Principles of science advice
& understanding risk within that context

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Science and technology advice

Informing or influencing policy through evidence involves much more than simply providing policymakers and politicians with results of scientific and technological research or risk assessments and expecting that these results are applied to policy deliberations and decisions.

Changing nature of science

•From linear to non-linear
•From singular to multidisciplinary to systems- based
•Accepting complexity, from certainty to probabilistic

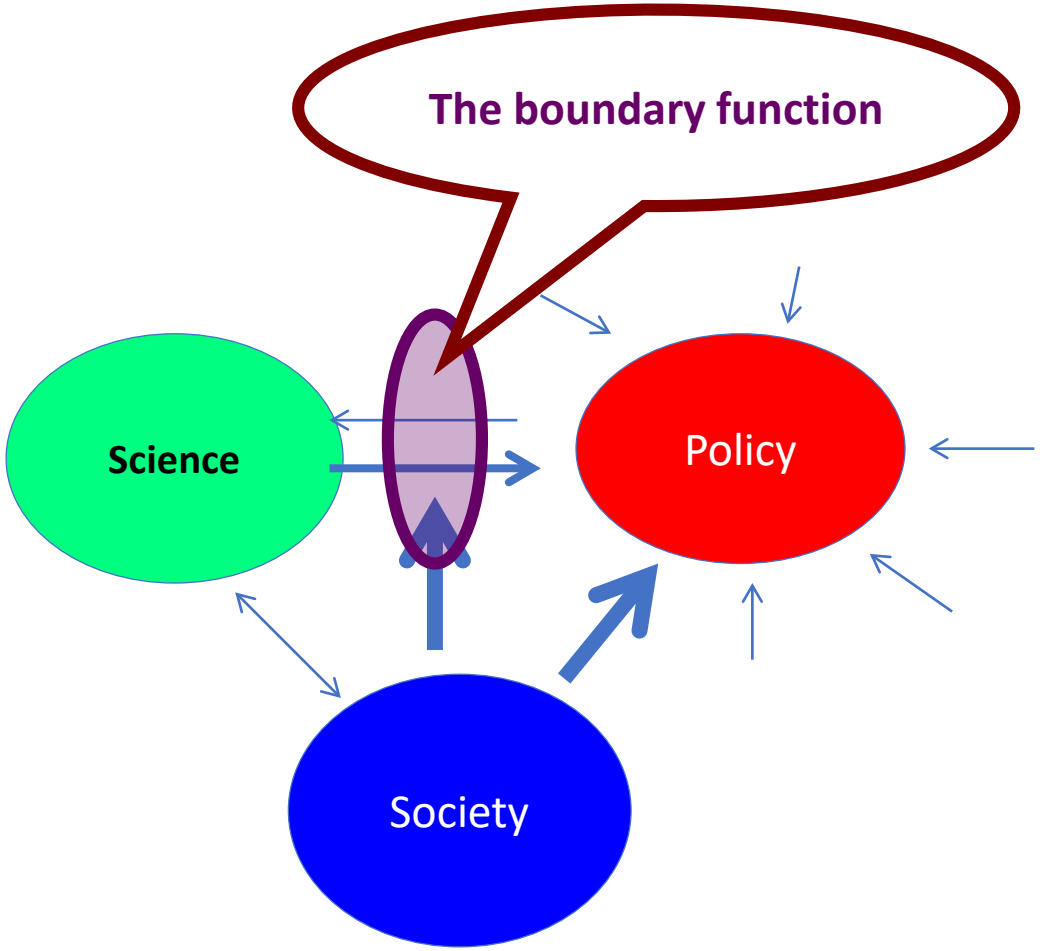
•The impact of big data and AI applied to big data

•From normal to post-normal…
- The science is complex
- The science is impacting increasingly on society
- Facts uncertain, there is much which is unknown
- Stakes are high and decision making is urgent
- There is a high values component and values are in dispute

- The science applied or needed in the policy space is often ‘post-normal’
- It is inevitable that in this context issues of, and differences, in risk perception arise

Science and policy making

- Science and policy making are very distinct cultures, methods and epistemologies
- The place of societal values is very different in science and policy making
- There is increasing recognition of the need for boundary structures to link these cultures.



