Principles and Structures of Science Advice – placing within a city perspective

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Auckland, July 2017

The science – policy nexus

- Presumption: That governments at all levels are more likely to make better decisions when they use well-developed evidence wisely
- Virtually every challenge governance at all levels from local to global face has a scientific dimension which may or may not be recognised
- The need for an effective and trustworthy science advisory ecosystem even at a local level

Science has traditionally been a peripheral player in the urban debate of the last 5000 years – technology has traditionally provided the urban-science interface in cities.

We don’t have a rule book or a toolkit for integrating science in the way we develop the urban narrative….

Finding the value chain for science from influencing decision-making through to guiding implementation is critical.

We are entering a more scientifically orientated era for cities. It will require fresh thinking qround skills, diffferential institutional structures, different forms of governance, partnerships.

Debra Roberts; IPCC co-chair, chief resilience officer of Durban

SUSTAINBLE DEVELOPMENT GOALS

Why cities matter

- Where most people live – how do they want to live, work, play?
- Where impacts on social and environmental health are appear most intensely
- Urbanisation induces multiple environmental, social, health and infrastructural challenges
- Cities are the units of innovation and hubs for:
  - Ideas
  - Commerce
  - Culture
  - Science
  - Productivity
  - Social development (and challenges)

Science and policy making

- There are few areas of local government policy in which evidence, knowledge and science cannot assist;

  - Infrastructure (energy, transport etc)
  - Innovation
  - Resource management
  - Environmental protection
  - Social issues
  - Housing
  - Demography
  - Health, education, justice
  - Use of technologies

Urban challenges and science

- The lack of governance clarity national/local
- Single issue local politics versus party positions
- The need to get beyond planning silos and develop a systems approach
- The need for an integrated approach involving natural, social and engineering sciences
  - Demography
  - Environment
  - Social
  - Human
  - Economic
  - Infrastructure
  - Transport
- Horizon scanning, forecasting
- The need for implementation science at a local level (eg behavioural insights)

Opportunities??

- Big data
- Sensors
- AI

- Synthetic biology
- Vertical farming

- Energy systems (eg waste recycling)

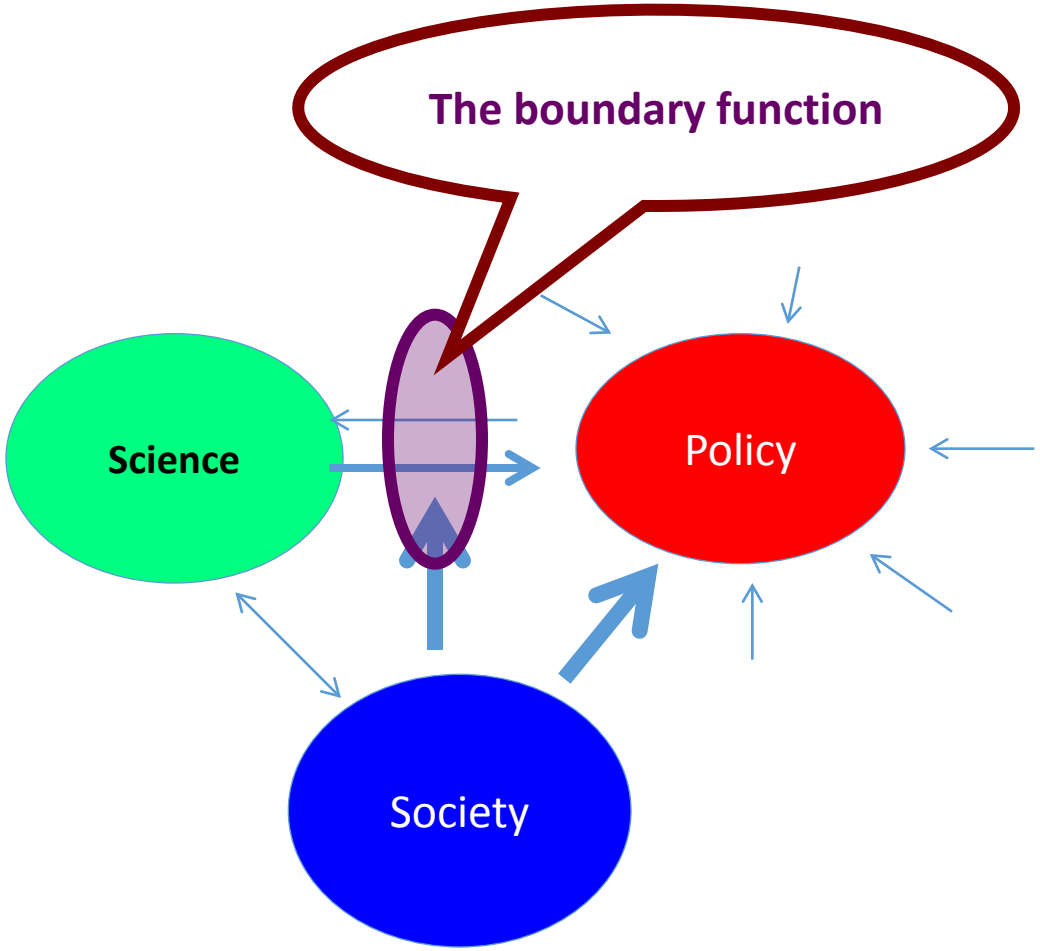
- Integrating social and physical sciences

