



INGSA Manifesto for 2030

Scientific Advice for the Global Goals

DRAFT FOR CONSULTATION

www.ingsa.org/manifesto/

Please respond by 31 January 2018

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1: THE CONTEXT FOR THIS DOCUMENT

In November 2015, the concluding declaration of the World Science Forum (WSF) in Budapest made a specific request for a set of principles and processes to underpin scientific advice.¹ The relevant section of the declaration reads:

“The need to define the principles, processes and application of science advice and to address the theoretical and practical questions regarding the independence, transparency, visibility and accountability of those who receive and provide advice has never been more important.....We call for concerted action of scientists and policy-makers to define and promulgate universal principles for developing and communicating science to inform and evaluate policy based on responsibility, integrity, independence, and accountability.”

The International Network for Government Science Advice (INGSA) was tasked with taking this forward, and reporting back to the WSF in Jordan in November 2017. An INGSA task-group was established to steer this process, co-chaired by Dan Sarewitz (Arizona State University, USA) and James Wilsdon (University of Sheffield, UK and INGSA Vice-Chair). Marc Saner (University of Ottawa, Canada) also played a key role.

In undertaking its task, INGSA began by reviewing and synthesizing a substantial body of earlier work, and related efforts to codify principles and guidelines in particular national systems, or international advisory bodies. We have assembled a list of these resources here: <http://www.ingsa.org/resources/ethics-and-principles/>.

Over the course of 2016 and 2017, INGSA then organised a series of consultative roundtables and workshops for practitioners, policymakers, ethicists, policy analysts and legal scholars. These included:

- A kick-off workshop in Brussels before the main INGSA conference (Sept 2016);²
- A parallel Global Young Academy workshop in Brussels (Sept 2016);³
- A side meeting at the Science Forum South Africa in Pretoria (Dec 2016);⁴
- A consultative session at the first Arab Leadership Dialogue on Science Advice to Governments at the Dead Sea, Jordan (Dec 2016);⁵
- A panel discussion at the AAAS Annual Meeting in Boston, USA (Feb 2017);

¹ <http://www.sciforum.hu/declaration/index.html>

² <http://www.ingsa.org/events/2016-conference/>

³ <http://www.ingsa.org/events/training-workshops/global-young-academy/>

⁴ <http://www.ingsa.org/ingsa-news/ingsa-wins-sfsa-diplomacy-award/>

⁵ <http://www.ingsa.org/events/training-workshops/middle-east-jordan-dec-2016/>

- A workshop on social science advice to policy, hosted by MCC-Berlin and Stiftung Mercator in Berlin (April 2017);⁶
- A side session at an OECD/JRC/Campbell Collaboration/INGSA conference on evidence-informed policymaking in Paris (June 2017);⁷
- A number of participants at these events made additional written contributions.⁸

As we began to draw together the findings of this process, we concluded that INGSA's most useful contribution would not be to produce another list of generic principles, or detailed guidance on the operation of advisory systems, as such material is readily available from a range of sources.⁹

Instead, we have developed an *INGSA Manifesto for 2030*, focused on how local, regional and national institutions and governments, and the international system, could strengthen scientific advice and evidence in support of the UN's Global Goals (Sustainable Development Goals, or SDGs).¹⁰ These are now a growing focus of INGSA's capacity-strengthening work, particularly in lower-middle income countries. The Manifesto sets out **six ingredients** of scientific advice for the SDGs.



This is a draft for consultation. We invite comments by **31 January 2018** online at <http://www.ingsa.org/>; or by email to Lara Cowen (l.cowen@ingsa.org).

A **final version** of the INGSA Manifesto will be launched in June 2018, alongside the 3rd meeting of the UN's STI Forum, at which point we hope individuals and organisations will add their support.

<http://www.globalgoals.org>

⁶ <http://www.ingsa.org/wp-content/uploads/2017/05/Summary-INGSA-MCC-Mercator-soc-sci-WS-Apr-2017.pdf>

⁷ <http://www.oecd.org/gov/evidence-informed-policy-making.htm>

⁸ <https://paulcairney.wordpress.com/tag/principles-of-science-advice/>; <http://www.ingsa.org/conference-news/science-advice-reflections-from-the-conference-by-heather-douglas/>; <http://www.ingsa.org/ingsa-news/if-the-principles-of-responsibility-integrity-independence-and-accountability-are-the-answer-then-what-was-the-question/>

