Principles and Structures of Science Advice

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International Network of Government Science Advice (INGSA)

Operates under the aegis of International Science Council

Concerned with all dimensions and levels of science advice to policy makers

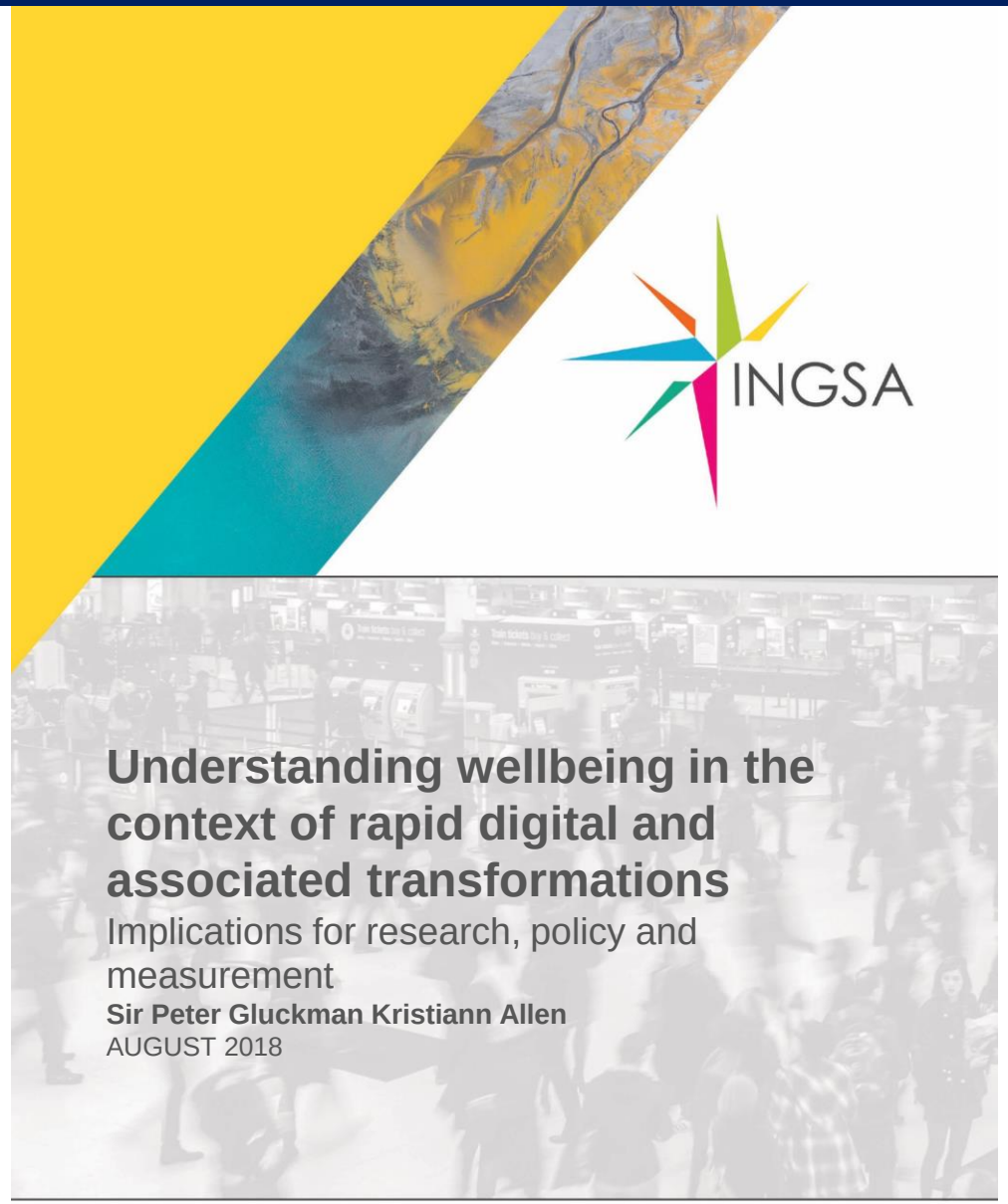
- Networking
- Research and academic network
- Capacity building workshops (individuals, academies, institutions)
- Thematic workshops
- Partnerships (eg with JRC, UNESCO)
- Hosts Foreign Ministries Science and Technology Advisors Network (FMSTAN)

Membership : academics, practitioners, policy makers (>4000 members, >75 countries)

- African, Latin American, Asian, European, North American chapters
- Science Diplomacy division (SPIDER).

www.ingsa.org

International Network for Government Science Advice



https://www.ingsa.org/wp-content/uploads/2018/10/INGSA-Digital-Wellbeing-Sept18.pdf

SPIDER: Science Policy in International Diplomacy and External Relations

- A division of INGSA: chair Vaughan Turekian (USA)
- Open to academics, diplomats etc. interested in science diplomacy
- Meets jointly with FMSTAN
    - Technology facilitation and information exchange
    - Issues such as role of disruptive technology on nation state autonomy
    - Ethical conduct of scientists in transnational emergencies
    - Science in ODA
    - Science and science diplomatic perspectives on SDGs
- Next meetings are in Vilnius in June 2019 then Vienna Nov 2019.