The science – policy nexus

- Presumption: That governments at all levels are more likely to make better decisions when they use well-developed evidence wisely
- Virtually every challenge (local) 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
- But we also face the challenge of a post-expert, post-elite, post-truth world
- Is robust science available? Will it be used, misused, manipulated or ignored?
- The need for an effective and trustworthy science advisory ecosystem - even at a local level (but there is no consensus yet as to the optimal model)

Science and policy making

- Science and policy making are very distinct cultures
- The nature of the interaction is influenced by context, culture and history *and by the relationship between science and society*
- There is increasing recognition of the importance of boundary roles and structures to link these cultures
- The nature of boundary entities is variable and evolving: there will not be a one-size-fits-all model



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
- It is evolving into a distinct set of skills

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 understood
- The explosion of knowledge and the pace of innovation is both an opportunity and a challenge for society and governments
- The issues of social license for science and technology are growing
- And the nature of science itself has changed and is changing

Changing nature of science

- From linear to non-linear
- From singular to multidisciplinary
- Accepting complexity
- From reductionist to systems based

  From certainty to probabilistic
- 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

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

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

- And policy is inherently values-rich
- Post-normal science engages and confronts values constantly

‘Values’ has distinct meanings in considering post-normal science and policy making

Integral to science

- Critical thinking
- Skepticism
- Ethics
- Integrity of the processes
- Avoid in bias in collection and analysis of data
- Acknowledging the limits of data and the inferential gap
- Judging the sufficiency of evidence

Integral to individuals and society

- Cultural, political and religious
- Egoistic, social-altruistic or biospheric
- Hierarchal vs individualistic
- Past experience
- Indigenous and local knowledge
- Cognitive biases

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

- Values discussions are difficult
- Science has frequently been misused as a proxy for what are primarily values debates:
  - GMOs
  - Water fluoridation
- Science cannot usually resolve irreconcilable worldviews

