Science Communication Theory
in the real world

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TE WHARE WĀNANGA O TE ŪPOKO O TE IKA A MĀUI
VICTORIA
UNIVERSITY OF WELLINGTON

National SCIENCE Challenges
THE DEEP SOUTH
Te Kōmata o Te Tonga

”SCIENCE”
Many perspectives and definitions

A method of inquiry
Body of knowledge
Expertise
Facts
Questions
Process

A way of looking at the world
A western knowledge base
Culture
A narrative/ discourse
Societal creation

Sector of economy
A profession
Institutions
Funding system

Big Pharma
Untrustworthy/suspicious
Opaque
Powerful

It’s important to be aware of what OTHER people think of as “science and technology” and individual science topics

Science is done by people

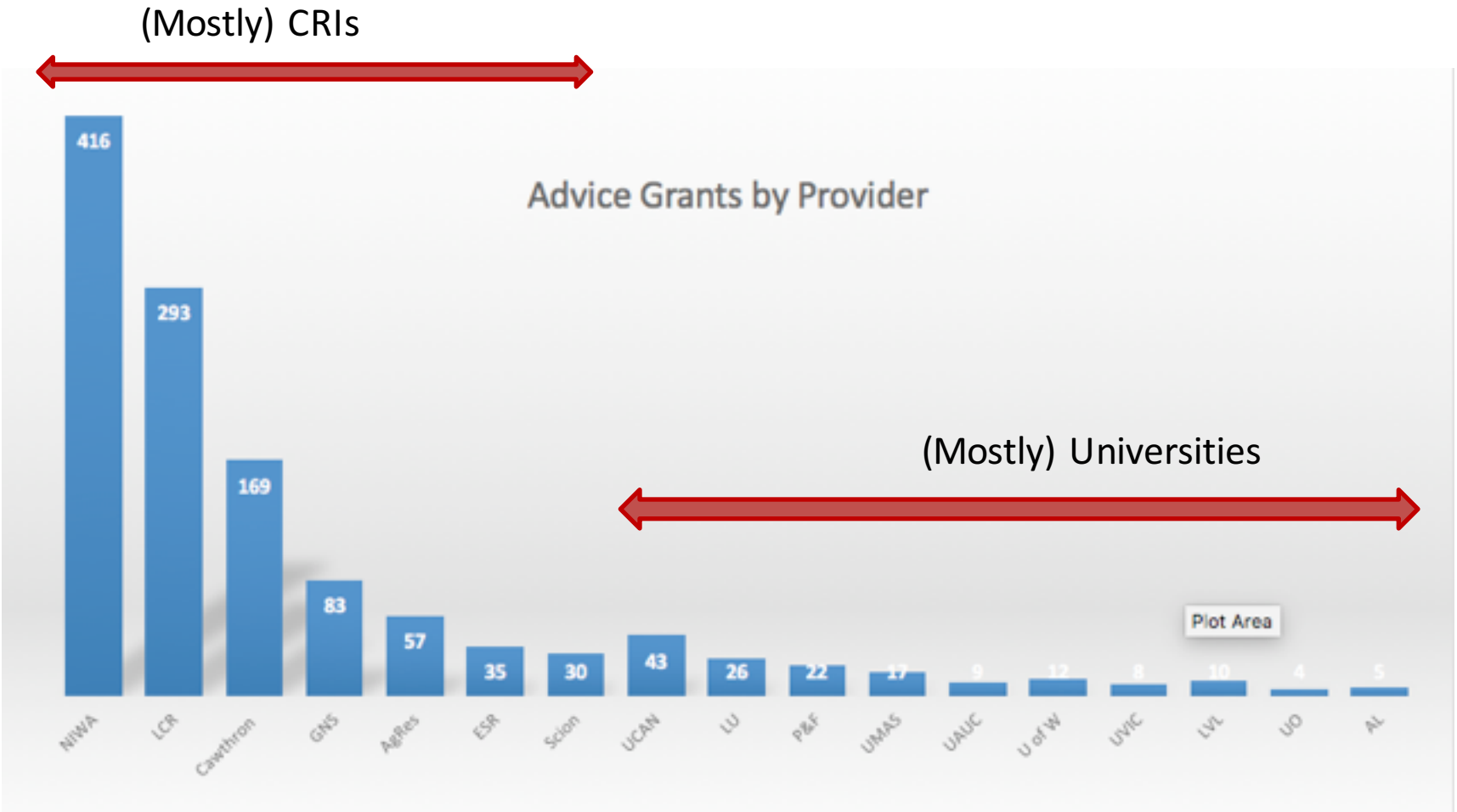
Science is done by people

And therefore is influenced by many factors:

Political
Institutional
Cultural
Economic
…

"the science that gets done is the science that gets funded"

Envirolink grants



Envirolink: a council-managed knowledge transfer scheme designed to increase the amount of "tech transfer" from government-funded environmental research to councils.

What is the purpose of Science Communication?

From the perspective of

- **Scientists**
- Media (journalists)
- Different members of the public
- Councils??

Why scientists get involved in education, outreach, & public engagement?

- ★ social responsibility
- ★ encourage public engagement with science
- ★ inspire a next generation of scientists
- ★ increase scientific literacy
- ★ justify public funding
- ★ support communication & education professionals
- ★ because its inherently rewarding and fun
- ★ "because it's a good thing to do"

Why scientists get involved in education, outreach, & public engagement?

- ★ Increase funding (public and private)
- ★ reach politicians through public support (votes)
- ★ attract students (recruitment)
- ★ have political influence
- ★ ego
- ★ visibility for your research / yourself / your group (marketing)
- ★ commercial interests

What is the purpose of science communication?

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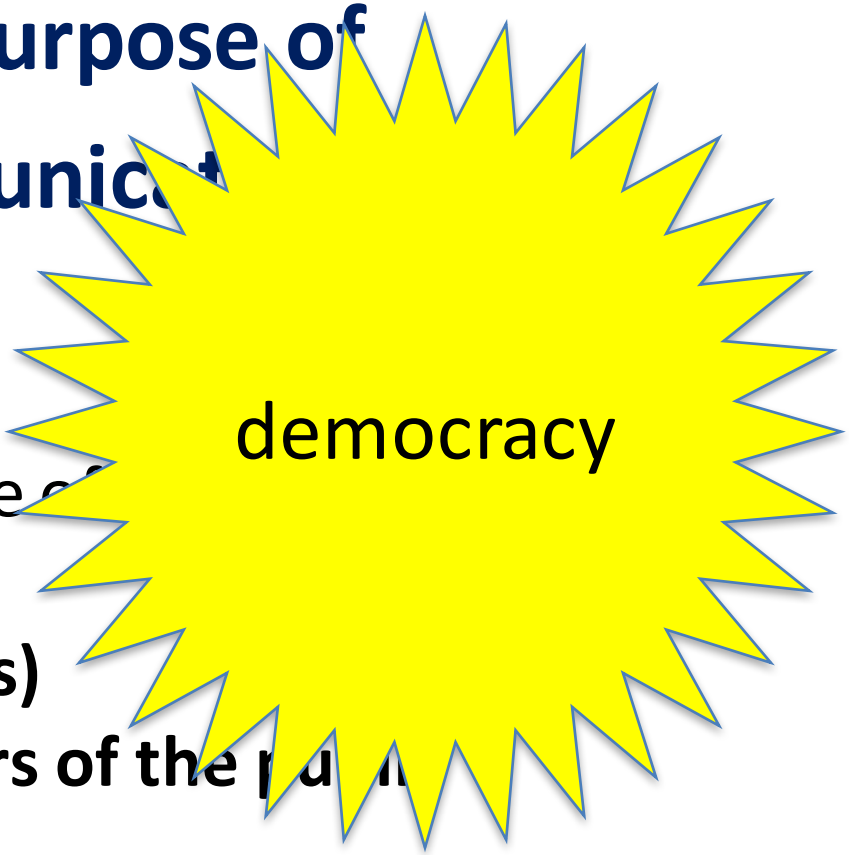