⁹ See e.g. Science Council of Japan http://www.jst.go.jp/pr/info/info908/index_e.html; UK principles & guidelines <https://www.gov.uk/government/publications/scientific-and-engineering-advice-guidelines-for-policy-makers>; <https://www.gov.uk/government/publications/scientific-advice-to-government-principles/principles-of-scientific-advice-to-government>; OECD GSF report <http://www.oecd.org/newsroom/oecd-calls-for-common-principles-for-developing-and-communicating-scientific-advice.htm>; US National Academies on Using evidence in policymaking http://sites.nationalacademies.org/DBASSE/Evidence_in_Public_Policy/index.htm; and the Brussels Declaration on the Ethics and Principles for Science and Society Policy-Making <https://www.euroscientist.com/policy-making-manifesto-squaring-science-human-factor/>

¹⁰ <https://sustainabledevelopment.un.org/?menu=1300>

2: THE VALUE OF A MANIFESTO

Scientific knowledge has become a conspicuous element of governance processes at every level. This growing role emerges from changes in the type and complexity of challenges facing public institutions, and from the ever-evolving scope and capabilities of science itself. Amidst these changes, the appropriate processes and structures for providing expert scientific advice to governments are themselves highly context dependent. They are also under considerable stress.¹¹

Against this backdrop, this document lays out a manifesto to guide the organization and conduct of—and appropriate expectations for—science advisory processes at different levels of governance from local to international in the implementation of the UN’s Global Goals. Reports and documents in this area often assert a set of requirements or qualities of an advisory system (independence, accountability, etc.) without being clear about what these are, or what arrangements favor their emergence and maintenance. Our approach has been to look pragmatically at the conditions under which science advice is needed, within the particular context of the SDGs, and to see from that which design criteria are necessary.

There are several reasons why we think a manifesto is the right format for this task. A manifesto allows us to emphasize new directions and priorities. It is shorter and more pertinent than a detailed set of guidelines, and we hope it will engender engagement and debate. In short, we favour compass over detailed maps, deliberation over commandments, and filtering over comprehensive lists.

There is nothing new about the idea that expert scientific advisors can provide valuable insight and information to governments. The rise of organized science brought with it a broad awareness that wise action in the world could benefit from the type of knowledge that science could provide. By the 19th century, many modern states were bringing science to bear on socially important activities, ranging from agriculture and natural resource management to navigation and standardization of measures. They also continued to emphasize the utility of science in war and other military settings.

Only since the middle of the 20th century, however, has the idea gradually arisen that science advice itself should be a specific part of governance at a nation’s highest levels—that government leaders were facing challenges whose solutions required the type of expert input that only scientists could provide. Many factors contributed to the emergence of this idea. World War II, however, marks the clear boundary between a time where the science advisory functions were embedded (for the most part inconspicuously and at low administrative levels) within the normal function of governments, and the still-unfolding era when national leaders seek trusted inside sources of scientific expertise to help them address national and global challenges.

The close relationship between scientists and the leaders of the UK and US during World War II was itself unprecedented, and reflected an awareness that scientific and technical advance could be focused and accelerated by governments to support

¹¹ Gluckman P and Wilsdon J (2016) From paradox to principles: where next for scientific advice to governments? *Palgrave Communications*. 2:16077 doi: 10.1057/palcomms.2016.77

strategic war goals. Perhaps above all, it was the placing of the terrifying power of nuclear weapons into the hands of the US President—and, in short order, those of the leaders of other major powers—that made seemingly unavoidable (until now) the need for science advisory capabilities to be created at the highest levels of government—ushering in we might call the era of science advice.

Yet from the very beginning of this era, the relationship between science advice and national leaders was contested. Churchill famously remarked that he wanted “science on tap, not on top,” while President Truman rebuked Vannevar Bush, his wartime science advisor, for excessive political independence, and President Eisenhower famously warned that, “in holding scientific research and discovery in respect, as we should, we must also be alert to the equal and opposite danger that public policy could itself become the captive of a scientific-technological elite.”

Today, affluent, industrializing and developing nations alike have adopted a variety of structures and institutions for linking science to policy.¹² Governments from Beijing to Brussels, Prague to Pretoria have experimented with new methods and institutions for assisting evidence-informed decision-making. An expanding cohort of national academies and learned societies is investing in policy capacity at a national level, and networking to influence global agendas, through new collaborations like the InterAcademy Partnership and the European SAPEA (Science Advice for Policy by the European Academies) platform.¹³

In the international arena, there are more intense interactions between science advice, foreign policy and science diplomacy. Several governments have appointed science advisers to their foreign ministries. There has been debate about how to strengthen advice across the United Nations system, with uncertainty over the future of the UN Scientific Advisory Board, created in 2014, and now in abeyance.