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

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

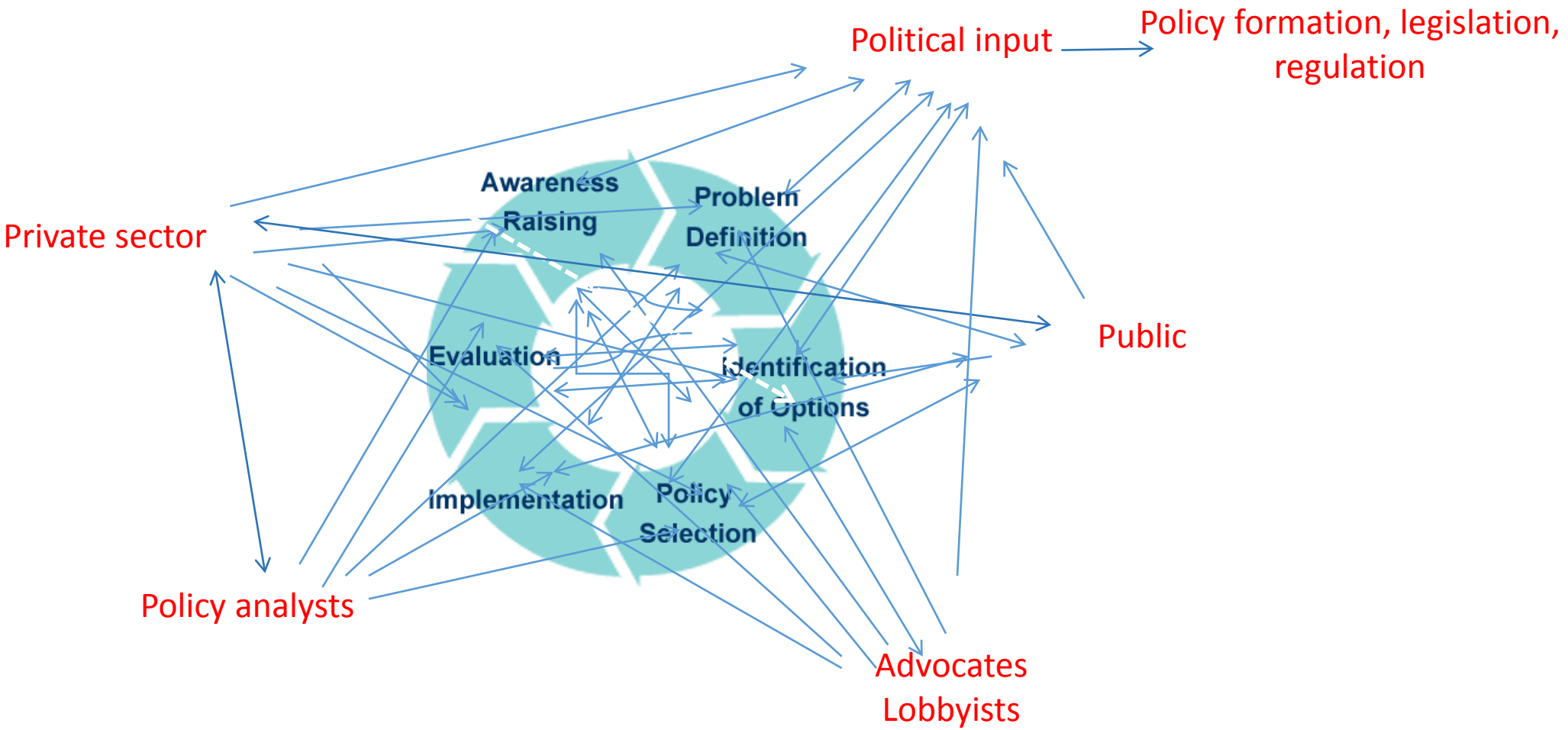
- Hypothesis: at the city level the weight of the role of evidence may differ

What is evidence ?

