Strengthening The Role of Communication in Evidence-Informed Policy

Pedersen, David Budtz

Published in:
Building Back Wiser: Knowledge, Policy and Public in Dialogue

Publication date:
2022

Document Version
Publisher's PDF, also known as Version of record

International Network for Government Science Advice

INGSA 2021

Building Back Wiser: Knowledge, Policy and Public in Dialogue

Viewpoints

Kristiann Allen, Naomi Simon-Kumar, Grant Mills (Eds.)

International Science Council
The global voice for science

IDRC · CRDI
International Development Research Centre
Centre de recherches pour le développement international

wellcome

Québec
Fonds de recherche – Nature et technologies
Fonds de recherche – Santé
Fonds de recherche – Société et culture

Canada

Published by the International Network for Government Science Advice

INGSA is a New Zealand-based International Organisation hosted at the University of Auckland and operating under the auspices of the International Science Council.

Private Bag 92019, Auckland 1142, New Zealand

Contact: info@ingsa.org

Website: www.ingsa.org

Twitter: @INGSciAdvice

Conference content archive:

http://www.ingsa.org/ingsa2021

The production of this Viewpoints book is made possible by the IDRC.

IDRC · CRDI
International Development Research Centre
Centre de recherches pour le développement international

Sir Peter Gluckman
Inaugural Chair of INGSA
President-Elect of the International Science Council
Distinguished Professor of Medicine, University of Auckland

Welcome to the 4th Biennial Global Congress of the International Network for Government Science Advice (INGSA)

This is an important transition for INGSA as it moves from its start-up phase to become a more formal organisation. As INGSA's inaugural Chair, I am delighted that Professor Rémi Quirion will soon be stepping in as the network's first President under a formalised constitution. I want to thank the many people who helped shape INGSA's early years. In particular, James Wilsdon, our first Vice Chair, members of our inaugural 2014 programme committee, our secretariat, and members of our informal executive group were all instrumental. The support of the International Science Council also has been critical to INGSA's success, and we remain an important member of the ISC family.

I am proud and impressed by what our INGSA global community has built and achieved over these past six years. From an initial provocation by participants at our first meeting held in Auckland alongside the 2014 AGM of the ISC's predecessor (ICSU), to today's vibrant network of over 5000 members in more than 150 countries, INGSA has helped to shape the global discourse on evidence informed policymaking.

The response to establishing INGSA as a network demonstrated that we were on to something important. We quickly saw the demand, across the Global South and North, for networking and lesson-sharing, for building capacity and for creating opportunities among policy and knowledge professionals at the interface of science (in its broadest sense) and public policymaking. We saw a space for inter-regional collaboration and for knowledge and skill development about the policy dynamics, the institutional contexts and the national and international drivers that facilitate or impede evidence use in public policy.

Thus, INGSA set about helping to fill that gap. But we could not have done so without the help of core funders at the International Development Research Centre, the Wellcome Trust, the Fonds de Recherche de Québec, the Government of New Zealand, core collaborators like the Joint Research Centres of the European Commission, and a host of project funders in countries around the world.

Nor could we have known back in 2014 just how central the work we were involved in would become by March 2020 and beyond. In helping to structure and strengthen science-policy interfaces globally, we have always focused on the complex collective challenges that are well-articulated in the Sustainable Development Goals. Their urgency and complexity require both evidential consensus but also an equity of knowledge and decision-making practices to be able to move forward.

The Covid-19 pandemic has of course amplified and deepened these challenges that were already confronting us. But it has also shone a useful – and sometimes harsh - light on the principles and practices of science advising around the world. This is a moment to seize, and these are lessons to build on.

The INGSA 2021 meeting was supposed to have been held in 2020, the year that disappeared. If nothing else, we all now have the benefit of '2020 hindsight'. Let's hope that this collective experience, together with the growing appetite for evidence-informed policymaking can now offer us opportunities for informed foresight as well.

In the pages of this compendium, the speakers and panellists of the 4th biennial commit their thoughts and ideas about today's pressing challenges. The variety of perspectives is inspiring and revealing. Might it be a guidebook?

Rémi Quirion
Chief Scientist of Québec; President of INGSA

Contexts and Levels: Expanding INGSA's reach

Bienvenue à toutes et à tous au 4e congrès international sur le conseil scientifique aux gouvernements de l'INGSA, qui se tient à Montréal sous un modèle hybride. Warmest welcome from Montreal to INGSA 2021. I would have loved to be able to shake your hands at the Palais des Congrès but due to the covid-19 pandemic, a hybrid model had to be used. In spite of the many challenges encountered by the organisers, we hope that we have been able to create an exciting program that will prove to be most informative and useful to participants from all over the world. Science advice and science diplomacy have never been as front and centre as they have during the pandemic. Our three levels of government, national (Canada), regional (Quebec) and municipal (Montreal), and the global head office on INGSA in New Zealand, have been working together in developing a program aiming to discuss lessons learned regarding science advice from the pandemic.

Besides global issues related to the covid-19 pandemic, guiding principles taken into account for the program include the Sustainable Development Goals (SDG) of the United Nations; Equity, Diversity and Inclusion (EDI) & Open Science.

We also aimed to expand INGSA's reach by including in the final program challenges and opportunities related to cultural & linguistic differences as well as different levels of governments. For example, a full day is dedicated to science advice in French-speaking countries with the creation of a network to facilitate exchanges and promote best practices. Sessions also include discussions on similarities and differences in science advice at the global, national, regional and local (municipalities) levels, as well as the need for a more interdisciplinary and inclusive approach to science advice. The pandemic is certainly a case-in-point in that regard.

Thanks again to the organising committee for all its hard work and meeting the many challenges in organising such a hybrid meeting spanning all time zones. Special thanks to Kristiann Allen, Grant Mills, James Wilsdon, Alexandre Bourque-Viens, Brite Pauchet, Julie Dirwimmer, Gabrielle Gagnon, Clément Duhaime and Michel Audet.

And my final thanks and gratitude go to Sir Peter Gluckman, the instigator and inaugural Chair of INGSA. If the world of science advice is where it is today, it is largely because of him.

Merci.

Mona Nemer
Chief Science Advisor of Canada

Facilitating collective efforts to face collective challenges

It is my pleasure and honour to welcome INGSA 2021 participants to Montreal, Canada, be it in person or virtually. The INGSA biennial is a unique opportunity to take part in discussions that are at the intersection of science and policy, and to glean best practices from the various science advice models.

The past 18 months have illustrated the importance of science and science advice as the global community came together to fight a new virus. Very early in the COVID-19 pandemic, many countries, including Canada, could count on scientific advisory mechanisms and a sufficient pool of experts to inform government decisions. The need for ongoing advice over a long period of time was unprecedented and created challenges of coordination and sustainability. It put pressure on the largely voluntary experts who provided advice through task forces and advisory councils while carrying out much needed research, as well as clinical and public engagement duties. It also presented unique opportunities for raising public awareness of science and science-informed decisions. Science was used in real time for evolving public policies while data sharing and international coordination became more important than ever to overcome the pandemic and keep societies safe.

It is with this backdrop and the perspective of the many global challenges ahead of us that we come together at INGSA 2021, to share lessons learned and discuss how to further enhance the effectiveness of science advice to governments and maximize the impact of science to society.

One of the key takeaways from my experience working through the pandemic is that science advisors would benefit from having rapid and seamless access to relevant data in time of crisis, and this should be supported by modern and integrated data infrastructure.

Enhanced and more timely access to data seems like an obvious and basic requirement for evidence-informed decision making, yet the pandemic showed us that many of the structures to support this requirement were not in place. Data will be instrumental for providing advice in peacetime and during emergencies. Putting in place the human and data infrastructure to help us better prepare for future health crises while dealing with the many challenges of climate change will require the kind of collective efforts that INGSA members can facilitate.

I look forward to the many insights that will be shared at the INGSA biennial and throughout the pages of this collection of Viewpoints and to the many collaborative opportunities ahead.

Enjoy the conference!

Table of Contents

The International Network for Government Science Advice (INGSA) is an innovative forum for individuals and organisations engaging with the theory, practice and structures of evidence-informed policymaking and science diplomacy. The network has evolved into a globally respected platform, providing training resources, expertise and thought leadership. Established under the auspices of the International Science Council (ISC), with funding primarily from The Wellcome Trust and the International Development Research Centre (IDRC), INGSA now comprises over 5000 members from 120 countries.

Since 2014, INGSA has held a global congress biennially. The founding meeting was held in Auckland in collaboration with the ISC's predecessor, ICSU, and the Office of the Chief Science Advisor of New Zealand (2014). This was followed by partnerships with the European Commission (2016) and the Government of Japan in collaboration with the Graduate Research Institute for Public Policy of Japan (2018). The 2020 congress was postponed due to the COVID-19 pandemic and is replaced with this year's hybrid/online congress. It is hosted by the Office of the Chief Scientist of Quebec, Professor Rémi Quirion, in collaboration with the Chief Science Advisor of Canada Dr Mona Nemer.

INGSA2021 (www.ingsa2021.org), kicks off a new phase for the network. The pandemic has raised awareness not only of the importance of well-structured science-policy interfaces, but also of the complexity of our shared challenges as we 'build back wiser.' In this context, INGSA has matured. By agreement with the ISC and funders, INGSA is now moving from an informal to a more formal structure, bringing new ideas about the path ahead. These are reflected in the themes and format of the congress.

This collection of short essays captures state of the art thinking by experts and practitioners at the interfaces of science and policy making. These Viewpoints were commissioned especially by INGSA to anchor the 4th biennial global congress. They offer a taste of what panellists and speakers will address in more depth during the congress. As a legacy document of the congress, this collection provides an important snapshot of key issues, big ideas and anticipated challenges for societies globally, as we all begin to emerge from the bleakest days of the pandemic. But just as the pandemic did not affect everyone equally, there are also predictable inequities in recovery. There is thus a moral imperative for societies to apply the best available knowledge, research and development in just and innovative ways. The recovery of societies and economies now must go hand-in-hand with collective action to stabilise the climate crisis and make real progress on the Sustainable Development Goals.

These issues are addressed in various ways across these essays. The first section brings together writing from speakers and panellists on Day 1 of the INGSA2021. Under the theme **Promise and Pandemic: Reshaping Science Advice**, essayists take a look at what the pandemic has revealed about evidence-informed advising globally. They point to the promising responses and failures, while raising questions about the need to think differently about how governments interact with each other, with the expert community and with citizens at times of crisis. They consider structural enablers and barriers and why sensitivity to context, transparency and inclusion really do matter in science advising.

The second section of the collection is themed **Foresight and Resilience: from SDGs to Emerging Technologies**. Here authors take up the pre-pandemic challenges, which are now entangled with its effects and continuing drivers. These include unexamined digitalisation, social inequities, climate chaos and biodiversity loss, to name a few. Their drivers are multiple and interacting, as are their impacts. Essays in this section address how robust evidence can help to ensure preparedness, not just for crises, but for all of the societal transitions that sustainable development demands. In what ways are policy-making and the knowledge paradigms that inform them shifting?

In the third section, essays are brought together under the banner **Evidence and Democracy: Sustaining Trust in a Challenging World**. Here we are challenged to think about the role of expert knowledge and science advice in democracies. This is more crucial than ever as societies struggle with dis/misinformation and mistrust. Trust and legitimacy in public decision-making does not arise from evidence alone, but from how it can resonate with public values. What are we learning about how science and values can together help navigate the uncertainties of our time?

The fourth section is dedicated to **science advice and science diplomacy practices in *La Francophonie***, taking the opportunity of INGSA's biennial in a Francophone territory to reflect on the diversity of approaches and the impact of culture & language in our practices for the use of science to inform and support policies. INGSA 2021 brings with it the launch of new francophone activities, where we expect that this great diversity of approaches and lessons will be carried through.

The fifth section provides a summary of the **INGSA2021 Conference Satellite events** that took place during the conference. These events presented opportunities for conference attendees to further deepen and expand their engagement with the issues at the science/policy/society interface, across a range of topics. INGSA partnered with organisations to host these interactive events, including an immersive policy simulation on cascading climate change impacts, the future of Open Science, and the role of independence in science advice.

The sixth section presents INGSA's work within key partnerships, particularly the suite of activities funded by the **International Development Research Centre** (IDRC). This project is designed to support the development of knowledge and capacity for evidence informed public policy in the Global South, particularly in the context of COVID-19. The project has been instrumental in building communities of knowledge and practice and in integrating institutional lessons across the Global South and North. This is key if we are to achieve the kind of step-change in collective action that the SDGs require in a post-pandemic world. We are especially proud to feature the IDRC-funded INGSA 2020 Knowledge Associates and their research projects, which are generating vital knowledge to better inform policies in their countries and regions.

In the appendix, readers will find a guide to this year's **Digital Posters**, which are featured for the first time at the 4th Biennial. These posters are divided into research posters, and presentations describing 'innovations in science advice'. Find out about the authors and posters in this collection and then head over to the conference platform or web-archive to view them and learn about the latest programs, practices and institutional structures that are enabling better informed policy making all over the globe. The scope and depth of policy innovation presented is truly impressive. It is cause for great optimism in our challenging times.

We thank all the contributors to this collection.

Retrospective:

INGSA 2016 Biennial Congress hosted by the European Commission. Brussels, 2016

1 Promise and Pandemic: Reshaping Science Advice

Modes of Science Advice in Peacetime and Crisis

Chor Pharn Lee

Principal Foresight Strategist at Centre for Strategic Futures, Prime Minister's Office, Singapore

Historically, science advice was shaped by events (e.g. the oil crisis led to the setup of US Dept of Energy). The ongoing pandemic is likely to influence the future of science advice to governments. Now, science advice is not a straight process where scientists describe evidence, and then policy makers act on it. Instead, we get a divergent and at times counterintuitive range of policy outcomes across countries. This is because decision makers take into account political constraints, resource constraints, value divergences and other trade-offs in addition to scientific evidence. We may need science advice to meet decision makers as humans who are prone to biases and pressure.

One suggestion is to change the type of "science" and "advice" in peacetime and crisis modes.

	Peacetime mode – advice	**Crisis mode – advice**
Natural sciences	"Classic" science advice as technical input to regulation, large national programmes	Balance between credibility and rigor versus timeliness and urgency
Nat. Scie + Soc Sci + Engineering	Identify library of risks with cross cutting policy implications	

In the table, the upper left quadrant is "classic" science advice - technical input to regulatory agencies or large national programmes, and science here typically denotes the natural sciences. The process is meant to be slow and deliberative, and not a good fit during crisis.

The right quadrants are where policymakers find it hard to balance between credibility and rigor versus timeliness and urgency during crisis mode, if the science is uncertain. For example, we risk confusing the public with technical caveats to protect scientific rigor. Science gives us vaccines, but pandemics are social. Where there are social spill-overs, we need to marry natural sciences with social sciences and a healthy dose of engineering so that we can scale up solutions like trace/test. Having said this, it is very hard to get this balance right and both science and policy-making come out looking poorer for it. What if instead we invest in building up resilience and identifying blind-spots upstream during peacetime?

This means investing in the lower left quadrant, such as assembling a library of risks (e.g. a Carrington event) with cross-cutting implications requiring a team from natural, social sciences, engineering and policymakers. Run small scale experiments to help identify blind-spots and build out response capacities early on. Some of this may include cross-border capacities like regional vaccine production capacity, more coordination among scientists in a growing g-zero world. Trust built up during peacetime through these networks, information exchanges with clear rules of engagement helps to narrow perception/expectation gaps and facilitate crucial two-way communication the system needs to do well when crisis hits.

Science-policy alignment can also be a double-edged sword if it is seen to politicise science, but this can be mitigated with safeguards to avoid groupthink and institutional capture.

COVID-19 pandemic: Lessons learnt so far and the way forward

Andrea Ammon

Director of the European Centre for Disease Prevention and Control

Throughout the COVID-19 pandemic, the European Centre for Disease Prevention and Control (ECDC) has provided scientific evidence that is accessible, relevant to the needs of decision-makers and stakeholders, robust and timely, while trying our best to ensure that it is not lost in translation – a challenging task when time is limited, scientific uncertainties and political pressures are high, and irrefutable evidence to support decisions may be lacking.

Through our work, we have learnt many valuable lessons which will help us be better prepared for future pandemics. We can't know for sure when the next crisis will come, but we know that it will come and that we need to be ready.

There is a need to assess what worked and what didn't, to review our actions and decisions and form the basis of a rational plan on how to move forward, based on each country's specificities and also their similarities. It is important to look into these ad-hoc decisions that were taken and that made a difference, and to include them in our future preparedness plans so that we don't need to reinvent the wheel.

Strengthening public health systems and capacity building is key and must be seen as an investment and not a cost. This is true not only during pandemics, but also to tackle vaccine-preventable diseases and antimicrobial resistance – two other major public health issues.

We should use this pandemic to learn how to further improve our surveillance systems so that they are able to accurately capture valid data on population health on an ongoing and timely basis, covering large populations. Unlocking the potential of data and of further digitalisation can result in better monitoring, increased speed and efficiency in response and development of evidence for decision-making, patient empowerment, and cost-savings.

The COVID-19 pandemic has also shown us that we must work further on community engagement, and to make sure that community engagement is anchored as a central activity in the revised pandemic preparedness plans. All parts of the general public should be engaged as a central part of all control efforts and not only as passive receivers of messages.

Working with partners is key, as no country or region can cope with pandemics alone. We must fully embrace collaboration and capitalise on each other's expertise in specific areas while sharing the burden of a global response to a pandemic.

And last but not least, we need to continue supporting policymakers and stakeholders, while understanding the reality they operate in. Flooded with information, requirements, and evidence coming from different directions, they are often pressured to make the right decisions, at the right time, for the widest number of people.

In the end, the control of a pandemic is not achieved by one group alone – be it policymakers, healthcare professionals or the general population – but by all of us. Only if we are prepared together, we are safe together.

Science advice during Covid-19: What factors made the difference?

Romain Murenzi

Executive Director of The World Academy of Sciences (TWAS)

There has never been so much talk about 'science' as in the last year and a half. The global pandemic has dramatically highlighted the critical value of science advice. Science advice has in fact become the centrepiece of government policies from the global North to the global South, with particular to attention to the least developed countries, where it is almost absent.

COVID-19 has been an unprecedented challenge for health systems and for the peoples of countries ranging from Italy to the United States and the United Kingdom, from Brazil, India and South Africa to Burundi and Nepal. The pandemic, in fact, strained even the strongest of health systems of the global North.

In this context, we should ask ourselves: how can science shape policy and how can policy shape science? As intertwined as they are, two distinct yet parallel processes should take place, both converging towards one global well-being. I am referring to two key elements of science advice: science working for policies, on the one side, and policies enabling and fostering science, on the other.

Science policy—initiating or improving policies that can benefit from science advice and science results—is critical in health crises and must be evidence-based in order to lead to sound policy decisions beneficial for all. Managing an effective response to the pandemic and planning the subsequent recovery phase will continue to require a range of evidence from various scientific fields.

As formal government science advice systems do not exist in many developing countries, how do they cope with health crises like COVID-19?

They mostly rely on the advice of the World Health Organization, which sets global standards and establishes public health measures through evidence-based recommendations from scientists. A mission to which also TWAS gives its modest contribution.

The response to COVID-19 revealed that a far more collaborative relationship among scientists, policymakers and the results of scientific research was needed. And it still is. The Statement on Covid-19 that TWAS released on 9 April 2020 clearly indicated a collaborative solution, in line with the Academy's parent organization, UNESCO, which is strenuously directing its efforts towards strengthening and standardizing the open science movement. In its statement, TWAS recommended that medical professionals, public health officials and researchers be all part of the solution. Science policy, in fact.

TWAS mission also encompasses establishing a scientific capacity-building through grants, awards, various opportunities and network-building among researchers. Policy for science, in fact. Since science advice is not easily available in developing countries—if it's available at all—the role of academies of science, including TWAS, is thus critical.

The response to COVID-19 revealed that a far more collaborative relationship among scientists, policy-makers and the results of scientific research was needed.

Science advice during Covid-19: What factors made the difference?

Stephen Quest

Director-General of the European Commission's Joint Research Centre

During the Covid-19 pandemic, researchers all over the world were under huge pressure to guide policymakers through the unknown. They were constantly in the spotlight and had to accept and explain the evolving nature of knowledge. Reliable data to coordinate and compare responses between countries was lacking. Evolving policies were difficult to communicate to the public. Debates about science unfolded live and were impacted by a proliferation of misinformation making communicating the science behind the decisions ever more difficult.

Nevertheless, this crisis also reinforced what believers in the importance of evidence-informed policymaking knew all along. It showed that pressing global challenges cannot be addressed by fragmented science, but require a variety of disciplines to come together and work with policymakers. It also highlighted the importance of coordination and exchange between science advice mechanisms regionally and globally. In addition, it emphasised an old truth that, without citizens' buy-in, without considerations of their concerns and values, policies regulating human behaviour will not be accepted and effective.

Covid-19 revealed a diversity of science-for-policy systems and styles of evidence-use across Europe and beyond. This made coordination and connection an even greater challenge. We could have capitalised on their different strengths and complemented one another better where gaps emerged.

Despite the challenges, the new momentum for science in policymaking is a silver lining of the pandemic. Policymakers, scientists and citizens appreciate the need for a stronger scientific basis of our preparedness and response to crises. A good example is the recently amended EU legislation on Civil Protection which foresees the establishment of resilience goals at EU level, building on science and knowledge. However, we must learn lessons not just for future pandemics but systematically anchor science in public policymaking and administration. Resilient systems for better use of evidence in public administration will be useful when other crises come, such as those linked to climate change, but will also benefit policymaking overall.

We must also strengthen connections between science for policy systems of different countries. Across the EU, the JRC is leading the change through institutional and individual capacity building. As part of the European Commission's Technical Support Instrument, we are building a coalition of countries committed to collaborate in science for policy, to build connections across countries and strengthen structures within their national administrations. Through programmes such as Science meets Regions, we also support science for policy at the local and regional level, and we train trainers across Europe to strengthen researchers' 'science for policy' skills.

Finally, as providers of scientific knowledge, we need to be humble and open to the inclusion of citizens' diverse knowledge, experiences and values in policymaking. Science is not interpreted and acted upon in isolation of these factors, as Covid painfully illustrated. The JRC's forthcoming report about the role of values and identities in the political environment aims to move the conversation about this forward and our new Competence Centre on Participatory and Deliberative Democracy will also help mainstream these practices.

Resources:

Knowledge4Policy Platform: https://knowledge4policy.ec.europa.eu/evidence-informed-policy-making_en

Science meets Regions: https://ec.europa.eu/jrc/en/science-meets-regions

The Oxford COVID-19 Government Response Tracker, Blavatnik School of Government, University of Oxford

Yuxi Zhang

Postdoctoral Research Fellow at the Blavatnik School of Government, University of Oxford, and a subnational team captain of the Oxford COVID-19 Government Response Tracker

Helen Tatlow

Research Assistant for the Oxford COVID-19 Government Response Tracker (OxCGRT)

When a bunch of Oxford lecturers and students were brainstorming tracking government policy responses to COVID-19 in the seminar room of Blavatnik School of Government in March 2020, the UK Prime Minister Boris Johnson stated on TV that his government was confident about eliminating the virus within three months. In the seminar room or the press room, no one expected their mission to be more than a "sprint" that would last for a few months.

Looking back today, however, this journey has become a "marathon", which has seen new virus variants and novel policies one after another. The virus mutation and the evolution of the "social immune system" have kept us – researchers – on our toes. We have maintained a living coding scheme to track emerging policies to provide timely evidence to support policymaking. For example, recently, we have remoulded our existing testing indicator to capture the utilisation of lateral flow tests alongside PCR tests to detect COVID-19 cases.

Besides, tracking policies in more than 180 countries and territories means that we always try to balance cross-country comparability and country-specific policy details. Our policymaking partners shared that they want the data to be comparable and straightforward. At the same time, it is helpful to hear stories of policy innovation and have necessary contextual information to make sense of policies existing in other countries.

Is it possible to combine simplicity and richness in the evidence we provide? It is undoubtedly challenging, but we have learnt that researchers need to do more than just providing the main product of a large-scale panel dataset. Leveraging the brainpower of more than 600 volunteers who speak nearly 100 different languages, and many live in the countries for which they collect data, we have accumulated invaluable insights into local policy realities. We publish regular regional reports to provide a reader-friendly one-paragraph summary of policy changes in these countries. We also offer background information, case studies and analyses of more granular data collected at the subnational level in our working papers. In addition, we team up with partner projects, such as INGSA to conduct in-depth analyses of a selection of topic issues. We also have direct conversations with policymakers every fortnight to provide a deep dive into policy details.

The complexity and scope of the evidence have made it necessary for researchers to utilise multiple dissemination methods to achieve effective communication with data users, particularly policymakers.

Resources:

The Oxford COVID-19 Government Response Tracker: https://covidtracker.bsg.ox.ac.uk/

We collaborate with INGSA to conduct in-depth analysis of policy issues through the International Public Policy Observatory. https://covidandsociety.com/about-ippo/

Addressing inequalities with social sciences: Lessons learned from Southeast Asia's experience with COVID-19

Inaya Rakhmani

Director of the Asia Research Centre at Universitas Indonesia

This think piece was formulated based on an ongoing 11-country study about the mobilisation of social sciences in COVID-19 responses in Asia, jointly organised by the Global Development Network and the Asia Research Centre, Universitas Indonesia. The study problematises the multilayered social inequalities that exist within the sciences, and between social scientists and the policy community, and how this reveals the connections and disconnections between social sciences and policy responses towards COVID-19 in Southeast Asia.

Governments across Southeast Asia are grappling with containing the multi-dimensional health crisis, of which scholars and pundits generally agree to have worsened pre-existing social inequalities. The majority of countries in Southeast Asia are experiencing a surge in cases and deaths since May 2021, and most of international, regional, and national funding goes into healthcare equipment (testing and vaccinations) while the spread of the virus is social (physical and social mobility). It is, in a way, a social issue that takes the form of a health crisis. But unequal prioritisation is being given to health policy responses rather than analysing why it is more difficult to restrain mobility in some areas, villages, districts, cities, provinces, states than others.

It is a pressing time for social scientists to interpret and analyse why and how some policy responses are successful and why others are not, while most of those who are involved intimately in policy-processes are predominantly trained in large-scale surveys and predictive modelling. While such approaches are important in their ability to extract generalisations, also important are deep accounts of vulnerable social groups—who are often socially positioned as vital workers (domestic workers, seafarers, construction workers, drivers and delivery persons)—whose social world can only be properly understood through specific ethnographic methods.

This, in turn, further exacerbates social inequalities between classes, race, ethnicity, gender—among others—and sets aside their voice from policy debates when those not being able to afford working from home are at the centre of infectious diseases. In response to this absence, community-led resilience emerged in the form of pantries for the poor (the Philippines), loose networks monitoring and providing local aid (Indonesia), and finding new ways to provide digital work (Malaysia). Such initiatives, in which social scientists partner with communities to build resilience, is organised outside formal state measures, which means poor policy uptake. In short, in some countries in Southeast Asia, for social scientists to be somewhat successful in impacting communities through well-aligned COVID-19 policies, working informally is the predominant way. The question, then, is how to strengthen these initiatives in ways that can address larger and deeper social inequalities with immersive social sciences.