New mechanisms for evidence-informed assessments have also been created, drawing on lessons from the Intergovernmental Panel on Climate Change (IPCC). The largest of these is the Intergovernmental Platform on Biodiversity and Ecosystem Services (IPBES), formed in 2012 and now involving 125 countries. But the model is being applied elsewhere, for example, through an International Panel for Social Progress (IPSP) and calls for similar mechanisms to tackle antimicrobial resistance.¹⁴

At every level of government, the ecosystem of institutions and individuals engaged in expert advice and evidence-informed policymaking is more diverse than ever before. Distinct yet overlapping communities of research, policy and practice are congregating around a core set of questions about how to improve the provision, communication, relevance and application of evidence to policymaking. Perspectives from the natural sciences and engineering are being enriched and complicated by a deeper understanding of public values and cognitive biases from the social, political and behavioural sciences.

¹² AAAS (2017) Connecting Scientists to Policy Around the World. AAAS: Washington DC, February 2017 <https://www.aaas.org/GlobalSciencePolicy>

¹³ <http://www.interacademies.org/>; <https://www.sapea.info/>

¹⁴ See <https://www.ipsp.org/>; <http://www.nature.com/news/policy-an-intergovernmental-panel-on-antimicrobial-resistance-1.15275>

3: WHAT DO WE MEAN BY SCIENTIFIC ADVICE?

Listing the types of problems where advisory mechanisms may be expected to play a role shows that the very idea of ‘scientific advice’ can be difficult to pin down. Tackling poverty, preventing an epidemic, responding to a natural or technological disaster, conserving renewable resources like fisheries or forests, ensuring food safety, protecting humans and the environment against toxic chemicals, managing water supplies, assuring affordable and reliable energy access, governing the emergence of advanced artificial intelligence—such problems unfold at different rates, are addressed at different (often multiple) levels of government, are embedded in different types of legal and regulatory regimes, implicate different cultural, political and economic interests, and are accompanied by different types of expertise and information. Yet each is an example of a problem that science advisory processes might be asked to address.

What, then, is scientific advice? We might say it is the variety of processes and arrangements by which scientific expertise and policy making at different levels of government are brought into productive collaboration to address a variety of types of problems. We might add that the ‘scientific’ in this context includes evidence and expertise from the social sciences and humanities, as well as natural and physical sciences and engineering. Yet such definitions provide a limited basis for developing practical guidelines.

From the start, INGSA has valued the diversity of models, institutional arrangements and approaches to scientific advice and evidence-informed policymaking that exist worldwide. This diversity, and the breadth of specific contexts in which advisory systems operate, is itself an important foundation on which effective advice builds. Sir Peter Gluckman, Chair of INGSA, has described five categories of science advice that need consideration, which may also apply at a sub- or transnational level.¹⁵

a) **Technical advice:** Ministries/departments and agencies require constant input of technical advice either from internal or external subject-matter experts and scientists. It is important that there are protocols in place, similar to those developed aimed at protecting the integrity of such technical input.⁶ Much also depends on the processes of selection of external experts and how they do their work.

b) **Regulatory advice:** Science and technology are core to the work of regulatory agencies dealing with everything from highly technical matters such as standards, aviation safety, or pharmaceutical regulation, for instance, through to matters involving possibly disputed values such as the use of GMOs, reproductive technologies, and environmental regulation. Such regulatory agencies are an essential science-based service of governance.

c) **Deliberative advice:** Governments often ask the scientific community—e.g. via a national academy—to convene a panel of experts to respond to a question or set of questions. These processes take considerable time and may involve workshops, consultations, or other mechanisms to study a given

¹⁵ Gluckman, P. (2016) Science Advice to Governments. *Science and Diplomacy*.
<http://www.sciencediplomacy.org/article/2016/science-advice-governments>

issue. Such deliberative processes are best suited to slow-burning or longstanding problems. Sometimes, national academies will offer unsolicited advice based on their own assessment of need. The standing of academies and their capacities vary enormously around the world.

d) **Informal advice:** Science has a role at every stage in the policy process, particularly at the initial brainstorming phase when policy makers and politicians may be framing an issue. In this process, advice is needed virtually on demand. Effectively, such advice can only be given by individuals, whether they serve formally as science advisors or president of a national academy or national council of science. Such roles require a high level of trust between the individual providing advice and the policy maker and politician. This work is grounded in the integrity of the advisor, which in turn can be assisted by a multilateral process of peer review.

e) **Science advice in crises and emergencies:** The Sendai Framework of the UN Office for Disaster Relief Reduction (UNISDR)⁸ highlighted the need for holistic scientific advice during crises and emergencies. Too often, science advice in crises has tended to be “siloed” within individual agencies. Increasingly, governments are looking for a more integrated and planned response from the scientific community to help in crises.⁹ Some see the key role of an individual science advisor to be that of knowledge brokerage during crises. The net effect is that the advisor becomes a more intimate part of the executive’s decision-making process.