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 increasingly 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?

THE SCIENTIST:

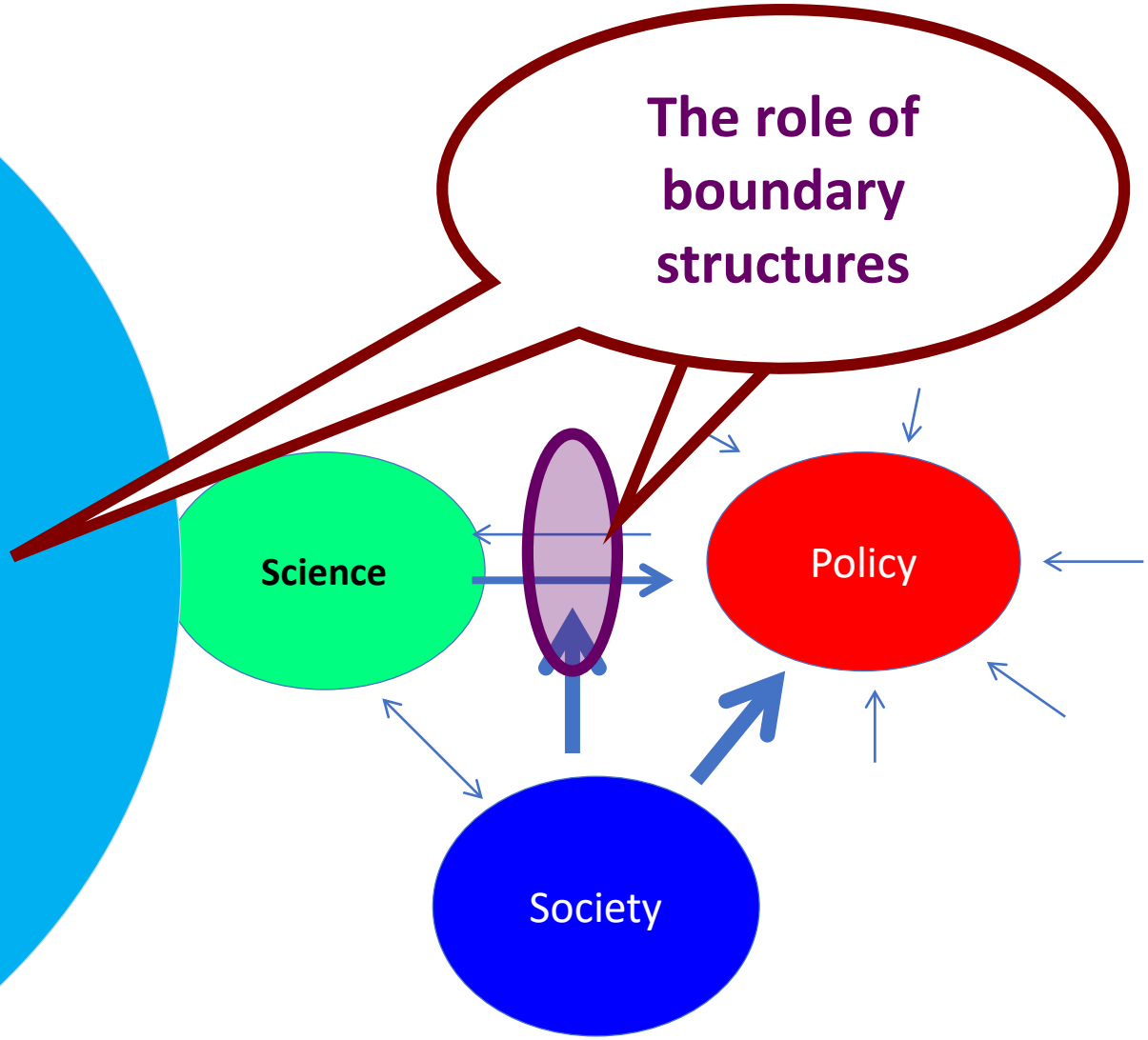
Brokerage
or advocacy?