Key Points for the Future of Science Diplomacy

Mitsunobu Kano

Science and Technology Co-Advisor to the Minister for Foreign Affairs of Japan

Global issues such as the COVID-19 pandemic or zoonotic diseases cannot be resolved by one country, and international cooperation is essential. It seems to have been difficult to fully utilize science diplomacy for COVID-19 measures because countries struggled to respond to the domestic situation during the pandemic. In this piece, I would like to put forward some key points for the future, based on the three dimensions of science diplomacy, and present Japan's research collaborations and international cooperation.

The pandemic revealed problems, vulnerability, and inadequate preparedness for zoonotic diseases in our societies. To prepare for the future, it is critical to anticipate possible crises like pandemics and natural disasters and to forecast science and technology necessary for crisis responses, in addition to conventional foresight. While the international community needs to cooperate in gathering and sharing knowledge, the findings should be reflected into domestic policies including the investment in science and technology. In this respect, interlinkages between *Science in Policy* and *Science in Diplomacy* will play a significant role. Establishing common systems based on scientific knowledge such as vaccine certificates is also important in terms of *Science in Diplomacy* and *Science for Diplomacy*.

For building robust societies that are resistant to zoonotic diseases, international research collaborations are indispensable. Japan Agency for Medical Research and Development (AMED) and Japan Science and Technology Agency (JST) promote research collaboration between Japanese and foreign researchers. AMED supports researches in medical sciences like vaccines and medications (Plan A), while JST pushes on research projects in non-medical fields for realizing free social activities under the COVID-19 pandemic (Plan B).

In terms of *Diplomacy for Science*, each country should give diplomatic support to smoothly carry out such international joint research projects. From the perspective of *Science for Diplomacy*, outcomes should be shared with societies, and countries should strengthen their cooperation and make good use of the research findings for resolving global issues.

Similarly, in vaccine diplomacy, ACT Accelerator and the COVAX Facility are crucial for the equitable distribution of vaccines in the world. Japan has strongly supported the COVAX Facility through financing and co-hosting the COVAX AMC Summit. During the G7 summit in June this year, further commitment to COVAX was reaffirmed by the member states. Accelerating efforts are needed, including the provision of cold chain equipment as "Last One Mile Support", which contributes to the delivery of vaccines down to each and every person by leveraging relevant technology.

While the international community needs to cooperate in gathering and sharing knowledge, the findings should be reflected into domestic policies, including the investment in science and technology.

A mission for the future of Science Diplomacy

María Estelí Jarquín

Deputy Director, International Affairs, University of Costa Rica

The study and dissemination of Science Diplomacy gained huge importance during the Covid-19 pandemic. More and more countries are joining the global conversation of creating national and regional Science Diplomacy strategies. However, something has become evident: the enormous diversity of actors who participate can vary from country to country.

In some countries, the ministries of science will play a more prominent role, while in others the actions will be coordinated by the ministry of foreign affairs, or with the involvement of the ministries of education or economy. In others, higher education institutions will be at the centre of all decisions while, elsewhere, private sector will take the lead. So... is there a perfect formula that works for everyone?

The answer to this question can be complex. In this context, a relevant mission to establish for the future of Science Diplomacy it is to understand who the main stakeholders are and what the nature of their role is in each country (resources, mandates, etc.). We will surely see a melting pot of possibilities depending on the region and the political system that we analyse, since the strategies of Science Diplomacy will be largely a result of the political culture of each place.

More and more, countries engaged in designing a Science Diplomacy strategy are facing a big challenge: "who to call to the table?" In this article, we tried to approximate this question by mapping the STI public institutions of the six member countries of the Central American Integration System (Guatemala, El Salvador, Honduras, Nicaragua, Costa Rica and Panama) and then understanding their capacity to connect internationally in order to highlight their potential for Science Diplomacy.

It is then crucial to include for future research agendas more comparative analysis on the understanding of the countries' institutional settings. After all, Science Diplomacy has a huge component of "building partnerships for the goals" (Sustainable Development Goal number 17 from the 2030 Agenda). However, when partnering, it is important to really understand who should be at the table.

Covid-19: Providing a boost for science diplomacy?

Jan Marco Müller

Science & Technology Advisor, European External Action Service

As is the case in many other fields of public policy, diplomacy has been deeply affected by COVID-19. Impacts ranged from the geopolitical dimension (e.g. mask and vaccine diplomacy or the future of WHO) to practical implications (e.g. diplomats not being able to reach or leave their duty stations or not having access to vaccines). Not to forget that COVID-19 deprived diplomacy of one of its most important tools: face-to-face meetings.

However, COVID-19 has also sharpened the awareness of diplomats that engaging with foreign and security policy think tanks, which are abundant in the capitals, is not enough when having to solve complex challenges at planetary scale. While such awareness was already there on issues like climate change where diplomats have been interacting with institutions such as the IPCC for a long time, COVID-19 required diplomacy to work with public health experts in natural and social sciences as well as medicine. Like many other civil servants, diplomats had to learn what a spike protein is and why the incidence rate matters.

At the same time, researchers saw themselves dragged into the geopolitical arena, with many governments keen to make promising announcements. As well, throughout the pandemic scientists experienced how pre-prints of their papers attracted international media attention but also suffered the effects of anti-vaxxers and disinformation campaigns. Still, it is useful to remember that global scientific cooperation and data sharing, including between countries that are political foes, enabled the development of a whole range of vaccines in less than a year – an unprecedented feat and a testimony for the power of science.

In view of the pandemic, the European External Action Service established the position of a science & technology advisor in August 2020, followed by the establishment of a vaccine strategy task force, providing evidence to inform the EU's global response to the coronavirus and serving as a broker between science and diplomacy. The position quickly became a reference point for both Headquarters and EU Delegations for all science-related matters, not just health-related ones. While the position is currently filled by a secondment supported by the European Commission's Joint Research Centre, it remains to be seen whether it can firmly be anchored in the organization, drawing lessons from the COVID-19 pandemic.

It is useful to remember that global scientific cooperation and data sharing enabled the development of a whole range of vaccines in less than a year – an unprecedented feat and a testimony for the power of science.

Covid-19: highlighting the need to convey uncertainties when providing scientific advice for policy-making

Salim S. Abdool Karim

Director of the Centre for the AIDS Programme of Research in South Africa, and CAPRISA Professor of Global Health at Columbia University, New York. Co-chair of the South African Ministerial Advisory Committee on Covid-19

Policy-makers require clear evidence-based advice to guide actions to impact the rapidly growing and evolving Covid-19 pandemic. Globally, scientists have been thrust into prominent roles to provide scientifically-sound advice in the policy-making process. However, the rapidly evolving nature of the pandemic has created a high level of scientific uncertainty, which is challenging to convey and incorporate into the advice by scientists. This challenge is well illustrated by the emergence of multiple new variants of SARS-CoV-2 that have overturned prior scientific opinions and advice:

- Some scientists promoted (e.g., Barringdon Declaration) and even implemented (e.g., in Sweden) minimal restrictions to allow widespread viral transmission to create naturally-acquired herd immunity only to discover that new viral variants lead to reinfection by evading immunity from past infection.
- Some scientists prematurely declared that herd immunity had been reached after initial waves led to high seroprevalence (e.g., in countries like India, South Africa and Brazil) only to witness more severe subsequent waves due to new viral variants.
- Some scientists promoted early easing of public health prevention measures as vaccination rates rose, only to experience new outbreaks caused by new viral variants (e.g., in Peru, Israel and other countries).

The unpredictability of genetic mutations that lead to the creation of new variants, now named with letters from the Greek alphabet, has highlighted the uncertainties in our knowledge of SARS-CoV-2. The virus has turned out to be a rapidly changing foe creating wave upon wave of new infections. Even the world's most formidable weapons against SARS-CoV-2 have been challenged; clinical trials have demonstrated how the AstraZeneca-Oxford vaccine's efficacy in preventing clinical illness dropped from 70% against the Alpha variant to 10% against the Beta variant. But the efficacy of some other vaccines, such as the Pfizer-Biontech vaccine, seem so far not to have not been impacted by any of the variants. These findings highlight the importance of conveying a degree of uncertainty that all vaccines are not equal.

Simplifying probability and uncertainty into words (e.g., probable, possible) carries its own hazards. Innovative approaches are needed to convey scientific uncertainty, both to policy makers and the public. This challenge is compounded by politicians, scientists and others, often sceptics of intrusive interventions, who disingenuously use hindsight to attack scientific advice and government decisions, that have often been made in the midst of high levels of uncertainty. Despite these challenges, advice based on scientific evidence, with all its uncertainty, is essential in developing policies aimed at controlling the pandemic.

Innovative approaches are needed to convey scientific uncertainty, both to policy makers and the public.

The role and influence of Chief Science Advisors

E. William Colglazier

Editor-in-Chief of *Science & Diplomacy* and Senior Scholar in the Center for Science Diplomacy at the American Association for Advancement of Science (AAAS). Former Science and Technology Adviser to the United States Secretary of State (2011-2014)

The role of the Chief Science Adviser (CSA) is heavily influenced by history, culture, politics, and governmental structure of a country. Although I never served as CSA, I have known most of the Science Advisers to the American President over the past fifty years. Their relationship with the President has varied considerably. Not all held title of special assistant to the President – these CSAs had little direct interaction with the head of state. None of the CSAs was in charge of a major governmental agency during their term as CSA. Only the most recent CSA was appointed at the rank of Cabinet Secretary. Most had influence on government funding for scientific research, i.e., "policy for science." Some had influence on issues that can be considered as "science for policy" – including responding to technological disasters and mobilizing science for diplomacy. The role and influence of CSAs in other countries are likely to be quite different from that in the U.S. The "science advisory ecosystem", including the role of the CSA, has clearly evolved everywhere as scientific and technological advice has grown in importance for political leaders.

Here are some of the questions of most interest to me in hearing answers and perspectives of the four CSAs in our session:

- First, how is the role of CSA been determined by history, culture, politics, and governmental structure of your country?
- How close of a relationship have you had with the head of state and/or with his or her closest advisers?
- Has your role included managing a major governmental function in addition to providing advice? How has your influence been felt on "policy for science" issues including funding for basic and applied scientific research?
- Do you provide a coordinating role among government agencies on issues where scientific and technological input is relevant?
- To what extent have you provided advice on broad issues of domestic and foreign policy?
- Have you had a role in governmental responses to natural or human-caused disasters?
- How have you interacted with major non-governmental scientific and technological institutions in your country, as well as with private companies and civil society, all of which are providing advice to political leaders?
- To what extent have you been involved in your government's response to the COVID-19 pandemic?
- How has your role evolved with growing importance and impact of emerging technologies on domestic and international affairs?
- If you could change one thing that would help to make the role of CSA even more effective in your country, what would that be?
- To what extent has the existence of the CSA position helped to increase the influence of and trust in science by the general public?

Reflections on Science Advice Practice during Covid-19

Juliet A. Gerrard

New Zealand Prime Minister's Chief Science Advisor

The pace of new information that emerged during COVID-19 during a time of escalating risk provided a unique opportunity for science advisors internationally to share real-time observations and reflect on their practice. Three reflections from my experience on the front row of the COVID-19 responses are front of mind:

1. **Good advice is hopeless if no-one is listening: the critical value of relationships.**

In my experience as the Prime Minister's Chief Science Advisor in New Zealand, the key relationships were: 1) my own relationship with the PM; 2) my relationship with the forum of Departmental Science Advisors, especially the Science Advisor to the Director General of Health; and 3) my relationships with international peers. Strong personal relationships proved vital and displaced any formal grouping or international network.

2. **What we didn't know was arguably more important than what we did know.**

It was vital to be honest about the limits of knowledge and the pace of change of our knowledge, and be clear where science could, and could not, help. Part of my work has been to communicate this to decision-makers, and to help decision-makers communicate this to the public. The value of honesty and good communication in this regard has been vital in the public acceptance of the Aotearoa New Zealand response.

3. **The science-politics interface was arguably more important than the science-policy interface.**

The evidence synthesis work undertaken by Chief Science Advisors around the world was pretty much aligned (with a few notable exceptions, such as advice on mask wearing). Yet, the outcomes around the world in terms of COVID-19 numbers were dramatically different, even in countries with similar science advisory mechanisms. The interplay of science, policy and politics that led to this situation is revealing.

The value of honesty and good communication has been vital in the public acceptance of the Aotearoa New Zealand Covid-19 response.

Perspective on Science Advice during the COVID-19 from a Developing Country

Teatulohi (Lohi) Matainaho

Outgoing Chairman of the Papua New Guinea Science & Technology Council and Chief Science Advisor

Access to scientific and health information and data on COVID-19 by a developing country like Papua New Guinea (PNG), is heavily dependent on what is provided by the WHO. Scientists and medical advisors also access critical information through their professional networks. The following perspective is taken from my involvement as a member of the Medical and Scientific Advisory Committee that is responsible for advising the PNG Prime Minister and the National COVID-19 Pandemic Controller.

1. Science Advisory and Public Policy

Establishment of an appropriate science advisory mechanism is a challenge in a situation where the accommodation of science is not quite entrenched in public policy and in the government decision-making matrix. An independent science advisory process has its inherent challenges in conveying its recommendations on masking, social distancing and vaccination, often without clear communication of the scientific basis to the public- who may still lack basic knowledge about viruses, infections and vaccines. This further adds to the sudden elevation of science advice (and its potential role) as a 'disruptor' in the decision-making environment.

2. Related National Scientific Expertise

Lack of local and national scientific expertise and research work in virology, epidemiology and public health can have a major bearing on one's capacity to inform government. Such experts (rather than external experts) can provide confidence to decision-makers and the public.

3. Political Domain

Often scientific rationale and reasoning may not be the basis for decision-making or the primary source of information. Contestable ideas and reasoning may be given more room than the testable or evidence-based science.

4. Public Awareness and Public Reasoning

Public awareness of the science of COVID-19 and public health requirements is often subjected to existing knowledge and on the faith of people in life –in their own mitigation of fear and possible danger of COVID-19 to their lives.

5. Data Sharing and Local/ National Response

It is essential that local response is guided by local data and critical information that may be available, such as on variants and their potential impact. Managing response in a sustainable manner can reduce burden on limited health resources.

6. Research in COVID-19

Seroprevalence studies are vital. There is limited COVID-19 research.

The need for different types of science advice

Corien Prins

Chair of the Netherlands Scientific Council for Government Policy (WRR)

Science advice has played an important role in the COVID-19 pandemic. All over the world science advisors have been put in the spotlight, especially those that provided the epidemiological advice in the first acute phase of the crisis. However, as the crisis prolonged, there grew a need for different types of advice, for instance on how to tackle economical and societal consequences of the pandemic. In several countries advisors and politicians, struggled to broaden the scope of the advice to a more multidisciplinary and encompassing approach.

The Dutch advisory landscape, which consists of several advisory councils, planning agencies and public knowledge institutes, is able to provide these different types of advice. There is an Outbreak Management Team (OMT) with the specific task to deal with any infectious disease outbreak. Especially in the first months of Covid-19 pandemic, this structure seems to have worked as intended. However, as the crisis prolonged and the call for advice on broader aspects of the crisis became louder, the limitations of this structure became visible. From that point on, other advisory bodies have tried to complement this advice based on their own expertise and thus broaden the scope of policy makers in this crisis.

Fitting its legal task, the Netherlands Scientific Council for Government Policy (WRR) has contributed with publications that specifically address long term challenges and consequences of this crisis (for more information visit: https://english.wrr.nl/wrr-en-corona).Together with two other advisory council we published an essay with the core message that we should not just be prepared in terms of hospital beds, but also in terms of science advice infrastructure. Therefore, we must strengthen our ability to:

1) adapt, both in our role of advisors as well as in the advisory infrastructure our work is based upon;
2) provide advice that is multidisciplinary in content and discussion;
3) be sensitive to the distribution and recognition of responsibilities between science-based advice on the one hand and politics & policy on the other hand;
4) sensitive towards the relevance of processes of and safeguards for knowledge development in society.

Diversity is a strength of the Dutch advisory landscape. As always, the challenge is to provide the right type of advice, by the best-suited advisory body at the right time. This is ever more relevant in a crisis that directs the attention of policy makers to acute problems and tends to ignore long term challenges. This is one of the reasons why we are currently working – together with the Netherlands Royal Academy of Sciences – on scenario studies, to broaden the discussion in parliament that seems to be directed to just getting back to 'normal'.

The challenge is to provide the right type of advice by the best suited advisory body at the right time. This is ever more relevant in a crisis that directs the attention of policy makers to acute problems and tends to ignore the long term challenges.

Science Advice in the COVID-19 pandemic

Mark WJ Ferguson

Director General Science Foundation Ireland and Chief Scientific Adviser to the Government of Ireland

The COVID-19 pandemic has turned out to be a unique experiment in scientific advice, whereby all Science Advisory Mechanisms in all countries faced the same problem at the same time. So how did we perform? Here are three provocative questions:

1. Is there any correlation between the scientific advice mechanisms (established / ad hoc / individual / group etc.) and how that country performed in the pandemic (quality and implementation of the advice, results – infection rates, deaths, hospitalisations, economic / social disruption etc.) If so, what is causative and what is coincidental?
2. Is there any correlation between the extent of pre-pandemic preparedness and how that country performed in the pandemic?
3. Did the dependence on, and power of, scientific advice during the pandemic make science a political force and hence call onto the stage other political actors e.g., opposition groups, ideological differences, power seeking individuals etc.

Reports such as that of the Independent Panel have focused on many facets of the pandemic and made recommendations for improvements and new structures for preparedness. Here, I want to reflect on what went well and what we could improve, from a scientific advice perspective. Whilst everything can be improved, I think the following things worked pretty well: scientific collaboration and data sharing (e.g., biology of the virus, vaccine development, sequencing, variants etc.), structured and informal discussions, data and expertise sharing between science advisers, facilitated by pre-existing networks and contacts, open access to publications, preprints and reports, rapid response of research funders.

In my opinion we underappreciated the following and should strive to do better in the future:

1. Importance of prudent judgement – what to do when you know little and there is no / poor evidence? What degree of risk to take?
2. If you are looking for evidence for actions you are always behind – a follower rather than a leader. How to foster leaders as well as those following the science / evidence.
3. The value of a deliberate diversity of responses together with their real time evaluation to allow rapid pivoting to the optimal response.
4. The challenge of transitioning from generic public health responses when we know little, to a more scientific approach, when we know something.
5. Communicating and responding to the evolution of evidence – things change, often dramatically and scientific evidence often becomes obsolete quickest.
6. How to communicate uncertainty whilst also giving hope, confidence, national solidarity and encouraging compliance, whilst avoiding fear, despair and panic in the population.
7. Balancing agility and reliability.
8. Communicating the contested nature of science – there are more scientists alive today than ever before so getting consensus is more challenging.
9. The importance of implementation science and implementation capacity.
10. The importance of fear in influencing people's responses.
11. The illusion of precision of outputs from models with poor inputs. Small changes in model assumptions might lead to major changes in policy. We need more robust predictive modelling.
12. We need better preparedness, e.g., pre-negotiated platforms for rapid deployment of global clinical trials – the bureaucracy and time to establish these were excessive.
13. Better problem identification and curation – i.e., what we do not know that is important, e.g., no one predicted the early nursing home vulnerability and challenges, yet it was obvious and important.
14. Recognising that the pandemic exaggerated national tendencies.
15. Prioritising research into, and the importance of, certain topics, e.g., ventilation, different testing modalities and their use (e.g., for surveillance, diagnostics, facilitating reopening etc.) and rapidly incorporating learning from the East.

Capacity building is key for transdisciplinary practice

Theres Paulsen

Director of the Network for Transdisciplinary Research (td-net), Swiss Academy of Sciences

Transdisciplinary approaches complement the canon of scientific knowledge production to help society find evidence-based policies and sustainable solutions to its complex challenges.

Transdisciplinarity goes beyond interdisciplinary approaches by not only recognizing scientific knowledge as the "right", but by integrating practical knowledge as equally important. Ideally, this is done not only by conducting scientific interviews with stakeholders and those affected, but by involving them directly in the scientific process, i.e. by letting them participate in the learning process and in the interpretation of the data and findings. In this way, science also leaves the classical path of scientific policy advice or knowledge transfer; through dialogue formats, learning processes are promoted on both sides and research questions as well as implementation measures are co-designed.

In favour of adapting to life-world contexts, purely science-related evaluation and reference systems have to be rethought namely for projects and science careers – this is inconvenient. Collaborative approaches are still struggling for broad acceptance in the scientific system and an adequate definition for excellence is still lacking. However, even established scientific work has its weaknesses as already formulated in an OECD report by Jantsch and Piaget in the 1970s. The reductionist approaches of the disciplinary sciences very often miss the reality and thus the needs of politics and society (in addition of the understanding how things are, society also need knowledge on "what works"). Sustainability research shows that important societal preconditions such as values, traditions, specific framework conditions have also to be taken into account in science. This is why it is often the process and the process design that can be generalized and not the results as such.

Good transdisciplinary practices do not drop from the blue and are anything but trivial. We all agree that Transdisciplinarity has been in practice since decades, but why do we still not train better for the use of its methods? Capacity Building is key in order to decide which approach is adequate for a certain problem. Scientists need to be empowered to use different approaches. Key questions are "what kind of knowledge needs to be developed? Which disciplines and or practitioners need to be integrated and when in order to help solving, mitigating, or preventing societal challenges?" Is it then still enough to be very well trained in one discipline? We have to reflect what the blind spots are and how we can get positive diversity in the science system.

The Time for Transdisciplinarity is Now

José Siri

Senior Science Lead for Cities, Urbanization, and Health for the Wellcome Trust's Our Planet Our Health Programme

We need transdisciplinary science more than ever. In the past month alone, staggering heat waves in western North America and massive flooding in Europe and China have caused hundreds of deaths and far-reaching impacts on lives and livelihoods. The scale and intensity of these events was unprecedented but will become commonplace under projected climate change. Meanwhile, the pace of needed emissions reductions is rising steeply due to collective climate inaction, COVID-19 has exposed vast fragility in human systems, sustainable development is lagging far behind its lofty goals (1), and information flows and inequality are emerging as new (or once-again-relevant) complex challenges to health and wellbeing.

Transdisciplinarity is key to addressing such problems for at least four reasons:

First, transdisciplinary research (TDR) marshals, consolidates, and leverages greater information resources than traditional science, incorporating professional expertise and local and experiential knowledge alongside the resources of multiple disciplines. This blending of perspectives and a focus on systems thinking makes TDR uniquely suited to understanding complex problems rooted in the particularities of place.

Second, TDR generates ownership among users of scientific evidence – decision-makers, businesses, civil society, and communities, among others – through negotiated priority-setting that takes account of their needs and opinions. Interventions and policies rooted in transdisciplinary research are less likely to miss the mark and suffer from poor uptake or utilization.

Third, TDR is more efficient than traditional science. Because solutions are embedded in their structure, TDR projects generate needed innovation simultaneously with scientific knowledge. In an era when we must act rapidly under considerable uncertainty, TDR bypasses lengthy cycles of sequential knowledge production and application, allowing for evaluation of intervention or policy experiments on the fly.

Lastly, TDR generates relationships between science and society. In my experience, the single most important predictor of the efficacy of science in influencing policy is the existence of long-standing relationships between knowledge-holders and decision-makers. For too long, science has held itself at arms' length from decision-making in a counterproductive effort to model neutrality – we can no longer afford to exclude critical knowledge and expertise from societal debates.

Fortunately, the special role of TDR is increasingly recognized, through efforts like the Wellcome Trust's Our Planet, Our Health funding programme, the UK Prevention Research Partnership, the Belmont Forum, and the OECD's work (2) on developing guidelines for funding and implementing transdisciplinary science. More such efforts are urgently needed.

References:

(1) Green M, Harmacek J, Krylova P (2020). Social Progress Index 2020: Executive Summary. Social Progress Imperative: Washington, DC, USA.

(2) OECD Global Science Forum (2020). Addressing societal challenges using transdisciplinary research. OECD Science, Technology and Industry Policy Papers, No. 88. Organisation for Economic Co-operation and Development: Paris, France.

Transdisciplinarity: A necessary but complex reality

Ana Maria Hernandez Salgar

Chair of Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES)

Beyond a theoretical concept, understanding what happens around us requires a look through different eyes: the perspective of lived reality; the perspective of the natural sciences; the perspective of the social sciences on, for instance the relationship between nature and humanity; from the perspective of economic sciences; and the present and future impacts of the realities studied, and those who explore policy options to address all the findings.

It has been traditional for each discipline to approach its studies separately. However, when the objective of scientific production is to support decision-making, this needs to change. When working to build a bridge between research and decision-making, there is often the need to learn to speak different languages: that of the scientist who presents and analyzes the facts; that of the society that supports the execution of decisions; and that of decision-makers at different levels, who establish the ways and means to achieve the required social, economic, cultural and environmental objectives.

Thus, transdisciplinarity in practice embraces different knowledge systems, both those organized in the scientific method, as well as that knowledge that have another types of organization and schemes, such as indigenous and local ones.

Talking about a transdisciplinary science is complex since the different methods of learning and expression of knowledge cannot be pigeonholed into a single way of doing or framing the production of knowledge. Talking about transdisciplinarity between the different branches of knowledge is something much more palpable.

In the case of IPBES, the construction of knowledge requires transdisciplinarity. However, it is a complex process that always appears almost impossible at the beginning of each assessment and evolves in a more harmonious way as the authors meet, dialogue, and value the weight of each knowledge system to approximate key messages towards decision makers. This work involves respect for other knowledge systems and methodologies, the ability to understand other sources of data and analysis outside the disciplines of each expert, and finding 'common language' to make scenarios relevant to political decision making. For these reasons, transdisciplinarity, even though it is complex, is urgently needed to offer enough tools for decision makers to make better decisions for people and nature.

Transdisciplinarity is a complex process that always appears almost impossible at the beginning of each assessment and evolves in a more harmonious way as the authors meet, dialogue, and value the weight of each knowledge system.

Structures of transdisciplinary science advice: Key to a better prepared future

Nicole Grobert

Chair of the European Commission's Group of Chief Scientific Advisors

We live in an increasingly complex world. This becomes especially evident in times of crises, as we have learned during the Covid-19 pandemic, but also when facing more long-term threats like climate change. To find sustainable solutions and successfully respond to these challenges, we need to leverage all available knowledge.

The European Commission's independent Group of Chief Scientific Advisors (GCSA) is set up to do exactly that; it supports the European Commission's policy-making activities with high quality, timely and independent scientific advice on complex issues that require a holistic, transdisciplinary approach. The group is composed of seven eminent scientists from a variety of disciplines. The GCSA, established in October 2015, develops Policy Recommendations based on scientific evidence, which is typically provided through Evidence Reviews Reports prepared by the SAPEA consortium (Scientific Advice for Policy by European Academies). SAPEA gathers expertise across a variety of disciplines from over 100 academies and societies across Europe. Together the GCSA, SAPEA and their secretariat in the European Commission form the scientific advice mechanism (SAM).

The unique structure of SAM acknowledges the need to combine evidence from various disciplines to best address the issue at stake and its effect on society to inform impactful policies. A recent example is the Joint Opinion on "Improving pandemic preparedness and management" developed by the GCSA together with the European Group on Ethics in Science and New Technologies (EGE) and Special advisor to President Ursula von der Leyen on the response to the coronavirus and COVID-19. Transdisciplinary science advice is challenging, and good communication across disciplines is critical. It requires additional training for scientists and policymakers to enhance understanding among each other and with citizens.

It takes time to develop a common language and trust. In this context, two types of science advice need to be distinguished: advice to respond to acute crises and advice that aims at long-term effects. Both are important but have different dynamics and require different mechanisms. We face different degrees of certainty, what do we know, what do we not know, and what are we uncertain about, which is even more difficult to navigate in transdisciplinary science advice. While long-term, strategic advice can afford more focus on what we know, a fast response is characterised by more uncertainty.