While this typology is focused on the executive branch of government, a democracy works best when decision makers and those responsible for holding them accountable have access to current, reputable information. Depending on the constitutional arrangements, parliamentarians and legislators often require their own sources of advice independent of the executive. This may be done through distinct units as in the case of the UK’s Parliamentary Office of Science and Technology (POST)¹⁰ or the European Parliament’s Science and Technology Options Assessment (STOA) Panel.¹¹ Here, advice is generally associated with reviewing proposed legislation, or a select committee process.

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

What roles do different elements of a scientific advisory system play?

Typology developed by P. Gluckman

4: WHO IS THE MANIFESTO FOR?

We hope that the **INGSA Manifesto for 2030** will be of value to those involved in the production and use of scientific advice and evidence in policymaking relevant to the UN Global Goals. Examples would include: governments, international agencies as recipients of advice and government scientific advisers; advisory councils or committees; technical expert committees; policymakers who commission or use expert advice; national academies; international advisory bodies; assessment panels as providers of advice; and scholars, analysts and researchers of policy processes; and the media.

Since INGSA was established, we have been approached for advice by a growing number of governments and international bodies, so another motivation is to meet an identifiable demand for strategic guidance and direction in this area.

In line with INGSA's capacity-building goals, we envisage the **INGSA Manifesto for 2030** being of particular value to governments, academies or international bodies at an early stage in their establishment of advisory systems or structures.



HRH Princess Sumaya bint El Hassan and other attendees at the 1st Arab Leadership Dialogue on Science Advice to Government, held at the Dead Sea, Jordan in December 2016, where the Manifesto was one of the discussion items on the agenda. (Photo: CRDF Global)

5: THE GLOBAL GOALS

In September 2015, 193 world leaders agreed seventeen Global Goals, with a set of targets to be achieved by 2030. These seventeen SDGs, 169 targets and numerous indicators were agreed following an extensive process of stakeholder consultation.¹⁶ For the next thirteen years, the SDGs offer a roadmap for the global agenda. They are aimed at all countries regardless of income level, and their successful delivery by 2030 will require action at every level of government, business and civil society.

¹⁶ <https://sustainabledevelopment.un.org/?menu=1300>

The research community has a crucial role to play in providing the evidence, expertise and data to inform, measure and monitor the implementation of the SDGs. But processes of translation from evidence into policy are far from straightforward. As a framework for action, the SDGs' reach must also extend well beyond the policy community. Success will depend on the complementary – and ideally, coordinated – actions of many others, including in the private sector and civil society.

Two years in, it is already clear that uptake of the SDGs is variable at best. Higher-income countries have tended to frame the goals within a developmental assistance model, rather than seeing how these goals can help to address their own priorities as well. And the goals sit uneasily with current political mood in the United States and elsewhere – given their focus on multilateralism, promotion of trade, promotion of human rights, action on climate change and so forth.

At the same time, it is hard for anyone to disagree with the broad aspirations encapsulated in the seventeen goals. The primary issue then is a pragmatic one of how we can move faster down this road. What tools do we need? How can science help? We need to address this in three ways: first, how science can help to plan the journey; second, how to decide on the tools needed for the journey; and third, how science might help policy makers keep on the best path to the desired destination.

6: WILL THE ROAD TO 2030 BE EVIDENCE-PAVED?

To answer this question, we first need to ask 'whose evidence?' and 'what evidence counts?' And when we talk about science, we need to remind ourselves that this is not a compilation of facts, rather a set of processes that aim to discover relatively reliable information about the world around and within us.

But there are other forms of evidence that have particular impact on the policy maker. Belief, observation, experience and anecdote are all forms of evidence that influence the policy-maker. Science must understand its relationship to such forms of evidence and present itself respectfully and recognize that its positioning is ultimately linked to the robustness of its processes.

Science advice deals with few if any problems that can be decisively resolved with yes-or-no answers provided by experts, or even with a bit more research. Those are the problems that get solved. The vexing problems for science advisors are those that are not amenable to easy solutions—which is most of them. Problems typically addressed by science advisors are characterized by contested values, uncertainty about the future (meaning that experts may disagree about the best course of action; multiple decision options are plausible), high stakes (meaning that whatever decisions are made, there will be winners and losers), and the demand by policy makers for action.