THE POLICY MAKER

Pragmatic policy options
or politically driven policy options

THE POLITICIAN

Evidence informed policy
or policy informed evidence



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

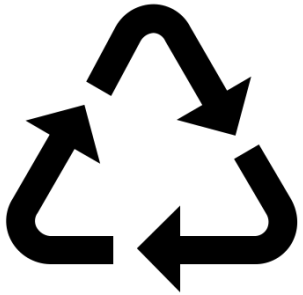
    Evidence of need, possible solutions, impact
  - Public opinion
  - Political ideology
  - Electoral contract
  - Fiscal objectives and obligations
  - Diplomatic issues and any international obligations

What is evidence ?

- Politicians and policy makers have many sources of evidence
  - Tradition and prior belief
  - Local knowledge
  - Anecdote and observation
  - Taxi drivers
  - 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

Policy-making

- Often has **mixed and not always clear objectives**. It is 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

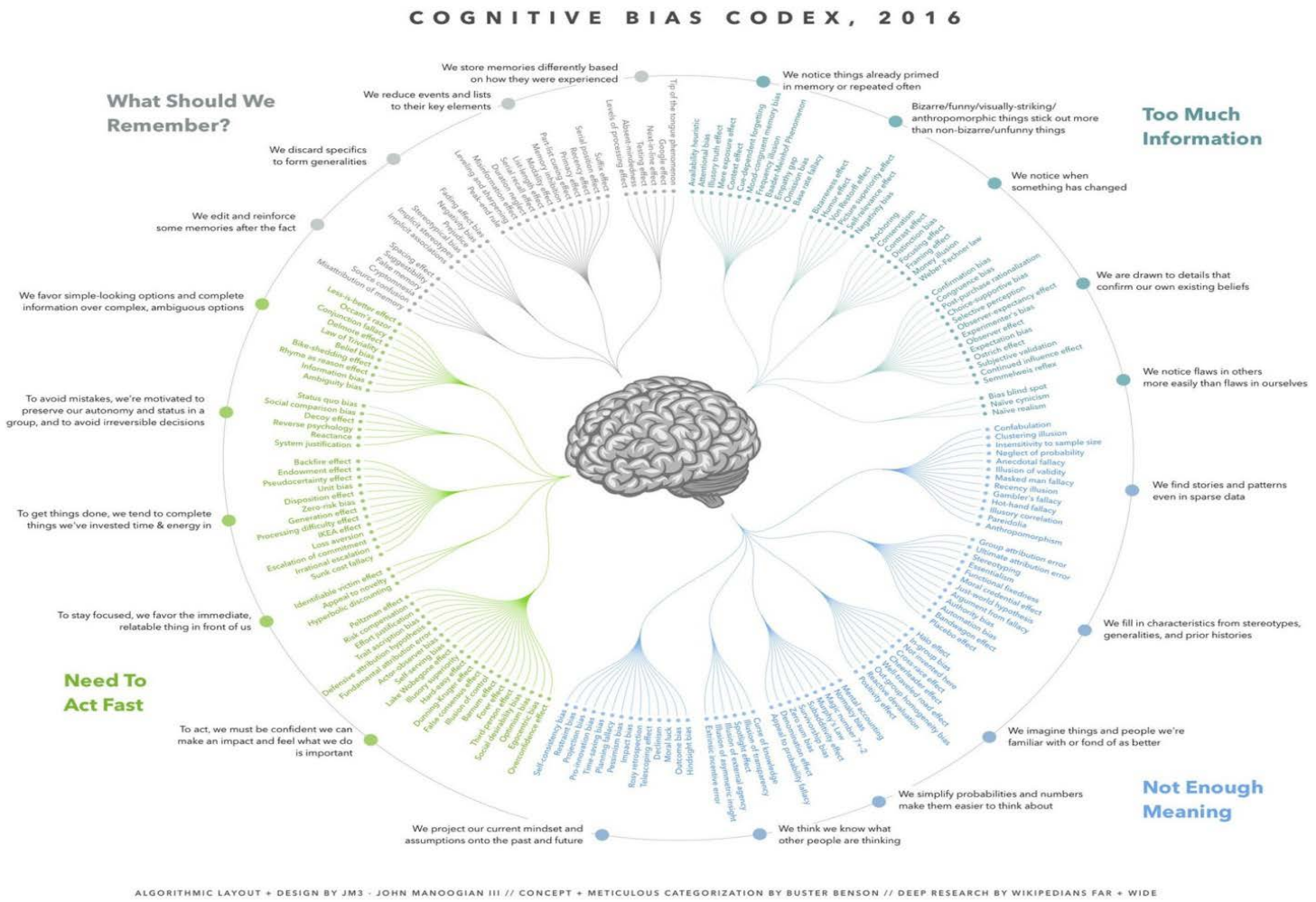
The understanding of risk

Actuarial/probabilistic

- Hazards are not risks without exposure
- Risk is a function of hazard, frequency and intensity of exposure, resilience and sensitivity
- Risk registers are valuable policy support tools
- Is important to distinguish acute events from trends as they involve differing preparation
- But the problem of rare high impact events ('black swans') is a policy and political problem
- Explanation of risk; the need to separate absolute from relative

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



The understanding of risk

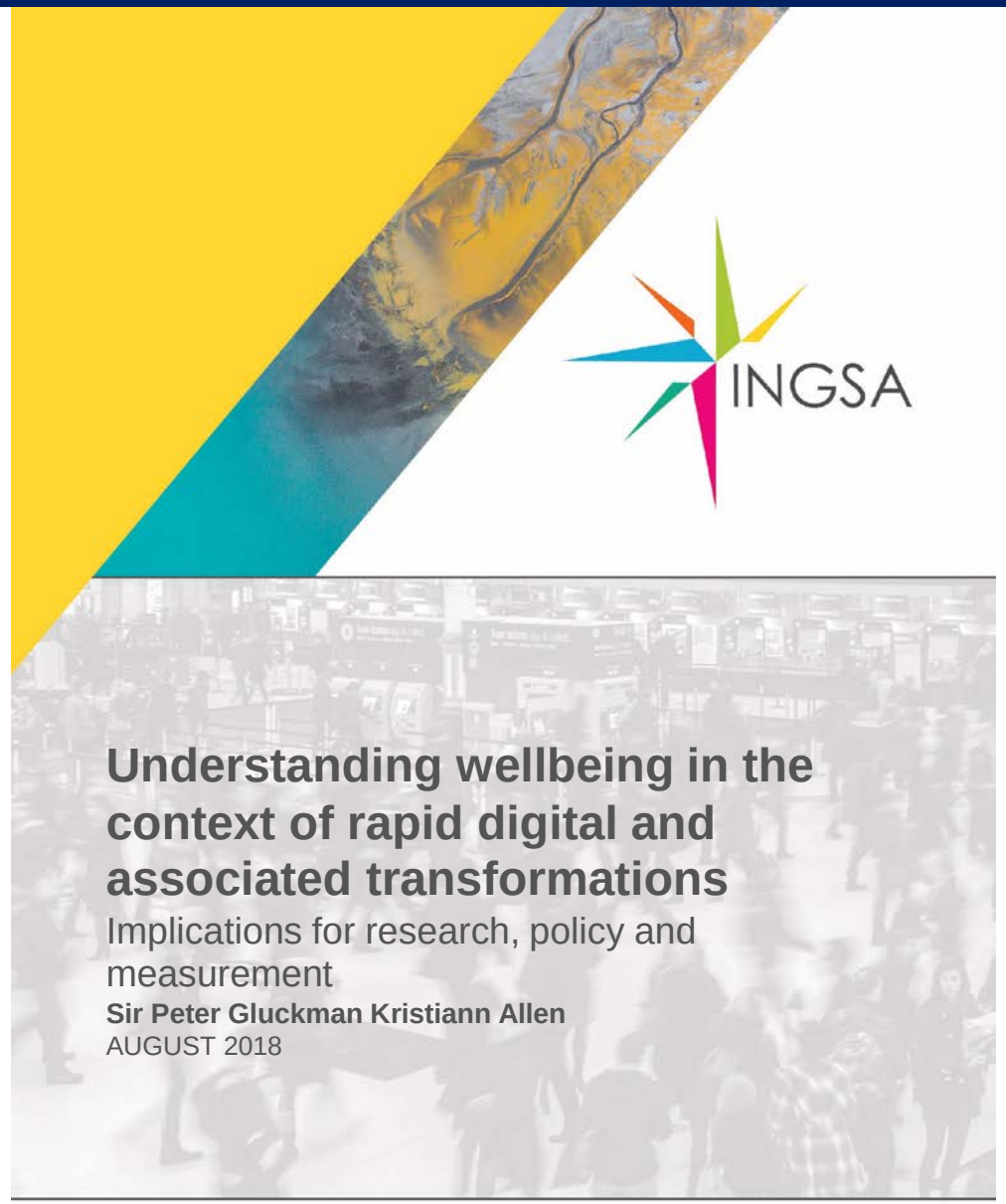
- **Actuarial/probabilistic**
- **Perceptional**
- **Reputational and political**

