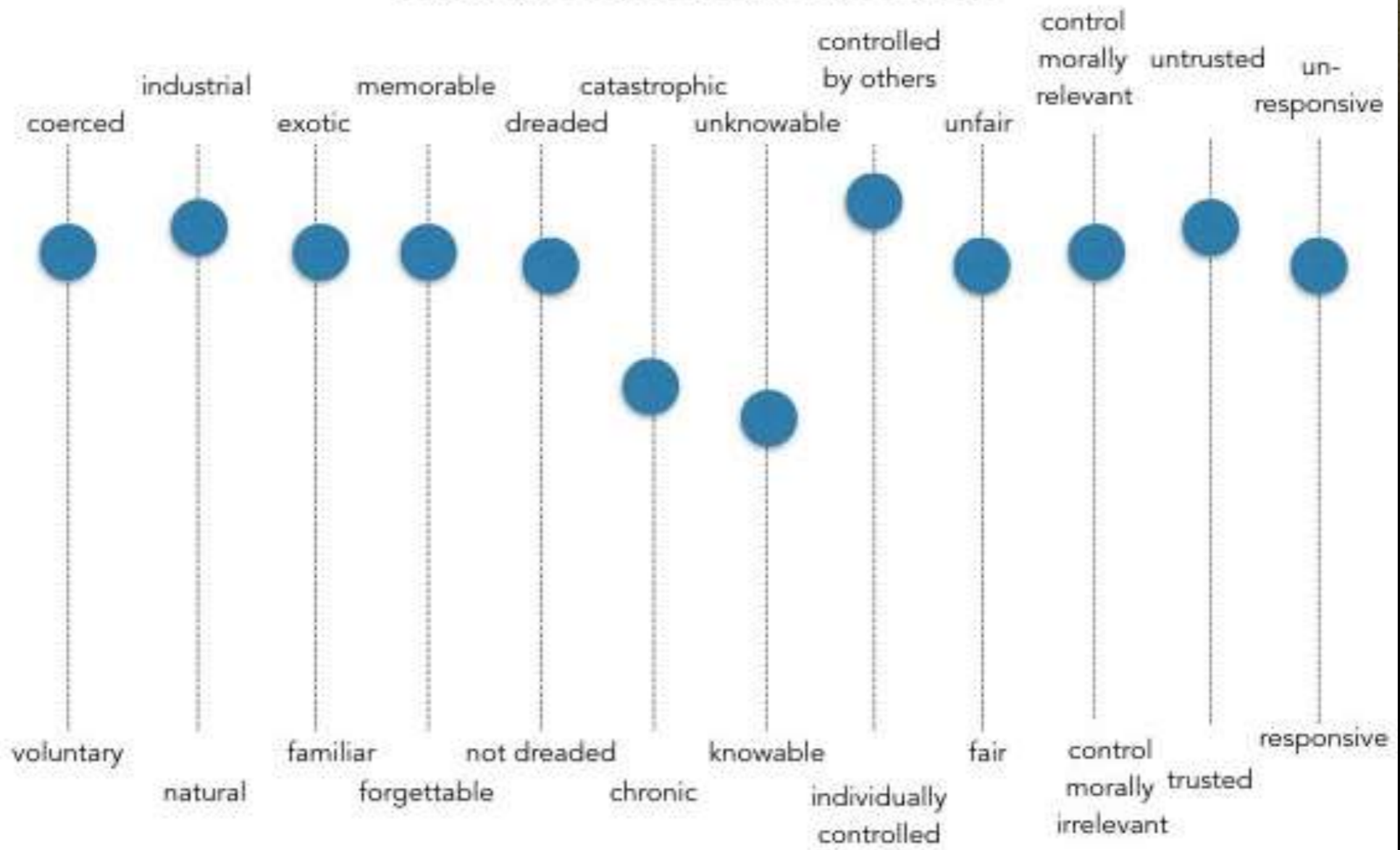
exposure voluntary
 agent natural
 agent familiar
 agent forgettable
 consequences not dreaded
 consequences chronic
 true hazard knowable
 hazard individually controlled
 exposure unfair
 assurances, control efforts
 morally irrelevant
 sources trustworthy
 process responsive

affects general population
 effects immediate
 no threat to future populations

 victims statistical
 preventable / plenty benefits
 little media attention
 no opportunity for collective action



Primary components of outrage





So, scientists face 2 communication challenges:

1. **to talk better** - to explain that the hazard is low
2. **to listen better** - to hear that the outrage is high

$$\text{RISK} = \text{HAZARD} \times \text{OUTRAGE}$$