More information: www.ingsa.org or g.mills@auckland.ac.nz

The evolving science-policy nexus

- The nature of science is changing
- The relationship between science and society is changing
- The nature of policy making is evolving
- The relationship between society and the policy ‘elite’ is changing
- Evidence informed policy making sits at the nexus of science, policy and society and the ecosystem itself varies – different needs in different contexts:
  - level of governance
  - different targets – politicians, policy makers, public, media, agencies, cities, international organizations
  - different purposes – from crisis to forecasting
- It is evolving into a distinct set of institutions and individual skills

The science – policy nexus

- Virtually every challenge governments face has a scientific dimension, which may or may not be recognised
- But science alone does not make policy; many values and political considerations
- We also face the challenge of a post-expert, post-elite, post-truth world
- Presumption: *That governments are more likely to make better choices when they use well-developed evidence wisely*
- What is a fact, what is data?
- Is robust science available? Who defines it as 'robust/reliable'?
- Will it be used, misused, manipulated or ignored?

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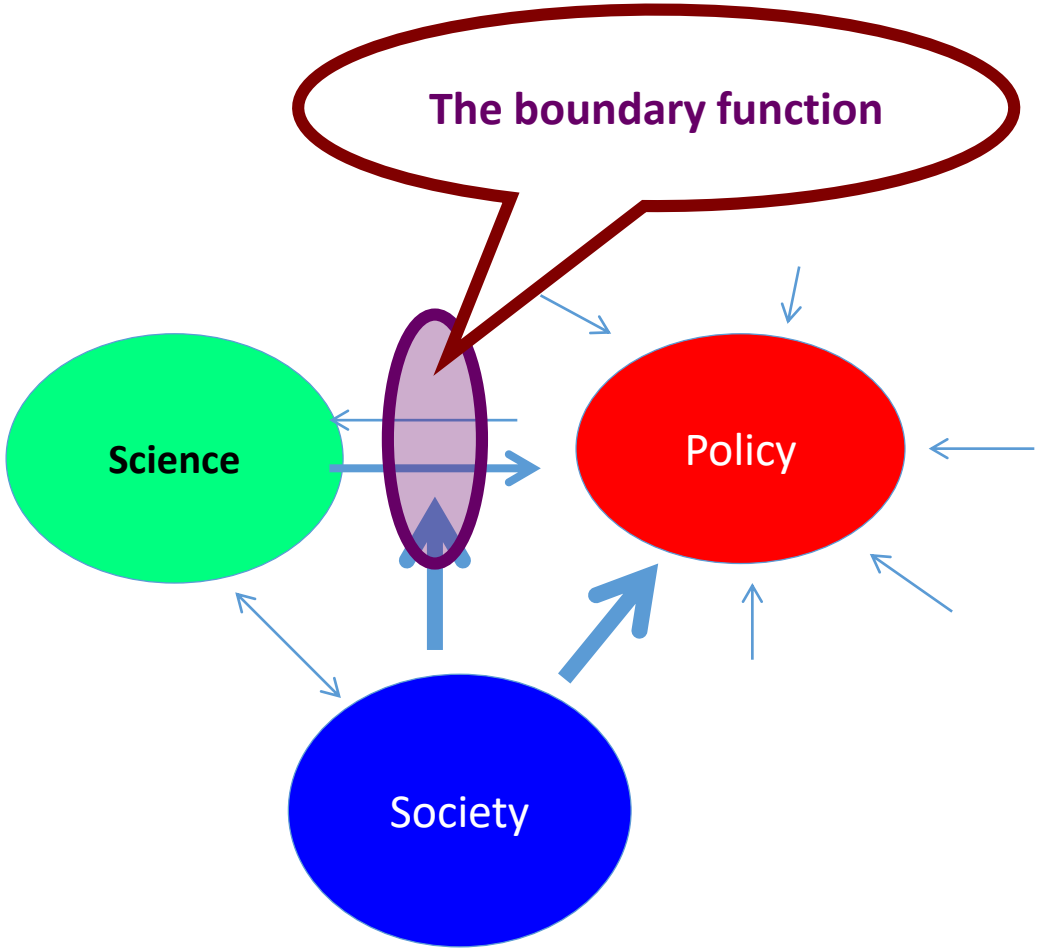
Science and policy making

- Science and policy making are distinct cultures, methods and epistemologies
- The nature of the interaction is influenced by context, culture and history and by the relationship between science and society
- The place of societal values is very different in science and policy making
- How these interactions operate will on the framings of intent by different parties

- There is increasing recognition of the value of boundary structures to link these cultures.