The understanding of precaution

- The precautionary principle was intended to lead to adaptive management leading to changes in regulatory control of technologies as more is learnt of its risks
- But the post-normal nature of the issues new technologies confront can mean that science becomes a proxy for other debates and precaution can become a political rather that an actuarial risk tool
- The flood of new technologies (digital, IOT, AI, GE, meiotic gene drive, brain enhancement, human machine interfaces) creates the need for more adaptive technology management tools

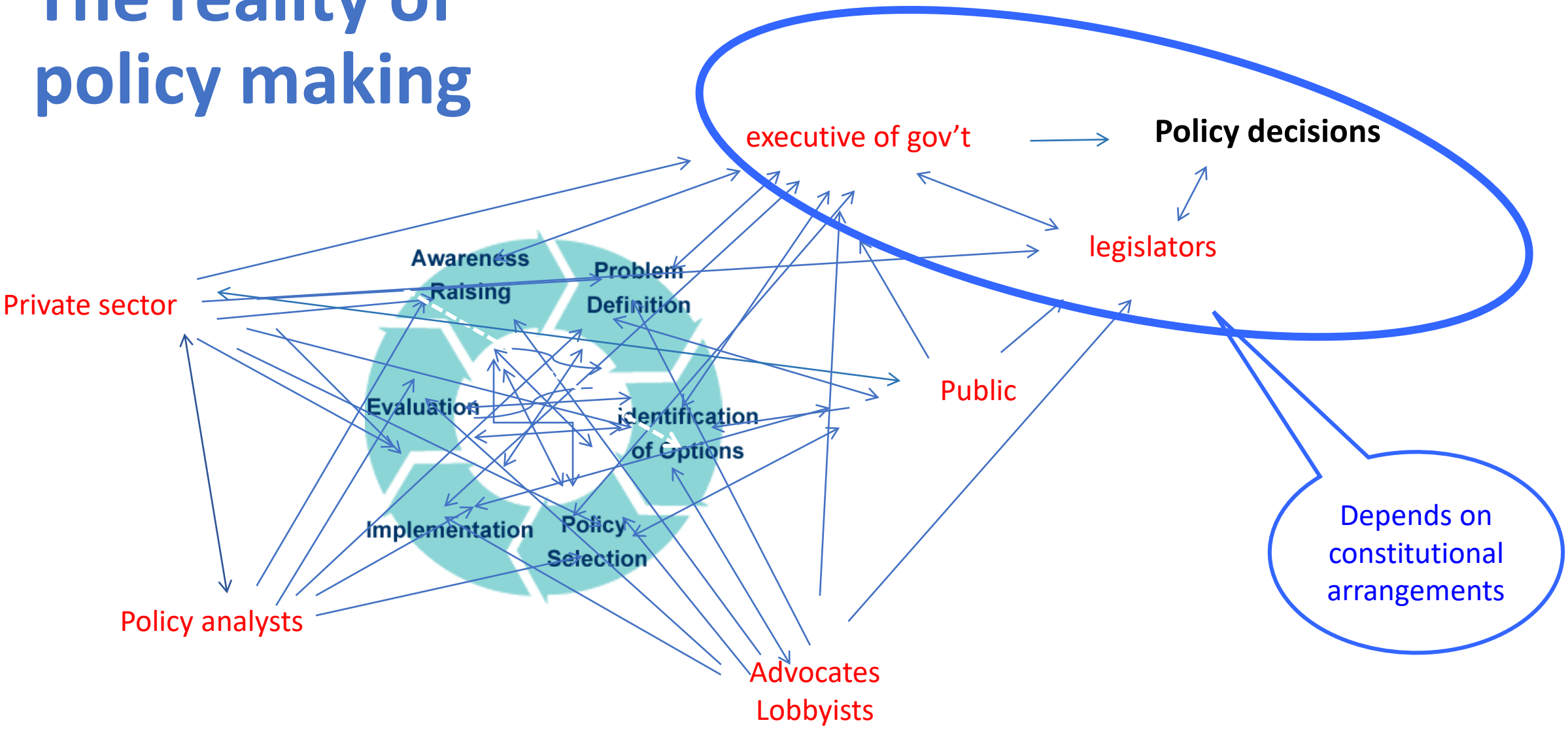
Some challenges ahead

- Tradeoffs to address global commons and sustainability
- Real crises
  - Natural disasters
  - Technological disasters (industrial failure, software failure, infrastructure failure)
  - Human-induced crises (cyber, terrorism)
  - Biological disasters (epidemics)
- Manipulated crises
  - Deep fakes
  - Manipulated news
- Technological change
  - Digital
    - AI
    - IOT
    - Autonomous weapons
  - Life sciences – GE, meiotic gene drive
  - Human machine interfaces
- Anti-scientism/ post truth/ populism
- Anti-expert



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

The reality of policy making



Questions that the policy audience will always have:

- 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?

Scientists and policy making

- Scientists are
  - Good at problem definition
  - Very good at public advocacy
  - Less so at finding workable, scalable and meaningful solutions