Transdisciplinary science advice is key to better prepare for the future. We need a tiered approach, a system that allows more time and flexibility to work in interdisciplinary ways.

Transdisciplinary science advice is challenging, and good communication across disciplines is critical. It requires additional training for scientists and policy-makers to enhance understanding among each other and with citizens.

Science is tested if it can address the Global Commons challenge?

Naoko Ishii

Center for Global Commons, The University of Tokyo

We are facing extraordinary challenges, represented by climate change, biodiversity loss and recently the pandemic. It was in 2009 when a group of earth system scientists alerted that we may have already transgressed several planetary boundaries that provide us with a stable and resilient earth system, which is the Global Commons as we call it.

The progress in the real world is slow. The IPCC's 6th assessment report in August 2021 sent the message that we have a very slim chance of containing temperature rise under 1.5 degrees Celsius, unless we accelerate actions with scale and speed.

We are running out of time and need to urgently ignite the comprehensive transformation of key economic systems such as energy, food, cities and increasing circularity. We also need a new way of stewarding the Global Commons because the current system based on intergovernmental treaties and organizations are not delivering.

Is science helping us addressing these global scale challenges?

I see two critical gaps which science needs to close if it is to play a helpful role.

First, it needs to get over siloes within disciplines in natural science and between natural and social science. From a non-natural scientist perspective, I am amazed how loyal natural scientists in general are to their own disciplines, for instance, even if the earth system is united with each component's interacting with one another. Fragmentation and isolation within and across disciplines leads to delay in understanding the comprehensive picture of where we are against the capacity of the earth system. This is fatal when the world requires urgent actions.

The boundaries between natural and social science are another challenge which scientists need to get over, as total economic system transformation requires not only knowledge of natural science but also that of social to come up with a road map for economic and social change. This is a huge work!

Another critical gap to be closed is the one between science and actions by policy makers, business leaders and citizens. I acknowledge that science has been making a good effort to let decision makers in the real world understand the key message from science. If you take a look at change in a way the IPCC reports is written for policy makers, it is apparent that the recent ones are much better read by non-scientists, which enabled decision makers to act on.

That said, the real world is also very much siloed and stuck with incumbent incentive structure in the dominating economic system, which prevents decisive actions for transformation.

With those challenges, we need a new way of governing the Global Commons. I see promising sign of booming model of distributed leadership among key decision makers across sectors, sometime called multi-stakeholder coalitions. This partnership mechanism should be driven based on knowledge in science and also guided by science in implementation. This is where the use of science for humanity is tested.

Shift's Happening: Six Drivers of Paradigmatic Change

Armine Yalnizyan

Economist and Atkinson Fellow on the Future of Workers

1. **Inequalities:** The pandemic highlighted multiple inequalities that were previously well-known but not viewed as sufficiently critical to address in order to improve the economic system. However disparities in incomes, opportunities, and access to services have viscerally shaped pandemic-related life-and-death, health and employment outcomes, escalating demands for action to reduce inequalities and "build back better".
2. **Population Aging:** The pandemic also accelerated a trend in how economies and societies operate, irrespective of a global crisis: population aging. Tightening labour markets and widespread labour and skills shortages throughout the Global North will accentuate the push and pull with the Global South, redrawing the map of mobility, workers' bargaining power, and changes in regional geopolitics.
3. **Global Competition:** Pandemic economics also relied heavily on technology, permitting more "work from home" arrangements. Though affecting the minority of jobs, employers are realizing if people can work from home, they can work from anywhere. More white-collar workers may find themselves in competition with equally skilled counterparts from lower-wage jurisdictions. This will introduce more volatility for some of the highest skilled and paid workers in richer nations. This could destabilize a workforce not affected by the first wave of outsourced production, and hasten global wage convergence for professionals and para-professionals. Since richer workers pay relatively more tax, this could challenge public coffers in the Global North.
4. **Climate Chaos:** Extreme climate events are triggering greater urgency to accelerate the reduction of carbon emissions in some regions, with spill-over effects in others. The multilateral trade-pacts of the past forty years, which supported export-led growth, are giving way to a new type of international policy alignment in response to this shared global existential threat.
5. **Data Ownership/Use:** There is growing tension between public and private sector decision-makers in their use of data. Data is a necessary utility for developing and refining public policies. But it is treated like a commodity that is used by firms, especially large ones, to extract value. The private sector is nimble and adept at analysing public data to deepen and broaden markets. Not only is the public sector slower in using public data to improve well-being, it has been slow to ensure data access for public purposes from "proprietary" sources. Governments are also struggling to regulate global entities, as these market players challenge and redraft existing rules of the game. In response, a slow drift towards policy alignment (rather than codified trade pacts) is emerging regarding corporate taxation, the classification of workers, cybersecurity, antitrust, etc., with long reach into our individual and collective lives.
6. **From Costs to Net Benefits of Public Finance:** How we talk about public finance is changing. The GFC of 2008-9 and the pandemic have reduced focus on government deficits and debts. Add to this mental shift the material shift of an aging population. This has a cascading effect on labour laws and immigration policies, as well as spending on skills development and income support. Both fiscal (tax and spend) and monetary (price stability) policies will be impacted the population ages against a backdrop of resistance to higher taxation. An aging demographic contributes less to public coffers, while often using more public services. Governments will refocus attention from austerity and balancing budgets towards showing the effectiveness of public spending in boosting economic growth. This shift in accountability moves emphasis from outlays/costs to net benefits, which is a nascent methodology for Finance Departments. It shifts the sightline from the fiscal year to cumulative impacts. Canada has been developing these analytics[1] and, as the government's recent report *Evaluation of Pathways to Education*[2] demonstrates, when we do our jobs well through public policy, both individuals and societies benefit from public spending. But we have to know what works. The greatest returns on public investments flow from closing opportunity and outcome gaps for people who have historically faced systemic inequalities. This can only occur through public policy, not market forces. It is a radical departure from the past, and perhaps the foundation of a new economic, and public policy, paradigm.

Resources:

1. Employment and Social Development Canada Evaluation Reports: https://bit.ly/2WeTo80

2. Evaluation to Pathways to Education, final report: https://bit.ly/3kdJz2o

Changing the Paradigm with Indigenous Knowledge and Navigating the Crises of our Time

Nii Gaani Aki Inini (Dr. Dave Courchene), Anishinaabe Nation

Founder of the Turtle Lodge and Chair of the National Turtle Lodge Council of Elders and Knowledge Keepers

We are living in unprecedented times. Humanity is suffering from the mindset of domination, that originated from the idea that we could control and dominate Nature. We need to come to terms with the way we are treating Mother Earth as a non-living entity. The land itself is the source of the solutions to the identity crisis and symptoms we are facing. The land can revive our individual identity. We start to feel the voice of the land.

Of equal concern is the way we treat each other as different colours of people, that has led to anger and violence. We have yet to evolve to a level of being related as brothers and sisters. Rediscovering our identity as unique members of the human family is fundamental. We all have gifts to share and an identity, complete with original instructions on how to take care of each other and our home, Mother Earth.

The world is in need of spiritual leaders.

We need to change the narrative, globally, to a paradigm based on a foundation of values: natural laws. True humanity is built on values that stem from the heart – being kind, humble, showing respect, loving all of creation.

Mentorship by Indigenous Knowledge Keepers can support the youth in knowing and feeling the land. Knowledge Keepers can lead by creating Earth-centred education approaches, including rites of passage and ancient approaches of connecting to the land.

Learning to read the Book of Nature gives our youth the best chance of surviving following natural law. The land has an intelligence, a heart of kindness, and can provide direction in how to live in a sustainable and respectful way.

There is no one panacea to solve all problems. Nature operates on the principle of balance. Working together, with diverse approaches based on sacred values, keeps the balance. Together we can develop Earth stewardship initiatives, grounding scientific knowledge with a foundation of natural law.

Together we can develop Earth stewardship initiatives, grounding scientific knowledge with a foundation of natural law.

Indigenous Knowledge Keeper-led places of education should be supported with proper investment.

An international education campaign of Indigenous Peoples sharing their knowledge of our relationship that has sustained us for tens of thousands of years, should be supported.

When we begin by re-establishing our relationship with the Earth, we will find our way out of this world that is not sustainable. We will achieve justice and oneness, knowing we are all brothers and sisters, united by the heart.

The New Reality of the Anthropocene

Achim Steiner

Title: Administrator of the UN Development Programme (UNDP)

In the first of his celebrated lectures on Physics, Richard Feynman asks: "If, in some cataclysm, all of scientific knowledge were to be destroyed, and only one sentence passed on to the next generations of creatures, what statement would contain the most information in the fewest words?" Feynman's answer was the atomic hypothesis: that all matter is composed of little particles in constant motion. The theory is only an approximation of "the truth" (atoms are composed of even tinier particles) but it is powerful because it not only explains many attributes of matter but is also the foundation for other branches of science, from chemistry to biology. It shows how science takes us beyond our immediate perceptions (even with the most powerful microscopes, atoms are virtually impossible to see) and what seem like many disparate things with a multitude of shapes and colors (rocks, buildings, organisms, water, air) towards a simple theory, reached through reasoning and experiments. Science often makes us see the world afresh, identifying risks unseen by the naked eye and novel ways to improve lives.

This is exactly what is happening with climate change. Science is the basis of our understanding of climate risks and of what we need to do to mitigate climate change. But beyond the glare of the climate emergency, science is telling us that this is but one of a set of processes of dangerous planetary change that poses risks to people and all life on our planet. The increase in the frequency of new and reemerging zoonotic diseases, the loss of biodiversity and of ecosystem integrity are other examples. This is happening not locally or regionally, as has been the case for millennia, but globally and at an unprecedented pace. And there is an underlying driver common to all these seemingly disparate challenges: planetary pressures that are driven by human activity. For the first time in our history, catastrophic risks to our existence depend more on our choices than from natural hazards. The term "Anthropocene," even though it has not yet been adopted by the geologists revising the geological time scale, has been used to capture this new reality. Much like the atomic hypothesis takes us beyond our immediate perceptions to a more fundamental understanding of all matter, the reality described as the Anthropocene points to human choices as the drivers of a wide range of dangerous planetary change that may seem disparate and distinct.

The Anthropocene may seem disempowering or to call for a retreat in human aspirations. But what to do going forward depends on what we value and aspire to. And how we measure progress and evaluate policies. A little over 30 years ago, the introduction of the human development approach provided a stark departure from the notion that progress meant simply holding ever more material resources. Instead, it focused on the ability of people to be and do what they value and have reason to value. Human development is not only about wellbeing, but also the ability of people to make different choices. As people reason about what they value and why, the new reality of the Anthropocene is becoming ever more present. It can no longer be left in the background of human choices but brought to the fore. And so, the next frontier in human development implies expanding freedoms while easing planetary pressures. Science will be central, but so will the affirmation of universal human rights and the relentless pursuit of equity. If anything, the Anthropocene shows that if humans have the power to alter planetary processes, they also have the power to make different choices. While avoiding a cataclysm of the type that Richard Feynman invoked is by no means certain, advancing the next frontier of human development may very well be one of our best bets to ensure that it does not happen.

2 Foresight and Resilience: From SDGs to Emerging Technologies

Bringing society back in: Co-production of care and wellbeing

Elizabeth Jelin

Senior Researcher, Centro de Investigaciones Sociales, CONICET-IDES, Buenos Aires

During the pandemic, all kinds of preexisting inequalities and injustices, from the global to the local, exacerbated, became visible to the world. This intolerable reality calls for a reordering of global priorities and issues. The central concern becomes how to bring about wellbeing and diminish pain and suffering of the population of the whole world.

During the last decades, social science research (especially from a feminist perspective) has shown the importance of the concept of CARE. Research made evident the multiple dimensions of the concept and of the practices of care, as well as the institutional arrangements involved. The result is a clear understanding of the social and political organization of care, which involves different combinations of family, state, market and community action. Also, an understanding of the multiple inequalities that the existent organization of care manifests. Gender, class and ethnicity inequalities show up in the provision of paid and unpaid care work, inequalities in the quality of care received, international differences and flows of care workers (domestic workers, nurses, etc.) across countries and regions of the world.

To what extent has this scientific knowledge, which was produced mostly by a cooperation of social scientists with social organizations, policy-makers at the various levels of governance, informed the policies implemented to face the pandemic?

In a first stage of the pandemic, international and national governments called on scientists' advice. Epidemiologists, virologists, experts in vaccine development and other specialists in medical knowledge became the key providers of advice. Other health-related scientists provided inputs for the adaptation of facilities and technological inputs for the care of the sick, and for the preventive measures to take. "Stay at home", "wash your hands", social distancing and confinement were the main strategies. How can these be implemented when there is no running water? When living space per person is minimal? When monetary income depends on casual informal work? Policies were NOT informed to the same degree by social science knowledge, which came in much later and as secondary. Reality showed the consequences: increase in gender inequalities and in gender-based violence, socio-psychological effects of not developing strategies to handle grief or to handle the confinement of children and adolescents.

Some lessons learned:

1. Science is not a unified body of knowledge. Scientific endeavors imply controversy and uncertainty. This is not only true for social science, but for every scientific field.
2. Human behavior and practices are not a consequence or an adaptation to what other scientists and policy-makers decide and impose. They have to be considered in their agency and participate in the outcome.
3. There is a need to place CARE of people at the center of policies. Care as a holistic and multidimensional concept, ranging from basic needs –food and hygiene, education and emotional support–to the provision of utilities, health institutions, and the like.
4. The desired outcome –more wellbeing for more peoples in the world–is to be co-produced by scientists, policy-makers, social organizations, and citizenship at large. No top-down policy can be successful, be it science-informed or not.
5. Finally, as the pandemic has shown, a major effort is to be made is to have standardized good data collection and systematization. These can provide the basis for diagnoses and for policy.

Carbon inequalities in times of pandemic

Ilona M. Otto

Wegener Center for Climate and Global Change, University of Graz, Austria

Global social and economic inequalities have risen very sharply in recent years. At the end of 2019, there were 513,244 individuals possessing wealth higher than $30 million (1). Data from 2017 show that while these individuals represent only 0.003% of the world's population, they own 13% of the world's total wealth (2). Moreover, the lifestyles of the wealthy, which involve high levels of material consumption, are extremely carbon intensive (3). Estimates show that some billionaires have a carbon footprint more than 1000 higher than the world average (4).

According to a recent UN Emission Gap Report the wealthiest 1 percent of the world's population was responsible for more than twice as much carbon dioxide emissions in the period from 1990 to 2015 as 3 billion people who belong to the poorer half of the world. Accordingly, the wealthiest ten percent of the population is responsible for more than half of the emissions during this period (5).

Measures aiming to control the coronavirus pandemic, including mobility restrictions, have changed the trends of global CO2 emissions, with global CO2 emissions decreasing 8.8% in the first half of 2020 compared to 2019 (6).

However, the pandemic has also greatly altered global poverty trends. It is estimated that the global restrictions have pushed approximately 144 million people into poverty (7). For the first time in the last 20 years, the number of people in extreme poverty is on the rise (8). Persons at an increased risk of poverty include those who face multiple forms of social and economic exclusion, including women, people with disabilities, the elderly and youth, and those belonging to racialised migrant or religious groups. The structural disadvantages they faced before the outbreak of the coronavirus pandemic, have worsened in the course of the crisis (9).

However, the pandemic did not leave the world's richest untouched. Millionaires faced a combined loss of $700 billion in March 2020. Unlike the negative impacts of climate change, which can be shielded to some degree by wealth, the effects of the pandemic have affected the richest somewhat more quickly and directly through mobility restrictions, reduced corporate profits, and also immediate health impacts (10). Nevertheless, the world's 25 richest individuals increased their wealth by $255 billion during the pandemic (11).

The pandemic has shown us how strongly our global economy, as well as different population groups, are closely linked. Three countries - the United States, Brazil, and Mexico - account for nearly half of the world's reported COVID-19 deaths, however, they contain only 8.6% of the world's population. These three countries also have very high levels of income and wealth inequality. In Europe, 60% of deaths were concentrated in just three countries - Italy, Spain and the United Kingdom. Most parts of Northern and Central Europe had much fewer deaths and lower mortality rates. The countries with the highest mortality rates are among those in Europe with the highest income and wealth inequalities (12).

These cases indicate that economic inequalities may have a strong influence on the capacity with which our societies can cope with shocks and crises. As one example, findings from the UK show that homeless people without access to hand-washing facilities can spread disease more rapidly. Poor living and working conditions increase the risk of infection.

A research lens on inequalities is beginning to show their strong interaction with system resilience. In practice, this could mean that the wealthy would have an interest in reducing economic and social inequalities and to design a system that cares for the most vulnerable in society.

Yet, consumption emissions by the wealthy have steadily increased over the past 30 years, rather than allowing poorer people to improve their life conditions. Evidence is pointing to the fact that it is necessary to share the remaining carbon budget more responsibly. Among our challenges now is to consolidate that evidence and communicate it effectively.

References:

(1, 2, 3, 10) Otto I.M., et al. (2019). Shift the focus from the super-poor to the super-rich. Nature Climate Change 9: 82-84 https://www.nature.com/articles/s41558-019-0402-3

(4) EcoWatch (2021). Private Planes, Mansions, and Superyachts: Calculating Billionaires' Massive Carbon Footprint https://www.ecowatch.com/carbon-footprint-billionaires-2650552617.html

(5) Oxfam (2020). Confronting carbon inequality in the European Union. https://www.oxfam.org/en/research/confronting-carbon-inequality-european-union

(6) Liu, Z. et al. (2020). Near-real-time monitoring of global CO2 emissions reveals the effects of the COVID-19 pandemic. Nature Communications, 5172 https://www.nature.com/articles/s41467-020-18922-7

(7) Brookings (2020). The impact of the COVID-19 on global extreme poverty. https://www.brookings.edu/blog/future-development/2020/10/21/the-impact-of-covid-19-on-global-extreme-poverty/

(8) ILO (2020). Global wage report 2020-21: Wages and minimum wages in the time of the COVID-19. https://www.ilo.org/global/research/global-reports/global-wage-report/2020/WCMS_762302/lang--en/index.htm

(9) ODI (2020), Pushing people further into poverty : the impacts of Covid-19 in lower- and middle- income countries. https://www.odi.org/blogs/17752-pushing-people-further-poverty-impact-covid-19-lower-and-middle-income-countries

(11) Investopedia (2021). Ultra-High-Net-Worth Individuals. https://www.investopedia.com/terms/u/ultra-high-net-worth-individuals-uhnwi.asp

(12) MarektWatch (2020). Opinion: COVID-19 spreading fast in countries with lots of economic inequality. https://www.marketwatch.com/story/covid-19-spreading-fast-in-countries-with-lots-of-economic-inequality-2020-06-29

The United Nations Research Roadmap for the COVID-19 Recovery: Leveraging the Full Power of Science for a More Equitable, Resilient and Sustainable Future

Steven J. Hoffman

Director, Global Strategy Lab; Scientific Director, CIHR Institute of Population and Public Health

The COVID-19 pandemic and the social and economic crises it has created have exposed and exacerbated long-standing economic and social inequities and highlighted the precarity and environmental unsustainability of many global systems. Recovery from COVID-19 and building the more equitable, resilient, and sustainable future envisioned in the 2030 Agenda for Sustainable Development will require full global collaboration.

The United Nations (UN) Research Roadmap for the COVID-19 Recovery provides a framework for leveraging the full power of science in support of a more equitable, resilient, and sustainable recovery. Developed upon the invitation of UN Deputy Secretary General Amina J. Mohammed, the UN Research Roadmap aims to ensure the recovery is informed by the best available evidence and that through global coordination early recovery lessons inform later efforts. Designed to complement the UN's Framework for the Immediate Socio-Economic Response to COVID-19, the Roadmap focuses on addressing social and economic consequences of the pandemic that span five pillars: health systems and services; social protection and basic services; economic response and recovery programs; macroeconomic policies and multilateral collaboration; and social cohesion and community resilience.

Developed over 10 weeks through a global participatory process, the Roadmap benefitted from the insights of more than 270 researchers, research funders, policy and civil society leaders and UN officials. The document illustrates the diverse and intertwined knowledge necessary to pursue a transformational recovery and is a guide to how research and the global science ecosystem can be designed and organized to nurture progress towards the UN 2030 Agenda.

The Roadmap identifies 25 research priorities – five priorities for each of the five pillars of the UN's socio-economic recovery framework. The need to advance gender equity, engage marginalized populations, ensure decent work, tackle intersectoral challenges, and reform global governance is highlighted across these priorities. The Roadmap also includes a framework for understanding how research can help societies achieve a quadruple bottom line and it presents five core strategies to strengthen the global research ecosystem.

Science is the world's best chance for a transformative recovery from COVID-19 and the ingenuity and research from the full range of disciplines will be required. The most promising solutions to the complex challenges laid out in the UN Research Roadmap will require social sciences and humanities knowledge and support for true interdisciplinary research.

Resources:

The United Nations Research Roadmap for the COVID-19 Recovery: Leveraging the Full Power of Science for a More equitable, Resilient and Sustainable Future

United Nations (UN), "A UN framework for the immediate socio-economic response to COVID-19", (New York, UN, 2020)

Strategic foresight: a powerful sensemaking tool that helps bridge the divides

Kristel Van der Elst

Director General, Policy Horizons Canada

The COVID-19 pandemic highlights the ongoing challenges policymakers face when using science evidence to support their decision-making and influence public health behaviour. Two of these challenges are the changes to how we make sense of the world, and increasingly complex and uncertain decision-making contexts.

The way we make sense of the world is being reshaped by changes in knowledge production and power; digital disruption; shifts in shared narratives and experiences; our capacity to sense, feel and think; and our mental models and ways of knowing. All of these changes have been at the heart of the challenges to communicating public health information in ways that reach citizens and encourage their cooperation. Yet understanding and harnessing these shifts may also be an opportunity to increase overall trust in government and academic experts, with long-term implications for the public's views on democratic institutions and science.

Science, policy, and government decision making have traditionally seen the world as linear, with direct links to cause and effect and rooted in relatively homogenous societal values. This is at odds with a world that is increasingly pluralistic, ambiguous, complex, and uncertain. When faced with a crisis involving high degrees of uncertainty, decision makers can be spurred to make decisions rapidly, with little reliance on scientific evidence.

Strategic foresight is becoming increasingly valued as a powerful sense-making tool in this context, and can assist in bridging the gap between scientific advice and policy-making in four major ways:

- Foresight helps decision-makers adopt a whole systems view to consider the implications of scientific, technological, biological evolutions and crises across multiple domains and across society. It also helps contemplate/envision first and second order consequences over time and across sectors;
- The foresight process helps uncover and question assumptions and beliefs, and invites decision makers to consider alternative circumstances. This thinking process generates more flexibility, resilience, and sensitivity to signals of change when new information arrives;
- Foresight can create a safe space in which a range of policies can be developed and tested, allowing decision makers to adapt and upscale quickly when needed;
- Foresight provides decision makers with the tools that encourage conversations with stakeholders on the future they wish to create, the outcomes they want, and how different decisions can influence their future. It also allows individuals to share perspectives, and, if not to come to common ground then to at least arrive at a mutual understanding.

In conclusion, strategic foresight enables a form of adaptive leadership that can further reinforce the input of scientific evidence and advice into policy making and decision making. It provides realistic hope for improved outcomes in an increasingly complex and uncertain world.

No, We Don't Have A Crystal Ball

Jeanette Kwek

Head, Centre for Strategic Futures, Prime Minister's Office, Singapore

The goal of foresight work is not to identify the one road, out of the many possible future roads, that we are destined walk down. To believe that is the goal of foresight would be to suggest that human agency is irrelevant: if our future is predetermined by forces larger than us, then what is the point of trying to chart our own paths? Instead, good foresight work in my view does three things, which also happen to make foresight invaluable to policy development.

First, foresight helps us to **look ahead**, to anticipate changes in our environments and adapt to them as they unfold. Mechanisms such as horizon scanning help us continually sense incipient change, connect the dots across a range of domains, and identify areas of deep interconnectedness and interdependence in our complex operating systems. Good foresight work also helps to frame and educate decision-makers about emerging issues and the opportunities and challenges they bring.

Second, foresight helps us to **think afresh**, particularly in response to unexpected shocks like the COVID-19 pandemic, which can have disruptive effects across a range of domains and timeframes. Foresight processes help us not to look at the world as we want it to be, but at the world as it is and one day could be. They help us to explore both desired and feared outcomes of disruption, and reimagine where our economies and societies could go as a result.

Third, foresight encourages us to **take action** today. It may sound counterintuitive, but the goal of a good foresight system is to support better decision-making today, in preparation for tomorrow. (Not to make better decisions tomorrow for tomorrow.) To do that, foresight mechanisms must help to balance the constant pull of the present against the more distant needs of the future, sometimes by providing vivid and compelling narratives that provide a strong reason to take a longer-term perspective in decision making. One useful methodology for doing this is scenario planning. Scenarios help us to reperceive the present through the lens of the future, to identify where and when we might be able to act today to produce changes that we prefer, rather than leave us at the mercy of future trends.

Ultimately, the goal of foresight is to build the resilience and adaptability of our policy-making ecosystem, so that we can work to successfully build our shared future.

Ultimately, the goal of foresight is to build the resilience and adaptability of our policy-making ecosystem, so that we can work to successfully build our shared future.

Development Foresight: Engaging the Power of Standing in the Future

Claire A. Nelson

Futurist and Sustainability Engineer; Chief Ideation Leader, The Futures Forum, United States

In the world of development finance, strategic foresight has not traditionally been seen as a worthwhile tool. For the most part the development finance world is governed by the rules of rate of return and one major challenge is the futility of trying to define a meaningful number to the ability to prognosticate alternative futures. Thankfully, our increasing understanding of the reality that complex systems of systems are the field of change, is leading to increased acceptance that one does not need to measure a phenomenon to declare it worthy. Thus, positive changes in attitudes to 'development foresight' as a policy analysis tool are taking shape.

Singapore comes to mind as a leading example of how foresight and futures literacy is being done well. But in many countries, foresight remains unheard of, or something to be done by the consultant that is brought in by the donor to run a workshop. While these are admirable first steps, a lot more will need to be done to achieve the level of futures literacy needed to design sustainable world we say we want. There must be capacity in-country that understands the cultural and social norms that shape the future.

Short-termism in planning is akin to living in a fool's paradise. It is critical that development practitioners become futures-literate and bring that capability to bear on the decisions that are being taken now in project, policy, process, and product design choices we must make. We must arrive at the level of evolutionary leadership intelligence that would allow us to as a matter of course look at long term impacts of our decisions on both built and natural environments and ecosystems. The threats are real.

I like to say that my one voice represents many perspectives on our shared human story – the voice of the female, the global South, small island nations, oppressed minority – all part of the chorus of citizens who are clamoring to be heard by policy makers and by politicians. Thus, the panel includes perspectives not often heard in the global discourse on the future, and provide a more balanced view than normal, on what might be possible for us to co-create. Indeed, some of the voices come to life in scenes from the future that are part of the narrative of the future that is explored in my book Smart Futures for a Flourishing World: How to achieve a paradigm shift and Global Sustainability.

Why do successive governments fail to act?