Science and policy making

- Policy is rarely *determined* by evidence but policy can be and should be informed by evidence

- Inputs into policy
  - The science

    Evidence of need, possible solutions, impact
  - Public opinion
  - Political ideology
  - Electoral contract
  - Fiscal objectives and obligations
  - Diplomatic issues, international obligations

Science in the 21st century

- Increasingly science is embedded within society rather than standing apart from it
- It is now a tool of national and international development and is placed in a more utilitarian framing by Governments
- The need for science in the policy process is increasingly claimed
- The explosion of knowledge and the pace of innovation is both an opportunity and a challenge for society and governments
- The issues of the ‘crisis in science’
  - Quality and quantity
- The issues of social license for science and technology are growing
- And the nature of science itself has changed and is changing

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Changing nature of science

- From linear to non-linear
- From singular to multidisciplinary to systems- based
- Accepting complexity
- From certainty to probabilistic
- The impact of big data and AI

- From normal to post-normal…
    - The science is complex
    - Facts uncertain
    - There is much which is unknown
    - Stakes are high
    - Decision making is urgent
    - There is a high values component and values are in dispute

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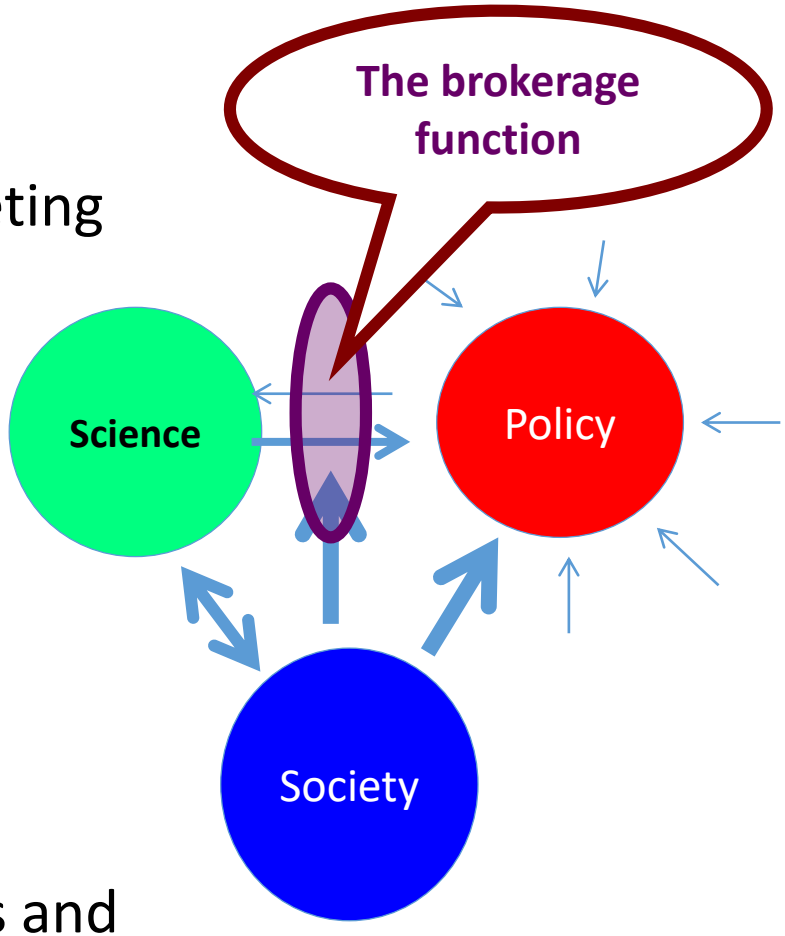
The post-normal perspective

The science applied or needed in the policy space is often 'post-normal'

- Complex system-based analysis with multiple and competing knowledge streams
  - Uncertain and incomplete knowledge
  - Stakes are high and decisions are urgent
  - Values in dispute
- Science advisory systems must be cognizant of these characteristics to be effective
- The importance of social sciences, humanities etc.
- Failure to recognize these issues can make policy makers and politicians skeptical about the utility of science.



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Science and values

- Science is not values-free: scientists make values-based decisions all the time:
  - what to study; what methodology; what is considered sufficient evidence for conclusions…
- But the scientific method is designed to limit (or identify and mitigate) the influence of human values on the collection and analysis of data
- But the biggest value judgments in science are the quality and sufficiency of data on which to reach a conclusion.
- And there is nearly always an inferential gap between what scientists know and what conclusions they reach

- How science is *used* by society is intimately and inherently values-rich
- And policy is inherently values-rich

The challenge of science being used as a proxy for values debates

- Societal values discussions are difficult
- Politicians often avoid them
- Science has frequently been misused as a proxy for what are primarily values debates:
  - Climate change
  - GMOs
  - Reproductive technologies
  - Stem cells
  - Water fluoridation
  - Harm reduction strategies
- Science cannot usually resolve irreconcilable worldviews

The challenge of science at the policy-societal nexus

- Too much science
- The changed nature of science
- The challenge of values within and beyond science
- The post-normal nature of much science
- Post-truth
- Different perceptions of risk
- Different perceptions of expertise
- The behavior and reciprocal perceptions of scientists and policy makers
- The utilitarian poistioning of science

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The science–policy nexus in a post-fact world

The ease of information access has changed the public dynamic

The net is awash in ’facts’ but whose facts are they?

This access to facts allows many to assume they need no further interpretation

But the ‘facts’ selected are generally a biased set chosen by past framing and the biases of the echo chamber of social and mainstream media and generally reinforcing prior biases.

This is the environment where experts can be ignored, deprecated or considered irrelevant

This is the environment of post-facts, post-elite and post-truth

And yet policy makers still have to act and are expected to make good decisions!