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- Scientists
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Why communicate science?

… there are six principal objectives that motivate people and organisations to develop activities to communicate science. These are:

- To promote an awareness of science as "part of the fabric of society"
- To promote an individual organisation
- Public accountability
- To recruit the next generation of scientists and engineers
- To gain acceptance of science and new technologies; and
- To support sound and effective decision-making

Traditionally addressed with a linear approach

The Deep South National Science Challenge

<u>Mission</u>: to enable New Zealanders to adapt, manage risk, and thrive in a changing climate.

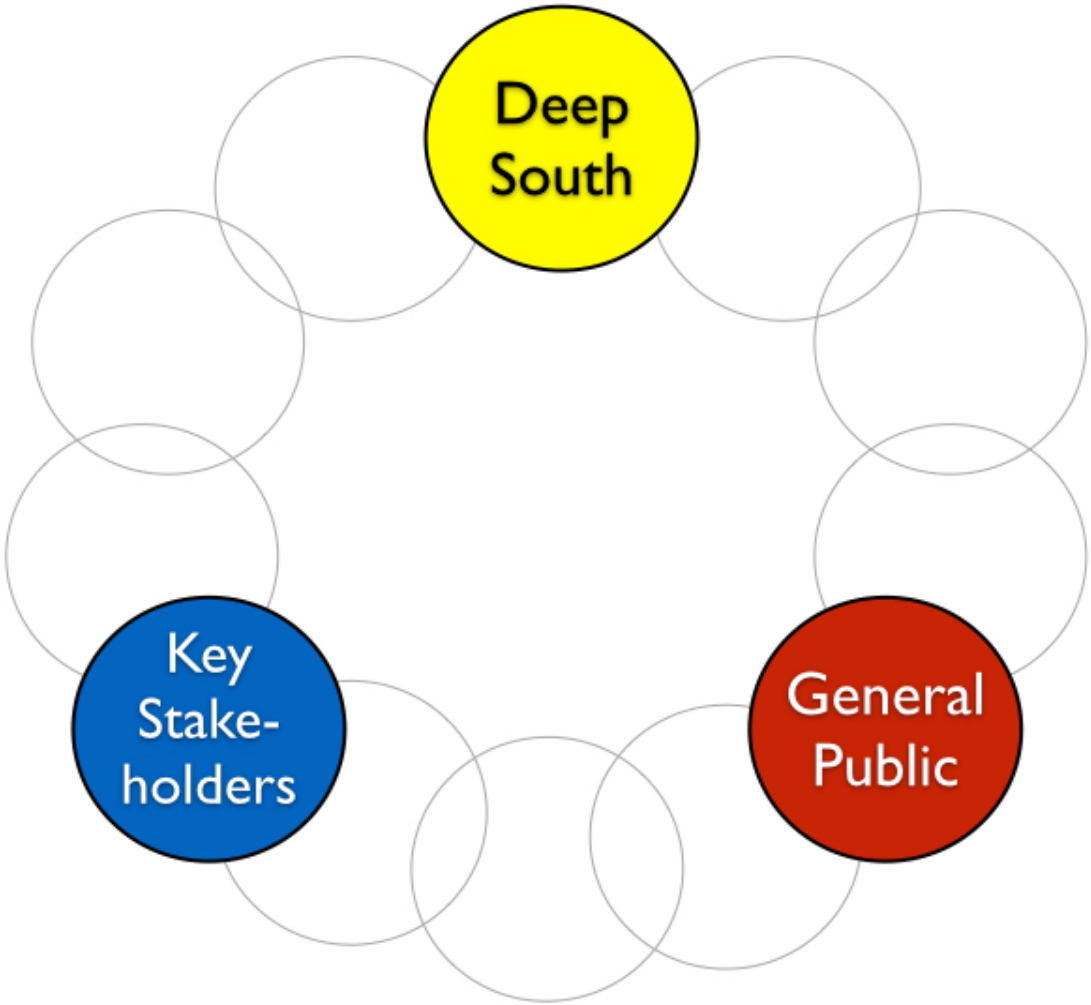