Martin Müller

Executive Director Academic Forum at the Geneva Science and Diplomacy Anticipator (GESDA)

The world is in a period of transition, and we see a rising instability and uncertainty that will lead to global systemic challenges in the coming decades. The pace and scale of change as well as the interconnectedness, the global nature and sometime long-term impact of the issues are unprecedented in human history. This requires governments to be able to think and act across silos and across different spaces and times. The problem is that dominant institutions – including governments, markets and international organisations - developed under different conditions to tackle a different set of problems. It remains to be seen whether these institutions can develop the capacity to act on those systemic long-term issues. Into developing the capacity and formulating answers, science and scientific advice have a critical role to play.

It is true that scientists and experts warned about potential pandemics decades ago, and the SARS and MERS epidemics were concrete examples of what could happen.

This has triggered some responses by governments and institutions, but also provided them the false certainty that they had the measures in place to tackle the next disease outbreak, discarding further advice and preparation. We have seen with the covid-19 pandemic that the world was absolutely not ready. The pandemic, however, has alerted governments around the world about the risk of lethal and highly transmissible viruses, without exposing humanity to the maximum effects. You can argue that it can be seen as a 'societal vaccination' and therefore makes the institutions work towards better surveillance mechanisms against the next emerging pathogens. The role of science and science advice to support policy formulations and inform decision-makers was recognized.

Does science advice have a role in accelerating a meaningful anticipatory response to long-term systemic issues?

So what now? Science and science advice definitely have a role in accelerating a meaningful anticipatory response to the long-term systemic issues facing humanity. The complex nature of those issues requires however to cross the boundaries between scientific fields and consider the interplay between different effects. This requires the participation from scholars from all fields of sciences, including social sciences and the humanities.

For science advice to be considered effectively, it must be translated in a way that is understandable for policymakers, government officials and citizens. This is a challenge as the understanding of the major issues of our time require a basic scientific literacy across a range of scientific fields. To accelerate meaningful responses, people designing policy responses must understand the science and technological drivers behind the issue but also how their interventions will contribute to resolving the issue and how society will react. This requires a constant interaction between the worlds of science and governance and a co-design of solutions to ensure effective impact.

Foresighting Beyond Endless Frontiers: Rethinking the Social Contract between Science and Society

Jeff Kinder

Executive Director, Science and Innovation, Institute on Governance, Canada

The global pandemic demonstrates the importance of science advice and the risk to humanity when the integration of science, policy, and society is not functioning well. Anti-vaxxers and anti-maskers present some of the most vocal opposition to scientific evidence and public health officials who operate with a mandate to keep us safe. In Canada, we see the repercussions where a lack of trust in science and trust in government, and a lack of political support for scientific information, are contributing to disease spread and the unnecessary loss of life.

But we didn't get here overnight. In the closing months of the Second World War, US President Roosevelt asked his science advisor, Vannevar Bush, how the nation could continue to benefit from research in peacetime as it had done during the war. Dr. Bush's report, *Science: The Endless Frontier*, outlined a basic compact in which society supports science with public funds and assures the scientific community a great deal of autonomy in exchange for the considerable but unpredictable benefits that can flow from the scientific enterprise.

Fast forward 75 years, many of the underlying social, economic, cultural, and political assumptions in *The Endless Frontier* are outdated. The social contract is showing strain in the face of decreasing trust, rising concerns about scientific integrity, and calls for more inclusion and diversity as we grapple with systemic racism and meaningful reconciliation with Indigenous people. Science and engineering are still very necessary to help address society's grand challenges and disruptive opportunities but our approaches to the governance of science, research funding and performance, and how new knowledge and innovations are put to use must evolve in a 'post-truth' / 'post-trust' context.

Foresight has great potential to inform a re-examination of the evolving relationship among science, innovation and society, not by *predicting the future* (singular) but by *envisioning plausible futures* (plural) to inform strategic decision-making. The Institute on Governance (iog.ca) has launched a multi-year, collaborative research initiative *Beyond Endless Frontiers: Rethinking the Social Contract between Science and Society* to support medium- to long-term planning in Canada's federal government. Building on a hindsight exercise and multiple foresight workshops, the initiative explores how science and science advice can remain relevant in the new reality.

Profound uncertainties call for reasoning and interpretation

Eeva Hellström

Senior Lead, Strategy and Foresight at the Finnish Innovation Fund Sitra

Risks refer to potential losses or harm, the probability of which can be estimated to at least some extent. Uncertainty is a state of incomplete knowledge that can result from a lack of information or from disagreement about what is known or even knowable. In an increasingly complex and interconnected world, we face profound uncertainties caused by the complexity of impacts of known events and by unexpected events which challenge our understanding of how the world functions.

Science has traditionally aimed at producing new evidence to reduce uncertainty caused by the lack of information. In supporting evidence-informed policymaking, scientist have mostly been aware and open about the uncertainties related their findings and clearly communicated these uncertainties to policymaking.

Unexpected events and other profound uncertainties challenge the ideal of evidence-informed policymaking. In unexpected events there may be little evidence to share, whereas in persisting complex challenges too much and even very contradictory evidence may exist. Both provide little basis for analytic synthesizing. This leaves us with reasoning and interpretation.

Unexpected events often call for swift decisions under conditions of insufficient information while policymakers may not have the time or readiness to base decisions on new frameworks. This may unintentionally lead to the strengthening of existing path dependencies. Science can provide a better understanding of such dependencies and illuminate fallacies of sunken costs that inhibit change. With the power of reasoning, science can also identify potential new path dependencies with long term impacts. By engaging in joint reasoning on present and future path dependencies, science advice can have a significant role in supporting decision-making for more resilient societies.

When dealing with uncertainties related to the complexity of phenomena, interpretation becomes increasingly important. The interpretation of complex phenomena is at best a collective act, where multiple perspectives and multiple types of knowledge meet. Science advice is encouraged to engage not only in bi-polar dialogue with policymakers but increasingly in a multi-nodal dialogue with people representing different types of knowledge, ranging from foresight to experiential and unstructured tacit knowledge. Policymakers are also important knowledge holders, which is why they should not be regarded as target groups, but a valued member of such dialogues. (For more information, see our report: The Future of Knowledge Use in Societal Decision-Making)

For both approaches – joint reasoning and collective interpretation – the same old wisdom applies: It is often too late to create a network when you need it the most.

Improving Resilience: Adopting a systems approach to systemic risk

Albert S. van Jaarsveld

Director General and Chief Executive Officer, International Institute for Applied Systems Analysis (IIASA)

The emergence of frequent, varied, pervasive and compound threats to humanity has touched all of humankind around the world over the past decade. These threats are experienced as random events, coming from all quarters in an unpredictable and even compound manner. There is increasing evidence that this accumulation of events also is driven by growing physical and social interdependencies, where global change is increasingly leading to systemic and existential risks that can have cascading impacts, placing intolerable, unequal and unsustainable burdens on communities and societies, even leading to local collapse. However, collapse and fragility are not inevitable and can be turned into resilience by adopting a systems approach to systemic risk.

The above perspectives were explored by the IIASA-ISC Platform for "Bouncing Forward Sustainably: Pathways to a post-Covid World", and underscored the imperative to systematically reduce risk, build resilience and secure long-term developmental gains for humanity (Mechler et al. 2021).

In order to deliver on this ambition, the IIASA-ISC study suggested two broad principles to enhance the building of resilience:

1. to acknowledge that there has been a gradual evolution of resilience framings in in research, policy and practice in recent years: resilience is today largely seen as movement to a new and more desirable state after a disturbance, not merely returning to the previous state, and
2. that there is a need to increasingly focus on systemic solutions and investments to enhance resilience (see Fig. 1). More pervasive resilience thinking and planning across sectors, systems and borders offers opportunities to create broader societal progress. The historic emphasis placed on efficiency at any cost has left us all more vulnerable and fragile.

Increasing systemic resilience also increases the likelihood of benefitting from the triple dividends of increased resilience (Surminski & Tanner, 2016), namely, (1) avoiding damages and losses from disasters, (2) unlocking socio-economic potential, and (3) generating development co-benefits.

The science of systemic risk assessment itself can also be strengthened through improved emerging systemic risk assessment and disaster resilience (Rovenskaya et al. 2021). The science of risk assessment should become a multiscale and global cooperative research agenda (e.g., Future Earth RISK KAN and Global Risk Perception Initiative). However, the cutting-edge science advice can only be relevant if it utilized in a timely and unbiased manner. It seems puzzling that national governments invest vast amounts of resources on developing competitive national science systems but then at times seem unwilling to listen to science advice when dealing with pressing issues that require policy responses. Another puzzling observation is that while risks are becoming increasingly global, governments often do not seem to want to deal with them at the global level, which repeatedly leads to lose-lose outcomes.

From an institutional perspective the IIASA-ISC study called for a global risk and resilience dialogue that engages policymakers, civil society, the private sector, and the scientific community in mapping the risks and drivers of risks at different scales and in discussing the implications of these for risk governance, prevention, and preparedness. Such efforts might thus ultimately lead to the establishment of a Global Commission on Resilience or Compound Risks that could build on the efforts by UN bodies and other International organizations. Ideally an all-risk disclosure mechanism to deal with major socio-ecological and disaster risks would be helpful. These risks can then be systematically mitigated using appropriate public and private market-based investment and innovative insurance mechanisms.

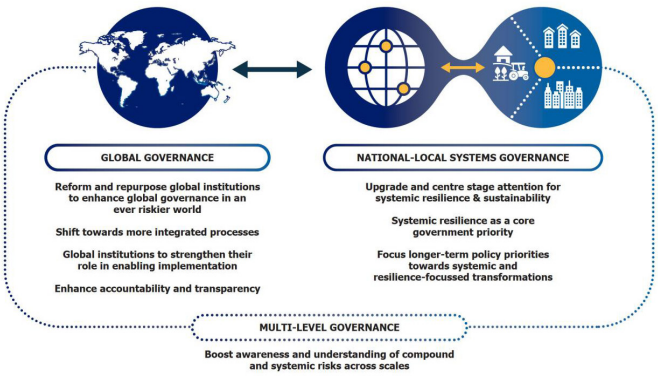


Figure 1. Options to enhance governance for sustainability (Mechler et al. 2021).

References:

Mechler, R., Stevance, A.-S., Deubelli, T., Scolobig, A., Linnerooth-Bayer, J., Handmer, J., Irshaid, J., McBean, G., et al. (2021). Transformations within reach-Pathways to a sustainable and resilient world: Enhancing Governance for Sustainability. IIASA Report. IIASA-ISC [pure.iiasa.ac.at/16819]

Rovenskaya, E., Kaplan, D., & Sizov, S. (2021). Transformations within reach-Pathways to a sustainable and resilient world: Strengthening Science Systems. IIASA Report. IIASA-ISC [pure.iiasa.ac.at/16821]

Surminski, S., & Tanner, T. (Eds). (2016.) Realising the 'Triple Dividend of Resilience.' A New Business Case for Disaster Risk Management. Heidelberg: Springer

Science Advice for Complex Risk Assessment: Addressing Complex, New and Interacting Threats

Abdoulaye Gounou

Head of the Bureau of Public Policy Evaluation in Benin

Benin uses scientific research in general and the evaluation of public policies in specific ways to address complex, new and interacting threats. The use of a 'helpdesk' brings the world of science closer to that of policy makers for better use of evidence.

The institutionalization of the evaluation of public policies in Benin, thanks to strong political will, enables the production of evidence from the evaluations of public decisions. The launch of the National Evaluation Policy in 2012 marked the culmination of this institutionalization process.

In support of this process, the National Directorate of Scientific and Technical Research (DNRST) is responsible for the design, management and control of State policy in terms of scientific and technical research. Under the authority of this Directorate, around one hundred institutes and centers nationwide produce evidence on a daily basis in all sectors of national affairs for the use by Government.

In addition, the helpdesk is an evidence management service that the Government of Benin has been using since 2019 to feed its public policies, programs and development projects with support of evaluation results. It is a single point of contact that provides synthesized multidisciplinary information and a management service to deal with internal or external requests from the Government, which helps in decision-making. The helpdesk has emerged as the missing link in the effective and increased use of data from evaluations and scientific research in policy formulation.

References:

(1) Amouzou, A, Kanté, A, Koffi, A, Maïga, A, Munos, M, Walker, N and Winch, P, 2020. Regional Scoping Study for the West Africa Capacity Building and Impact Evaluation (WACIE) Program.

(2) Anca Dumitrescu, Déo-Gracias Houndolo, Dislène Sossou, Bertrand Bio Mama, 2019. Synthèse de la littérature sur l'évaluation d'impact dans l'UEMOA (P. 2).

(3) Chirau, Takunda, and Cara Waller, and Caitlan Blaser-Mapitsa. 2018. The National Evaluation Policy landscape in Africa. A Comparison. Johannesburg: Clear-AA and Twendé Mbele. Policy Brief. https://tinyurl.com/y3wo9ty3.

(4) Goldman, Ian, Albert Byamugisha, Abdoulaye Gounou, et al. 2018. The emergence of government evaluation systems in Africa. The case of Benin, Uganda and South Africa. African Evaluation Journal 6 (1). 1-11 https://doi.org/10.4102/aej.v6i1.253.

(5) Goldman, I., Byamugisha, A., Gounou, A., Smith, L.R., Ntakumba, S., Lubanga, T., Sossou, D., Rot-Munstermann, K., 2018: The emergence of government evaluation systems in Africa: the case of Benin, Uganda and South Africa 6, African Evaluation Journal http:/doi.org/10.4102/aej.v6i1.253.

When a pandemic converges with an infodemic, resilience lies in science and media literacy

Dr. Catherine Mei Ling Wong

Lloyd's Register Foundation Institute for the Public Understanding of Risk at the National University of Singapore

The COVID-19 pandemic has demonstrated how a global public health problem combined with the rapid spread of online mis/disinformation can lead to compounding risks. What we saw in the last two years, was the tight coupling of a number of systems that were previously only loosely connected. The convergence of a highly contagious virus with public healthcare systems, mainstream media, alternative media and social network platforms has fundamentally shifted the way people communicate facts, science, and risk. The COVID-19 pandemic has revealed how, now more than ever, scientists do not have a monopoly over knowledge and public trust in science cannot be taken for granted.

Social media and alternative news platforms have filled a gap in the public sphere for a wide range of actors to air their views freely. While this was initially a great tool for marginalised communities and critics of authoritarian regimes to get their voices heard, the dynamic and function of these platforms have now evolved. Social media, alternative media and social network platforms have created opportunities for bad actors to amplify scientific uncertainty, cast doubt on scientific methods and data, and politicise science at a scale and speed that was previously not possible.

For policy to be informed by science, it must also be accepted by the public. Hence, science must also connect with the public. This means that scientific assessments of risk and what values are at stake must resonate with that of society. This requires reflexivity in the scientific community and a simultaneous effort in increasing science literacy and media literacy across a broad spectrum of society. Scientists will need to enlist the help of conventional media actors like journalists and documentary makers, as well as new emerging media actors like social media influencers, Tiktokers, Vloggers, podcast makers, etc. Scientists and policy makers should also work with credible third parties to build a risk communication strategy so that people who are doubtful feel connected to decision-makers. This helps to build trust and trust builds resilience in society against complex and compounding risks, from pandemics to infodemics.

The importance of intentional avenues for policy education and engagement by Next Generation Researchers

Vanessa Sung

Former President and Internal Director, Science & Policy Exchange; Policy Advisor in the Office of Chief Science Advisor of Canada

I have the privilege of moderating a panel with representation from six different next generation researcher (NGR) groups. Among them, two are associated with governments (Canada's Chief Science Advisor's Youth Council and Québec's Chief Scientist's Intersectoral Student Committee), one is a trainee-led non-profit organization (Science & Policy Exchange), one is a university-affiliated student group (Toronto Science Policy Network), and two are associated with broader global initiatives (Global Young Academy and Canadian Commission for UNESCO's Youth Advisory Group). The groups vary in advisory function and structure, which present unique benefits as well as challenges – a topic that will undoubtedly make for interesting discussion on the panel.

The diversity of these groups reflects both a growth in recognition by institutions of the importance of NGR perspectives and in interest from young researchers in participating in policy. To the latter point, consider the Canadian Science Policy Conference, the largest annual science policy meeting in Canada. The presence of students and postdoctoral fellows at the conference has grown over the years, reaching as high as 16% of all participants in recent years. Internships and fellowships, such as the Mitacs Canadian Science Policy Fellowship (now in its sixth year), continue to be popular and competitive. During Science & Policy Exchange's #Students4theReport campaign in support of the 2017 Fundamental Science Review, student unions and associations representing over 300,000 students across Canada signed on to the initiative.

For the most part, NGR engagement with policy occurs outside of the formal curriculum, including through external workshops and conferences, which can present financial, time, and accessibility challenges. Notable exceptions in Canada include the University of British Columbia's Public Scholars Initiative. Youth advisory groups and young academies are valuable and terrific opportunities, but have limited number of members. There is room to create more avenues for policy education and engagement for NGRs, especially ones intentionally built into the curriculum, perhaps in a shift toward a more holistic approach to training. In tackling both ongoing and future global challenges, we will need the diverse experiences, perspectives, and expertise that NGRs can offer across different sectors of society.

Young people are not just leaders of the future, many are leaders of today. We should work to expand opportunities for their participation in science policy and advice.

The Inclusion of Young People in Science Advice

Arthi Ramachandran

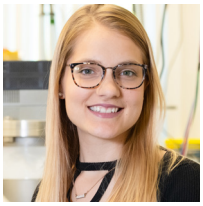
Canadian Commission for UNESCO Youth Advisory Group member, Science & Policy Exchange alumna

Next generation researchers (NGRs) are the future science advisors and diplomats, so it is incredibly important to incorporate their unique perspectives. For most NGRs, engagement in the worlds of policy and science advice occurs outside of their formal studies and requires NGRs to seek workshops/events/groups on their own. One of the biggest challenges is getting a seat at the table and ensuring NGR voices are heard.

The Canadian Commission for UNESCO's Youth Advisory Group (CCUNESCO YAG) is comprised of dedicated and creative members, representing most regions in Canada that actively participate in our CCUNESCO initiatives to help identify the issues and concerns of youth in their communities and nationally, develop projects for youth, and make recommendations based on their viewpoints and experiences. By the inclusion of young people, CCUNESCO benefits from innovative ideas, different perspectives and expertise in developing initiatives and implementing priorities. As a member of the CCUNESCO YAG, I have been fortunate to be able to provide my science expertise and perspectives to multiple projects, in particular in topics such as Open Science and the UN Decade of Ocean Science for Sustainable Development. The active inclusion of youth in CCUNESCO's initiatives ensures that our diverse perspectives are included in priorities moving forward.

While some organizations actively seek the perspectives of youths, the majority of institutions do not do so sufficiently. In my opinion it is crucial that this changes. We need to work on removing the barriers currently in place that prevent NGRs from seeking out these opportunities since it is usually on top of their formal curriculums. Overall, we need to work on (1) increasing opportunities, (2) ensuring that opportunities are readily accessible to all, and (3) providing NGRs an equal seat at the table.

By the inclusion of young people, CCUNESCO benefits from innovative ideas, different perspectives and expertise in developing initiatives and implementing priorities.



The inclusion of Next Generation Researchers in governance

Josée Maurais

University of Sherbrooke; Vice-president, Québec's Chief Scientist's Intersectoral Student Committee

The intersectoral student committee (CIE) serves the boards of directors of the three research funding agencies of the Province of Quebec, Canada (FRQ). The committee's mandate is to advise the chief scientist of Quebec and the boards of directors of the FRQ by identifying strategies to promote the accessibility of research funding to optimize the potential of Next Generation Researchers (NGR) as well as to enhance NGR influence and impacts in research and society. The committee's strength lies in its intersectoral composition, its ability to consult the NGR community on a large scale, its collaboration with various committees that are interested in issues specific to NGR and the collaborative nature of its work with the FRQ.

Since its creation in 2014, the CIE has demonstrated the relevance of its mission and established itself as a key player within the FRQ and the research ecosystem in Quebec. In particular, the CIE carried out work in 2020 and 2021 on the role of NGR in research groups funded by the FRQ to examine, among other things, the place they occupy in the governance of these groups. Following this consultation, the committee was able to propose recommendations to encourage and enhance the participation of NGR in the governance of research groups. The CIE was then invited to make recommendations to other bodies with the aim of including NGR at different levels in the decision-making processes.

Over the past few years, the CIE has also produced various opinions and more recently has created a declaration on mitigating the effects of COVID-19 on research. This includes a wide range of recommendations, including a few that invite granting agencies, governments, and academic and research institutions to provide NGR with significant opportunities to contribute to research governance. The inclusion of NGR in governance thus makes it possible to deal with the specific issues related to COVID-19 as well as the various situations that may arise for individuals. It encourages the adoption of an attitude and actions that support NGR. The objective of the CIE is that these recommendations endure and continue to improve practices.

Resources:

http://www.scientifique-en-chef.gouv.qc.ca/wp-content/uploads/Rapport_Regroupements_VF.pdf

The committee's mandate is to identify strategies to promote the accessibility of research funding to optimize the potential of Next Generation Researchers (NGR) as well as to enhance NGR influence and impacts in research and society.

Including the Next Generation in Science Advice: The Perfect Recipe

Madison Rilling

Director Talent & Outreach, Optonique

Next generation researchers (NGRs) can play an important role in the global science advisory landscape and are eager to do so. After all, political decisions and public policies impact their lives today, and shape the world that they will live in tomorrow.

But what exactly does this advisory role look like? Is there a one-size-fits-all model? (Un)fortunately, there isn't.

However, common threads between existing structures can inspire and facilitate the purposeful inclusion of NGR voices in science advice. Based on my past experience, which includes serving on the Québec Research Funds (FRQ) intersectoral student committee (CIÉ) and the Canada Chief Science Advisor's Youth Council, I have identified three key ingredients to include the next generation in science advice: structure, support and sustainability.

(1) Structure: establishing an advisory structure determines how NGRs integrate, interact with and contribute to science advice. Assuring clear mechanisms for regular and spontaneous input is essential in optimizing the role that NGRs can play, parallel to their personal and professional obligations. This can include designating a contact person or coordinator within a given science advisory body or department, and defining clear channels for active involvement, such as consultations, calls for participation on committees, and report submissions.

(2) Support: NGRs intrinsically bring fresh perspectives and generational diversity to the table. Providing support and training can help them to better translate their ideas in a way that is useful and impactful. In particular, increasing the NGRs' understanding of government, overarching political dynamics, as well as formal and informal science advice tools, is essential for contextualizing and shaping their work. This builds their capacity to approach issues holistically and to communicate their perspectives and concerns efficiently, and effectively, to science advisory bodies.

(3) Sustainability: structures which depend solely on a given person are to be avoided. Though this is sometimes how NGR councils are founded, models which pair NGR involvement directly with the decision-making process will promote long-term involvement. For example, this may be done by making councils statutory, or by dedicating seats to NGRs on boards or committees. Currently, to transition from anecdotal to lasting models of success, more literature documenting the structure & contributions of NGRs in science advice is needed. This, along with building bridges between the growing international network, will contribute to the sharing of best practices and will catalyze collective efforts of NGRs in science advice.

Developing Science Advice Capacity in Next Generation Researchers for Ensuring Trust and Sustainability

Binyam Sisay Mendisu

Program Officer at UNESCO International Institute for Capacity Building in Africa (IICBA) & Member of the Global Young Academy (GYA)

The quality and sufficiency of evidence for policy making, among others, is determined by the multiplicity of the source and the diversity of the researchers contributing to its synthesis. In this regard, the crucial importance of re-presenting intergenerational insights cannot be overemphasized. Deliberate and planned engagement of Next Generation Researchers (NGRs) in knowledge synthesis is key as it leads to much-needed trust in public policy making and to ensure its long-term sustainability.

NGRs are uniquely positioned to bring fresh and valuable perspectives into evidence-informed policy making. The last few decades have witnessed massive changes in the ways in which knowledge is generated and researchers are trained. A recent study by the Young Academy of Finland reports that 'the skills required from researchers are very different to the ones required 20 years ago'. Moreover, NGRs not only bring their expertise and perspectives to the table, but also the voices and concerns of their generation. In some contexts, for example in Africa, where the youth accounts three-fourth of the population, policy decisions that haven't integrated intergenerational perspectives simply face serious issues of trust and relevance. Then, how could the engagement of NGRs be done taking long term gains into account?

On Developing Science Advice Capacity in NGRs as Science leaders

Excelling in science advice requires new set of skills and experiences on top of being good researcher. Since these aren't always integrated in formal curriculum, intentional and formal efforts to develop the science advice capacity of NGRs in these set of skills will take us a long way. Best practices are currently available at the African Science Leadership Program (ASLP), Global Young Academy (GYA) and INGSA. For instance, in 2019, INGSA, ASLP and UNESCO joined hands to successfully organize 'Science Advice and Science Leadership Workshop for Early Career Scientists and Policy-makers of the Eastern Africa Region' in Ethiopia. The workshop presented an opportunity to develop capacity of NGRs in the region with an eye on preparing them for a wider science leadership role.

On Pursuing Formal and Institutional Avenues

Ad hoc initiatives and mechanism to incorporate insights from NGRs won't lead to sustainable results and long-term gains. Instead, formal and institutional engagements by NGRs in science advisory landscape help to increase the acceptability and effectiveness of public policy making. For instance, several senior academies helped to midwife young academies around the world. Yet, simple and effective structures for regular and formal engagements of NGRs are still missing in many places. Thus, the institutionalization of mechanisms is highly encouraged in order to make the best of the experiences and perspectives of NGRs.

Student-run groups: connecting early career researchers to science and policy

Sivani Baskaran

Co-Founder & Past-President, Toronto Science Policy Network

The Toronto Science Policy Network (TSPN) is a student-run science policy group at the University of Toronto, which provides a platform for the students, postdoctoral fellows, and community members to learn and engage in science policy. Since its inception in 2018, TSPN has hosted over 20 events and drawn in over 500 participants. While our main focus is engagement with the local community through workshops, panels, and talks, TSPN has participated and led campaigns such as Vote Science during the 2019 Federal Elections and a survey on the impacts of COVID-19 on graduate students across Canada.

Most early career researchers do not remain in academia and TSPN events provide a space for them to learn about opportunities within the science policy interface with little commitment. Our workshops teach attendees the policy making process and how to use and translate their science to different audiences including media, politicians, policy makers and other scientists. We host community panels which serve as a place to learn "Just the Facts" about key policy topics from Climate Change to Transit Systems. And finally, our talk series gives attendees insight into the different career pathway to go from science to policy.

In some of our other initiatives, TSPN has taken on more of an advisory and advocacy role. In April 2020, we launched a survey for graduate students across Canada to understand how people were being impacted. This survey was in response to seeing very little done to communicate and engage with students on developing new policies. We have also submitted federal budget recommendations and letters to elected officials requesting support for science and early career researchers.

As a student-run science policy group, we made a space for ourselves to be a voice connecting early career researchers to science and policy. And over years we are seeing more student-run groups emerging such as the Ottawa Science Policy Network and Ryerson Science Policy Network. Student-run groups provide opportunities for early career researchers to lead, connect, advocate, and learn within the science policy interface. More than ever, this past year has highlighted the need for science and the importance of evidence-based policy. It is critical to support early career researchers in learning and engaging in this space.

Student-run groups provide opportunities for early career researchers to lead, connect, advocate, and learn within the science policy interface.

The next challenge: Strengthening linkages for whole-of-society preparedness and response

Mami Mizutori

Special Representative of the UN Secretary-General for Disaster Risk Reduction and Head of UNDRR

The Sendai Framework for Disaster Risk Reduction is built on evidence collected during multi-year consultation amongst UN Member States.

It is focused on disasters caused by natural or man-made hazards, as well as related environmental, technological, and biological hazards and risks.