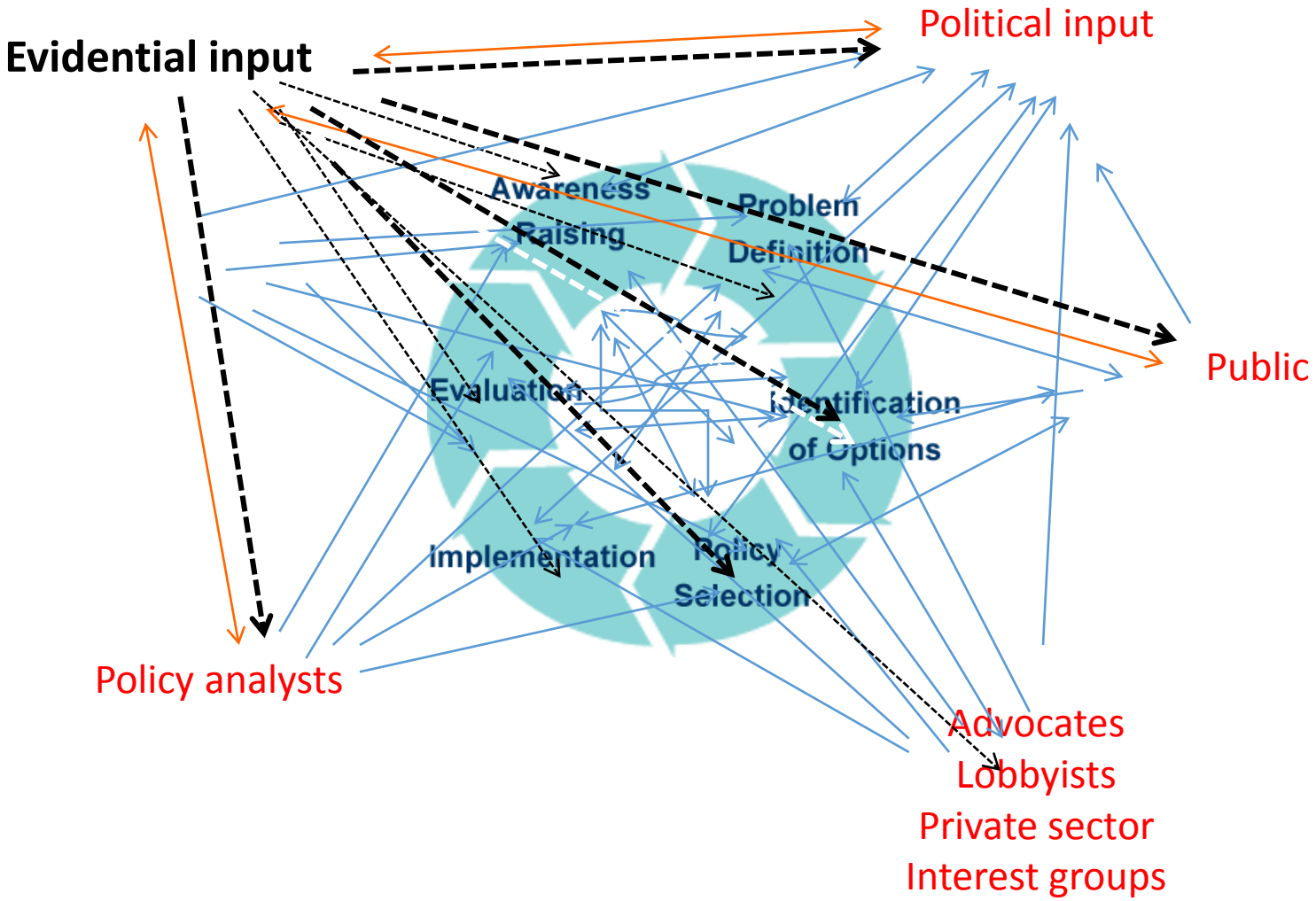
- Politicians and policy makers have many sources of evidence
  - Tradition
  - Prior belief
  - Anecdote and observation
  - Science
- Scientific evidence is argument supported by information produced according to a set of formal processes
- Scientific processes aim to obtain relatively objective understandings of the natural and built world. Science is defined by its processes which are designed to reduce bias and enhance objectivity.
  - But important value judgments lie within science especially over what question and how to study it. But the most important in the context of policy is the sufficiency and quality of evidence.

- The policy process is rarely as described in textbooks

Policy making is messy



So what is the value of science advice in the ‘post-trust context?



More important than ever

But it matters how it is done

It needs sensitivity to the complex dynamics

It needs to work with this complex entanglement of formal and informal actors

Policy makers

- Have limited bandwidth and often limited manouvrability
- They lurch to problems
- The policy cycle is generally very short and getting shorter
- Most relevant science incomplete and much is ambiguous
- They cannot be expected to be scientific referees
    - The need for translation and brokerage
- 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
- Different perceptions of risk
- Different perceptions of expertise
- The behavior and reciprocal perceptions of scientists and policy makers
- The utilitarian poistioning of science
- Implications for the future of public science

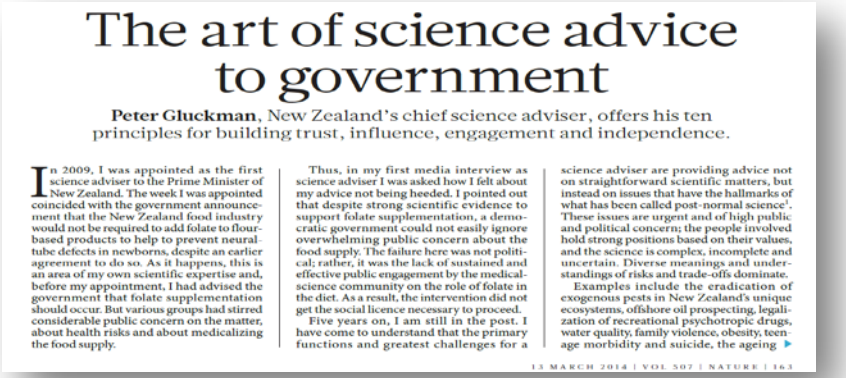
The construct of science advice: the concept of brokerage

- 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

- Science does not make policy, it informs policy by elucidating options.