The Deep South Challenge

Processes and Observations

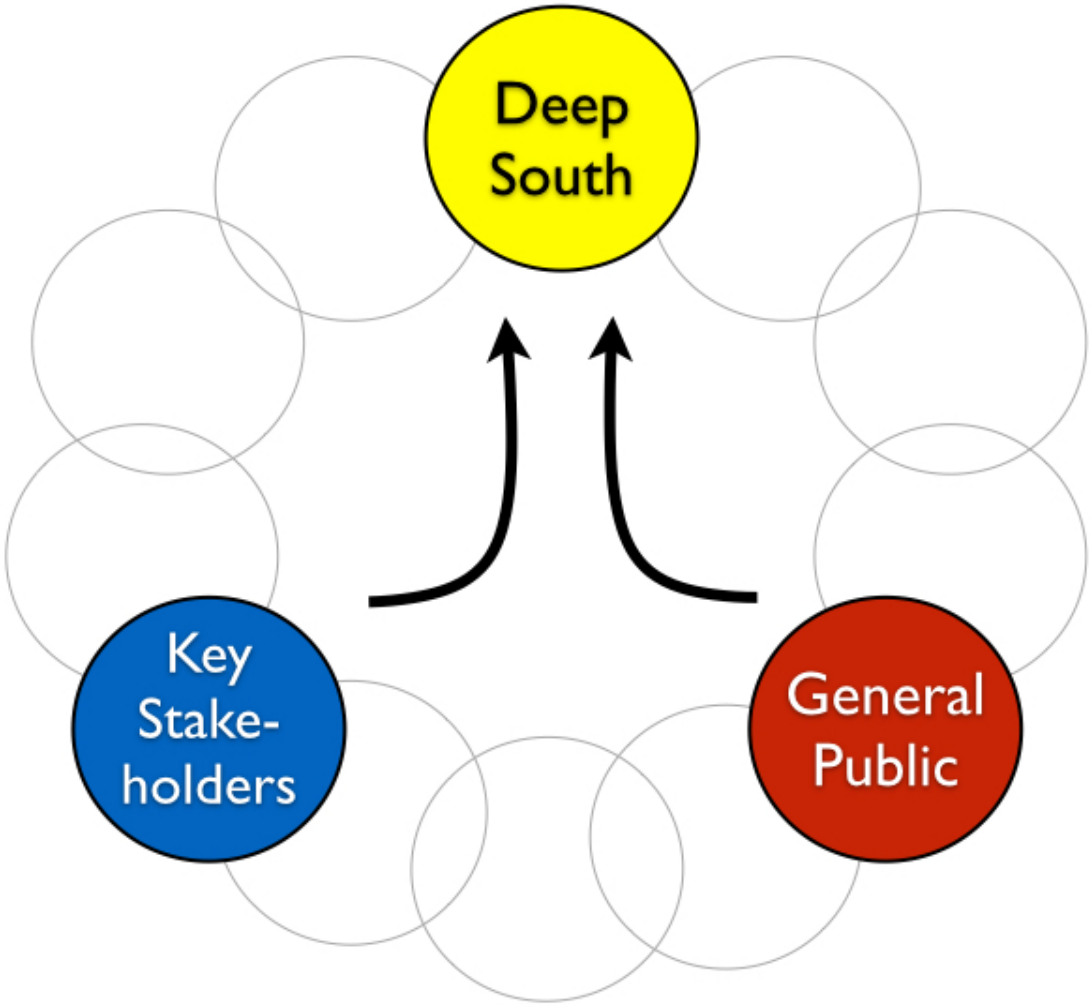
Impacts and Implications

http://www.deepsouthchallenge.co.nz/

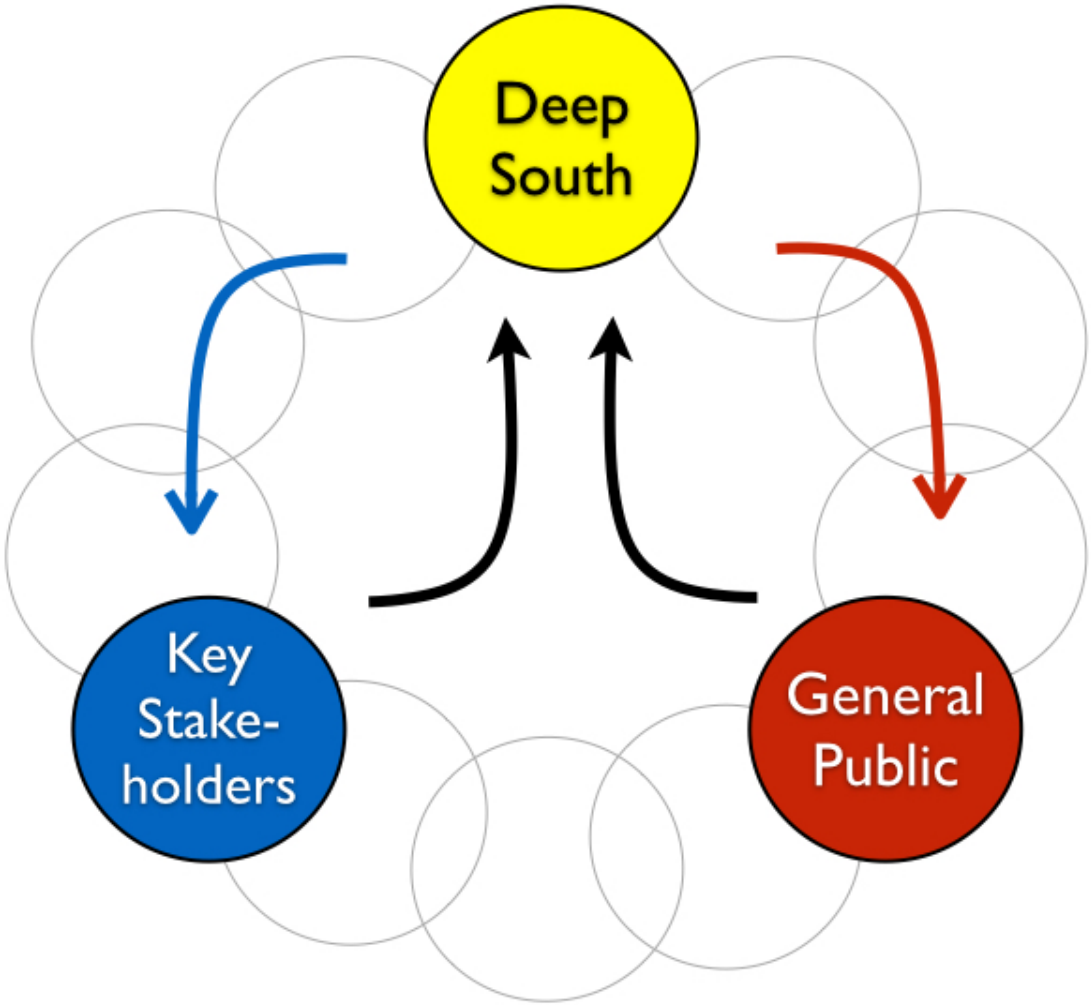
Engagement Programme: big picture



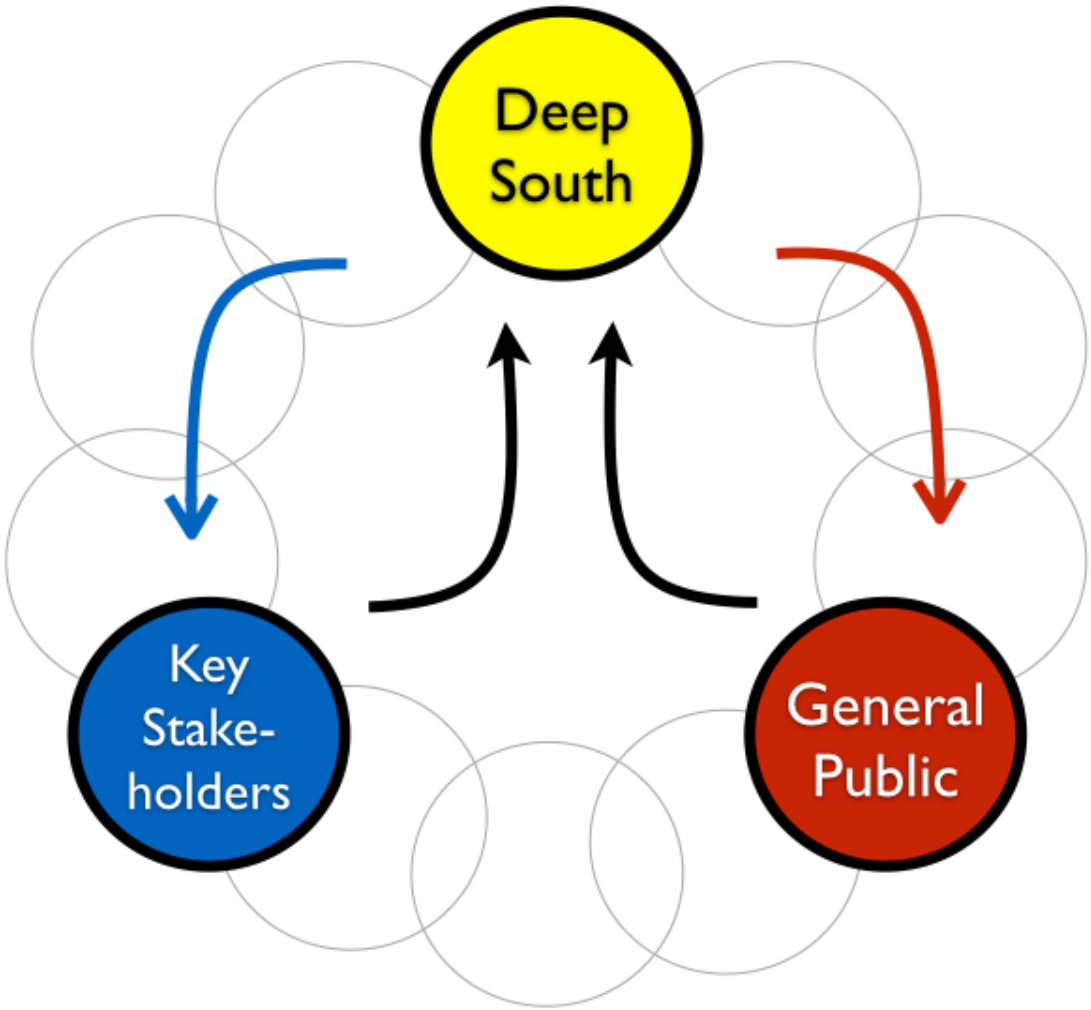
1. Informing Research Priorities



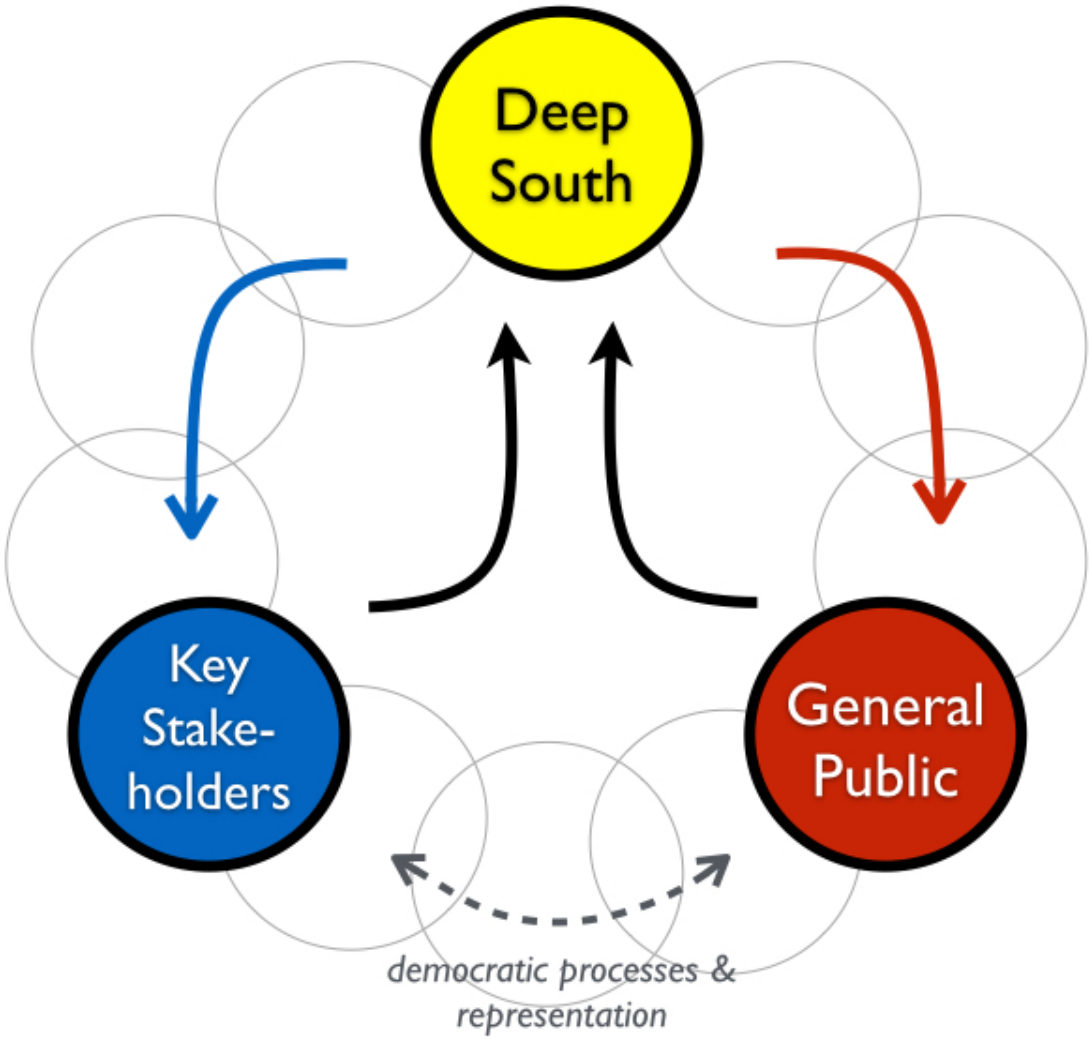
2. Sharing & use of information



3. Capability building



4. Democratic processes



Articulation in an Engagement Strategy

Challenge Mission:
This Challenge will enable New Zealanders to adapt, manage risk, and thrive in a changing climate.

Engagement Goal:
to **improve New Zealanders' ability and capacity to make decisions informed by climate change science.**

Understanding that climate change might inform decision-making

Using information from the Deep South to directly inform decisions