  - They often approach the policy maker with considerable hubris.
  - They often do not understand the complex processes of policy making
  - They can have difficulty taking a multidimensional/ multidisciplinary perspective
  - They often fail to recognise that more science will not generally resolve differing world views

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
- Much relevant science is incomplete and much is ambiguous
- They may see scientists as good at problem definition but not at 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?

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

Barriers on the 'policy' side

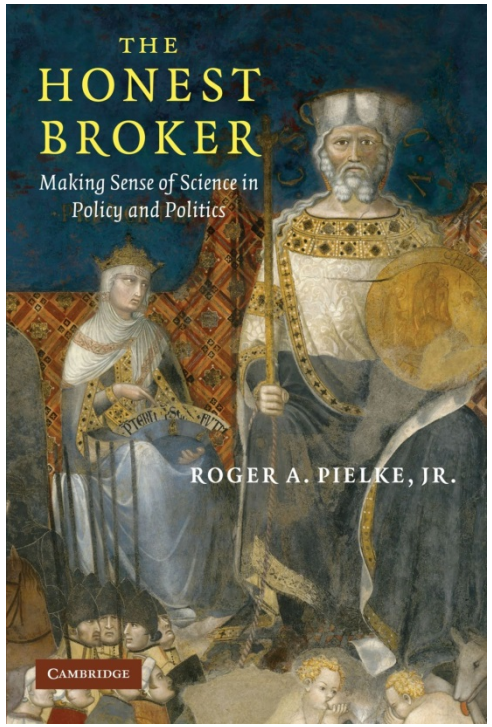
- Policy directed evidence versus evidence informed policy (the policy-political interface)
- Turf protection, Hubris
- Not recognizing when science is needed or can help
- Assumption science cannot help in complex issues where knowledge is contested
- Policy silos
- Past exposure to scientists as advocates /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
- Trend in public policy training has shifted towards policy management

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		+	++	±

Advocacy versus brokerage

- **The Issue Advocate** is the scientist who collects and presents data with a view to servicing a cause
- **The Honest Broker** tries to identify and overcome biases to present what is known, what is not known, what is the scientific consensus, what are the implications for policy and action and the tradeoffs of various options