This Framework also advocates for the collection of disaggregated data on disaster affected persons by age, gender, and disability.

Such data is important to develop evidence-based national and local strategies for disaster risk reduction, tailored to the risk profile of all segments of an exposed and vulnerable population regardless of age, gender, ethnicity, disability, legal status, or place of origin.

Importantly, the Sendai Framework placed emphasis on health because of many countries' experience of disease outbreaks such as Ebola, MERS, SARS and H1N1.

However, a review of national strategies for disaster risk reduction after the outbreak of COVID-19, found that many lacked provisions for pandemic preparedness. Furthermore, in most cases, health services that take the lead for disease outbreaks were not linked up with national disaster management authorities to ensure a whole-of-society engagement in both preparedness and response.

The truth is that it often takes more than evidence to motivate action to mitigate impact when the threat is regarded as unlikely to materialize, as was the case with the Indian Ocean tsunami in 2004. Or if timely action falls victim to vested interests, as in the case of efforts to reduce greenhouse gas emissions to diminish global warming.

Therefore, the Sendai Framework places great emphasis on the need to strengthen disaster risk governance based on evidence for the effective and efficient management of disaster risk.

Good news is that, when it comes to managing single, recurring hazards, the world has had notable success in reducing loss of life. In the past, hundreds of thousands of people have died in cyclones in the Bay of Bengal but thanks to the zero casualty policies of the Bangladesh and Indian governments, large-scale loss of life no longer happens.

The next challenge is to further strengthen disaster risk governance to ensure a multi-sectoral response that takes account or the multi-hazard, systemic nature of risk and how disasters can have unforeseen cascading impacts which undermine sustainable development.

There is also huge under-investment in disaster risk reduction despite the obvious cost benefits. If we had invested the billions required to mitigate the threat of the current pandemic, we could have saved many lives and avoided much of the disruption costing the global economy over $12 trillion.

Evidence has played an important role to improve how we manage disaster risk to prevent and prepare better, but there is still a long way to go.

Partnerships for a Change

John Mauro

City Manager for the City of Port Townsend, Washington

All too often, "a small group of thoughtful, committed citizens"... well, you know. Margaret Mead would famously say with optimism that they can change the world and are the only thing that ever has. But does today's increasingly myopic and fiercely persistent societal focus on the individual spell out disaster for how (or what) change is made? At the local level, a small group of individuals can often control or block a legislative agenda or stop change in its tracks by effectively fomenting NIMBYism. At the national or international level, a small group (or one authoritarian or dictatorial individual) can steer the course of history or the ruin of an economy and disintegration of the social and environmental fabric. Meanwhile, who is the protector and arbiter of the collective and outcomes like those embodied in the Sustainable Development Goals (SDGs)? As the individual becomes more of a lens in this increasingly neoliberal world, and as "thoughtful" seems fluid and ambiguous, particularly during an emerging infodemic, how can we be assured that those thoughtful, committed citizens are changing the world for the better?

Cities as solutions are, indeed, those arbiters. At their best, cities empower, channel and direct those committed individuals toward delivering on the common good. They forge ideation, integration, innovation and, critically important, they set the table for productive multi-sector collaboration. Working together is nothing new, it's second-nature, a defining characteristic of humans and core to how we evolved and survive – and how we might continue to do so. At the current confluence of mostly self-inflicted existential threats to humanity – COVID, climate disruption, inequality, housing crises, racism, mass migration, the false promises of capitalism, neoliberalism's reinforcement of the individual, among others – partnerships are critical in establishing a multi-dimensional civic space for informed policy dialogue and sustainable, resilient and just solutions.

Solutions and partnerships, like cities, come in all shapes, sizes and alignments. Sometimes they nest in vertically integrated relationship with each other. Sometimes they are independent but influence or inspire others. I've experienced partnerships from a variety of municipal vantage points, scales and time periods – from the Seattle-initiated US Mayors Climate Protection Agreement borne from the failure of the US federal government to join the Kyoto Protocol, to the development of Auckland Council's Climate Action Plan with its robust primary research and multi-sector engagement, to the Port Townsend/Jefferson County (WA) region's Intergovernmental Collaborative Group and its community-based drive for local resilience and COVID recovery. Each provide an example of how partnerships grounded in science can be leveraged for success; each also illustrates mistakes, lessons learned and areas for improvement.

Using these examples as a launching point for discussion, I look forward to framing up sustainability and resilience and the nexus and feedbacks at multiple scales between, for instance, climate change impacts, migration, housing availability and affordability, mobility, pressures on rural landscapes, demographic change and economic system. As we face this range of existential threats to humanity, many of which are inexorably linked and often compounding, digging more deeply into the critical role of the city as a forger of community partnerships and meaningful civic engagement may be the only way through.

How should science advice engage with publics?

Sujatha Raman

Director of Research, Centre or the Public Awareness of Science (CPAS) at the Australian National University

From the perspective of researchers on science advice, the first response to the question posed in the title is likely to be: *don't just present the facts; understand and engage with the diversity of values that publics might hold*. Value judgments are inevitable in science advice, so the idea is that advisors will make better judgments when they are cognisant of values that differ from their own. The field of deliberative democracy (research and practice) offers extensive resources on how to go about engaging with publics in light of these considerations.

However, this need for engaging with values in science advice is often understood too narrowly. The usual reason offered is transparency. But complete transparency is impossible; nor is it obvious that publics demand transparency for its own sake. Good judgment is more likely at the heart of public expectations from science advice. So talking openly about values that inform expert judgment can help create a culture in which: expert disagreement is considered normal; where it is possible for publics to 'speak back' to advisors or policymakers when the situation demands; and where publics can both inform and amplify science advice.

For this culture of science/public engagement to flourish, science advice needs to also: *broaden what is taken to be relevant matters of fact for science advice to consider*. I outline three such matters that are increasingly important as science advisors move beyond only describing the nature of planetary crises to exploring and recommending transformative solutions.

The first is a matter of **knowing the realities of everyday life**, and the inequalities entailed. Covid has shown the problems that ensue when advisors and policymakers imagine the public as an undifferentiated mass. Without knowing (say) how 'essential workers' live, work and move around and the factors that condition these realities, we cannot know how the virus moves or how to manage the pandemic.

The second is a matter of **knowing and opening up a diversity of possible solutions** to intersecting planetary crises (of environment, health, food systems and livelihoods) to policy attention. By engaging with publics, advisors may discover how some are already experimenting with their own novel solutions to crises. In turn, this creates a responsibility on advisors to amplify policy awareness of different pathways forward including those that may not fit dominant assumptions.

The third is a matter of **knowing the larger issues of economic and social change that need to be considered** in conjunction with environmental change. Advisors can no longer focus on technological solutions to planetary crises without putting these in such a wider context. Likewise, given that everyday life cannot be easily separated into 'economic', 'social' and 'environmental' components, engaging publics could become a critical part of generating the kind of knowledge that science advisors are increasingly expected to deliver about solutions to crises.

Evidence for complex decision making

Gabriela Ramos

Assistant Director-General for Social and Human Sciences, UNESCO

Evidence-based policymaking depends on the coverage and quality of the evidence base used. Economics usually dominates this, and within economics, GDP. The attraction of GDP is that it includes so many different things in a single figure that can be tracked and compared over time and place. But it is not a measure of well-being and it does not account for environmental damage or a host of other vital social, environmental and even economic trends. Using GDP as a proxy for well-being, led to a goal to maximize outcomes, based on an efficiency criteria, and not on equity or sustainability.

Before the pandemic, there was a movement to go "beyond GDP" and other traditional statistics to use data that tell us more about what matters to people – are they getting healthier, happier, wealthier, better educated, more socially connected, and so on. COVID-19 brought into sharp relief what this kind of holistic policymaking means. Hard choices had to be made on what, and in some cases who, to prioritise. Governments had to find a balance between the competing claims of the economy, public health, education, social life, and human rights. We are still in a context to find the right balance.

One positive aspect of the COVID tragedy was that the value of science-based decision-making was recognised. "Following the science" became the norm. And unlike traditional, linear economics where pulling a few policy levers is supposed to get the machine back on track after a shock, the science of epidemiology is based on complex systems theory. One lesson from this is that there are no "externalities". The interconnectedness of society, the economy and the environment means that a shock in one area can quickly be amplified and transmitted, causing failures to cascade from one system to another – from health to the economy via transport and trade in this instance.

Epidemiology also shows how objective and subjective factors combine to influence behaviours and outcomes. Contagion and fear of contagion interact to produce waves of caution and carelessness, contributing to the rise and fall of the number of cases as people adopt or discard precautions.

Often, there is good objective evidence for radically different choices. An infrastructure project may boost growth and employment, but damage the environment and quality of life. Making vital systems more resilient may make them more expensive. Measures to protect the population may constrain human rights.

We need all the sciences, physical and social, to construct our evidence base. But to move from data to decisions, our analytical frameworks have to incorporate the humanities to deal with the complexity of our contradictory experiences, hopes, fears, history and cultures. Science can advise us, but the choices are ours.

Systemic and multilateral efforts to address shared challenges

Martha Delgado Peralta

Vice Minister for Multilateral Affairs and Human Rights at the Mexican Ministry of Foreign Affairs

Mexico is fully convinced that, not only is it necessary to highlight the importance and usefulness of multilateralism as a system capable of generating responses to shared challenges, but it is equally crucial to reflect on how to reform this system in order to better tailor it to the contemporary global context, rendering it more effective in its actions and closer to ordinary citizens. This is our vision of a functional and effective multilateralism, which draws on the decisive action of each member of the international community to solve the problems that afflict everyone, without leaving anyone behind.

In this sense, scientific advice constitutes a powerful tool for governments and decision-makers, as it promotes public-policy that is evidence-based. However, it is a fact that neither politicians nor the public align themselves spontaneously to evidence – for different reasons. Indeed, a delicate balance needs to be procured between what is scientifically advisable –assuming the politician is well advised by scientists– and what is politically feasible or convenient. This means that focused strategies need to be designed for scientific advice to play a role both in decision-making by politicians as in engaging with the public.

A systemic, long-term measure for this work is, of course, the introduction of a strong science component at all levels of the educational system that allows citizens – including future politicians – to acquire an understanding of what science is about and gain a sense of respect for it, develop a methodical, rational way of thinking, and apply critical judgment on science-related issues that enables them to separate the wheat from the chaff.

A shorter-term measure that helps build trust and legitimacy on all sides, is the creation of spaces for an open, transparent and respectful dialogue between policy makers and politicians, scientists of different disciplines, and the relevant public – be it a local community, a group of labourers, a miners' union, or an environmentalist party. Numerous specific examples serve to illustrate the benefits of this approach; all parties gain in the process and contribute to a positive outcome. However, experience shows that these successful examples remain often local in space and in time; the agreements reached are not respected and implemented, there is no systematic follow-up and no multiplier effect. These weaknesses, which play against the process, need to be addressed. In other words, although this may be a short-term measure, its longer-term impact should be ensured.

How Artificial Intelligence and Politics Are Shaping Trust in Scientific Experts

Frédéric Bouchard

Dean of the Faculty of Arts and Sciences at the Université de Montréal

Collectively, we have never relied more on scientific expertise for decision-making. And yet, our relationship to expertise is changing for reasons that have been accelerated by, but go beyond, the pandemic. The transformation of trust in expertise going forward will depend on the interaction of two phenomena:

1. how trust in institutions in general is changing
2. how technology and our thirst for convenience are training us to defer to algorithms more readily than to humans.

Let's remember that, based on various surveys, trust in scientists has remained high for the last 40 years: scientists are some of the most trustworthy figures in society. This is not the case for other groups: trust in elected officials and journalists for example has diminished markedly in the same period. This weakening of trust in other institutions may well end up affecting trust in scientists: the pandemic has tied scientific expertise (higher trust) to elected officials' decision (lower trust). Ironically, while Covid has shown the essential contribution of science, it may also weaken trust in scientific expertise because of its apparent symbiotic relationship to other groups. There is no fatality here, but we still must take heed of this risk and strengthen the integrity and credibility of scientific institutions.

The second process is independent of the pandemic and in a way more fundamental. Our increasing reliance on artificial intelligence in everyday gestures (e.g., request for the best recipe on Siri, medical advice on Google, fastest routes on Uber) is training each and every one of us to rely on digital tools to provide not only information but answers. We are now increasingly delegating human *judgment* to machines. While we are demanding more and more transparency from humans, we are tolerating the relative opacity of algorithmic solutions. This shift is happening both at the individual level and increasingly at the institutional level.

Fear and convenience may lead us down a dangerous path: if we are not careful, we will soon be doubting trustworthy humans while trusting opaque machines.

For scientific expertise to keep its essential place in enlightened decision-making, both at the individual and at the collective level, we must understand the unfolding of these two processes. How will the evolving (and covid-induced deepening) relationship between experts and elected officials affect trust in science? How should we adapt our advice practices to take advantage of genuinely useful AI tools while increasing the role of humans in ultimate judgment and arbitrage? We are able to answer both of these challenges if we recognize the urgency of doing so.

Retrospective:

Professor Michinari Hamaguchi, President of the Japan Science and Technology Agency welcomes delegates to INGSA2021, Tokyo

3 Evidence and Democracy: Sustaining Trust in a Challenging World

Are new tools and concepts needed or just a better understanding?

Vladimír Šucha

Senior Policy Advisor at UNESCO

The world is moving at unprecedented speed. Several fundamental changes are unfolding: the change in technology, which is triggering a societal transformation; climate change, which is increasingly urgent, and the geopolitical shift. Fast speed, hyper-connectivity, increased complexity and uncertainty are putting the traditional nexus between science, technology, society, economy and politics into serious stress test. Multiple crises, disturbances and growing polarization are creating a fertile ground for breaks and failures in existing social fabric and political structures.

Functioning governments, open to engage with the science community, may change or become more hostile. The post-fact forces, or algorithms may undermine the trust in science and trust in society which are fundamental drivers of post-modern evolution. As a result, the social contract, favorable for science and its function in the society, may be altered. Is science and science – policy interface ready for these possible changes? How should science advice react, predict or prepare for the difficult time? Will there be a role, will there be a space for science in the society undergoing significant and potentially turbulent transformations?

The post-fact forces may undermine the trust in science and society which are fundamental drivers of post-modern evolution.

Silvio Funtowicz and Jerome Ravetz, almost 30 years ago, suggested that the traditional models and approaches to science policy interactions are ineffective. They defined a new paradigm for policy-relevant science and called it "Post-normal science". Post-normal science is appropriate when applied scientists and scientific consultants are unable to embrace systems uncertainties and when the decision stakes are very high. The quality assurance of scientific inputs to the policy process then requires an "extended peer community" to complement traditional scientific peer-review. The COVID crises quite clearly demonstrated that in spite of almost three decades from the introduction of this concept, we still have difficulties in embracing it.

Do we need to invent a new concept or will proper understanding of the old one help to meet the challenges, which the future will certainly bring? We need to tackle the complex, non-linear issues with complex approaches and tools, where one number or one truth are not the answers. Where "extended peer communities" are not only encompassing different fields of science and technology but are extended to all concerned stakeholders and citizens.

I hope very much that our debate in the panel will bring some answers and directions for future work and developments.

When Should Experts Support Government Advisory Mechanisms and When Should They Oppose Them?

Roger Pielke Jr.

Professor of Environmental Studies at the University of Colorado Boulder, Principal Investigator on the Evaluation of Science Advice in a Pandemic Emergency (EScAPE) project, Author of The Honest Broker

One of the remarkable features of science advice across the global response to COVID-19 has been the prominence of what we in the EScAPE project have come to call "shadow science advice." The defining characteristic of "shadow science advice" is that it involves experts who provide science advice to government, but outside of formal governmental advisory mechanisms.

Like "shadow ministers" in a government (where the terminology is taken from) the expectation is that shadow science advisors want to improve decision making and ultimate outcomes. In 2021, such an expectation must be made explicit, because there are unfortunately examples of those who would seek to act in ways that are not constructive to either decision making or outcomes.

There is much to say about the practice of "shadow science advice" but here I'd just like to raise a question that I believe our community should grapple with more explicitly. That is:

When should experts support government advisory mechanisms and when should they oppose them?

Consider the following examples:

- In the United Kingdom, the official government science advisory body in the pandemic – called SAGE – was opposed by a group of experts not affiliated with the government – who called themselves the Independent SAGE.
- In the Netherlands, a group who called themselves the Red Team self-organized to offer advice in opposition to the government, and then ceased their activities when they judged that their work had been done or was no longer helpful
- In Sweden, the Vetenskapsforum COVID-19 (Science Forum COVID-19) – another self-organized group of experts – sought to oppose official government advisory processes and policies.

And there are many other examples. While "shadow science advice" has always existed (indeed, the EScAPE project that I lead is a shadow science advisory mechanism), the pandemic has elevated the significance and influence of such advisory mechanisms. In the United States it might be argued that under the Trump Administration shadow science advisors engaged in a hostile take-over of the government's COVID-19 response.

I suggest that shadow science advice raises all sorts of important questions. Such as:

- What criteria should an expert use when deciding whether to assume a supportive versus oppositional role?
- Do extra-governmental advisory mechanisms have potential to delegitimate official advisory bodies? Governmental policy as well?
- Should we discuss ethical guidelines for serving in advisory roles (official or shadow) in support of democratic governance?

Expertise is absolutely essential to good governance and empowers decision making that achieves intended outcomes. But at the same time, expertise is not a substitute for governance. The pandemic has made clear that we experts need to think carefully about our roles and responsibilities, so that we support both good policy as well as practices of democracy.

Resources:

Evaluation of Science Advice in a Pandemic Emergency (EScAPE) project

Foundations of the Science Advice System

Jean Philbert Nsengimana

Managing Director, The Commons Project Foundation; Former Rwandan Minister of Youth and ICT

The system of science advice is based on trust, truth and care. It assumes policy makers and public administrations will trust the scientific community to provide true, factual and evidence-based advice. The system assumes the presence of good leadership that cares about and puts public interest first. It only works when communities and countries are able to foster communication, cooperation, collaboration both domestically and internationally.

When any of these assumptions fails, the system derails and public policy systems become dangerous weapons that put the society and people's lives in harm's way.

Local, national and global crises provide a great environment for testing the strength and resilience of science advice systems. This is evident in multiple domains, ranging from climate change, global trade, gender equality to the ongoing COVID-19 pandemic. I will use the latter to illustrate what happens when one or more foundations of the system fail.

Trust: When the coronavirus epidemic struck China late 2019, one of the instinctive moves that all countries made was to close their borders. Suddenly, instead of working together to solve the problem, countries started seeing one another as the problem. In retrospect, border closures did not succeed at stopping the spread of the virus. Nevertheless, largely for political reasons, border closings remain one of the most widely used strategies against the pandemic. The trust deficit among nations caused untold suffering and losses to people, industries and economies that depend on the good functioning of global logistics systems, travel and tourism. Lives were lost. Jobs were destroyed. Livelihoods were shattered.

I happen to work for an organization – The Commons Project (TCP) – that is leveraging innovation and deploying technology platforms to help countries rebuild the lost trust, reopen borders and restart their economies. The problem we are tackling is: how does a country trust a health credential (whether it's lab results or vaccination) issued by another so that they may allow entry to foreign nationals without endangering their own populations? In this instance, mistrust can be justified by the incidents of fake covid-19 test and vaccination certificates that made headlines in all continents. There can't be trust without means for verification. To solve the problem, TCP joined forces with over 500 public and private organizations under the scope of the Vaccination Credential Initiative (VCI) to develop the open SMART Health Cards (SHCs) standard for providing individuals with verifiable vaccination certificates.

Similarly, whenever trust deficit threatens science advice systems, openness and transparency should be the solution. Not protectionism, egoism or bigotry. Technology and innovation are great enablers, but it takes political will, leadership and partnership for them to be successful.

Truth and honesty: The pandemic amplified the already looming crisis of misinformation, alternative facts and conspiracy theories. Thousands of lives and billions of dollars continue to be lost due to neglect of basic public health measures and vaccine hesitancy as a result. Truth is useless without adequate education and proper strategies to counter the criminal use of freedom of speech.

Leadership & Partnership: The most glaring contemporary failure of science to policy advice is illustrated by the current vaccine nationalism. The ongoing hoarding of vaccines by rich countries while people are dying in the global south doesn't make any scientific or even common sense. This situation alone brings into question almost all the assumptions that we make about science advice-policy advice at global scale.

Good leadership in this globalized world is about caring beyond oneself. Partnership is about recognizing that we either win or lose together. In both instances, the world has a long way to go, before the policy-science-society cycle is virtuous. Right now, folks in countries like mine continue to see this cycle as vicious. When cracks and fault lines appear in the system, the job to repair them befalls all of us, as leaders of the scientific, business and public policy systems. The failure of these systems is therefore our own failure. Intellectual honesty and humility requires that we recognize that as the first step towards repairing the damage.

Social and political values in the science-policy interface: The tensions of pluralistic policy-making

Manuela Fernández Pinto

Associate Professor, Center for Applied Ethics at Universidad de los Andes (Bogotá, Colombia)

The role of science and scientific knowledge in democratic societies involves different tensions, particularly with respect to policy making. For instance, expert knowledge is required to address technical questions, but at the same time the voice of the people should be prioritized for a democracy not to turn into a technocratic regime. Also, expert knowledge needs to be produced following the standards of scientific communities and peer evaluation, but those standards and evaluations do not require public consensus. In addition, we would like our public policy to be as informed as possible, but we do not want political discussions to be silenced by expert voices. There are thus tensions between scientific expertise and democratic policy-making.

An important aspect of such tensions is related to the social and political values that surround the science-policy interface. According to a traditional view, science is value-free and provides neutral evidence that is then applied in the policy realm, where values come into place. However, in recent decades a number of scholars have shown that the ideal of value-free science is not only unrealistic but also undesirable. Scientific knowledge and expertise are inevitably produced in contexts laden with social and political values, and even the individual decisions of scientists are permeated with different considerations regarding values.

Acknowledging that science is not value-free opens in turn a number of questions regarding the role of values in knowledge production and the public appropriation of such knowledge: How should we understand scientific evidence for policy-making, if we acknowledge that science itself is not value-free? If so, which values should guide scientific knowledge production for public policy? How should democracies choose such values? How should scientists conduct research considering the policy applications of such research? How should science contribute to public policy or what is the role of scientific experts in democratic policy-making if scientific evidence can no longer be regarded as neutral and impartial? These are all thought-provoking questions regarding the tensions of pluralistic policy-making that we ought to address.

Acknowledging that science is not value-free opens in turn a number of questions regarding the role of values in knowledge production and the public appropriation of such knowledge.

Science and Politics vs. Politicization

Heather Douglas

Associate Professor in the Department of Philosophy and a member of the Socially Engaged Philosophy of Science Group at Michigan State University

Pluralist societies have pluralist values. Those values are central to policy-making, and central to the conduct of science. Just as policymakers need to deploy values to make choices regarding which goals and which policies to pursue and how to make important trade-offs, scientists need to deploy values in order to choose which problems deserve their attention and to decide when evidence is sufficient to support a claim. Neither science nor policymaking can be value-free.

When are the values central to these endeavors legitimate? For governance, legitimate values are those identified and defended through political processes. This sounds dangerous for science. Politics is usually viewed as a problem for science, as source for contamination or distortion. But politics is where we decide how to live together in complex pluralist societies. Politics is essential for debate about what constitutes the public good, by which rules and laws we will be collectively bound, and how to allocate crucial public resources. These are important discussions, and it is important that science be part of these discussions, both as part of the public good and as a key source of information for political decisions (advice).

Given the importance of both politics and of science, we need to delineate good interactions from bad interactions between politics and science. Rather than decrying when science is political, we should decry when science is politicized. When partisan camps become entrenched on scientific issues, such that evidence and debates about its implications become irrelevant to the views of political actors, we have a problem. When scientists are prevented from speaking to the public about what they are finding, or areas of research are undermined or attacked because they are producing politically unwelcome results, or the debate over an issue becomes a matter of political loyalty rather than a discussion of evidence, values, policy pathways, and trade-offs, science has been politicized, to the detriment of both science and democratic politics.

In order to do their work properly, scientists must be responsive to evidence and be able to interpret it without fear of retaliation from those in political power, while being clear about the values shaping the generation and interpretation of evidence. Political debates need to take seriously the work of the scientific community, even if that work does not determine political decisions. Debates that cannot do this are effectively useless, and the public suffers as a result. The politicization of science is not just a problem for science; it is a problem for democratic politics.

Resources:

https://www.the-scientist.com/critic-at-large/science-advocacy-in-the-post-trump-era-68684

Brown, M.J. (2013) "The Democratic Control of the Scientific Control of Politics." In: Karakostas V., Dieks D. (eds) EPSA11 Perspectives and Foundational Problems in Philosophy of Science. The European Philosophy of Science Association Proceedings, vol 2. Springer, Cham. https://doi.org/10.1007/978-3-319-01306-0_39

Douglas, H (2015). "Reshaping Science: The Trouble with the Corporate Model in Canadian Government." *Bulletin of the Atomic Scientists* 71,2: 88–97.

Schroeder, S. (2020). "Thinking about Values in Science: Ethical versus Political Approaches." *Canadian Journal of Philosophy*, 1-10. doi:10.1017/can.2020.41

Acknowledging value plurality in the science-policy interface

David Mair and Mario Scharfbillig

Joint Research Centres of the European Commission, Belgium

Scientists spend much of their time focusing rightly on detailed technical questions. When they come to give policy advice however, they have to address new and considerations, connections and complications. A crucial part of this different world is a multitude of conflicts over the same facts and what to do about them, which often have at their heart, the different values of the actors involved.

Values are the glue that holds societies together and a standard against which to evaluate what is right or wrong. But values are also diverse and plural within societies. Some of the most fundamental values people hold give rise to conflict, which is an empirical fact. Each side usually thinks or feels they are the only right one, but this is an illusion.

Values are also "truisms", we hold them dearly, but it does not mean that we have come to hold them following a long thought processes. We rather come to hold them through a multitude of personal experiences, especially when young, influences of family, friends, school and peers and they are mostly stable thereafter. Their influence on our thinking is also at least partly unconscious, even when we think we are fully rational in our beliefs and decisions.

Science itself is not value-free. For example, thinking about which research questions are investigated in the first place is not only heavily based on the values and interests of the researcher, but also by funding institutions. Science can overcome individual values influences through institutions like peer review to a certain degree, but two problems remain: what if the reviewers share the same values themselves? And more importantly for policy advice, what happens when scientists give advice without peer review, as is almost always required to deliver timely input?

Scientists don't need to hide their values or try to eliminate their influence either. They simply need to acknowledge that the people we disagree with are often neither stupid, nor evil. Being proud, but at the same time also humble about ones' own values and acknowledging value plurality in society is essential for scientists to fulfil their duty in the science policy interface. Being aware of their own values avoids falling prey to the politicisation of science and safeguards against compromising of their advice.

Being aware of values avoids falling prey to the politicisation of science and safeguards against compromising of scientific advice.

Bridging Science to Policy and Action for Impact

Asma Ismail

President, Academy of Sciences Malaysia; Ibn Sina Chair for Medicine at the International Islamic University Malaysia

Today, our world faces a confluence of very pressing challenges in the social, economic and environmental spheres. This has exacerbated demands for technology-driven solutions, accelerated digital transformation, data-driven decisions (evidence-based) as well as agile responses in record time. As a result, we are pushed to adopt a techno-centric approach as opposed to a human-centric approach that gives credence to people and values. Social responsibility and whole government approach with participatory leadership must take centre stage to navigate the unprecedented challenges of our time.