<u>Engagement Goal</u>:
to **improve New Zealanders' ability and capacity to make decisions informed by climate change science.**

This is broken down into **six objectives**:

1. Ensuring research responds to New Zealanders' needs
2. Public communication and 2-way engagement to help inform climate-related decisions
3. Working with key sectors to enable more informed decision-making
4. Providing training and support in climate change engagement
5. Providing Challenge updates and information
6. Evaluation and research

…. which is delivered (practically) through **four workstreams**:

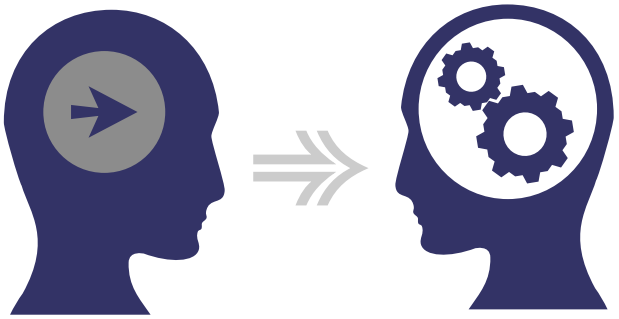
1. Broad and Internal Engagement
2. Tailored Engagement
3. Capacity building (training) in engagement
4. Evaluation and research

But what does this actually look like?