These issues are more acute in the 'post-expert' world that many argue is now taking shape.¹⁷ Such claims can be overblown, but at least in the global north, the climate of confidence and trust in experts and institutions does appear to have shifted. Greater transparency and access to information has altered the relationship

¹⁷ ref post truth books

between citizens, experts and other elites. This has been aggravated by economic pressures on those who legitimately feel left behind in the decade since the global financial crisis. As we come to understand more about how collective knowledge is generated within social networks, or the role of cognitive biases in how people reach conclusions, we can see how it is a challenge to ensure that policymakers and wider publics accept and apply scientific knowledge.¹⁸

Given these challenges, what scientific evidence is needed to map and prepare for the road ahead? In 2015, towards the end of the SDG consultation process, the International Council for Science (ICSU) provided a pointed analysis of the goals,¹⁹ and highlighted crucial knowledge gaps before a number of them could be reached. Others require more systematic transfer or application of current knowledge.

Earlier this year, ICSU returned to this issue and dissected in detail four of the goals: zero hunger (SDG 2); health and wellbeing (SDG 3); affordable and clean energy (SDG 7); life below water (SDG 14).²⁰ This analysis again identified a significant number of knowledge gaps. We now need a similar analysis across all 17 goals. As ICSU points out, the high level of interconnectivity between the goals also has implications for filling these gaps and for policy decisions related to implementation. Under each of the SDG headings, and in navigating the overlaps, interdependencies and trade-offs between them, it is important to embrace complexity,²¹ and favour multiple options over simple answers.²²

7: SIX INGREDIENTS OF SCIENTIFIC ADVICE FOR THE SDGS

So if the road to 2030 must be evidence-paved, what are the crucial elements of a scientific advisory system to support the implementation, delivery and evaluation of the Global Goals? Based on our consultations over the past year, INGSAs proposes the following six ingredients:

7.1 Roadmap research

Last year's UN Global Sustainability Report proposed that **globally coordinated and deliberative research roadmaps** for the SDGs are required. But who should do the coordinating? The report suggests that the 'science and engineering communities' could do this, through platforms such as the UN Technology Facilitation Mechanism to the SDGs. But this has neither the construct nor the mandate to do so (although its advisory group has offered some cogent advice). The STI Forum (Multi-stakeholder Forum on Science, Technology and Innovation for the SDGs) is another possibility, but has so far been primarily focused on issues of technology transfer.²³

¹⁸ Sloman, S. and Fernbach, P. (2017) *The Knowledge Illusion: Why we never think alone*. Penguin.

¹⁹ <https://www.icsu.org/publications/reports-and-reviews/review-of-targets-for-the-sustainable-development-goals-the-science-perspective-2015>

²⁰ <https://www.icsu.org/current/press/new-report-from-scientific-experts-provides-a-unique-guide-to-translate-sustainable-development-goals-into-reality>

²¹ Stirling, A. (2009) Keep it complex. *Nature*. Vol 468:1029. 23 December 2010.

²² Pielke Jr., R. (2007) *The Honest Broker: Making Sense of Science in Policy and Politics*. Cambridge University Press.

²³ <https://sustainabledevelopment.un.org/TFM/STIForum2018>

Future Earth has made a very positive contribution to aligning research efforts, and fostering collaborations, but is less equipped to operate at policy interfaces.²⁴

So although the Global Sustainable Development report has identified roadmapping as an important step, it has not identified how this can be implemented. The complexity of the UN system means there is no truly comprehensive view of its various advisory inputs. The multiple UN agencies tend to work in silos, and the full breadth of sciences do not have a strong voice in many agencies that could be making great use of such evidence and advice. There is a need to go beyond scattered and serendipitous progress in plugging these knowledge gaps.

ICSU's analysis suggests that a high level roadmap of knowledge gaps could be achieved relatively rapidly. This model needs to be systematically applied across all 17 goals. Without this, the vagaries of contestable research may limit progress.

The question then becomes: even if gaps were identified and agreed, how would the global community coordinate to fill them? Some years ago, the Global Fund for AIDS, TB and Malaria developed a multilateral template for joint funding of aid and some implementation research. But this was tightly circumscribed in both scope and approach. By contrast, there is no general global research funding system, and never likely to be one. Understandably, most governments spend their research funds mostly in their own borders on issues of domestic relevance (though there are exceptions to this, such as the UK's 1.5bn GBP Global Challenges Research Fund²⁵).

A great deal is likely to be left to uncoordinated and at times capricious national funding, development assistance funding, and the various interests of foundations and private funders, to pick from an unknown menu of possible research themes, all claiming to be relevant to the SDGs. There will be the temptation to go for more immediate impacts, rather than somewhat more upstream for novel ideas and solutions. The indicators within the SDGs repeatedly identify ambitious targets – but in many cases this will require considerable innovation to achieve, and a mix of implementation science and more upstream research. Implementation science is essential for so much of what the SDGs require, yet can be the most difficult type of research to fund. It can be politically sensitive if it is evaluating a program that is in place, or trialing one where continuity of support is uncertain.