Human-centric approaches require more participatory and collaborative models of engagement with diverse stakeholders, trans-disciplinary feedback and futures thinking. Effective and active engagement among businesses, government, policy makers, communities and citizens as knowledge partners towards addressing major challenges by co-developing possible solutions should be the order of the day. This will forge shared responsibility, collective action and positive impact. In this context, there is a need for science, technology and innovation (STI) advisory bodies, learned societies that hold the authority coming from a collective view, to function as neutral entities, garner the trust of stakeholders, and be a voice of influence and change maker to create or enhance policy change.

Science and technology is moving faster than governments can enact laws to regulate the application of emerging technologies and new business models. Agile and anticipatory governance to proactively respond to new or disruptive products and services is vital. In this data-intensive era, science needs to embrace an open enterprise paradigm. No longer can science be confined behind laboratory and library doors. The transition from data ownership to data access will accelerate scientific discovery, understanding and applications. This would stimulate the democratisation of knowledge and cross-sector collaboration.

Science is for scientists to serve humanity, not themselves. As such, responsible research and innovation must be inculcated from young and move from being a mere concept to practice. To produce the desired results, intangibles (values, ethics, trust and trustworthiness) play a big role. For the ecosystem to be successful in creating impact and a sustainable change in society, the solutions provided by research and innovation must align the scientific and technological progress with socially desirable and acceptable ends.

In this data-intensive era, science needs to embrace an open enterprise paradigm. The transition from data ownership to data access will accelerate scientific discovery, understanding and applications.

The Social Value of Distrust

Maria Baghramian

School of Philosophy at University College Dublin and Project Lead of the EU-funded PERITIA (Policy, Expertise and Trust) project

A great deal of recent public and philosophical debate on experts has focused on finding ways to build trust in experts and to ensure that their trustworthiness is evident to the public. The distrust in experts is variously attributed to psychological, normative and socio-political causes such as cognitive biases, group polarisation, and politically motivated partisan reasoning. The standard reaction to the real or perceived breakdown of trust in experts is to call for better communication and messaging by scientists and science journalists, greater scientific literacy on part of the general public and countering the impact of motivated cognition. Additionally, great emphasis is placed on ensuring the trustworthiness of experts not only by proving their knowledge and competence, but also by demonstrating their honesty and social responsiveness.

Distrust, however, is not occasioned only by perceptions of incompetence, failures in performance, or professional dishonesty or irresponsibility. Rather, frequently, it is also rooted in experiences of harm and suffering brought about through historical or current collisions between experts and political powers, where damage and suffering has been inflicted, in particular, on the marginalised, the defenceless and the vulnerable. (Medical experimentations and other scientific tests are just two examples). Distrust in such cases signals social imbalances and wrongs in the way expert knowledge is placed in the service of the political and social interests of some sectors of the society at the expense of others. In such instances distrust is not only justified, but it may have the value of pointing at injustices that need to be rectified.

While ensuring the trustworthiness of the experts and policy makers who are advised by them is essential in countering unwarranted distrust, we also need to consider and act on the conditions that go into legitimising distrust. One way to achieve this complex goal is to create a climate of trust, a social and political environment where the concerns that legitimise distrust are acknowledged and addressed. A **climate of trust** will facilitate trust and trustworthiness at a collective level rather than focusing only on the experts and their trustworthiness or the attitudes of trust or distrust evinced by the members of the public. Trustworthiness, in this approach, becomes a feature of that wider institutional practices that make the legitimate acts of trusting possible. Giving due recognition to the legitimacy and indeed the value of socially motivated distrust is an important element of such institutional practices.

Pacing, Adaptation and Denial

Marc Saner

Chair, Department of Geography, Environment and Geomatics at the University of Ottawa; Founding Director, Institute for Science, Society and Policy (ISSP)

I agree that technology is fundamentally changing the world, physically, socially, and politically – and that regulation is a key tool for governments to address resulting opportunities and challenges.

I further agree that regulatory science is a form of science advice. And it is significant form because most countries employ more regulatory scientists than research scientists.

We must be mindful, however, that this form of science advice is constrained. The environment of regulatory scientists is highly structured because regulations are legal instruments. Regulations are passed by politicians and they can be fought in court. As a result, regulatory scientists do not provide "best known advice"; instead, they provide "best mandated advice". It is unprofessional (and possibly illegal) for a regulatory scientist to comment on issues outside of her mandate.

When product development accelerates, the obvious first concern may be **anticipation**. Nevertheless, I would argue that the biggest issue is the denial of the **pacing problem** (Marchant, Allenby & Herkert, 2011). We must first overcome this denial to achieve proactive, agile, and adaptive regulations.

Gary Marchant and colleagues define the pacing problem as follows (2011): "Our traditional government oversight systems are mired in stagnation, ossification and bureaucratic inertia and are seriously and increasingly lagging behind the new technologies accelerating into the future." In brief, 'pacing problem' denotes the challenge for regulators to stay abreast of the pace of emerging technologies. Legal instruments remain slow while technologies are accelerating. Furthermore, emerging technologies make products that are often hard to assess because of a lack of risk information and because of novel ethical challenges. It is difficult to use the idea of "familiarity" as it is often done in the context of known technologies. On top of that, the economic stakes are often significant: nations do not want to stifle the next block-buster platform.

During my work with on synthetic biology, I observed the following types of denial:

1. **There is no pacing problem:** The technology is evolutionary, not revolutionary, and we must not slow emerging technologies because they are vital for our economic future.
2. **The problem may exist, but we don't really know:** It's not all too clear what's coming down the innovation pipeline. We are not mandated to guess …
3. **Some of us think the problem exists, others don't:** The interpretation of novelty depends on the details of the various affected regulations.
4. **Ok, it exists, but we cannot change:** We don't have the power, nor the time nor the resources, and no-one is listening. Regulation is reactive, not anticipatory. It's a legal instrument.
5. **We may be able to change, but we don't like to:** Why me, why now – we are so busy.
6. **Wait, someone else said they would deal with it:** Oh! Other actors may address it!

The Situation Post-denial: Once there is a will, there is often a way. But change will have to be deep, systemic.

References:

Gary Marchant, Braden Allenby & Joseph Herkert, Eds. (2011). *The Growing Gap. Between Emerging Technologies and Legal-Ethical Oversight: The Pacing Problem*. Dordrecht: Springer.

Regulatory lessons from the Comprehensive Nuclear-Test-Ban Treaty (CTBT)

Lassina Zerbo

Executive Secretary Emeritus of the Comprehensive Nuclear-Test-Ban Treaty Organization (CTBTO)

Regulatory science advice is an increasingly important tool for governments as they manage and mitigate the complex challenges of the 21st century.

Responsive and adaptive science advice to regulate transformative technologies such as AI, gene therapy, robotics and vaccines is a primary means with which the government can protect their citizens. Lessons from other fields of science advising can help to highlight best practices and approaches. This paper examines the role of science advice in the context of the Comprehensive Nuclear-Test-Ban Treaty (CTBT) and provides lessons that can be applied to a regulatory framework.

The first negotiations on a verifiable nuclear test ban started in the late 1950s with a UN Conference of Experts. While this group reached consensus on many issues, disagreements on several technical matters remained. In this case, government science advice, which indicated that discriminating between earthquakes and nuclear explosions would be more difficult than expected, changed one party's position on a key issue. This, along with a deteriorating political environment, derailed the talks.

Nonetheless, government experts continued to meet through Ad-hoc committees and later within the mandate of the Group of Scientific Experts to develop technical aspects of a global seismic monitoring system. The scientific work undertaken by these multilateral bodies laid the technical foundation for the formal CTBT negotiations. Government science advice played an indispensable role in informing and steering these complex debates.

We continue to rely on science, technology, and human ingenuity to ensure that the CTBT verification regime remains robust, and at the cutting edge of scientific advancement. At the same time, government science advice on a national level, and science diplomacy on an international level, will be crucial for the long-term sustainment of the Treaty and its verification technologies and techniques.

Preserving trust and confidence in the data collected and processed through the CTBT verification regime is also paramount to achieving our objective of a nuclear test free world.

The impact of misinformation and mistrust in the public discourse on scientific questions and issues has been stark. The ongoing fight to contain and eliminate the Covid-19 virus and its multiple variants continues to provide immediate lessons for the future. Enhancing science advice to governments, increasing our efforts in science diplomacy, and building trust and confidence in democratized data remain key pillars of an effective approach to global governance and regulatory science. This will allow us to be more responsive and innovative when faced with new challenges and emerging threats.

Enhancing science advice to governments, increasing our efforts in science diplomacy, and building trust and confidence in democratized data remain key pillars of an effective approach to global governance and regulatory science.

Transparency, Principles and Incentives to Regulate Technology

Yoshua Bengio

Founder and Scientific Director, Mila – Quebec AI Institute; Full Professor, University of Montréal

Science is enabling gradually more powerful tools being deployed in society. Unfortunately, our collective wisdom, institutions and social norms are not keeping pace with those accelerating advances. Future AI or biotechnology tools could have tremendous positive societal impact as well as very concerning negative effects, which at the extreme could be existential threats for humanity. Standard regulation takes too much time to put in place and adapt, and it is difficult to foresee some of the negative consequences of future deployments of new technology. It is thus important that upcoming regulatory frameworks for technology be highly adaptive and rely more on prevention. Three important considerations may help achieve this: (1) greatly increased **transparency and monitoring**, (2) **principle-based legislation** and (3) **incentives-based public policies**.

1. To favour the responsible development of these technologies, the first and foremost requirement is that the public or its representatives have access to adequate detailed information (e.g., documented AI algorithms, software and dataset specifications). This goes against the current norms based on trade secrets by which almost all information about the implementation of AI systems is hidden and the development happening behind closed doors. Whereas the degree of **transparency and monitoring** is already fairly high in other industries where the public's security is at stake, like the aviation industry, it is currently not the case for information technologies, and that needs to change. It is important for the legislator to clarify what information needs to be documented and to enforce appropriate monitoring mechanisms giving independent experts a deep view into these systems.
2. Because the science behind these technologies and the myriad ways in which they can be applied and abused is likely to evolve in unpredictable ways, it is difficult for the regulator to draft regulation which covers in a precise fashion all the nefarious scenarios to be avoided. A preferable form of **regulation also involves principles**, which have the disadvantage that they leave room for interpretation, but can better cover such unforeseen scenarios. It also means that the courts, the businesses and the regulators will have to iron out these interpretations and the corresponding regulatory practice as the danger flags are raised, thanks to increased transparency and monitoring.

The above become effective after the development of the technology has taken place, often with great capital investment. In addition, governments should provide incentives which can play a preventive role and **encourage corporations to innovate in directions which are better aligned with public good**. This could come in the form of retroactive fiscal rewards or punishments based on the downstream social impact of their technology (positive or negative), thus channeling investments in directions that avoid long-term nefarious impact and instead favor beneficial applications.

Science Diplomacy as a platform for harmonization of regulations for agricultural biotechnology

Muhammad Adeel

Career Diplomat, Science Diplomacy Division, Ministry of Foreign Affairs Pakistan

Biotechnology is a significant part of the global knowledge economy and its share is expected to increase to 727.1 billion USD by 2025. Our knowledge about genetics and how it combines with the environment to bring about change at the organism level has undergone a rapid transformation. With each passing decade, researchers have been able to develop new suites of biotechnologies that provide new possibilities for the future. Developments in biotechnology, and life sciences in general, have resulted in the emergence of new methods that can be applied in crop breeding.

Amongst the factors that affect global food market trends and performance, regulatory changes are a key driver. Any country's competitiveness in the global agricultural economy depends increasingly on access to, and implementation of, the most effective technologies for crop production. A diverse array of stakeholders including innovators, regulators, farmers etc are engaged in a complex commercialisation ecosystem of developing new varieties both for domestic and international markets.

The regulatory interface of biotechnology, or any emerging technology is an important determinant of its successful uptake as well as commercialisation outcomes. The potential of agricultural biotechnology to contribute effectively to food security and climate change related challenges is directly related to the extent of science and evidence driven regulations. The disharmonized regulatory architecture of biotechnology has been manifested and explained through the lens of a trans-Atlantic divide as well as information driven barriers such as the criteria of risk/biosafety and the place of socio-economic considerations in determining risk. Disharmonized regulations related to agricultural biotechnology impact international trade and increase entry barriers for small and medium enterprises due to high compliance costs.

There is an urgent need to expand the science diplomacy interface in the international governance structures of biotechnology. Through the various deliverables of science diplomacy including science advice and inclusive deliberative platforms, it is possible to shape the contours of regulations in a productive way. Finding the sweet spot between avoiding over-regulations and addressing relevant risk considerations can be facilitated through science diplomacy at the international and sub-state levels. Technology will keep outpacing regulations, resulting in institutional drift, unless future proofing of regulations is achieved through better utilisation of science advice in existing governance structures and addressing regulatory asymmetries at various stages of the technology development and commercialisation pipeline.

References:

Jasanoff, S. and Kim, S.H., 2015. Dreamscapes of modernity. Sociotechnical imaginaries and the fabrication of power. Chicago.

Rabitz, F., 2019. Institutional Drift in International Biotechnology Regulation. Global Policy, 10(2), pp.227-237.

Robinson, S., 2021. Scientific imaginaries and science diplomacy: The case of ocean exploitation. Centaurus, 63(1), pp.150-170.

Resources:

https://gesda.global/scientific-anticipatory-briefs/

https://www.sciencediplomacy.org/perspective/2021/food-security-in-post-covid-19-world-regulatory-perspectives-for-agricultural

Storylistening: The use of narrative evidence to strengthen public reasoning

Claire Craig

Provost of Queen's College, University of Oxford; Former Chief Science Policy Officer at the Royal Society, United Kingdom

As SAPEA puts it: 'What counts as "good" evidence varies with the questions', meaning that the best evidence is salient and accessible, as well as rigorous on its own terms whether that rigour derives from a randomised control trial or a carefully constructed historical analysis[1].

Perhaps those creating or using evidence could help increase confidence in it by pointing out that their plea is not for the listener to put their trust in the expert speaking, however illustrious that person might be, but in the social systems that keep them honest whether through academic peer review and contestation, or democratic accountability. Synthesis helps too, partly by getting away from the presentation of single findings which are much less likely to be fully salient, to the richer presentation of evidence synthesised within disciplines or, in many cases, across them. High quality synthesis is rigorous, inclusive (responding to the questions of policymakers or publics rather than only being directed by what experts think might be relevant), accessible to those who need to use it (remembering that translation is essential but always carries risks: "any statement that is perfectly true is not useful, and any statement that is useful is not perfectly true"[2]), and transparent (therefore capable of being interrogated by those who wish to do so)[3].

Less commonly acknowledged is the potential significance of including evidence from the humanities and, in particular, narrative evidence from storylistening: critical analysis of stories as part of a plural evidence base[4]. Stories can broaden the range of models available for surrogative reasoning about present and future states; they can provide new points of view to inform the framing of the relevant target system; and they can help identify collectives and their potential behaviours. More generally, acknowledging that stories, whether associated with a computational model or a movie, operate in powerful ways in the world and have cognitive value in providing knowledge about the world, is one way to begin to take them seriously. More widespread narrative literacy of this kind – storylistening, not storytelling – would help engage with some of the concerns about misinformation and post-truth. Pretending otherwise does not make stories and their power disappear. Rather, it renders them vulnerable to abuse by those storytellers who wish to wield their power in ways that do indeed position stories as in opposition to evidence, including scientific evidence, and hence to undermine public confidence in evidence in all its forms.

References:

1 SAPEA. 2019. *Making Sense of Science for Policy under Conditions of Complexity and Uncertainty*. Berlin: SAPEA. DOI: 10.26356/MASOS

2 Adair Turner, quoted in Craig, C. 2019. *How Does Government Listen to Scientists?* Cham: Palgrave Macmillan.

3 The Royal Society and the Academy of Medical Sciences. 2018. *Evidence Synthesis for Policy: A Statement of Principles*. Accessed 3 November 2020, at: https://royalsociety.org/-/media/policy/projects/evidence-synthesis/evidence-synthesis-statement-principles.pdf

4 Dillon, Sarah, and Craig, Claire, *Storylistening*: Narrative Evidence and Public Reasoning (London: Routledge, forthcoming November 2021).

Strengthening The Role of Communication in Evidence-Informed Policy

David Budtz Pedersen

Professor of Science Communication and Director of Humanomics Research Centre, Aalborg University Copenhagen.

Communicated trusted and actionable knowledge is more important than ever. It helps us address global challenges such as climate change, migration and public health within a context of complexity, uncertainties and rapid changes. At the same time there are signs of a growing public distrust in experts, sometimes exacerbated by lack of clarity, openness and transparency. The need for greater mutual understanding between science and policy communities – as well as the wider public – is a key pathway to create trust. **Working together across boundaries and creating safe interfaces between science, policy and society is essential for securing social acceptability of evidence-based policies.**

For more than a decade, the Humanomics Research Center in Copenhagen (DK) has conducted research on research with a special interest in the intersection between science and policy, evidence-informed decision-making, science advice, and policy impact of research. In particular, we have focused on the use and mobilization of humanities and social science for policy making. Emergencies, such as pandemics and climate action, put science-policy relationships to the test. Tensions arise when science meets societal values. **Early engagement with policy makers, and a stronger role for social sciences and humanities, can foster the co-creation of solutions and recommendations, which are likely to find higher degrees of social acceptance.**

Throughout the Covid-19 pandemic, Danish authorities have relied on input from behavioral and social sciences, understanding not only how to better model compliance to restrictions and health guidelines but also to establish a trustful relationship to citizens through effective science communication. Putting trust in citizens and understanding covid-related behaviors and attitudes have proven to be a very important instrument in the re-opening of the economy. In September 2021, 86 per cent of all invited (from 12 years and up) have received 1+ vaccine dose. 96 per cent of everyone above 50 are fully vaccinated. Throughout the pandemic, Denmark has had higher acceptance than many comparable countries. The best predictor of vaccine acceptance is trust in the authorities' management of the pandemic. Importantly, effective science advice during emergencies is not only about transmitting facts and evidence but creating a collective project, avoiding polarization, and taking the attitudes and behaviors of citizens seriously.

In a recent report for The Danish Council for Research and Innovation Policy (DFiR), we analyze 14 instruments and mechanism for effective science advice to policy makers. The report summarizes discussions and key messages of recent international research on science advice and science communication. We suggest that building resilient systems and institutionalizing science advice through effective mechanisms can help prepare for future crises. Looking to the longer term, foresight, co-creation, and public engagement are important tools for shaping how decision-makers mobilize and integrate scientific advice and expertise.

Resources:

Communicating Science in Times of Covid-19
https://www.cost.eu/uploads/2021/02/210217_CCA_COVID_Publication-2.pdf

The Danish Eco-System of Science for Policy
https://ufm.dk/forskning-og-innovation/rad-og-udvalg/danmarks-forsknings-og-innovationspolitiske-rad/aktuelt/arrangementer/1005458dfirdebatoplgFINALa.pdf

Challenges in communicating scientific evidence

Elisa Reis

Professor, Institute of Philosophy and Social Sciences at the Federal University of Rio de Janeiro; Vice-President of the International Science Council

We often assume, implicitly or explicitly, that problems in translating scientific evidence into effective contribution to policy formulation are restricted to the flow of communication between science producers and policy formulators. However, policies must also account for the reaction of citizens. How the public perceives science-based evidence is part of the equation given that securing social support is a non-negligible factor. Thus, even if the transit between the science and the policy communities could flow smoothly through an exclusive highway, the successful outcome of their communication often depends on a much wider web system. Besides an ethical commitment, improving communication between the scientific community and the public is also a pragmatic way to strengthen the value of science as a public good.

Another topic I would like to call attention to respects the evidence provided by the humanities and the social sciences. What can contribute to make them more relevant to policy design and implementation? We know that dimensions such as human perceptions, cultural frames, regularities in human behavior, are too important to be neglected by policy initiatives, but often expertise about these subjects are not properly incorporated into policy design. It is critical to discuss strategies to overcome the bugs that seem to impair communication to provide for valued social information to be conveyed to policy activities.

Besides an ethical commitment, improving communication between the scientific community and the public is also a pragmatic way to strengthen the value of science as a public good.

Science Advice and Policy-making in a Changing information landscape

Peter Halligan

Chief Scientific Adviser of Wales

Science advice in an emergency is different to the usual type, pace and media attention given to science advice in Government. Throughout the last 18 months, science advice has remained at the centre of most of the major decisions UK and Welsh Governments has taken throughout this coronavirus pandemic. This is challenging as the scientific evidence informing the policy response to COVID-19 is often incomplete and conditional. As more data is collected, the scientific understanding of COVID-19 changes, and science advisors therefore need to provide greater clarity about what is known, partially known, unknown and unknowable. In some countries, scientific experts have become national spokespersons, expected not only to provide scientific evidence, but also justify policy actions, which in many cases are not solely based on scientific evidence but in response to misinformation.

Moreover, scientists are no longer providing advice exclusively for government but also for different forms of media and a less informed and often sceptical general public – where the performance of different political, medical and scientific leaders has been closely scrutinised and variously criticised or complemented. In the fast moving, time constrained situation, where policy-makers and the public want assurance and certainty at pace, and where scientific consensus is often difficult to achieve, communication of uncertainties and alternative views has the potential to undermine trust in scientific advice and fuel mis-and dis-information. The WHO has noted that the global spread of COVID-19 has been accompanied by a "massive infodemic" an overabundance of information –some accurate and some not – making it hard for people to find trustworthy sources and reliable guidance. Potential future issues worth considering include:

- In a public health crisis, the public need to understand the rationale behind policy measures and have confidence in the government's approach.
- Communication of scientific advice should be guided by providing advisors with a clear remit, with defined roles and responsibilities separate from ministerial policy decision making.
- As many efforts in science communication tend to favour more affluent or exiting information privileged audiences, COVID-19 has highlighted the differential effects of science literacy and social inequities, which in turn has impacted on the access and acceptance of scientific information and the public's capacity to evaluate the quality, and extract relevant meaning for behaviour.

Science advisors need to provide greater clarity about what is known, partially known, unknown and unknowable.

Retrospective:

Meeting of the 2019 INGSA Research Associates at the Wellcome Trust in London

4 Science Advice in the Francophonie

Science Advice in La Francophonie

As the INGSA conference took place in a Francophone territory in 2021, the organisation took the opportunity to focus on the practices of science advice in French-speaking countries, from Africa to Europe and North-America. The day devoted to the Francophonie demonstrated the importance of considering science advice in its cultural, linguistic and institutional contexts, which INGSA aims to integrate in its scope. There is no universal recipe for scientific advice, and the paths taken are influenced by cultures, customs and languages.

The representatives of the francophone community recognised the need to formalise science advice mechanisms in order to be better prepared for future crises, but emphasised that these must necessarily integrate communication initiatives towards the general public with a transdisciplinary dimension. In order to mobilise research on COVID-19, the francophonie has been able to draw on the achievements of HIV research, both through research infrastructures and pre-established networks at the international level. This example suggests that the relationships of diplomacy and solidarity firmly anchored in the Francophonie will be an asset in the development of a francophone network in scientific advice. This network will continue to address the specific challenges that are examined in this series of essays.

"Reflection is needed upstream": Opportunities and threats in the practice of science advice

Caroline Quach-Thanh

Professor, Faculty of Medicine, Université de Montréal; Physician in charge of the Infection Prevention and Control Unit, CHU Sainte-Justine

This pandemic, throughout which knowledge has been and continues to be generated as pivotal events unfold, has highlighted the fact that scientists have never been so engaged in informing and explaining in an effort to equip policy makers for decision making. However, a scientist's career and training do not necessarily prepare him or her to provide such advice. As scientists, we are capable of explaining our field of research and expertise. But we still had to learn how to communicate in a global context and to understand the impact of our explanations on other disciplines and on the management of a health crisis. Indeed, this is the very basis of science diplomacy: how to work together, in accordance with the functioning of our various academic, hospital, public health and political institutions, without creating chaos in the eyes of the public and decision makers. Many decisions have been made in the midst of uncertainty, with the public good as the ultimate goal. However, these decisions needed to be rooted in a clearly established process and framework. Thus we have learned that, while all truth is worth telling, reflection is needed upstream: scientific silos must be broken down, disciplines must talk to each other, because a scientific certainty in silico does not necessarily translate directly to public health in vivo. Another major consideration is that knowledge evolves at a dizzying pace in a context like the pandemic. Science advice cannot rely on anecdotal evidence, but must be based on a review of the entire body of science available at a given time.

When faced with an historical situation, politicians may be tempted to start with a clean slate, entrusting new advisors, within new working groups, with the task of supporting them. This must be done with a clear understanding of the roles of each party, to avoid creating inconsistencies that could undermine public confidence.

Scientists clearly have a role to play in identifying gaps in existing knowledge, prioritizing them, and conducting research to address them. This type of science advice will ideally be transdisciplinary so that all perspectives can be considered, as we all have our blind spots.

Science advice is a discipline in its own right and requires skills that not all scientists possess. The primary qualities are humility and a disinterest in the quest for power: the idea is not to promote one's own research or expertise, but to put this expertise at the service of the institution one is advising and, ultimately, the public.

Scientific silos must be broken down, disciplines must talk to each other, because a scientific certainty in silico doesn't necessarily translate directly to public health in vivo.

The pandemic and other health crises

Cécile Tremblay

Medical Microbiologist, Centre Hospitalier de l'Université de Montréal (CHUM); Professor, Department of Microbiology, Immunology and Infectiology, Université de Montréal

The COVID-19 pandemic has taken the world by surprise. The hundreds of "pandemic preparedness plans" developed by organizations such as the World Health Organization, national governments and many institutions all underestimated our collective ignorance in the face of a new pathogen: its routes of transmission, its ability to mutate, its virulence in target populations, in this case the elderly.

The first challenge in using science to support public policy is that science does not always have all the answers. It develops in real time and evolves rapidly. This leads to updates to recommendations that, while based on science, can seem contradictory to the public. The question of masks is a good example. While at the beginning of the pandemic, there was little evidence to support the use of masks by the general population, accumulated data from populations that had adopted their use early on showed a clear benefit. It was difficult to make the population understand this change in public health position.

This difficulty was exacerbated by the constant presence of misinformation in some traditional and social media, on a global scale. Voices that would have had little impact a decade ago are being amplified by social media and reaching an audience that is uncertain and vulnerable to misinformation. This discourse uses the uncertainties of science to reject it rather than seeing in this uncertainty, transparency and the recognition that knowledge is not static.

Thus, even when science makes major advances, as demonstrated by the rapid discovery of effective vaccines against COVID-19, and governments endorse this victory and promote vaccination, science itself is called into question. The politicization of the pandemic has been seen in the contamination of the public message by, for instance powerful conservative right commentators and other media who refuse to promote vaccination. In the influential US, this is despite the vaccine effort "Operation Warp Speed" being launched by a conservative President. Of course, the game is likely to avoid crediting the subsequent administration with the success of the vaccination campaign. Yet this polarization of public opinion against science, no matter where it is happening costs lives.

It is therefore important to ensure that governments and public health authorities speak with one voice, with a consistent, transparent and simple message. It is also essential that the scientific message be decentralized, by identifying local leaders who are respected by their peers and who can address the real concerns of individuals without judgment or coercion. Above all, support for scientific research efforts must be maintained to contribute to informed decision-making in this and future pandemics.