A lot of research has occurred in this area – over the last forty years there has been a transition from

Knowledge transfer

(Wynne 2005, Irwin 2006, Trench 2008, Pouliot 2009)

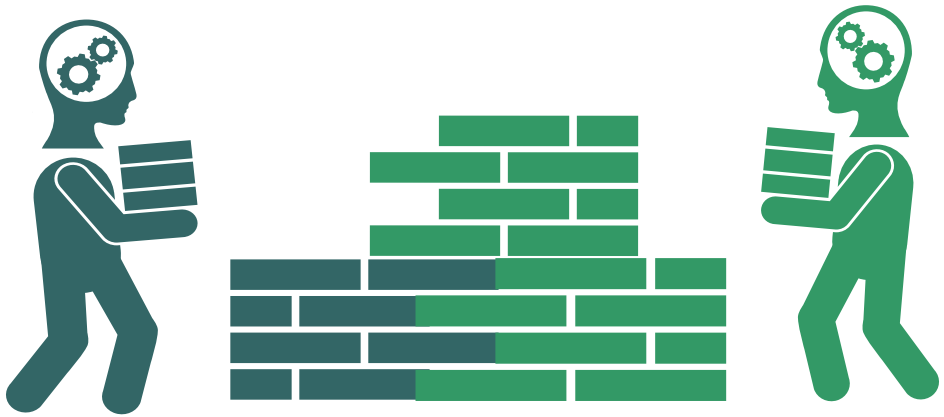


Knowledge sharing

(Jackson, Barbagello & Haste, 2006 Benneworth 2009)

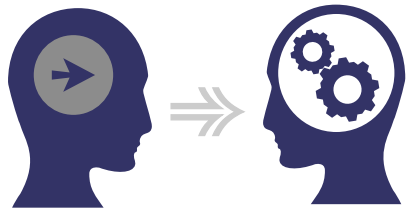
Knowledge building

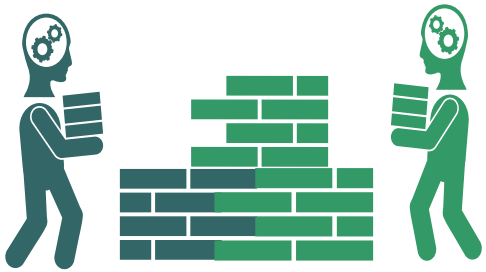
(Joly & Kaufman 2008, Williams 2010)



Transfer – sharing - building

Aim	Nature	Emphasis	Model
Knowledge transfer	One way transfer	Content	Deficit Diffusion
Knowledge sharing	Two way negotiation, consultation	Context	Dialogue Democracy
Knowledge building	Knowledge co-production, multi-directional	Content and Context	Participation Engagement





Knowledge Transfer

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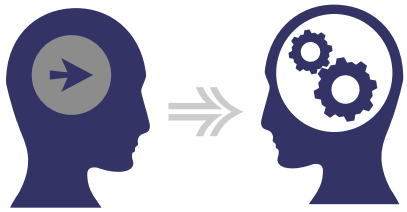

LINEAR MODELS

Appropriate for simple, non-political issues with common frameworks, and no required change in values, attitudes, behaviour

- No required action
- Little controversy
- Based on commonly understood principles and laws

Knowledge Transfer

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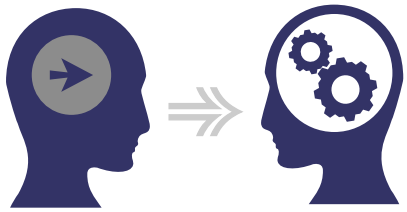

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- New Zealand Geographic feature article
- Website and news updates
- E-newsletter
- Radio interviews & podcasts
- News articles
- Infographic
- Reports

Knowledge Transfer

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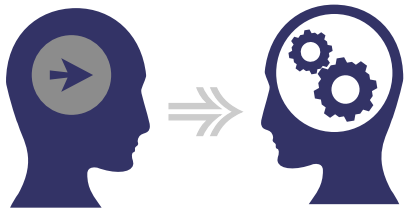

Often (unfairly) referred to as the **DEFICIT MODEL**

Based on assumption that the public have a 'deficit' of knowledge, and this can be remedied through more science communication

……not a helpful framework for communication of controversial issues!!

Deficit model; example 1

biotech

correspondence

Biotech remains unloved by the more informed

The media may be providing the message — but is anyone heeding the call?

Sir — Public hostility towards biotechnologies is frequently attributed to lack of information, due to poor and insufficient media coverage. For this reason, scientific researchers and policy-makers often call for journalists to give more attention to scientific issues, for better information campaigns and for more communication of science, to improve general understanding and thereby lead to greater public support for biotechnologies and other innovations. But is this approach correct?

In 2000 and 2001, with partial support from the Giannino Bassetti Foundation, we carried out two surveys of Italian public opinion. These were specifically to analyse the relationships between exposure to science in the media, information on biotechnologies, trust in science, and attitudes to biotechnologies. A representative sample of 1,022 Italian citizens aged over 18 were interviewed by phone in September 2000; another representative sample of 1,017 citizens were interviewed in November 2001. Some questions were identical for the two groups, others were year-specific. (A copy of the full list of questions used in the

applications such as "taking genes from plant species and transferring them into crop plants, to make them more resistant to insect pests" or "introducing human genes into animals to produce organs for human transplants, such as into pigs for human heart transplants". But it does result in greater criticism for some applications: 64% of the most exposed subjects consider embryo research to be ethically unacceptable compared with 59% of the less exposed, and 80% of regular consumers of science in the media consider reproductive cloning useless compared with 76% of low consumers.

Of course, media exposure to science does not guarantee accurate information; indeed, there are frequent complaints about the quality of science coverage by the mass media. People who are exposed to at least one high-quality source of public communication of science (for example, the Italian edition of *Scientific American*) are mo
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likely to have the information already.

whereas cloning for reproductive purposes is even more severely judged by the better informed than by the less well informed.

A higher level of information is associated with the desire for stricter state regulation of biotechnologies, as well as with the belief that regulation should not be left either to companies or to scientists alone. The better informed are also more likely to trust consumers' organizations and scientific institutions more than potential beneficiaries (such as patients' groups) and, sometimes, government institutions.

If media exposure to science does not account for different attitudes to biotechnologies, what does? Attitudes appear to be rooted at a deeper, cultural level where values (such as trust and conception of risk) are heavily involved and media information does not reach. Public awareness of biotechnologies is increasing and the level of education seems to be more

investments — as to the mass-media

Bucchi, M., & Neresini, F. (2002). Biotech remains unloved by the more informed. Nature, 416, 261–261.