Roadmapping could make a significant contribution. Doing it well will require a systematic and deliberative approach to identifying the types of knowledge that are needed, and ensuring national governments can apply the same categories and criteria in their public funding systems. Over the medium term, this strengthens the case for more integrated global systems of research management, along the lines of the Global Research Alliance on Agricultural Greenhouse Gases.

7.2 Innovate responsibly

While a gap analysis and roadmapping exercise will be needed to coordinate a global response to the SDGs, we have a good idea of the general types of research and technologies that will become significant as the SDGs emerge as a global agenda.

²⁴ www.futureearth.org

²⁵ <http://www.rcuk.ac.uk/funding/gcrf/>

But how will societies agree upon the technologies that could be most effective? The Global Sustainability report points to new data-science, bio-tech, nano-tech, neuro-tech and green-tech that could offer solutions. It also makes reference to geo-engineering, extraction technologies and other areas of research that are not without controversy. We need to anticipate the societal debates and questions of social license and governance that are likely to emerge.

Much can be drawn from the frameworks and approaches that have been developed over recent years under the banner of ‘responsible research and innovation’ (RRI), which has gained particular currency as a framework for research governance within the European Commission. At its simplest, RRI can be defined as “taking care of the future through collective stewardship of science and innovation in the present”. It brings to research policy a focus on questions of anticipation, reflexivity, deliberation, inclusiveness and responsiveness.²⁶

Several classes of such technology merit particular consideration. First, there is data science. Data collection is not free and in many cases it is not simple. Many countries do not have effective national statistical centres, and big data analysis cannot be done by data analysts alone, but needs expertise to define models and interpret data. There are also big questions around the social acceptability of data use. Who owns the data? Who has access to the databases? How is data then interpreted? These issues are huge in advanced economies, and will be equally large in LMICs. Globally, the issue of indigenous data sovereignty is another matter that mainstream data science has largely not begun to address. This is important because data science necessarily must set out a number of assumptions in developing its models. If these assumptions are not culturally informed, the outcomes could be wrong.

Second, digitalisation, AI and machine learning offer many opportunities but also threaten fundamental concepts of autonomy, democracy and national identity. The power of platform companies and social media is real – and it cannot be taken for granted that this power is innocuous or in the public interest. For example, the future of financial systems and national accounts could be seriously disrupted by block chain crypto-currencies. Are we satisfied that the putative ‘transparency’ of these technologies can replace the ‘accountability’ of institutions? There are also serious concerns about technological unemployment effects of technologies that could worsen inequalities in developed and developing nations.

Third, life science technologies from GM to GE to synthetic biology to whatever comes next offer enormous opportunities to deal with biosecurity, disease, food security, environmental management etc. But each of these technologies has real, perceived or unknown risks, creating for a complex discourse that can easily degrade into the entrenched views of one side or the other. Yet it seems likely that some of these technologies will have a role to play if we are to balance sustainability with the increased need for food production and against the background of climate and ecological change.

²⁶ Stilgoe, J., Owen, R. and Macnaghten, P. (2013). Developing a framework for responsible innovation. *Research Policy*. 42, 1568-1580; Valdivia, W. and Guston, D. (2015). *Responsible innovation: a primer for policymakers*, Centre for Technology Innovation, Brookings Institution, May 2015. www.brookings.edu/research/papers/2015/05/05-responsible-innovation-valdivia-guston.

These technologies offer enormous positives but also create dilemmas of control and social license. How these are managed will be critical – and will require both jurisdictional and transnational consideration. One role of an effective science advisory ecosystem would be to ensure adequate dialogue both with the public and governments on such issues. It also highlights the importance of science and technology communication is socially meaningful dialogues in every country.

7.3 Become knowledge brokers

National scientific advisory systems tend to include certain components: those dealing with knowledge generation, with knowledge synthesis and with knowledge brokerage. Knowledge brokerage is the process of transferring policy needs and priorities to the science community, and transferring an understanding of the evidence, and its limits or uncertainties, to the policy community.

An important question here relates to diversity: what types of knowledge, what disciplines, which methods, what modes of evidence are included in the brokerage process? In each of the SDGs, natural science, social science, data science, economic and political science and particularly implementation science will be needed. The humanities are also crucial. The SDGs speak to a critical juncture in human history when we are changing our environments, cultures and behaviours at a pace that makes the implications difficult to fully comprehend. The insights of historians, philosophers and others are needed to make sense of these changes.

So it is increasingly recognised that narrow single disciplinary approaches are no longer adequate to address complex, interconnected challenges. But there are various approaches to disciplinary diversity within research:

A **multidisciplinary** approach draws upon the strengths or expertise of different disciplines, and more effectively joins up their findings, but leaves disciplinary boundaries (and sometimes hierarchies) intact.