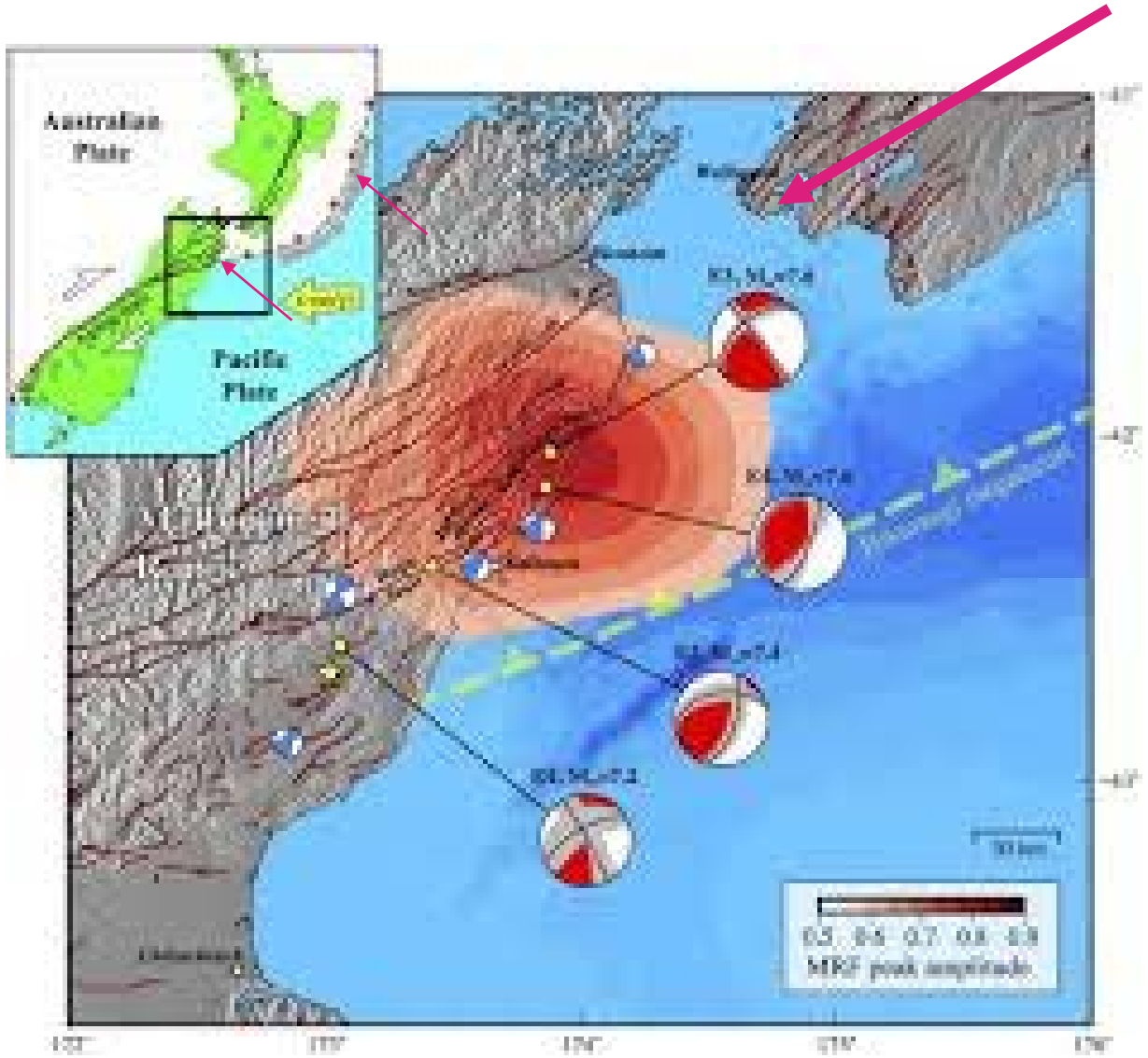
Roger Pielke, Jr (2009)
The Honest Broker

The nature of advice

	Policy for science	Evidence for policy: options	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	+	++		+	+	