Scientists and policy making

- Scientists are
  - Good at problem definition
  - Very good at public advocacy (and pleading for money !)
  - Less so at finding workable, scalable and meaningful solutions
  - They often approach the policy maker with considerable hubris.
  - They often do not understand the complexities of policy making
  - They can have difficulty taking a multidimensional/ multidisciplinary perspective
  - They may fail to consider the multiple domains that go into policy formation
  - They often fail to recognise that more science will not generally resolve differing world views
- But they still have critical roles in the policy process

Policy-making

- Policy making often has objectives which may not always be clear and are generally impacted on by acute externalities as well as by political and societal values.
- It is about making choices
    - between different options
    - which affect different stakeholders in different ways
    - with different consequences,
    - many of which are not certain
- Virtually all policy making carries complexity risk and uncertainty :
    - But perceptions of complexity, risk, cost and benefit vary between stakeholders
- The political perspectives of stakeholder effects, interests, electoral positioning and electoral risk are always present

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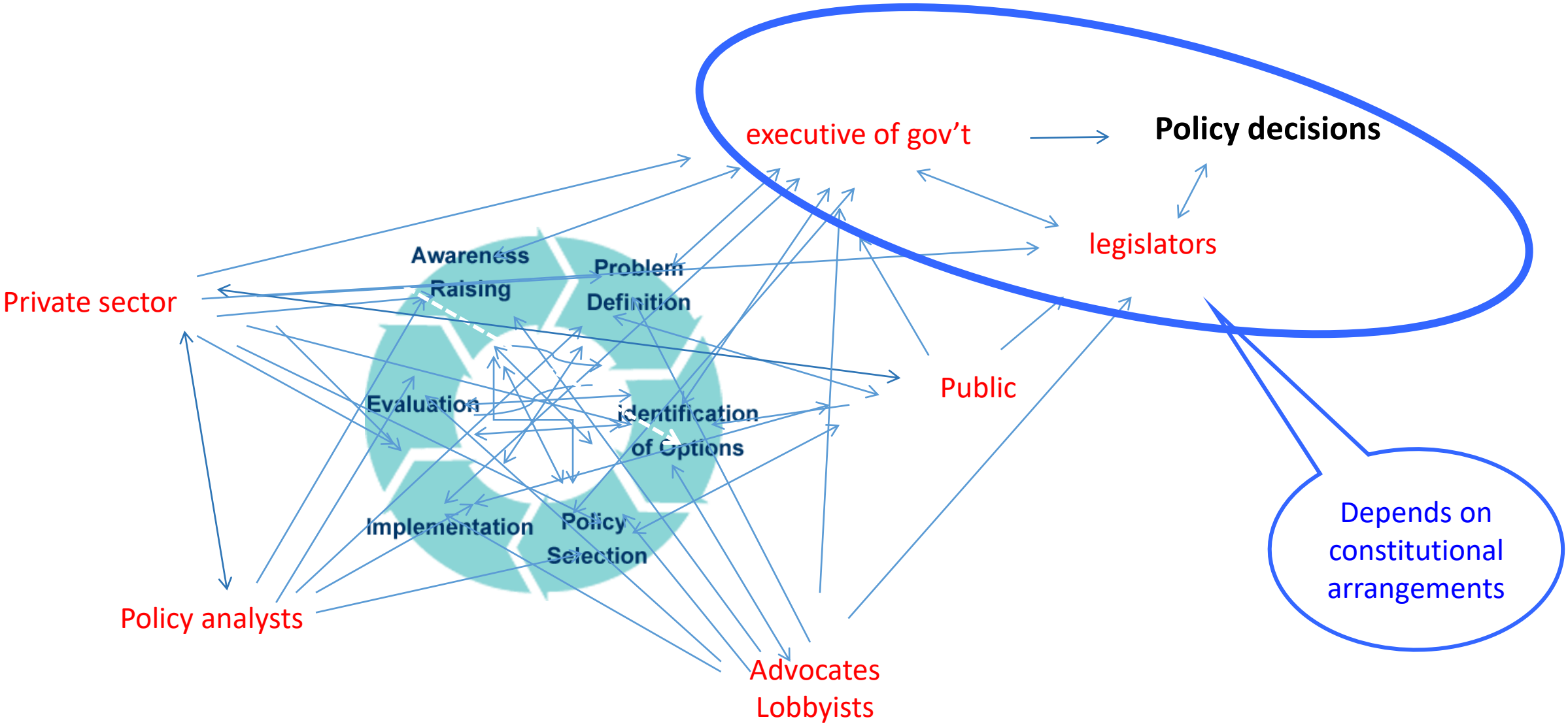
What is evidence ?

- Politicians and policy makers have many sources of evidence
  - Tradition and prior belief
  - Local knowledge
  - Anecdote and observation
  - Science
- Data does not equal information, does not equal knowledge/evidence
- Science is defined by its processes which are designed to reduce bias and enhance objectivity by minimizing values.
- Important value judgments lie within science especially over what question and how to study it and especially over the sufficiency and quality of evidence on which to draw conclusions.
- But the use of science by society is values rich – but in general these are a much more broader set of societal values


Awareness Raising
Problem Definition
Identification of Options
Policy Selection
Implementation
Evaluation


executive of gov't
Policy decisions
legislators
Private sector
Awareness Raising
Problem Definition
Evaluation
Identification of Options
Implementation
Policy Selection
Public
Depends on constitutional arrangements
Policy analysts
Advocates
Lobbyists

Policy makers

- Have limited bandwidth and often limited manoeuvrability
- They are constrained by electoral, fiscal and other considerations
- They lurch to problems, often driven by externalities
- The policy cycle is generally very short and getting shorter
- Most relevant science is incomplete and much is ambiguous
- They may see scientists as good at problem definition but not pragmatic (in the policy/political sense) solution finding
- They cannot be expected to be scientific referees
- Policy makers see evidence is one of a number of inputs
    - In what sense is it privileged and how is that privilege maintained? The role of the broker?