Principles and guidelines for science advising

- Trust
- Humility/Avoidance of hubris
- Distinguish *science for policy* from *policy for science*
- Understand science informs and does not make policy
- Protect the privilege of science
- Recognize the limits of science
- **Brokerage not advocacy**
  - What is known, what is the expert consensus
  - What is not known and other caveats
  - The inferential gap, risk management
  - How it relates to other considerations, alertness to social implications
  - Options and tradeoffs
  - It is not giving an absolute recommendation



The art of science advice to government

Peter Gluckman, New Zealand's chief science adviser, offers his ten principles for building trust, influence, engagement and independence.

In 2009, I was appointed as the first science adviser to the Prime Minister of New Zealand. The week I was appointed coincided with the government announcement that the New Zealand food industry would not be required to add folate to flour-based products to help to prevent neural-tube defects in newborns, despite an earlier agreement to do so. As it happens, this is an area of my own scientific expertise and, before my appointment, I had advised the government that folate supplementation should occur. But various groups had stirred considerable public concern on the matter, about health risks and about medicalizing the food supply.

Thus, in my first media interview as science adviser I was asked how I felt about my advice not being heeded. I pointed out that despite strong scientific evidence to support folate supplementation, a democratic government could not easily ignore overwhelming public concern about the food supply. The failure here was not political; rather, it was the lack of sustained and effective public engagement by the medical-science community on the role of folate in the diet. As a result, the intervention did not get the social licence necessary to proceed.

Five years on, I am still in the post. I have come to understand that the primary functions and greatest challenges for a science adviser are providing advice not on straightforward scientific matters, but instead on issues that have the hallmarks of what has been called post-normal science'. These issues are urgent and of high public and political concern; the people involved hold strong positions based on their values, and the science is complex, incomplete and uncertain. Diverse meanings and understandings of risks and trade-offs dominate.

Examples include the eradication of exogenous pests in New Zealand's unique ecosystems, offshore oil prospecting, legalization of recreational psychotropic drugs, water quality, family violence, obesity, teenage morbidity and suicide, the ageing ▶

13 MARCH 2014 | VOL 507 | NATURE | 163

Peter Gluckman
Nature, 13 March 2014

Five overlapping dimensions of science advice

- From technical advice to regulatory advice to policy advice
- Time scales from immediate (crisis) to deliberative to foresighting
- Informal/formal
- Internal to the policy system (eg science advisors) to external to the policy system (independent academies)
- From local to national to international

International Network for Government Science Advice

Informal mechanisms

- Is a key need of leaders and governments
- Brain storming
- Critical challenge to the policy maker
- Instant and responsive
- Can impact very early in policy cycle and repeatedly
- Requires a high level of integrity and trust
- Relies on individuals
- But is not unaccountable
- Is a conduit to deliberative science advice

Formal mechanisms

- 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

Different roles in a science advisory ecosystem

	Knowledge generators	Knowledge synthesizers	Knowledge brokers	Policy implementation
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		+	+++	+
Science advice to legislators		+	++	±

The nature of advice

	Policy for science	Evidence for policy: options (strategic)	Evidence for policy: Implementation (operational and tactical)	Evidence for policy: Evaluation (strategic and tactical)	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 to executive	+	++++	++	++	++	+++
Science advisor to legislators	±	+	++	++	+	

Expert input

- When does a city rely on its own expert opinion?
- When does it rely on central government scientific input?

  - Fluoride
  - Water quality
  - Environmental standards
  - Building standards
  - New technologies

How should cities get science advisory input ?

- Is it any different to other levels of government?

- Internal expertise
- External expertise

- Need for brokerage
- Need to link to other layers of governance and input

How cities/regions get science advisory input

- Do they need external input?
  - CSA - eg Southampton
  - Advisory boards
  - Formal engagement of academia; eg Gauteng City- Region Observatory http://www.gcro.ac.za
- Or can they rely largely on internal input
  - CIO – eg Chicago
- Danger of being too narrow; foresighting, trans-disciplinary, behavioural insights etc
- Has Auckland really exploited its academic and innovation resources?

INGSA

INGSA founded in 2014 under the aegis of ICSU
Memorandum of understanding with UNESCO
Concerned with all dimensions and levels of science advice

Networking
Research
Forum, resources, networking
Capacity building
Thematic workshops (eg foreign ministries, environment, migration)
Partnerships (eg with JRC, OECD, ICSU)
Principles of science advice (WSF 2017)

Membership is free : academics, practitioners, policy makers (>2800 members, 75 countries)
African and Asian chapters established. Latin American chapter in development.
Science diplomacy chapter in development; **urban chapter in development**

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