An **interdisciplinary** approach involves the fuller integration of disciplines, to develop potentially novel ways of approaching research questions, recognising that there is a diversity of ways to understand and address particular problems.

A **transdisciplinary** approach not only integrates expertise from across academic disciplines, but also involves societal stakeholders in the design stage, and throughout the research process. In transdisciplinary research, knowledge can come from beyond formal academic disciplines, and insights are often provided through other kinds of tacit knowledge – as held by local communities, businesses, social movements or practitioners. It also gives particular emphasis to respecting indigenous and local knowledge. Implementing the SDGs is likely to rely in large part on such transdisciplinary processes.

7.4 Build collective intelligence

Structures are diverse, but all countries share a need for a rich advisory ecosystem. Whatever structures are used rely on sufficient institutional development – of government, of academia, of policy making, through which they can develop and harness ‘collective intelligence’ – which the innovation think tank Nesta defines as: ‘a new term to describe something which is in some respects old... It refers to the ability of large groups - a community, region, city or nation - to think and act intelligently in a way that amounts to more than the sum of their parts.’²⁷

A conclusion of the 10 member group to the UN’s technology facilitation mechanism in 2016 (reinforced by conclusions of the STI Forum in New York earlier this year) was that all countries need a science advisory ecosystem, with a point of focus – in other words a science advisor. But how do domestic advisory mechanisms link to decisions made at a global level? Largely they don’t and that is a problem. The reality of transnational and multilateral policy agenda setting is that much of it is aspirational and advisory rather than treaty based. The UN system and its agencies produce many policy guidelines – in some rare cases leading to formal agreements. But while the inputs for developing this advice may come from disparate scientific inputs – either internal to the agency or via some forms of advisory committee – these processes are largely isolated from domestic national systems. Even when national scientists are part of global working groups such as with the IPCC, there is still often a domestic disconnect.

When it comes to decision making and voting in multilateral fora, this is largely done by member states through their foreign ministries. And relatively few foreign ministries are well linked to their domestic science advisory ecosystems. This is a recipe for miscommunication.

INGSA is working with countries, regions and organisations to identify and address these issues through capacity building. INGSA also has a special interest in science diplomacy and administratively supports the Foreign Ministers Science and Technology advisory Network, FMSTAN. This is an informal network of science advisors who have a formal connection to their foreign ministries.

Given that any action recommended at the international level must be implemented nationally, and that science is increasingly helping to steer those actions, it seems essential that there is better linkage between global science advisory systems and domestic science advisory systems if we want more effective science inputs into policies related to the SDGs. But for that to happen, these respective systems must solid, and willing and able to interact.

The UN itself and the international system as a whole is lagging in providing the necessary and effective leadership for ensuring coherent scientific input in to policy advice both internationally and nationally. The UN system is largely built in silos, agencies have their own science inputs which are largely inchoate, more integrative science is often left to UNESCO, and yet science and technology are crucial to progress across the whole agenda. Logic says some coordinating group close to the

²⁷ <https://www.nesta.org.uk/publications/governing-collective-intelligence>. See also Mulgan, G. (2017) *Big Mind: How Collective Intelligence Can Change Our World*. Princeton University Press.

centre of the UN system is needed. Because, unless whatever science advisory systems exist at the international level are coherently and appropriately linked to national science advisory systems, progress on key SDGs will be seriously impaired.

So what is the solution? The SDGs are aspirational, and therefore leave open what is realistic and what is possible. But many of them can only be addressed effectively if domestic science advisory mechanisms are better developed – or in many cases – better integrated.

The recent disestablishment of the outgoing UN Secretary General’s science advisory board offers an opportunity to think about what might replace it.

One possibility is that the UN Scientific Advisory Board should be re-established but that its membership should be drawn from distinguished scientists with a clear vision of the role of science, technology and innovation in supporting Agenda 2030. Its mandate should include:

- ensuring better coordination across UN agencies and programmes in the development of scientific input into UN policy development and implementation frameworks; promote effective linkages between the UN system and international scientific bodies;
- contributing to coordinated science roadmap development for the SDGs;
- encouraging the development of domestic science advisory systems and their coordination with UN agencies and advisory mechanisms; and
- assisting the Secretary General’s office as appropriate through the promotion of science diplomacy.

7.5 Strengthen the science and art of scientific advice

There are growing moves to research the use of research use, and develop the science and craft of scientific advice.²⁸ But there is a long way to go: with many competing priorities in low income settings: only half the countries in Africa, for instance, have national academies of science, and many do not have institutions for bringing scientific knowledge into policy development.