Barriers on the ‘demand’ side

- Policy directed evidence versus evidence informed policy (the policy-political interface)
- Turf protection
- Hubris
- Assumption that science cannot help in complex issues where knowledge is contested
- Policy silos
- Past exposure to scientists as advocates /lobbyists
- Lack of understanding of the scientific process and value
- Misuse of evidence synthesis hierarchies
- Superficial approaches to data analytics
- Mr Google and Mr Wikipedia
- Training in public policy has shifted towards policy management

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Beyond the evidence alone - perspectives of policy makers and politicians

- Why do we have to do something now?
- Why is it a priority?
- Have we got the option that meets our broader needs?
  - Who will it benefit, who wont it benefit?
  - Does it benefit priority stakeholders?
  - What are the risks and to whom?
  - What is the political risk of doing or not doing?
- What will it cost?

Purposes of evidence in informing policy

- To provided explanation of complex (open) systems so options can be explored
- To define options for action to achieve a particular outcome(s) and explore implications of each option

- To address a particular implementation issue or scientific question
- Emergencies/crises

- To define and plan an intervention
- To evaluate the impact and effect of the intervention

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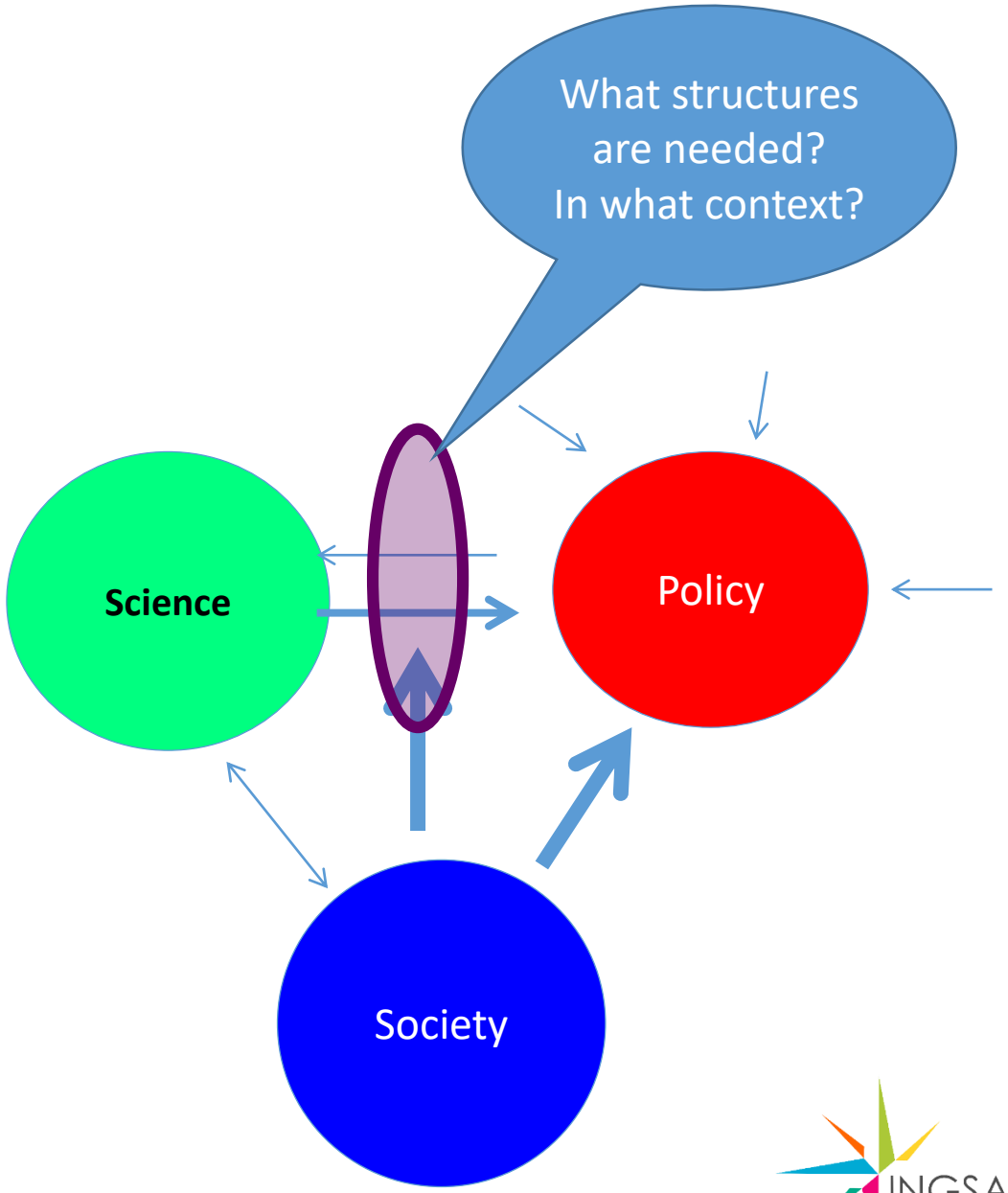
The interface (science – policy)

- **Is there a question; are the answer and the question aligned?**
- Advocacy or brokerage?
- Solicited versus unsolicited?
  (matching Q and A)
- Formal versus informal?
- Internal or external ?
- Deliberative or responsive?