The Dialogue of Science and Politics in Education Policy

Rahma Bourqia

Director, National Evaluation Authority in the Higher Council of Education Training and Research, Morocco

While a separation, and even a divergence, as expounded by Max Weber, are to be expected between "the profession and vocation of the scholar" and "the profession and vocation of the politician"[1], the pandemic has brought to the fore questions about this separation and suggests the possibility of a new reconfiguration of the relationship between science and politics.

Experience in an evaluation institution, with the aim of producing informed advice and publishing research-based evaluation reports which address public policy on education in Morocco, prompts reflection on the relationship between science and politics in the field of education.

The pandemic has disrupted education systems, with the impacts being most severely felt in developing countries. And while education is a key issue for development in these countries, it is caught between public policy, which is intended to develop it, and evaluation, which "judges" it through the lens of progress in education science, change theories and international standards.

In the context of a developing country, continuous educational reforms are imperative for bringing about significant change. They serve as a major lever for the country's development. But these reforms cannot succeed without research to identify and evaluate the paths taken by education and determine the efforts that need to be made to achieve an education that integrates both the achievements of science and the changes required for a quality education.

Nevertheless, the relationship between the product of scientific evaluation and public policy is not without tensions that arise from the different nature and purposes assigned to science and politics.

- Evaluation is in essence critical, insofar as it evaluates how far education has come and how far it still has to go to achieve a quality education. By pointing out the advances made and the shortcoming still to be overcome, it informs society about the state of its schools and demonstrates transparency. This cannot happen without creating dissonance in the work of the politician who, in essence, is seeking appreciative feedback for his or her actions, the effects and impacts of which may not be visible in their implementation.
- Moreover, because evaluation is critical by nature, addressing both politics and society, it provides the general public with material and arguments for criticizing the political system and fuels public grievances towards public policies on education. This places evaluation in a position of "complicity" with public opinion vis-à-vis the politician, thus creating a relationship of mistrust between the evaluating institution and the political institution.
- Another source of tension arises from the contrast between the innovative ideas produced by science, and public policy that is dealing with an education system faced with major challenges. Forced to operate within a scientific frame of reference, evaluation must be in tune with scientific knowledge in order to endow education with new ideas where pedagogy and technology intersect. This calls for a shift from the current state of the school to a new school model that is turned towards the future. On the other hand, politicians are often driven by the immediate effects of their actions. They act while taking precautions to avoid any profound and innovative changes that could mobilize the actors of the education system and their resistance to change.
- Furthermore, evaluation operates in an era where we see a rise in technocracy and the power of experts. In this context, when evaluation is presented as a certainty arising from expert opinion, it assumes the power of truth. Yet any evaluation can be the subject of debate, to allow for legitimate political discussion and criticism.
- Another source of tension lies in the different time frames occupied by science and politics. By its very nature, science is a long-term endeavor, whereas politicians act within the limits of a determined mandate: two time frames that may never meet. The question is, how do we reconcile their different temporal imperatives?

Given these, and other, challenges and areas of tension, we can ask ourselves the following question: how do we build bridges so that the impacts of science and politics converge towards a common goal that establishes education as a lever for the country's development and propels it into the future?

1 Max Weber. Le savant et le politique. Introduction de Raymond Aron. Collection 10-18, Paris, 1963.

The answer lies in the following:

- The creation of places and entities where science meets politics. The two spheres must be brought together, to facilitate the convergence of their interventions and impact the quality of education. The idea of creating a scientific committee, as many countries did during the pandemic, is an adequate mechanism to provide scientific oversight, alerting and fuelling public policy with ideas arising from scientific progress. A common space for dialogue should therefore be institutionalized. The case of the pandemic crisis was an exception, pushing both science and politics to coordinate their actions and respond to the call of humanity as it faced a planetary threat.
- Evaluation derives its legitimacy from the place of science in society. While it holds a prominent place in many countries, there are others where science is still developing and is not yet recognized as being indispensable for the efficacy and effectiveness of politics. Thus, for science to develop, it needs politics. And good science policy creates science for politics.
- Science, and the evaluation that stems from it, requires a pedagogy and a reassuring communications approach in order to engage with politicians and get them to be receptive and attentive to its message.
- If science is to dialogue with politics, it must assume its share of uncertainty, as is evidenced by its history and the advent of the pandemic today.

The pandemic has raised questions and debates on the role of the state, the direction of the economy, social inequalities, and the problem of equity in education. In some countries, such as Morocco, there is debate on the elaboration of a "new development pact", while in other countries there is talk of a "new social contract". The openings offered by these post-Covid 19 debates and discussions create a context in which dialogue between science, politics and the general public can take place.

References:

Innerarity, Daniel. Chapitre 5. Le dialogue du savoir et du pouvoir. Dans : , D. Innerarity, *Démocratie et société de la connaissance* (pp. 87-104). FONTAINE, France: Presses universitaires de Grenoble.2015

Conserving Canada's biodiversity over the next decade will require innovation and integration

Éliane Ubalijoro

Global Hub Director in Canada and Executive Director of Sustainability in the Digital Age, Future Earth

Never has it been more obvious: human-driven climate change, biodiversity loss, public health threats, and societal inequality are interlinked issues. The silver lining is that, in addressing one, solutions to the others begin to arise.

Over the last year, Future Earth's Canada Hub conducted a project exploring Biodiversity Pathways for Sustainability in Canada, funded by the Social Sciences and Humanities Research Council and with support from an expert advisory group[1] and our partner initiative Sustainability in the Digital Age. The project was a stock-take of progress around biodiversity governance in Canada over the past decade, and sought forward-looking avenues to biodiversity conservation in the next ten years, a critical period for achieving the Sustainable Development Goals (SDGs).

Some of our findings demonstrate the challenges we face, but also shed light on how to overcome major hurdles. For example, we found that the main drivers of biodiversity loss in Canada encompass not only land-use change, invasive species, chemical pollution, and local extractive activities, but also include the consumption of foreign imports that leads to biodiversity loss outside of Canada. To mitigate, we can connect biodiversity impact with supply and value chains, ecosystem services, and beneficiaries with the guidance of the global Ecosystem Accounting Framework.

Provincial and territorial biodiversity conservation policies in Canada are often embedded into broader plans, without explicit monitoring mechanisms. Thus, closer collaboration across local, municipal, provincial, territorial, and federal levels is required to ensure that monitoring infrastructure and related resources are aligned to deliver on conservation targets.

There is massive potential to integrate Indigenous knowledge, biological and social science, citizen observation, and digital technology, to rapidly scale up decarbonization and biodiversity conservation in Canada. But barriers to integrating all of this knowledge – such as an intrinsic hierarchy in the research evaluation system, rewards for academic publications over story-telling, and a lack of high-quality data that is processed in structured and standardized ways – must be overcome. The value of Indigenous knowledge and practices in stewarding land and water can be weaved together with Western knowledge systems to inform more effective, evidence-based biodiversity conservation policies.

A final key point is that Canada is a 'conservation superpower' meaning that its contributions to global ecosystem values exceed what is predicted by its area alone, and so its national policies can have environmental repercussions for the rest of the world.[2] In other words, Canadian policy recommendations on climate and conservation hold weight on an international stage. By embracing multiple knowledge systems for decision-making, and by supporting innovative mechanisms for behaviour change at the community level, Canada can set the bar high for a sustainable and prosperous future, and the world will follow.

References:

1. Included esteemed Canadian biodiversity scientists, Indigenous representation and federal government groups.
2. Coristine, et al. 2019

Resources:

Future Earth Canada Hub: https://montreal.futureearth.org/

https://sustainabilitydigitalage.org/

Ecosystem Accounting Framework: https://seea.un.org/ecosystem-accounting

Responsible Development and Use of AI and Digital Technologies

Lyse Langlois

Executive Director, International Observatory on the Societal Impacts of Artificial Intelligence and Digital Technology (OBVIA)

AI and digital technologies have great potential, but their development and integration pose major challenges on many levels. While they can bring many benefits to societies and organizations, technological innovation also relies on social innovation to foster collective ownership.

The mission of the International Observatory on the Societal Impacts of AI and Digital Technology (OBVIA) is to raise critical issues and identify plausible solutions to the problems and opportunities stemming from the rise of AI and digital technologies while taking into account the needs of society. In order to fulfill this mission, OBVIA promotes responsible innovation and the standards identified in the work of the Montreal Declaration for the Responsible Development of AI by prioritizing the values of equity, diversity and inclusion (EDI).

Our actions and commitments are based on 4 pillars: **Research and Creation** promotes research that enriches knowledge on the societal impacts of AI and digital technologies; **Monitoring and Surveys** organizes scientific and strategic monitoring of available data and work; **Deliberation** fosters public debate and leads large-scale consultations, giving a voice to civil society and opening up dialogue with stakeholders to support the co-construction of scientific knowledge; and **Public Policy** engages in major debates, consultations and commissions on public policies in the AI and digital fields and provides scientific and analytical support to public-decision makers.

OBVIA's work is carried out under an open and shared science model and follows five scientific orientations: 1- Contributing to the promotion of inclusion and the attenuation of bias; 2- Improving access to data while respecting individual rights; 3- Contributing to a better control of the algorithms used in AI and digital technologies; 4- Supporting the responsible and effective uptake of AI and digital technologies by organizations; 5- Promoting constructive, democratic dialogue through the uptake of accessible AI and digital technologies. The technological transformation we are experiencing must become a project at the service of societies, as it has the potential to transform the lives of citizens, public services and private companies.

It is essential to cultivate the conditions necessary for large-scale, socially supported technological and societal growth in order to better understand these developments.

Resources:

https://observatoire-ia.ulaval.ca/

Digital technology and artificial intelligence: A major challenge for public policy

Karine Perset

Head of Unit, OECD Artificial Intelligence Policy Observatory

With its rapid evolution and its multiple forms and contexts of application, artificial intelligence (AI) constitutes a major challenge for public policy. How can we regulate the risks presented by AI without hampering innovation or the adoption of AI by the sectors that can benefit the most from it, while considering the diversity of the situations and needs related to its deployment?

In order to answer these questions, public actors must be able to grasp complex technical knowledge and exchange experiences and best practices while referring to common frames of thought. In the same way, it seems necessary to guarantee the current and relevant nature of the data and knowledge that fuel their political reflection.

The OECD AI Policy Observatory (OECD.AI) provides a platform for information and dialogue on AI that aims to inform policy making with a view to fostering the emergence of practices to enable the deployment of trustworthy AI. As such, the Observatory contributes to the implementation of the OECD AI Principles, the first international standard on AI, adopted by OECD member countries in 2019.

OECD.AI provides real-time analysis of diverse data on AI development as well as in-depth analysis from all the stakeholders concerned, from scientific, political and academic communities to the business and regulatory sectors. Thanks to its global pool of experts and the diversity of their profiles, OECD.AI offers a multidisciplinary approach that addresses the broad range of issues raised by AI, which can be technical, legal, ethical, political and social in nature.

Many countries have begun to implement national strategies for the development of AI and appropriate regulatory frameworks. As AI continues to enter a growing number of economic sectors and to perform essential societal functions, the need for reliable frameworks, information, best practices, and data, derived in part from scientific advice, is likely to grow. To that end, making such tools accessible and operable is at the heart of the mission of OECD and the Observatory.

As AI continues to enter a growing number of economic sectors and to perform essential societal functions, the need for reliable frameworks, information, best practices and data, derived in part from scientific advice, is likely to grow.

Resources:

OECD AI Principles: https://www.oecd.ai/ai-principles

Retrospective:

North East Africa Workshop Series in Addis Ababa. Ethiopia, 2019

5 INGSA2021 Satellite Events

Open Science - Science for the 21st Century

The *Open Science: Science for the 21st Century* satellite event held on September 9, 2021, brought together international and national policy makers, funders and experts in Open Science infrastructure. The event presented an ideal opportunity to discuss the ongoing cultural shift in research practices towards Open Science. The discussions held during the event aimed to contribute to efforts in developing UNESCO's Recommendation on Open Science and the UN Agenda 2030 Sustainable Development Goals.

The event was viewed by over 90 attendees and featured distinguished speakers of various professional backgrounds ranging from academia, scientific institutes and governing bodies. The program began with welcoming remarks from Dr. Liette Vasseur, Dr. Mylène Deschênes and UNESCO representative Dr. Ana Peršić. Our keynote speaker was Dr. Vincent Larivière who currently holds the Canada Research Chair on Transformations of Scholarly Communication at the Université de Montreal. The event's panelists included Dr. Sonya Dumanis, Dr. Laura Rovelli, Kaitlin Thaney and Dr. Victoria Tsoukala.

One of the key arguments of Vincent's talk was the importance of ensuring equity diversity and inclusion in a research ecosystem impacted by the effects of the Covid pandemic. The talks also addressed the importance of encouraging the preprint of scientific articles in order to better disseminate research findings. Additionally, our discussions emphasized the importance of having more transparency in the peer review process, as well as the need to advance the availability of scientific research in national languages. Furthermore, the event highlighted the need to rethink decisions regarding what funders should be supporting, given what we know about the differences between closed and open infrastructure. Likewise, the speakers examined the need to involve citizen associations and government bodies in the advancement of Open Science. The panelist discussion was followed by a diverse group of case studies that highlighted the diversification of disciplinary requirements in tools and infrastructure and therefore different policy considerations and support.

The attendees of the event were highly receptive to the themes discussed at the satellite event. They recognized the challenges and necessity of developing Open Science policies. Participants acknowledged the complex issues related to gender inequality in an ever-evolving Open Science environment. Similarly, those in attendance were keenly aware of the need to adopt Open Science policies in scientific research and publication. Lastly, feedback collected from the event's participants supported the encouragement of collaborative efforts in the creation of Open Science frameworks and infrastructures.

A Comparison of Large-Scale Surveys Conducted in Québec and France to Assist in the Process of Making Policy Decisions Affecting Preschool Education

On September 9 of this year, a webinar on three surveys of preschool education was organized by the Direction de la recherche et de l'analyse économique and the Direction de la prospective, de la veille et des relations extérieures of the Ministère de l'Éducation, in conjunction with the Ministère de l'Éducation nationale, de la Jeunesse et des Sports (France).

The event was chaired by Nicolas Mazellier, Assistant Deputy Minister, Secteur de la prospective, des statistiques et des politiques of the Ministère de l'Éducation. The Minister of Education, Jean-François Roberge, and his counterpart from France, Jean-Michel Blanquer, delivered the opening remarks at the webinar.

The panelists outlined the methodologies employed in major surveys of preschool education conducted in both Québec and France. On the Québec side, Laurence Harvey and Sylvana Côté discussed the Enquête québécoise sur le développement des enfants à la maternelle (Québec survey of child development in kindergarten [in French only]) and the work of the Observatory for Children's Education and Health. On the French side, experts Michel Fayol, Anne Christophe and Thierry Rocher spoke about a large-scale study currently under way. In the back-to-school period of this year, a new panel representing some 35 000 K3 French students was set up by the statistical services department of France's Ministère de l'Éducation nationale. The students represented by this panel will be followed throughout elementary and secondary school.

The experts went on to discuss the similarities and differences of these surveys, in addition to the respective territories' separate education systems. The data obtained through the surveys document the level of development of children at this stage of their lives. The results are being used by decision makers and other stakeholders in the field to develop programs and measures designed to provide support for children's development and well-being and to foster better academic and social integration for children in both the short and long term.

This webinar enabled the participants to have a clearer understanding of the instruments used in these surveys of preschool education in Québec and France, and showed the benefits of the territories' collaboration in the field of education. The event also gave experts an opportunity to discuss the impact of preschool on children's development and well-being.

The webinar is accessible to all at:
https://youtu.be/gdy7RTKQ0mk

Raw Materials Challenge - Policy Simulation

On September 8 2021, over 40 participants from across the world took part in a unique simulation. Each participant became for a few hours a member of the new G77 task force and had to vote on policies that would affect the future of energy transition. The roles designed for this simulation represented all sorts of interests and perspectives: from research organizations to policy development, from the resource rich countries of the Global South to the rich societies of the Global North, from industry lobbyists to environmental activists. They were assigned to different working groups – consisting of both research and policy-oriented participants - and were linked to specific policies to be decided by them. They engaged in bilateral and multilateral negotiations and were pushed in different directions by news and lobbying. All participants struggled with difficult trade-offs of how to ensure that energy transition is not only effective but also just and environmentally friendly at the global scale. They quickly realize that critical minerals necessary for the transition have also their dark side – severe environmental and social problems.

In the post-simulation discussion, participants reported the experience to be highly educational but also very challenging. They felt strong tension between their personal views and values in real life and the job that was expected from them in the simulation. Participants reflected that experiencing this tension was part of their learning, and their understanding of the ideas "from the other side" by playing these stakeholders were helping them empathize with the real-life stakeholders.

As part of the INGSA conference, this simulation also triggered a broader topic of how to use data and scientific results to create arguments. The exercise exacerbated "the temptation to be more certain than the evidence allows is alluring" as described by one of the participants. It brought up many of the challenges associated with science advice and decisions making. The adequate mix of practical and reflective exercises created the grounds for fruitful reflection on the challenges that underlie the science policy interface and the need for systems thinking in tackling global sustainability.

The 'Raw Materials Challenge' simulation was developed by the Centre for Systems Solutions in collaboration with the International Institute for Applied Systems Analysis. It builds on the Cascading Climate Impacts simulation created in the project "CASCADES – Cascading climate risks: Towards adaptive and resilient European Societies" funded by the EU Horizon 2020 programme.

JRC-COST satellite session 'Independence in science advice'

The JRC-COST INGSA 2021 satellite panel on 'Independence in science advice' explored how to improve the science-policy interface, through an animated discussion, moderated by former European news correspondent Cathy Smith, between three panel members:

- Dr Sara Basart, Chair of the COST Action International Network to Encourage the Use of Monitoring and Forecasting Dust Products (InDust),
- Dr Jan Marco Müller, Science & Technology Advisor at the European Union External Action Service, and
- Prof. David Budtz Pedersen, Chair of the COST Cross-Cutting Activity on Science Communication

One of the first facts pointed out by the panellists is the role the pandemic has played in raising public awareness about independence of science, but also about independence of politics. "The roles played by scientists and politicians are extremely different", explains Dr Müller. "The role of politicians is to take decisions in a very complicated and complex environment, which is something we need to acknowledge. The role of scientists, on the other hand, is to inform, and more particularly to provide evidence to policy makers."

Prof. Pedersen added that "in times of emergencies like pandemics, climate change and other urgent issues, you have to be pragmatic and understand that the voice of scientists can only be heard within a limited timeframe. So, what you need to do is to make as much scientific sense as possible throughout the policy process. In many of these situations, scientists are only one component of a very complex policy process. In this way scientists can help shape policy making but should never be in charge of decision making."

Dr Basart underlined that "scientists are now facing a new challenge: communication. First, it is important to create a need in society by explaining the problem and thereby creating interest. Then you must reflect on the best way to communicate your research to a wider audience." She also highlighted that "for a scientist it is very difficult to start a new discussion and to enter the complicated world of policy making."

Dr Basart promoted multi-disciplinarity as a key condition for comprehensive, independent science advice: "When we talk about science advice, this means bringing together people from different backgrounds and expertise."

Dr Müller shared the reflection that "policy and science work at different speed. Policy makers need to produce news every day, or several times a day when dealing with a crisis for example. And science, of course, is an exercise that produces publications at a lower pace. What is important is to create a space where the two can meet."

Concluding remarks

"The key condition for valuable science informed policy advice is effective and clear communication. What happens after giving advice is pure politics. Moreover, it is important to make a distinction between science advice and science work, as these two are very different." – Dr Sara Basart

"Policy makers should be open about using scientific evidence and still feel they can make decisions that go against scientific advice. At the same time, we as scientists need to realise that we have a societal role, we need to get out of our ivory towers and out of our comfort zone." – Dr Jan Marco Müller

"It all comes down to institutional mechanisms which recognise the limits of science. Science informs, but does not make up policy." – Prof. David Budtz Pedersen

The webinar is accessible at: https://www.cost.eu/exploring-how-to-improve-the-science-policy-interface/

Publishing research results during a crisis; ethics and lessons learnt from COVID-19

Dr. Gregory Poland, Mary Lowell Leary professor of medicine at Mayo Clinic in Rochester, Minnesota, and editor-in-chief Vaccine.

Prof. Katrina A Bramstedt, PhD, Chief Ethics Officer and Transplant Ethicist at Bond University School of Medicine, Australia

Mr. Andrew Jack, Global Education Editor @Financial Times

Prof. Carlos H. de Brito Cruz, Senior Vice President, Elsevier Research Networks at Elsevier (Moderator)

Drawing from the experience during the COVID pandemic, this session focused on the communication implications of publishing and the need for real time information to inform public policy decisions.

In 2020, the journal Vaccine received about 2300 submissions and published 885 papers. In 2021, there were 2300 submissions till august. A first challenge is the sheer volume increase, on an already overtaxed system. The journal approaches eight to twenty plus reviewers to get two to three completed reviews, exacerbating reviewers overwork. Workflow improvement might require offering compensation for high quality rapid reviews, flexible and rapidly mobilizable associate editor pools, developing highly trained reviewer pools, and developing MoUs with international public health associations to use their assistance in pre-reviewing.

Ethics challenges are illustrated by the frequent invitations researchers receive to publish in predatory journals – 64% of the attendants had received such invitations. With the pressure to publish, this creates a not-so-good environment, leading to the enormous relevance of the attitudes of each researcher in adopting and defending good practices voluntarily. Funders and organizations have a role, in being judicious in choosing when to support APCs. The system requires a lot of good will and determination. Other issues relate to metrics. Excessive focus on impact factor and publication intensity, to the point of offering bonuses, create unhealthy incentives for researchers. Using metrics wisely is an art that all organizations and researchers must still perfect.

On the reporting side there was an explosion in outlets and quantity of information. Journalists face challenges to select, reflect, and report on relevant insights. There has been a facilitation of access to science, trough pre-print servers, and through lifting of paywalls. A downside to the explosion of quantity, is the potential degradation of quality. All this through a time of continued erosion of the traditional support networks of the mainstream media via advertising, in competition with social media giants. The public interest is not served by posting somewhat extremist or sensationalist insights that generate more traffic and information, and ultimately, advertising revenue for social media. Interestingly, metrics are useful for journalists, and groups of metrics would be valuable. Research leaders and funders must develop more sophisticated ways to look at academic output in an integrated way.

The webinar is accessible at:
https://www.ingsa.org/ingsa2021/ingsa2021-elsevier/

6 Transformational Partnerships

Strengthening the interfaces

The International Development Research Centre (www.idrc.ca), the Wellcome Trust (www.wellcome.org) and the International Science Council (www.science.council) have been core supporters of INGSA from the start. They recognised early on INGSA's potential as an integrating force that could bring together both experienced and emerging voices from the Global North and South to advance the cause of evidence informed policy making and science diplomacy for shared global challenges.

To this end, the ISC (formerly ICSU) has provided INGSA an institutional home, while the Wellcome Trust has ensured the stability of the Secretariat. Crucially, this has created a stable and reliable base from which to build and manage the network and develop its tools and resources. Wellcome support has also enabled INGSA to formalise its governing arrangements, which reflect both its current reach and its future vision.

Together, these partners have challenged INGSA to develop and enable a globally shared vision of evidence-informed policy making while remaining sensitive to local contexts. This challenge is met by INGSA's distributed operational model of regional chapters in Africa, Latin America and the Caribbean, and Asia.

Moreover, the IDRC's commitment to equitable access to knowledge generation, and its application in context-appropriate ways, has been a core influence in all of INGSA's work. In 2020 IDRC and INGSA launched a suite of activities in light of COVID-19 and the emergency response to it. This project takes a *Four "I"s* approach, focusing on *institutional* development, *individual* capabilities, *ideas* generation through research, and the *integrating* work of INGSA's chapters to share lessons about institutional best-practices by emerging research voices.

This IDRC partnership has enabled INGSA to identify and support three cohorts of Knowledge Associates in the Global South. The most recent cohort comprises associates from Zimbabwe, Jamaica, Kenya, Panama and Sri Lanka. The 2020 Knowledge Associate research projects focus on the pathways and impact of science advice for Covid-19 in their countries and regions. Preliminary work is already shedding light on, for instance, the role (and challenges) of the multi-lateral system as it confronts local conditions of knowledge application for national decision-making and crisis management. Find out more about the 2020 Knowledge Associates and their projects later in this section.

This partnership also supports institutional development. For instance, INGSA has introduced a pilot project with the INGSA-Asia Chapter: The South-East Asia Science Advice Network (SEA-SAN). This regional network was established in 2021 with an group of esteemed advisors. Each of them is well-placed to advise on the development and strengthening of institutional arrangements for science advice nationally and, by working together, within the region. As a community of practice, SEA-SAN is a model of regional support and information/idea sharing for other regions. As it develops, INGSA will support SEA-SAN to share its lessons learned and, ideally, to integrate its work with multi-lateral institutional partners.

Support from IDRC and Wellcome has also enabled INGSA's chapters to facilitate lesson-sharing within and between countries This work has ranged from advising on the establishment of ministerial science advisory mechanisms in Columbia, Chile and Rwanda, for instance, to surveying the science advisory landscape in Africa generally. And as the pandemic unfolded in early 2020, INGSA leveraged its regional presence and intelligence networks to develop one of the first online Covid-19 policy trackers and repository of emerging knowledge. The primary focus of INGSA's tracker was to better understand the comparative policy-making dynamics in the early days of the pandemic. Understanding the pathways of evidence and the types of evidence mobilised in different jurisdictions were important data to help improve the practice of evidence brokerage during a crisis. The essay by IDRC president Jean Lebel in this section further highlights some of these learnings. Moreover, the INGSA secretariat leveraged this work to develop significant research partnerships – with the NSF-funded 'Evaluation of Science Advice in a Pandemic Emergency' (EScAPE COVID-19) series of comparative case studies and the UKRI-funded International Public Policy Observatory (IPPO), which focuses on social science research to inform pandemic responses. Collaborators from both of these projects are part of the INGSA2021 conference.

Audiences will find other elements of the IDRC partnership throughout INGSA2021. For instance, SEA-SAN is featured as a Science Advice Innovation during the digital poster session and Montira Pongsiri, a member of SEA-SAN discusses 'fast and fair societal transformations with President Lebel during a plenary session. Emerging voices from within INGSA regional chapters feature in panel sessions (for instance, María Estelí Jarquín of Costa Rica and Alma Cristal Hernández Mondragón of Mexico, members of the INGSA-LAC, join panels. So too do Binyam Sisay Mendisu of Ethiopia and Madiagne Diallo of Senegal, who are both INGSA-Africa members. Current and former INGSA Knowledge Associates, Purity Rima Mbaabu of Kenya and Iffat Battool Naqvi of Pakistan also present their work. INGSA2021 also provides a platform to highlight the work of related IDRC funded projects such as Inaya Rakhmani's discussion on the role of social sciences in COVID-19 responses, and Christian Emini's presentation on PEP – Partnerships for Economic Policy.

There can be little doubt that these researchers and policy practitioners are contributors to the kind of globally-integrated and evidence-informed policy discourse that the world needs if we are to meet the 2030 Agenda. The transformative partnerships that support this work are just some of the tools that are helping to get us there.

Building Back Better: Supporting a more effective use of science for public policy in the Global South

Jean Lebel
President, International Development Research Centre

The COVID-19 pandemic is changing how science is being done, as it continues to advance at breakneck speed in a highly uncertain environment to combat the virus. The pandemic is also changing how science is communicated and perceived. This reinforces the importance of science advice mechanisms needed to confront key challenges about how science is communicated – both to the public and to decisionmakers – and how those mechanisms affect policies and behaviour. At the heart of the discussion is the need for a concerted effort to combat misinformation and build trust in science by strengthening key science institutions globally.