Deficit model; example 2

vaccination

[Vaccination story (Scientific American)]

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Antivaccination Parents Dig In Heels Even after Receiving Medical Info

Parents were less likely to think vaccines caused autism but strangely less likely to want their children to be vaccinated after being educated about the lack of a vaccine-autism link

Mar 3, 2014 | By Joseph Brownstein and LiveScience

Although public health researchers have worked to counter misinformation about vaccines and raise vaccination rates, a number of the methods they are using may be ineffective, according to a new study.

In the study, researchers focused on the now-debunked idea that the vaccine for measles, mumps and rubella (or MMR) caused autism. Surveying 1,759 parents, researchers found that while they were able to teach parents that the vaccine and autism were not linked, parents who were surveyed who had initial reservations about vaccines said they were actually less likely to vaccinate their children after hearing the researchers messages.

Deficit model; example 3

Climate change

nature climate change

LETTERS

PUBLISHED ONLINE: 27 MAY 2012 | DOI: 10.1038/NCLIMATE1547

The polarizing impact of science literacy and numeracy on perceived climate change risks

Dan M. Kahan[1]*, Ellen Peters[2], Maggie Wittlin[3], Paul Slovic[4], Lisa Larrimore Ouellette[3], Donald Braman[5] and Gregory Mandel[6]

Seeming public apathy over climate change is often attributed to a deficit in comprehension. The public knows too little science, it is claimed, to understand the evidence or avoid being misled[1]. Widespread limits on technical reasoning aggravate the problem by forcing citizens to use unreliable cognitive heuristics to assess risk[2]. We conducted a study to test this account and found no support for it. Members of the public with the highest degrees of science literacy and technical reasoning capacity were not the most concerned about climate change. Rather, they were the ones among whom cultural polarization was greatest. This result suggests that public divisions over climate change stem not from the public's incomprehension of science but from a distinctive conflict of interest: between the personal interest individuals have in forming beliefs in line with those held by others with whom they share close ties and the collective one they all share in making use of the best available science to promote common welfare.

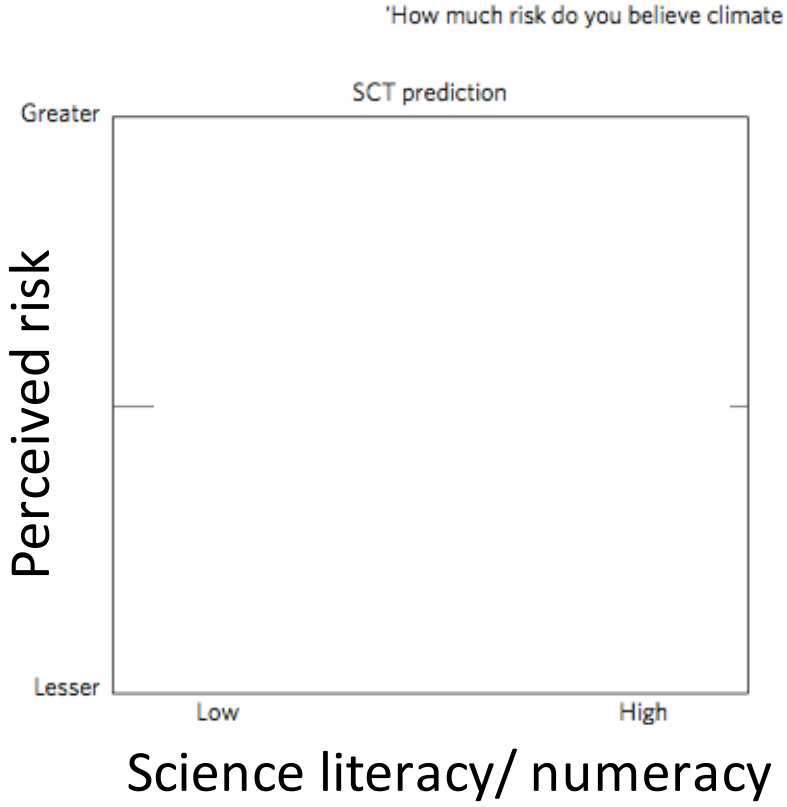
The study collected data on the climate-change risk perceptions of a large representative sample of US adults (N = 1,540). Measures

literacy—that is, concern should increase as people become more science literate.

Second, and even more important, SCT attributes low concern with climate change to limits on the ability of ordinary members of the public to engage in technical reasoning. Recent research in psychology posits two discrete forms of information processing: system 1, which involves rapid visceral judgments that manifest themselves in various decision-making heuristics; and system 2, which requires conscious reflection and calculation[10]. Most members of the public, according to this research, typically employ system 1 reasoning without resorting to more effortful system 2 processing. Although system 1 works well for most daily contingencies, ordinary citizens' predominant reliance on heuristic rather than analytic modes of reasoning is viewed as leading them to underestimate climate change risks, which are remote and abstract compared with a host of more emotionally charged risks (for example, terrorism) that the public is thought to overestimate[2,3].

If this position is correct, one would also expect concern

LETTERS NATURE CLIMATE CHANGE DOI: 10.1038/NCLIMATE1547



How much risk do you believe climate change poses to human health, safety or prosperity?