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Informal mechanisms
(CSAs)

- Is a key need of leaders and governments
- Brain storming
- Critical challenge to the policy maker
- Instant and responsive
- Role in crises
- Can impact very early in policy cycle and repeatedly
- Requires a high level of integrity and trust
- Relies on individuals
- Is a conduit to deliberative science advice (matching Q and A)

Formal mechanisms
(CSAs, academies, commissions)

- Much depends how the question is framed and by whom (supply side or demand side)
- Agenda can be compromised by committee dynamics and interests
- Can usually only input at a single point in policy process (not sufficiently supple and iterative)
- Hard to be timely or responsive
- Offers key opportunity for inclusiveness and legitimacy = trust

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Internal versus external inputs

- Internal
  - That close to the executive of government
    - Informal
    - Instant in crises
    - Repeated and iterative
    - Identify opportunity and need
    - Conduit to science community

- External
  - The broader academy
    - Expert committees, professional bodies, national scientific academies
    - Generally deliberative and formal
    - Single point intervention

Different roles in a science advisory ecosystem

	Knowledge generators	Knowledge synthesizers	Knowledge brokers	Policy Evaluation
Individual academics	+++	++		+
Academic societies/professional bodies		+		
Government employed practicing scientists	+++	+		++
Scientist within regulatory agency		++	++	
Independent think tanks		+++	+	+
What works units etc		+++	+	++
National academies		+++	+	
Government advisory boards/science councils		++	+	
Science advisors to executive of government		+	+++	
Science advice to legislators		+	++	±

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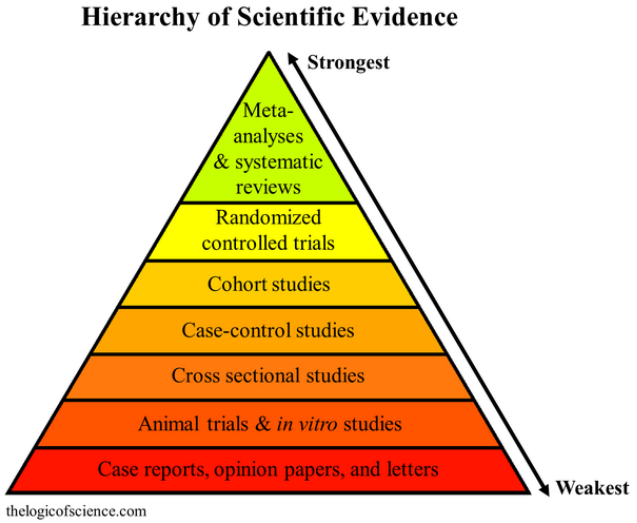
The nature of advice

	Policy for science	Evidence for policy: options (strategic)	Evidence for policy implementation	Evidence for policy evaluation	Horizon scanning	Crises
Individual academics	+	±	±	±	±	
Academic societies/profess'l bodies	+++	+	+	±	±	
Gov't employed scientists		+	++	+	+	+
Scientists within regulatory agencies		+	++	++		
Independent think tanks		+++	±	±	+++	
What works units etc			++	±		
National academies	+++	+			+	
Gov't advisory bds/science councils	++	+	+		+	
Science advisors	+	++++	++	++	++	+++
Advice to Legislators	+	++		+	+	

The challenge of evidence synthesis

- Different types of evidence synthesis are needed for different policy questions
- Evidence synthesis is a particular skill to avoid cherry picking and bias.
- Formal hierarchal processes have some use generally for simple interventional questions but have been used in complex contested situations (eg IPCC)



The construct of science advice: the concept of brokerage

- What is known, what is the consensus
  (need, impact, alternatives, monitoring etc)
- What is not known
- Other caveats
- The inferential gap, risk management
- How it relates to other considerations
- Options and tradeoffs

Purposes of evidence in informing policy

- To provide explanation of complex (open) systems so options can be explored
- To define options for action to achieve a particular outcome (s) and explore implications of each option

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To provide explanation of complex (open) systems so options can be explored

- Fresh water in New Zealand
- NZ prides itself on a clean green environment and promotes tourism on that basis.
- Yet growing public concern over state of fresh water due to intensive farming (especially diary – our biggest industry)
- Intense politicized contestation about the issue, what to do about it and even how to measure water quality.
- Much of the conversation was simplistic.
- The purpose of a report was simply to explain the complexities of fresh water so that all stakeholders, public and official, has some common understandings

OFFICE OF THE PRIME MINISTER'S CHIEF SCIENCE ADVISOR
Professor Sir Peter Gluckman, KNZM FRSNZ FMedSci FRS Chief Science Advisor