Science advice in crises

- Many countries have a crisis management group (eg COBRA in UK, ODESC in NZ)
- Increasingly countries recognizes the value of a very senior scientist in the room
  - To ask the question from a different point fo view
  - To ensure the right technical and scientific advice is achieved and preprepared where possible
  - To make sure the scientific advice is understood by non-scientists
  - To think about the longer term issues


Australian Plate
Pacific Plate

OFFICE OF THE PRIME MINISTER'S SCIENCE ADVISORY COMMITTEE
Professor Sir Peter Gluckman

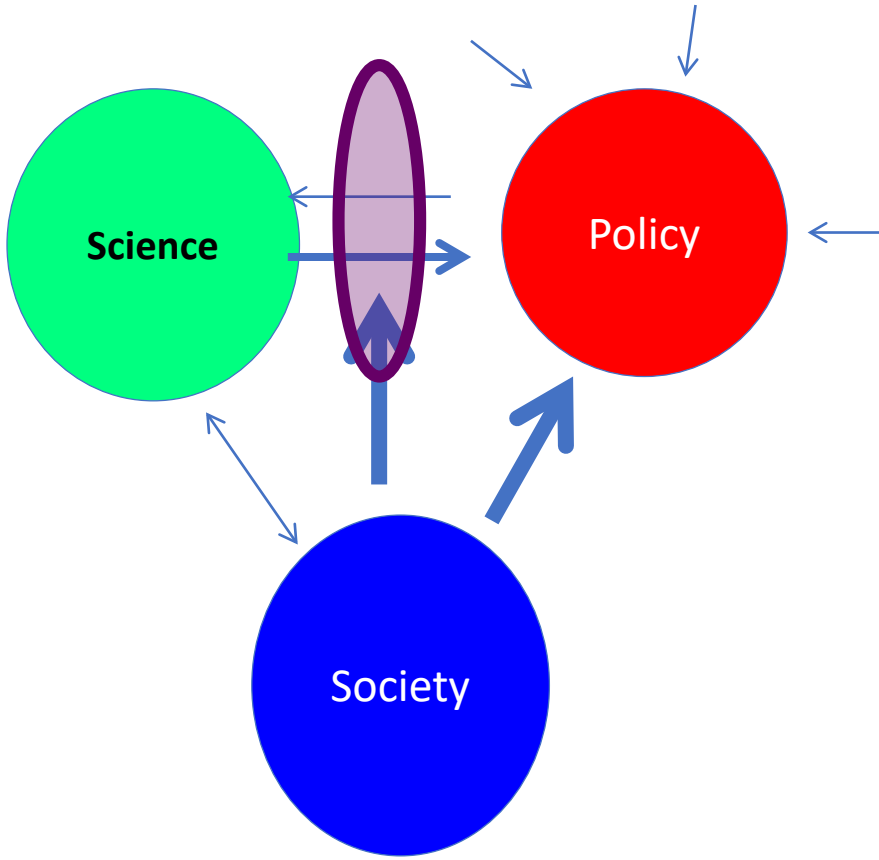
The psychosocial consequences of the Canterbury earthquakes

A briefing paper

10 May 2011

The interface

- The policy process ultimately always involves public values
- Public values are not necessarily responsive to more evidence
- Science can be used as a proxy in values debates
- Science has still to understand best how to have dialogue with and impact on collective knowledge
- This is made more complex by ‘e-democratization’ of knowledge - echo chambers, information bubbles, diminished collective diversity of knowledge formation, leading to claims of self –expertise.
- And truth-decay affects this further
- Trust in science is also affected by factors internal to science
- Lessons from post-normal science need to be turned into practice



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.

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

www.ingsa.org

International Science Council

- An integral part of the ISC for **science-policy** and **science-diplomacy**
- Over 5000 members from over 100 countries
- Secretariat based in Auckland (SciPoDS)
- Regional chapters: EU, NA, LATAM, Asia, Africa
- Science international relations and diplomacy division (SPIDER), also hosting FMSTAN
- Knowledge centre
- Forum for sharing, coordinating, networking
- Capacity building activities
- Open access learning resources
- Reports and research