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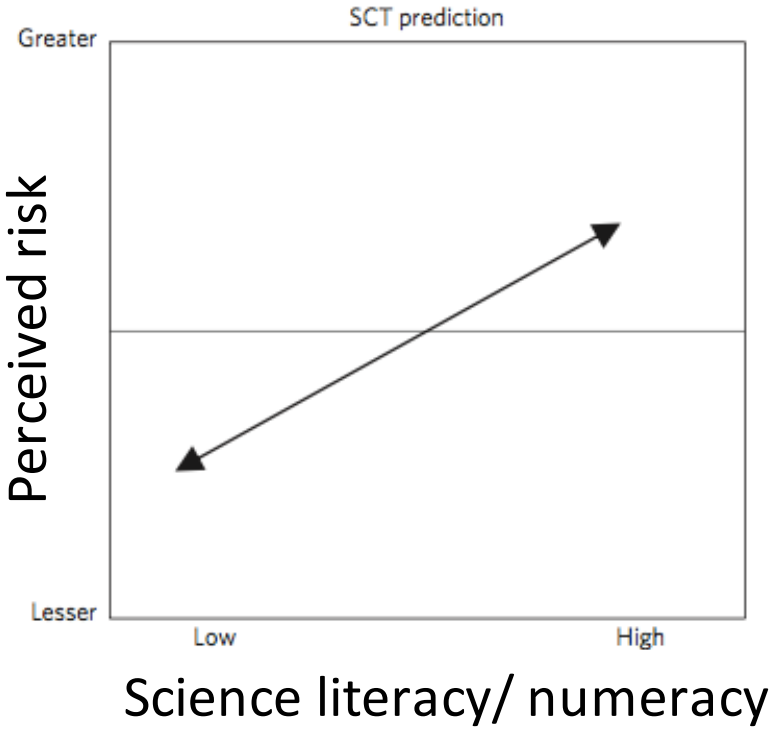
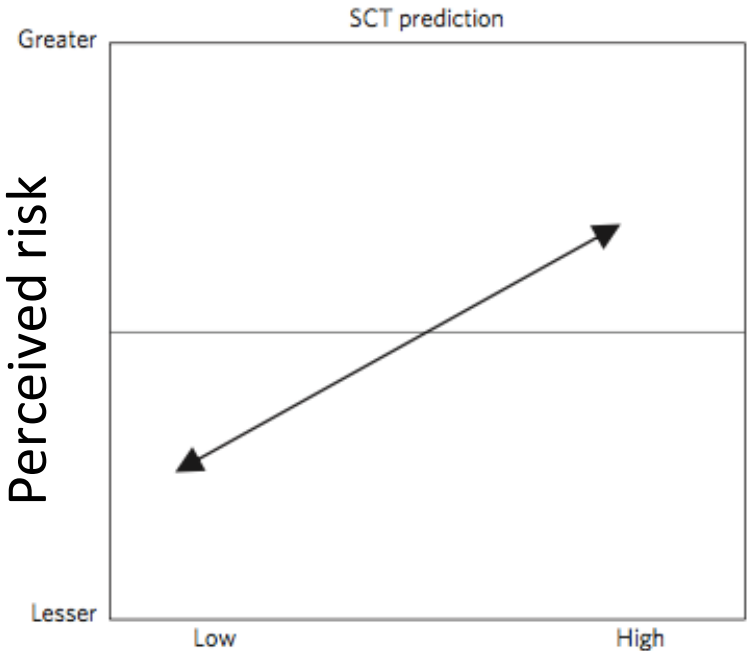
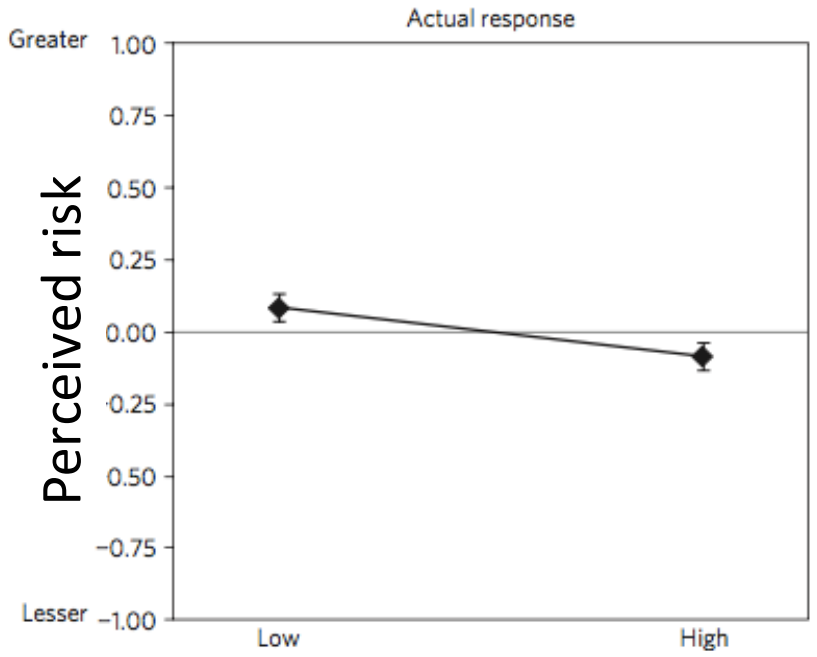
'How much risk do you believe climate change poses to human health, safety or prosperity?'



How much risk do you believe climate change poses to human health, safety or prosperity? **PREDICTION**

'How much risk do you believe climate change poses to human health, safety or prosperity?'





How much risk do you believe climate change poses to human health, safety or prosperity? **PREDICTION vs RESULTS**

NATURE CLIMATE CHANGE DOI: 10.1038/NCLIMATE1547 LETTERS

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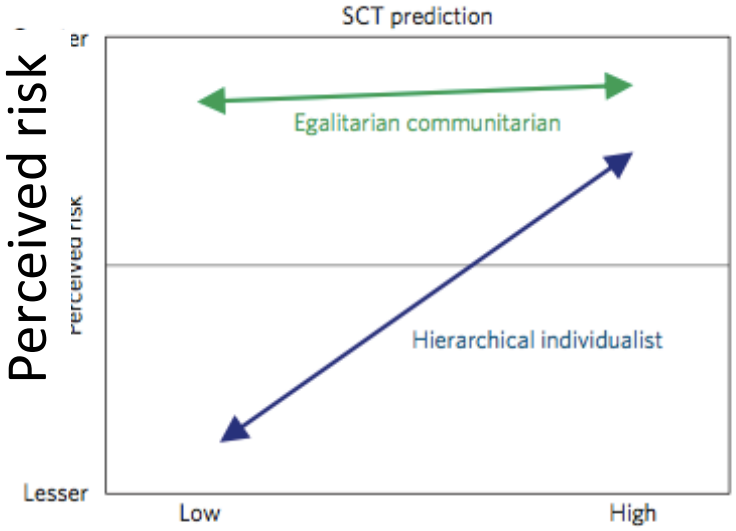
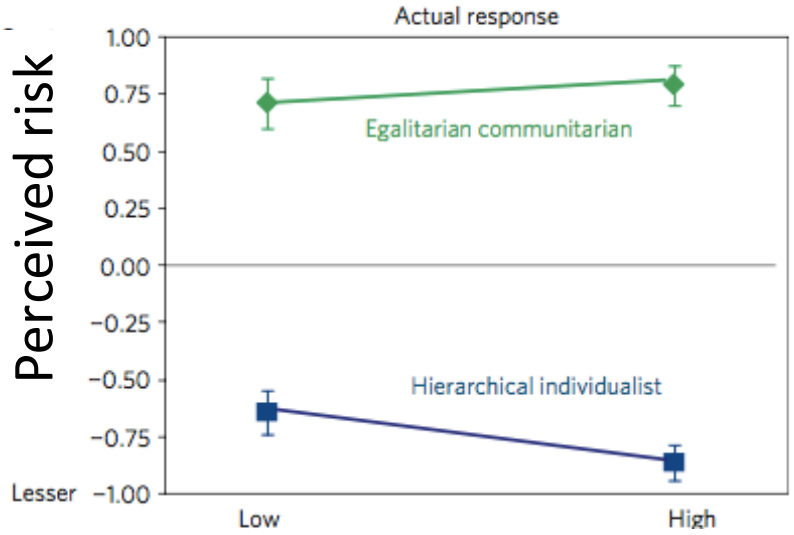


Science literacy/ numeracy



Science literacy/ numeracy

How much risk do you believe climate change poses to human health, safety or prosperity? **PREDICTION vs RESULTS**