New Zealand's fresh waters: Values, state, trends and human impacts

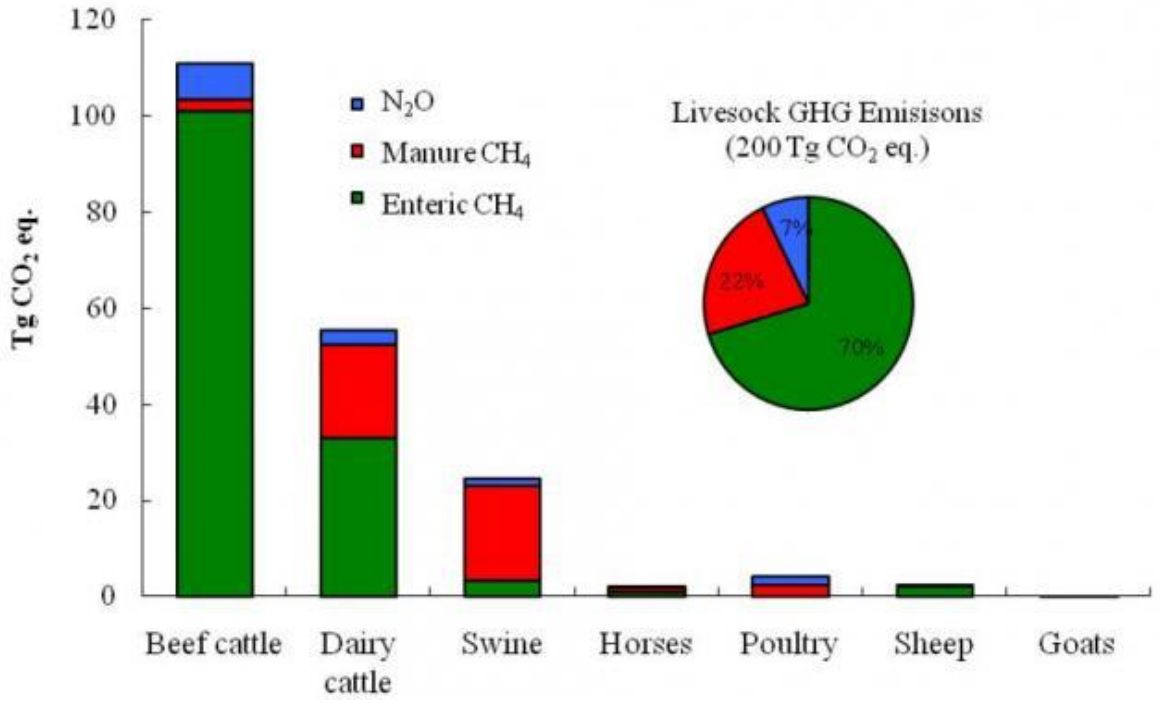
12 April 2017

https://www.pmcsa.org.nz/wp-content/uploads/PMCSA-Freshwater-Report.pdf

To define options for action to achieve a particular outcome (s) and explore implications of each option

- Over 50% of New Zealand ’s GHG emissions come from agriculture
- Primarily methane and nitrous oxide arising from intensive dairy, beef and sheep farming.
- In particular dairy farming has been highly valuable and much marginal land has been converted to dairy.
- Addressing GHG emissions is a high political and public priority
- But equally maintaining a robust economy which is built on agriculture is essential.
- Tension between environmental and economic goals
- CSA asked to evaluate what could be done

- **Mitigating agricultural greenhouse gas emissions:**
- **Strategies for meeting New Zealand's goals**
- July 2018



https://www.pmcsa.org.nz/wp-content/uploads/Mitigating-agricultural-GHG-emissions-Strategies-for-meeting-NZs-goals.pdf

To define options for action to achieve a particular outcome (s) and explore implications of each option

- Extensive stakeholder consultation and then report
- Improvements in farm practice without adopting new technologies would provide some improvements
- Regulating land use would gain more but had important social and political implications
- No toolkit existed that could easily incentivise better practice – suggested farm plans
- Potential for chemical inhibitors of methane and nitrous oxide is there but requires science, social license and regulatory approval
- New forages made by GM or GE would have major effect but have significant societal and political implications
- Similarly alternate landuse for cropping etc would only become economical at scale with new plant breeding technologies.

To address a particular implementation issue or scientific question

- A major industry had built up in NZ testing homes for metamphetamine on surfaces leading to expensive remediation and in the case of social housing, to evictions etc
- This has been driven by media and political moral panic
- The case for doing testing and remediation was suspect.
- The CSA conducted a review:
  - Testing was done in no other jurisdiction except where illegal synthesis had been suspected or discovered
  - It was not done for passive surface contamination.
  - The surface levels from passive exposure were not within a toxic range
  - The report immediately led to a reversal of practice

Methamphetamine contamination in residential properties: Exposures, risk levels, and interpretation of standards