IDRC's partnership with INGSA aims to shed light on this specific issue. It will inform responses to the pandemic, particularly in the Global South, where a lack of vaccines likely means that the most vulnerable populations will continue to suffer its effects for months, even years. This work also looks beyond COVID-19 to examine how lessons learned can inform efforts to tackle the biggest challenges facing the world –inequality and climate change.

Already, we see several lessons emerging from this work. For instance, trust in science is key. A pandemic recovery that also tackles inequality and climate change through inclusive and sustainable policies requires researchers to increase their engagement with the public and with policymakers. Robust evidence from high quality social and natural science must be valued. Science advice must be delivered in the right way, informed by how people think, and misinformation campaigns are best addressed by having facts delivered by trusted local leaders. New technologies also have an important role to play, and we are working to understand how artificial intelligence and big data can be harnessed to combat misinformation, rather than exacerbate the problem through biases.

Strong, inclusive science institutions in the Global South need enhanced visibility and steady support. These institutions can, in turn, enhance the visibility of researchers, including those who have been traditionally excluded. IDRC has a long history of working to strengthen science systems in low- and middle-income countries by supporting institutions such as universities and civil society organizations (including the private sector) that shape what science is being done and how it can achieve impact.

There are many initiatives underway that underscore the role of science in shaping public policy. The Trans-Atlantic Platform has brought together social science researchers from around the world through a competitive call for "building back better". The COVID-19 Africa Rapid Grant Fund, in collaboration with funders from the Global North and South, supports research and science engagement projects across 17 countries. It strengthens national and regional capacity to collaborate and respond to future shared challenges, including through a focus on science advice and science communication. The COVID-19 Responses for Equity Initiative is supporting 21 research projects in 42 countries in Africa, Asia, Latin America, and the Middle East to understand the socio-economic impacts of the pandemic, improve existing responses, and generate better policy options for recovery.

With work underway in a rapidly evolving environment, it is vital for the science community to convene, collaborate, and build on experience to ensure the lessons learned from the COVID-19 response and recovery help rebuild more sustainable, resilient, and inclusive systems that protect the environment, reduce inequalities, and build society-wide resilience against the pressing and persistent challenges of today and tomorrow.

2021 INGSA Knowledge Associates

INGSA is proud to partner with the Canadian International Development Research Centre (IDRC) to provide six professional development grants to support early-to-mid career researchers and policy professionals in Low- and Middle-Income Countries. During 2021-22, these INGSA Knowledge Associates are undertaking deep dive case studies on their country's use of evidence in policy decisions related to Covid-19.

Muhammad Djindan
Indonesia

Muhammad Djindan teaches at the Department of Politics and Government in Universitas Gadjah Mada (UGM), Indonesia. He holds a political science Bachelors from UGM and a Masters degree in Environmental Sciences with a major in Environmental Policy from Wageningen University in the Netherlands. Prior to the position at UGM, Djindan worked with international development organizations such as Oxfam, UNDP, and GIZ in the field of women's rights, disaster risk reduction, and disaster emergency response in Indonesia. Currently he is a part of the Resource Governance in Asia Pacific (RegINA) project – a cooperation project between UGM and Natural Resource Governance Institute (NRGI). Djindan's research interests include the science-policy interface, natural resources governance, and local politics.

Project:
The role and pathways of evidence in a contested policy: Large-scale social restriction in Jakarta

The multi-dimensional aspects of COVID-19 pandemic require the government to develop a comprehensive and coherent policy framework. Yet, in the context of a large archipelagic country with diverse cultures like Indonesia, COVID-19 policy also needs to accommodate the existing variations at the sub-national level. In the case of Indonesia, the government adapted the lockdown scheme into the so-called 'large-scale social restriction' policy (LSSR). In contrast to the lockdown policy in other countries that is usually applied nation-wide, the implementation of LSSR in Indonesia allows the government to consider contextual COVID-19 situations in each region. With these in minds, the head of the local government or the head of the national COVID-19 task force may propose to implement LSSR in an area to the Minister of Health. Nonetheless, the regulation states that LSSR status can be implemented only after the Minister of Health provide approval.

Since the beginning of the COVID-19 pandemic, the implementation of LSSR in the province of Jakarta has always been at the centre of public attention. This happens not only because Jakarta is the capital of the country, but also because the diverging priorities between the Governor of Jakarta that has set public health as its utmost concern and the National Government that see the need to keep and maintain the economic activities in the capital. Furthermore, it is known that there has been a strong political competition between the Governor of Jakarta and the President of Indonesia in the past. Therefore, the dynamic implementation of LSSR in Jakarta provides an interesting case to ponder the role of evidence in the context of diverging priorities and political rivalry between national and sub-national government.

The diverging priorities and political rivalry could render the role of evidence in the LSSR policy development either even more important or become meaningless. In the former, evidence play a crucial role to bridge the diverging priorities by setting aside the existing political rivalry and the disruption to the existing power relations between political actors. Whereas in the later, the evidence becomes irrelevant because it is degraded into merely a product of political interest. Nonetheless, the meanings of each evidence could also be differentiated. Certain kind of evidence may invoke disagreements but other kinds of evidence may facilitate convergence.

Thilinakumari Kandanamulla
Sri Lanka

Thilinakumari Kandanamulla is working as a scientific officer at the National Science Foundation of Sri Lanka (NSF SL), which is the premier science funding agency of the country. She holds an M.Sc. in agricultural microbiology, University of Colombo, Sri Lanka (2010), a postgraduate diploma in education (PGDE), University of Colombo, Sri Lanka (2017), a postgraduate diploma in international relations (PGD IR), Bandaranaike Centre for international studies (BCIS) - Colombo, Sri Lanka (2017) and a B.Sc. (Hons.) in Agriculture (Second Class Upper), University of Ruhuna, Sri Lanka (2007) with specialization in Agricultural Biology.

At NSF SL, she is coordinating activities related to bilateral and some multilateral scientific cooperative activities. Her Research Study at the PGD IR was on 'Science Diplomacy: Policy (2005-2015) and potential for Sri Lanka'. She has recently co-chaired the Macroeconomic Response and Multilateral Collaborations Steering Group of the UN Research Roadmap on rapid socioeconomic response to COVID- 19 and is acting as the Asia Pacific Regional representative of the Global Research Council's Gender Working Group. She is actively liaising with different stakeholders of the science-policy interface.

Project:
COVID-19 Pandemic in Sri Lanka: Support of Evidence for Policy making

Sri Lanka has been recognized as a country in the South Asian Region which has effectively controlled its first wave of the COVID-19 Pandemic. The Global Response to Infectious Diseases (GRID) index which ranks the countries across the globe taking the effectiveness and efficiency of the leadership and the preparedness of the Health Systems in each country in managing the pandemic, had ranked Sri Lanka in the 10th place in April 2020.

As such, this project studies the mechanisms and structures of information generation, transfer to and access by relevant stakeholders as well as the utilization for effective decision making, enablers, challenges, etc. It will undoubtedly be useful to further improve the existing mechanisms and structures and to provide best practices for benchmarking. Data are collected qualitatively and quantitatively. Structured interviews (in-person or on-line) with the relevant stakeholders and analysis of the existing structures and mechanisms at the sub-national and national level will be done mainly for qualitative data collection.

Primary and Secondary sources of data are also being used in this work. Structured interviews, observation of the operational mechanisms, questionnaires and surveys are being considered as primary sources of data. News articles in websites of recognized (locally and globally) news agencies and posts in multilateral organizations such as the WHO and the national level stakeholder organizations will be used as the secondary sources of data. Data are being collected from the divisional, district, provincial and national level selected stakeholders of public and private domains related to the Health, Economic, Disaster Management, Education and Social spheres.

Purity Rima Mbaabu
Kenya

Purity Rima Mbaabu is a lecturer at Chuka University – Kenya. Besides teaching and research, she has a track record of helping, inspiring and mentoring students through academic and career success. For her, growing up in a humble background taught her that hardwork and education are key to transforming her life, family and community. Inspired by this, she founded BrainSave international (–a charity organization) in 2012 where she supports and promotes education of orphans and children from humble backgrounds in Kenya. Helping others has been the most fulfilling part of her life.

She has over 10 years' experience in the application of GIS and Remote Sensing technologies in earth sciences, holds a Bachelor`s degree in Geography, MSc degree in Natural Resource Management, and currently pursuing a PhD in Climate Change at the University of Nairobi-Kenya. She has contributed to a number of scientific publications in top-notch journals. She has worked in several valuable projects such as Swiss r4d programme, woody weeds project, Mpingo Conservation and Development Initiative –Tanzania and Climate Change Agriculture and Food Security (CCAFS) – ILRI and currently INGSA.

While work and study engagements have taken her around the world, outside the office, she enjoys travelling, motivating people to achieve their dreams, charity and environmental conservation.

Project:
Response to COVID-19 Pandemic in Kenya: Tracking evidence-based actions and policy decisions at all levels of government

Occasioned by the outbreak of COVID-19, many global economies went into massive shock. As a global emergency, immediate response was needed through policy decisions. Such decisions in various jurisdictions are critical owing to the pandemic`s multi-sectoral impacts particularly the massive loss of human lives, strain on health systems and a risk of economic collapse. Policy decisions need to be based on evidence, which was initially lacking for the novel COVID-19.

The purpose of this case study is to assess use or disuse of evidence in COVID-19 policy decisions in response to the pandemic in Kenya. We are investigating the types and sources of evidence and how it flowed during the policy process (evidence-to-policy pathways), key actors and institutions involved in evidence synthesis and brokerage, the country-specific contextual conditions that facilitated or impeded the use of evidence in Covid-19 policy decisions. Moreover, the study is assessing in general, the enablers and barriers to utilisation of knowledge for policy.

A combination of methods - document analysis, literature review, questionnaire survey and key informant interviews are providing data. We aim to gather data at national level (from selected government ministries) and fifteen (15) out the 47 County governments. Cluster analysis will be used to analyse the evidence used, sources and policy decisions and their associated responses. Evidence-to-policy pathways will be based on the social science framework by Gold, 2009.

The study will provide an understanding on the extent to which policy decisions and response to COVID-19 relied on evidence, evidence synthesis and brokerage framework and institutions, actors involved, and the factors that promoted or impeded use of evidence in the policy process in the context of developing economies in the global south.

Judith Mendes
Jamaica

Dr. Judith Mendes is a researcher and policy advisor who has lived and worked in multiple sectors throughout the English-speaking Caribbean. She has a PhD in Marine Sciences from the University of the West Indies in Jamaica, a Masters in Ecological Economics from the Universitat Autònoma de Barcelona in Spain, and is a PMI certified Project Management Professional. She has executed consultancies for international donors, and is currently the Director of Research at Jamaica's National Commission on Science and Technology.

Project:
COVID-19 Evidence-to-Policy Pathways in Jamaica, a Small Island Developing State in Economic Turnaround

This case study on Jamaica covers the 14-month period from February 2020 (which the saw the first two policy actions: banning cruise ships from docking and requiring arriving persons who had visited China in the previous 14 days to quarantine) to March 2021 (in order to include the GOJ's 2021-2022 budget which should reflect any policy transitions from emergency measures to longer-term options).

Jamaica was one of the world's most indebted nations in 2013 with a debt to GDP ratio of 147%. By the start of the pandemic, Jamaica had reduced its debt to 96% of GDP (the first time debt had been less than GDP this century) while simultaneously reduced its poverty rate from 17.4 % to 12.6% of the population. Unsurprisingly then, the Government of Jamaica's response to the pandemic was focused on preserving these recent economic gains.

Also looming over all the pandemic policy responses for much of 2020 was the General Election. The ruling Jamaica Labour Party had won the 2016 election by a single seat in parliament (JLP – 32 seats, PNP – 31 seats). Failure to control the pandemic could lead to the government's failure in the next elections. The General Election was held on 3rd September 2020 and the JLP was re-elected by a landslide 49 to 14 seat majority.

The Office of Disaster Preparedness and Emergency Management had a pandemic response plan that was prepared with the assistance of Pan-American Health Organisation (PAHO) in 2017. This plan was largely bypassed, with immediate health responses being managed by the Ministry of Health, and a new COVID-19 Economic Recovery Taskforce established, under the chairmanship of the Minister of Finance, in April 2020 to coordinate the island's pandemic response. Two more task forces were established: The University of the West Indies's COVID-19 task force to provide expertise, and more recently, in September, the Ministry of Education's E-COVID Management Task Force to guide the reopening of schools (which have been closed since March).

This case study consists of three distinct activities:

1. Policy Intervention Timeline – The sequence of interventions is retroactively documented using the INGSA rapporteur form and publicly available information from newspapers, government ministry websites and The Jamaica Gazette (in which all amendments to the Disaster Management Act must be published);
2. Institutional and Actor Mapping – Having generated the chronology of policy interventions, the institutions and key actors recorded in the timeline, and their relationship to each other is mapped;
3. Key Informant Interviews – Having mapped the pandemic response ecosystem, key informants are being interviewed with particular attention on policy changes with the intention of idendifying what information instigated the change

The results of the study will attempt to show: why some existing institutional structures were not utilised in the pandemic response, what effect the General Elections played in shaping the pandemic response, and the extent to which the local academic community contributed to the pandemic response.

Pablo García de Paredes
Panamá

I was born in Panamá City, Panamá, and after a stay in France during my adolescence, I went to Buenos Aires, where I graduated from Architecture school, earned my MBA and a Professional Business Administration degree. Following a fruitful career in architecture and entrepreneurship, I decided to go all-in on multidisciplinary studies and I'm about to present my Doctoral Thesis at the University of Panamá (Social Sciences Department) with my research focused on spatial representation from an urban sociology perspective.

With the purpose of closing the circle that started with architecture as my point of departure, now I'm enrolled at the PhD program in Architecture at Laval University, Canada, affiliated to the Research Group «Accès à la cité » from the Center for Urban Planning and Development, where I'm currently doing research on Covid and City representations; a study into the new conceptualizations of home and itineraries derived from the COVID19 crisis.

I'm looking for ways to better understand how COVID has affected housing markets and behavior by systematically changing the way we understand our environment. Evidence framing is at the root of these social representations. Results allow for better public policy analysis and targeted action.

Project:
The Political Strategies of Evidence within Intermediate Countries: The Case of Panamá´s Housing Policy

This project seeks to understand what evidence counts when shaping public policy during the Covid 19 pandemic. We wish to identify the evidence selection strategies used by decision-makers in middle-income countries and the way the evidence-to-policy system operates. To do so, we will study the case of housing policy in Panama City's metropolitan area.

We will compare the population's deteriorating living conditions under the strain of the Covid-19 crisis with documents and interviews that deal with public policy choices during the pandemic. Our project will account for changes in public discourse and the effect on vulnerable populations, changes to the process of evidence selection, and changes to local institutions during the crisis. We will use official data, official documents such as the action reports published by the Ministry of Housing, and our data collected through original surveys on the ground.

Our surveys of living conditions show an uneven experience of the pandemic. Existing inequality before the pandemic has fueled differences in adaptation capability. The data shows that there are environmental factors that create risk elements for already vulnerable populations. By comparing these data with public policy choices, we can see revealing situations about the factors that influence these processes.

Strategic evidence selection dynamics show the importance of contemporary social theories – the world system theory, social regulation theory, and other theories describing the social distribution of gains and losses of the socioeconomic system in the territory are relevant to understand and anticipate the general character of governmental reaction to the pandemic in the case of middle-income countries.

Other elements such as corruption or opportunism take a secondary role compared to historical dependency. The cultural-historical paradigm, where people's development depends on spatiotemporal conditions, also demonstrates its importance as an organizer of the response. Preliminary results show that socio-cultural, spatial, economic, and political conditions form a whole susceptible to analysis and with the capacity to create patterns of response at the level of institutions and the level of individuals in leadership positions.

Gilchriste Ndongwe
Zimbabwe

Gilchriste Ndongwe has over ten years of experience working in the evidence informed policymaking and policy influencing sector in Zimbabwe. He was the Programme Manager for the Dfid (UK) Building Capacity to Use Research Evidence (BCURE) programme, with in-country experience of Ghana, South Africa. He co-lead in the piloting and implementation of the Evidence Informed Policy Making Course for Policy Makers in the Ministry of Youth, Ministry of Industry and Commerce and the Parliament of Zimbabwe. He is currently the Technical Lead in the World Health Organisation funded Embedded Rapid Reviews in Health Systems Decision Making in Zimbabwe. He is a member of the Africa Evidence Network.

Project:
Isomorphic Mimicrying OR Evidence Informed Legislative, Policy Frameworks?

Covid- 19 pandemic witnessed the proliferation of new institutions, legislative frameworks, policies and adhoc inter-ministerial; technical task committees (INGSA Report 2020). Most of these institutional mechanisms (formal and informal) were rapidly set up to address COVID-19 pandemic in Zimbabwe. These institutions, strategies and frameworks were set up amidst the presence of existing national public health policy and legislative frameworks. The use of advisory mechanisms internal to government seemed more prominent than turning to external actors within the wider national system (Ibid). Although this suggest the recognition of horizontal coordination, there is lack of evidence on what informed the development of new legislative frameworks, policies and institutional mechanisms.

Against this background, this study seeks to develop an evidence map using mixed research methods in identifying the types of evidence, whose evidence was used in formulating new formal and informal institutional mechanisms (demand-supply). This study is also developing evidentiary indicators on what was missing from existing public health legislative frameworks in operationalising the "flatten the curve strategy". Barriers and facilitators which enabled the flow of evidence and reliable information within the new institutional mechanisms in Zimbabwe are identified and analysed.

In-depth analysis on whether evidence was used and how was it framed and the factors at individual, institutional and systemic levels that influenced the use of evidence. In-depth evidentiary analysis of the evidence products, policy documents and strategies that were produced during COVID-19 will be undertaken. Evidence map will also analyse the levels of collaborations and their evidential inputs between the Malawi and Zimbabwe government with the evidence/research ecosystem (was there any demand-supply systems).

The study will produce an evidence map to inform policy, strategy and strengthen institutional mechanisms on the effectiveness and efficacy of COVID-19 response in Zimbabwe and Malawi. The evidence map will also produce evidentiary indicators on What Works and Not Work in policy, legislative formulation during a crisis/pandemic.

Retrospective:

INGSA workshop in Hermanus, South Africa, which lead to the creation of INGSA-Africa, 2016

Appendix

INGSA 2021 Research Posters

INGSA is pleased to introduce the inaugural peer-reviewed research component at its biennial congress. This virtual edition of a traditional academic poster session was spearheaded by Professor James Wilsdon, Digital Science Professor of Research Policy at the University of Sheffield and Director of the Research on Research Institute (RoRI). James is also the founding Vice-Chair of INGSA and a driving force behind the network from the beginning. His insights and expertise in research policy, research impact assessment and science advisory systems have been instrumental to the shape and positioning of INGSA's efforts. This inaugural set of digital posters is a testament to the growing field of research in science advice and science-policy interfaces that James, through INGSA and RoRI, has helped to establish.

Readers are invited to visit the conference platform (or post-conference archive at www.ingsa.org/ingsa2021) to view all of the digital posters. Thank you to all those who submitted abstracts and congratulations to those whose work was selected. The breadth and quality of the ideas and research is truly impressive and is a welcome sign of an increasingly visible field.

Digital Posters Contributors

Adamson, Matthew

Science Diplomacy at the International Atomic Energy Agency: Isotope Hydrology, Development, and the Establishment of a Technique

Aguirre-Bastos, Carlos

Foresight for Science Advice: Long-term vs short-term policy demands in developing countries

Banuelos, Cecilia and Esther Orozco

Science advice in Mexico during Covid-19 pandemic: Leading initiatives that benefit the Latin American and Caribbean region

Ciarli, Tommaso

A Map of Science, Technology and Innovation in Relation to the SDGs

Diallo, Madiagne

Novel tools and frameworks for science advice in 6 African countries

Falconer, Matthew, et al.

Knowledge exchange frameworks in natural resource management

Figueroa, Pedro

Organized Scientific Diaspora And Its Contributions To Science Diplomacy Schemes In Emerging Economies: The Case Of Latin America And The Caribbean

Golhasany, Hamid and Blane Harvey

Capacities for Knowledge Mobilization; Supporting Socially-Impactful Research

González, Alejandra

Science Diplomacy in Emerging Economies: A Phenomenological Analysis of the Colombian Case

Iffat Batool Naqvi

Gap between Science and Society: An evidence from societal myths about Covid-19

Jennings, Rhoda

Translating post-normal science into legislation: the science of the precautionary principle in European Union environmental law

Kondo, Akoko Sita
Transforming research evidence on rabies into practice in Côte d'Ivoire

MacDonald, Bertrum H.
The Critical Need to Understand Barriers to the Flow of Information in Science-Policy Interfaces

Mäkinen-Rostedt, Katri and Jaakko Kuosmanen
Structuring and modelling diverse science advice practices: the cases of Finland and European young science academies

McCabe, Ruth
Disease transmission and control modelling at the science-policy interface

Michalek, Tomas
Transaction of Understanding at Science-Policy Interface

Millar, Andrew
Universities are not 'academia' (and researchers are not 'academics')

Misuraca, Gianluca and Erika Widegren
Global Governance, Technology Diplomacy and the Future of Europe in the age of AI

Namdeo, Suryesh K.
STI Diplomacy in an Uneven World

Obermeister, Noam
What and how do science advisers learn?

Pelkonen, Antti
The use of scientific evidence in decision-making in Finland – A systematic review

Covid-19 Research Review: An innovation to provide Finnish decision-makers with up-to-date insights into science on the pandemic

Polejack, Andrei
Ocean science diplomacy in a post-normal world

Policy Horizons Canada
The Future of Sense-making

Ruhrmann, Henriette
How can legislators participate in shaping technological change?

Scarffe, Andrew and Marc Saner
Departmental Science Advisors in Canada, New Zealand and the United Kingdom: A Comparison

Schreiner, Greg
Measuring the Effectiveness of Scientific Assessments

Steenmans, Ine
Is there consensus on the alignment of science, technology and innovation with the SDGs? A global survey informing policy design

Stronge, Dean
Maximising well-being post COVID 19

Vallejo, Benjamin Jr.
Prospects for Government Science Advice in the Philippines

105

Innovations in Science Advice Contributors

Among the abstracts for digital posters submitted for peer review, a number were of a high quality, but did not fit the conventional model of an academic or research poster. Rather, these abstracts presented new structures or innovations in how science advice for policy is operationalised within various contexts globally. There was a sufficient number of this type of presentation to merit a different category and mode of presentation. Clearly, the COVID-19 pandemic has necessitated the establishment, adaptation or strengthening of modes of science advice at national and global levels. Do longer-term crisis or abiding policy problems have the same effect? What are the promising models and why? This new section of the INGSA biennial conference dedicated to 'innovations' is the place to discuss and find out. Readers are invited to learn more about the 'innovations in science advice' on the conference platform or post-conference archive.

Arabia, Anna-Maria

Science advice informing Australia's response to COVID-19: The Rapid Research Information Forum

Dall, Elke and Angela Schindler-Daniels

Innovating cooperation of European Union Science Diplomacy Research and Advice

Emini, Christian Arnault

Co-production for more responsive research.

Goucher, Nancy

Unlocking scientific findings in academia to address "wicked problems"

Hamid, Zakri bin Abdul

Southeast Asia Science Advice Network (SEA SAN): Creating regional linkages and a Policy Intelligence Platform

Hayter, Emily

Understanding capacity in context: collaborative analysis and design to strengthen capacity development for evidence use.

Krieger, Florence Gauzy and Sebastian Goers

RLS-Sciences: a multi-regional and multi-level science initiative

Lawson, Katrina

OUCRU Outbreak Advisory Board: Bringing researchers & policymakers together the pandemic in Vietnam

Maas, Timo

Knowledge impact assessment at the science-policy interface

Middleton, Alexandra

Science advice development in Finland during the COVID-19 pandemic

Millar, Andrew

"Centres of Expertise" broker the science-policy interface in Scotland

Quirós, Diego

COVID-19 data analysis tool for decision making support in Costa Rica's government institutions

Roig, Alexis

City-led Science Diplomacy: How Barcelona became the world's first city with a Science Diplomacy strategy

106

Innovations in Science Advice Contributors

Shahmy, Seyed

New horizon for data-driven Science for Policy – A proposed system to generate robust scientific evidence

Silva, Primal

BSL4ZNet: Using science diplomacy to harness knowledge of and preparedness for emerging biothreats in high-containment institutions

Stirling, Andy

Research, Innovation and Democracy: views underpinning and emerging from a new initiative for the UNDP

Villarreal, Aline

Science advice for local policymakers in Mexico City: Experiences and outcomes of the first cohort of science-policy fellows

Wardman, Toby

Creating a Science for Policy Podcast

107

Acknowledgements

INGSA is grateful for the support of **The Wellcome Trust**, the **IDRC** as core supporters of our programming. We thank the **International Science Council**, for providing INGSA an institutional home, and the patient and expert guidance this has brought.

This special essay collection, and the INGSA2021 biennial congress on which it is based, would not have been possible without the hard work and countless hours of staff at the INGSA Secretariat at the University of Auckland and the Conference Secretariat, led by staff in the Office of the Chief Scientist of Quebec and the Office of the Chief Science Advisor of Canada. Specific thanks go to Grant Mills, Naomi Simon-Kumar and Kristiann Allen in Auckland, to Brite Pauchet, Julie Dirwimmer, and Gabrielle Gagnon in Montreal, and to Alexandre Bourque-Viens and Sandy Hanna in Ottawa.

The conference program was guided by James Wilsdon (UK), Tateo Arimoto (Japan), David Budtz Pedersen (Denmark), Ana Maria Cetto (Mexico), Bill Colglazier (USA), Pearl Dykstra (EU, Netherlands), Ana Elorza (Spain), Ana Elorza Moreno (Spain), Naser Faruqui (Canada), Soledad Quiroz (Chile), Aminata Sall Diallo (Senegal), Marc Saner (Canada), Kavita Shah (India), Sameh Soror (Egypt), Michel Audet (Canada, Quebec), Rahma Bourgia (Morocco), Alain Charbonneau (La Francophonie), Alain Fuchs (France), Abdoulaye Gounou (Benin), Patrick Hyndman (Canada), Tounoa Kiri (La Francophonie), Stephane Lessard (Canada), Justine Germo Nzweundji (Cameroune). Conference Chairs were Peter Gluckman (New Zealand), Remi Quirion (Canada, Quebec) and Mona Nemer (Canada).

We thank Agence Universitaire de la Francophonie (AUF), Canada Foundation of Innovation (CFI) Canadian Institutes of Health Research (CIHR), National Research Council of Canada (NRC), Natural Sciences and Engineering Research Council of Canada (NSERC), Social Sciences and Humanities Research Council (SSHRC), Tourisme Montréal, Trottier Family Foundation, Ville de Montréal, the Wellcome Trust, and Elsevier, sponsors of the 2021 biennial congress.

We thank the IDRC for supporting the production of this essay collection. We are also grateful to the Canadian Science Policy Centre (CSPC), the Institute on Governance, the Institute for Science, Society and Policy, Acfas, Koi Tū: The Centre for Informed Futures, Science/Business, International Institute for Applied Systems Analysis (IIASA), and International Science Council (ISC) for dissemination.

Organising partners

Platinum

Gold

Silver

Dissemination partners

108

International Network for Government Science Advice

Private Bag 92019,
Auckland 1142, New Zealand

Website: www.ingsa.org

Contact: info@ingsa.org

Twitter: @INGSciAdvice