Deficit model - summarised

Embedded assumption in science establishment that

more knowledge to more public sources = more acceptance

Social science research shows very clearly that there's no necessary causal progression from more knowledge to more acceptance

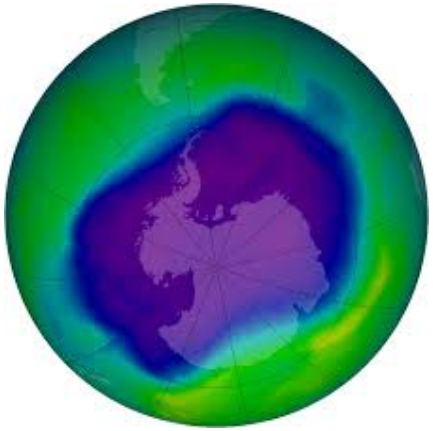
In fact, more knowledge often leads to more skepticism, more ambivalence, and sometimes outright opposition,

Types of communication

1. Consensual, non-problematic, informative

E.g. National Geographic, New Scientist, Radiolab, Scientific American…

2. public communication influences the science



E.g. Ozone hole, GMOs, UNFCC climate meetings, science funding – requires a sophisticated public

Why communicate science?

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- To promote an awareness of science as "part of the fabric of society"
- To promote an individual organisation
- Public accountability
- To recruit the next generation of scientists and engineers
- To gain acceptance of science and new technologies; and
- To support sound and effective decision-making

Traditionally addressed with a linear approach

Transfer – sharing - building

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Knowledge sharing*	Two way negotiation, consultation	Context	Dialogue Democracy
Knowledge building*	Knowledge co-production, multi-directional	Content and Context	Participation Engagement

**To support sound and effective decision-making*

Knowledge Sharing

Aim	Nature	Emphasis	Model
Knowledge sharing	Two way negotiation, dialogue	Context	Dialogue Democracy

Eg. Science cafes, stakeholder meetings, workshops, games

- issues may be political, have public impact
- potential controversy
- impacts health, food, safety, biodiversity, economy
- experts may appear to disagree
- useful for exploring communication of risk and uncertainty

Knowledge Sharing

Aim	Nature	Emphasis	Model
Knowledge sharing	Two way negotiation, consultation	Context	Dialogue Democracy

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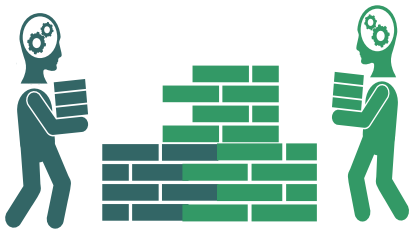
- Workshops (Climate Change Impacts and Implications)
- Panel discussions associated with events
- Social media discussions (Jamie Curry)
- Supporting Partnership Director
- Stakeholder meetings
- Funding development of a game

Knowledge Building

Aim	Nature	Emphasis	Model
Knowledge building	Knowledge co-production, multi-directional	Content and Context	Participation Engagement



Eg. Consensus conference, hackathons, citizen/participatory science, co-creation/ co-production workshops

- Research of public interest
- Research agenda can be negotiated

Knowledge Building

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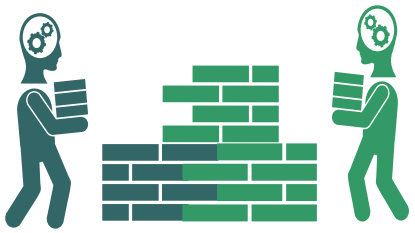

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- Deep South Dialogues – and associated research funding
- Stakeholder workshops (research agenda)
- Citizen Science – Weather@Home
- Representative User Group
- Partnership Director – feeding back research priorities
- **Funding** engagement research with citizen panels
- Capacity-building opportunities

Image: @bryanMMathers

… but there are things to keep in mind

audience

empowerment

process

listening

messaging

responding

what success looks like

Understanding how information is interpreted

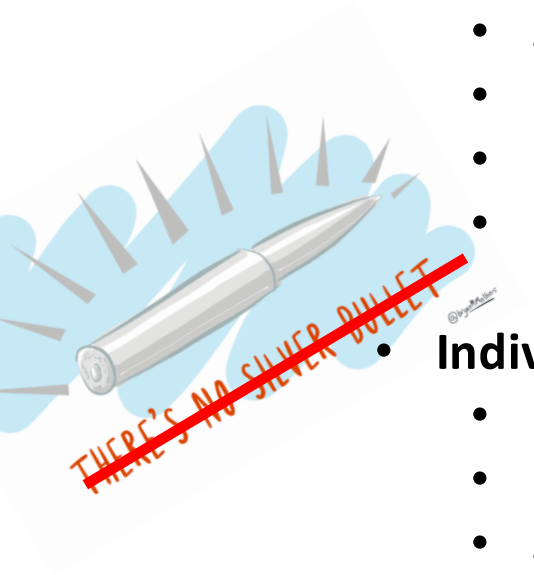
evaluation

tailored engagement

Image: @bryanMMathers

… Science in Society group

- **Undergraduate Minor** in Science in Society
- **New Master's** in Science in Society
  - Starting March 2018
  - Opportunities for internships
  - Focused on theory and practice
  - Full time (1-year) or part time (3-years)



- **Individual Courses, Workshops and Presentations**
  - Communicating Controversial Sciences
  - Climate Science and Decision-making
  - Science Communication
  - Science Writing

- **Research into Public Engagement**
  - Theoretically-grounded engagement activities
  - Engagement strategies (climate change, conservation, water quality, data complexity)
  - Consulting, judging, critiquing

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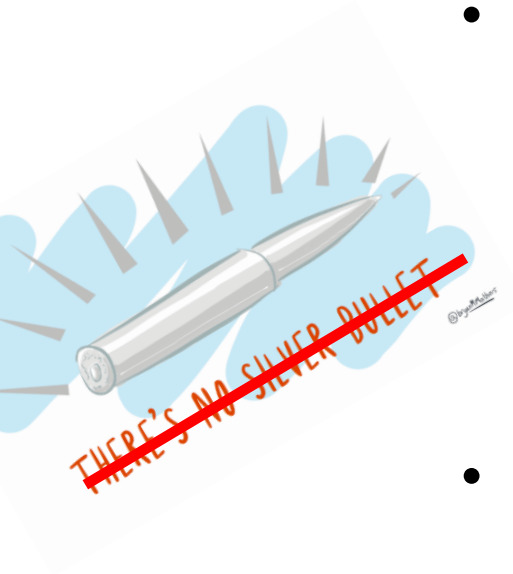
Practical ways we'd like to work with you:



- **Funding/Support** available for Engagement activities specific to your community/sector/region

DSC Expertise available – eg at conferences, workshops, symposia, for one-one one meetings

- **Capacity Building** – more "climate ambassadors"

Contact: Susan Livengood, Partnerships Director
Susan.Livengood@vuw.ac.nz

The Deep South National Science Challenge

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Rhian.Salmon@vuw.ac.nz