Integration of expert advice in policy-making varies significantly across jurisdictions. National and international contexts are crucial. While some aspects of scientific advice have been studied and theorised, others are less well-researched e.g. institutional design, the relationships between individual experts and systems, criteria of expert recruitment, and the role of experts as brokers or intermediaries.

As Geoff Mulgan reminds us, there is ‘a science as well as a craft of scientific advice’, and advisors need to draw more systematically on research in political science, social psychology, behavioural economics which investigates ‘why certain kinds of knowledge are acted upon, and others are not.’²⁹ This requires concerted efforts from both sides – academics and practitioners – to connect the latest scholarship to advisory processes and practices. Building and operationalizing such links is a priority

²⁸ e.g. <https://eppi.ioe.ac.uk/cms/Default.aspx?tabid=3487>; <http://www.alliance4usefulevidence.org/>

²⁹ Mulgan, G. ‘Experts and experimental government’ in Doubleday, R. and Wilsdon, J. *Future Directions for Scientific Advice in Whitehall*. London: Alliance for Useful Evidence/CSaP, April 2013

for INGSAs (for example, with UNESCO in 2018, we intend to start mapping different advisory systems more systematically, in an 'Atlas of Scientific Advice'. We are also planning a research conference on this theme in 2019.)

7.6 Foster humility in providing advice

Before it disbanded, the UN Science Advisory Board argued in its final report that "Science should be characterized by independence, diligence, prudence, and humility." All of these are important for effective scientific advice, but we suggest that humility is the most foundational and pressing as a response to external challenges.

This is not to say that science advisors should use humility as an excuse for inaction and failure. Rather, we would define humility as "striving for an accurate view of oneself and one's role" combined with an appropriate respect for the power and limitations of science and technology.³⁰ This attitude can be translated into clear, pragmatic guidelines by differentiating aspects of *competence*, *motive*, and *role*.

Humility of competence respects the limits of knowledge and understanding. It requires those engaged in scientific advice to be open to new ways of knowing and the need to learn from others, with different disciplines, traditions, ages, genders, or geopolitical perspective. Science is a pluralistic enterprise. In addressing complexity, it cannot and should not speak with a unitary voice. Accept and embrace the inevitability that uncomfortable knowledge is rampant. Even complex issues can be communicated with clarity and honesty over uncertainties, knowns and unknowns.

Humility of motive respects that any adviser has their own history, culture, and political motives. Bias and conflict of interest are inescapable. This is especially acute if advice on "science for policy" vs. "policy for science" are not clearly separated. For individual advisors, this demands transparency and reflexivity. For committees, it demands representativeness (not purity or independence). All science is value-laden starting with the selection of a research direction and ending with the choice on how to communicate results. But the goal is not to eliminate values, but to avoid forms of stealth issue advocacy (real or perceived).³¹

Humility of role respects that a division of labor in decision-making is legitimate and that the process is non-linear. Scientific and technical input is often essential but rarely sufficient for complex, high-stakes decisions. Policy making always involves considerations beyond the evidence. And evidence is derived not only from formal scientific processes. The goal and expectation of those providing advice should be to inform policy, not make it. Don't confuse science-illiteracy with a lack of competence or intelligence. In any context – but particularly that of implementing the SDGs – knowledge and advice need to be carefully situated with respect to timing, place, culture and social setting.

³⁰ Adapted by Saner, M. from Morris, Brotheridge & Urbanski (2005) Bringing humility to leadership; See also Jasanoff, S. (2007) Technologies of Humility. *Nature*. Vol 450, 1 November 2007

³¹ Pielke Jr., R. (2007) *The Honest Broker: Making Sense of Science in Policy and Politics*. Cambridge University Press.

8: WHERE NEXT?

This is a draft document for consultation.

We invite comments by 31 January 2018 online at <http://www.ingsa.org/>; or by email to Lara Cowen in the INGSA team (l.cowen@ingsa.org).

We would particularly welcome comments on the following questions:

- 1. What is missing from the Manifesto that you would like to see included?**
- 2. How can the Manifesto be improved, and made more relevant to your priorities and needs?**
- 3. Are there examples of institutional good practice in scientific advice for global goals that you would like us to include?**
- 4. What specific recommendations could we add – and directed to which actors at local, regional, national or international level?**
- 5. Would you like to become more involved in INGSA's work in this area? What could you bring to the Network as it strengthens and grows?**

An updated and final version will be published in June 2018, alongside the 3rd STI Forum (5-6 June– see <https://sustainabledevelopment.un.org/TFM/STIForum2018>)

At this point, we hope that individuals and organisations may choose to lend their support to the Manifesto. Details of how to do this will follow on the INGSA site.

Thank you in advance for your contributions and support.