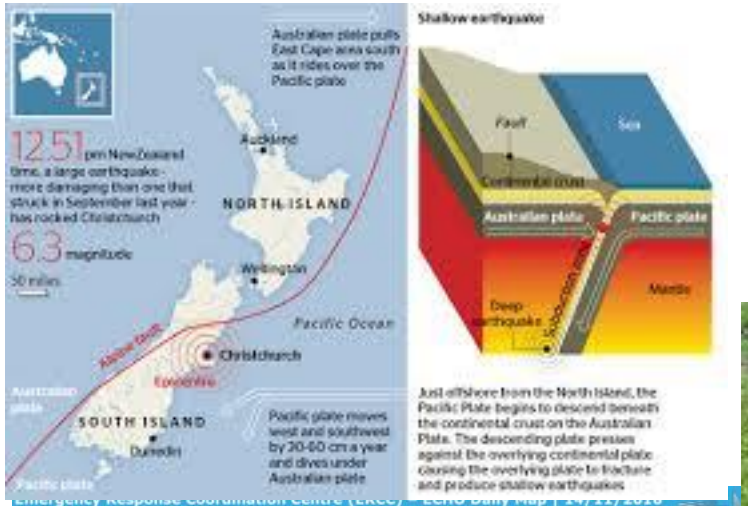
Credit: Radspunk, Wikimedia Commons

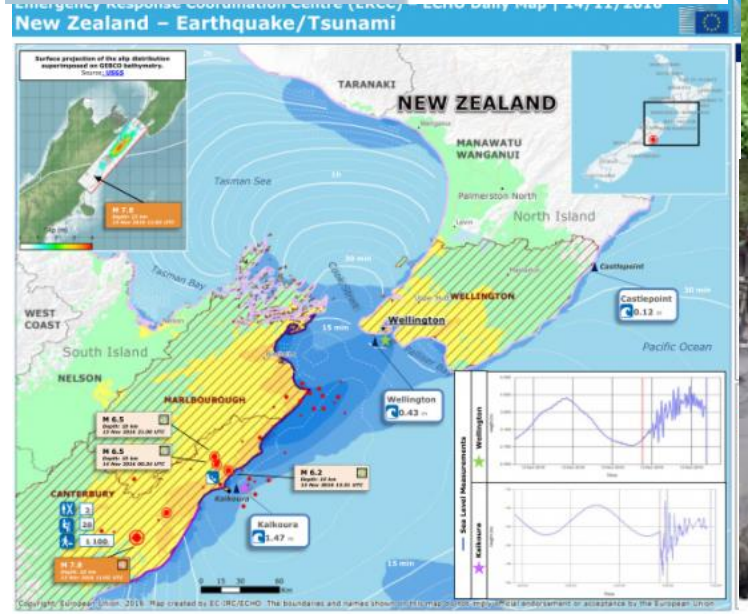
Editorial: Chief science advisor does New Zealand a favour

Barry Soper: Meth house myth - have we been duped?

https://www.pmcsa.org.nz/wp-content/uploads/Methamphetamine-contamination-in-residential-properties.pdf

Science advice in emergencies





Science advice in emergencies

- Arguably the most compelling reason for a CSA
- Needs a trusted interface between the technical and policy community
- Must be able to see issues or ask questions not necessarily seen by policy community or siloed response agencies
- Must be prepared
- Must understand risk, precaution
- Must be a trusted communicator
- Must be able to interpret options to the senior decision makers

The understanding of risk

- Actuarial/probabilistic
- Perceptional
  - The role of cognitive biases
    - Availability
    - Representational
    - Confirmational
    - Anchoring
    - Asymmetry
  - Perception of gains and losses, benefits and burdens
- Reputational and political
- The misuse of the precautionary principle

Many factors affect technological social license

The relationship between science and society
The state of evidence
Fitness for purpose

World views and disputed values
Cultural factors
- Spiritual beliefs
- Way of life

Societal structure and culture

Economic dimensions
Vested interests of particular stakeholders
Politics

Trust in the actors
Comfort with the old, fear of change
- Competition with incumbency
- Concepts of risk and precaution

Perceptions of cost and benefit

Key considerations in preparing advice

- Understanding the audience, context and timeline
- Are the question and the answer aligned
  - key role for the broker
  - Does the demand side understand what science can and cannot answer
  - Does the supply side understand clearly what the policy maker wants
  - Systems analysis, policy options, solution
- Brokerage versus advocacy
- Balanced and multidimensional evidence synthesis
- Stakeholder analysis (and engagement)
- Clarity of question, language, conclusions
- Consideration of other dimensions of policy input
- Clarity of presentation
  - Policy brief, report, visualisation

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Trust and science

- Individual scientists, scientists in professional organizations, NGOs, private sector legitimately engage in advocacy
- But advocacy is often associated with reduced trust in the message and can be seen as no different from other forms of lobbying

- Academies, advisory systems need to practice brokerage to be trusted. Trust and respect must be sustained with politicians, policy makers, publics and the science community.
- Trust is assisted by brokerage approaches (leaving the values to the policy makers and politicians), providing options (leaving choices to policy makers and politicians), and by avoiding hubris.
- Leaving the values to the policy maker and politicians is not easy but this does not mean that the conflation cannot be pointed out, indeed it must be.

The skillset needed and underpinning principles

- **Employing brokerage, avoiding advocacy**

- Diplomatic skills
- Policy entrepreneurship without advocacy
- Good communication skills to the four audiences
- **Understanding of the post-trust environment**
- **Avoiding hubris**
- **Maintaining integrity and trust with the four audiences**

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Governments are more likely to make better decisions when they use well-developed evidence wisely.

This will be true even when the issues are complex and contentious: well conducted knowledge brokerage to society, policy maker and politician can lead to better outcomes.

To do this they need a multi-valent science advisory ecosystem and a response policy community.