# TRANSFORMING DECISION-MAKING TO MEET THE GRAND CHALLENGES OF OUR TIME: THE ISSP MEMBER BLOGS

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**ISSP**

INSTITUT DE RECHERCHE SUR LA SCIENCE,
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INSTITUTE FOR SCIENCE, SOCIETY AND POLICY

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## FOREWORD

**Prof. Monica Gattinger, Full Professor, School of Political Studies, faculty of Social Sceinces, Director, ISSP and Chair, Positive Energy, uOttawa**

The past year was another of great uncertainty, turmoil and challenge for citizens, governments and businesses alike. All have been seized with the ongoing challenges of the COVID-19 global health pandemic.

They have also been seized with climate change, political polarization and systemic discrimination. And we have seen how tightly linked these health, environmental, political and social challenges can be – calls for environmental justice, the collection of race-based health data, and efforts to build trust in vaccines all attest to the close interconnections among contemporary problems.

Science, technology and innovation will be crucial to addressing these challenges, but so too will social and policy innovations. Indeed, meeting the grand challenges of our time requires innovation at the nexus of science, society and policy.

This means bringing together the people, expertise, knowledge and institutions from the public, private, academic and civil society sectors to collaboratively forge solutions and chart a successful path forward. It means transforming policy, social and scientific decision-making. Durable solutions to complex problems require deep interdisciplinarity, robust collaboration and authentic knowledge co-production.

This second compilation of ISSP member blogs centres on these issues. The blogs speak to how we need to transform decision-making to more effectively address grand challenges. Topics include transforming teaching, training and the science enterprise; fostering equity, diversity and inclusion in decision-making; putting into practice new decision-making models, and reframing how we think about science and technology in domestic and international policy. The compilation also includes a dedicated section on the grand challenges of COVID-19 and climate change.

This collection presages the ISSP's new five-year Strategic Plan, to be released next month. The plan is articulated around the Strategic Vision of helping Canada transform decision-making to meet the grand challenges of our time.

We hope this compilation gives you a good taste of what's to come for the Institute's research, teaching and engagement in the months and years ahead.


Prof. Monica Gattinger
Director, ISSP uOttawa

# TRANSFORMING DECISION-MAKING

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# TRANSFORMING TEACHING, TRAINING AND THE SCIENCE ENTERPRISE

## ADVANCING THE FRONTIERS OF RESEARCH: BUILDING A MORE INCLUSIVE SCIENCE & ENGINEERING ENTERPRISE

**Dr. Sethuraman Panchanathan, Director, U.S. National Science Foundation (NSF)**

*On April 15, 2021, the Institute for Science, Society and Policy at the University of Ottawa and the [Institute for International Science and Technology Policy at the George Washington University](#) hosted Sethuraman Panchanathan, the Director of the U.S. National Science Foundation (NSF), as part of the [2021 Bromley Memorial Event](#). This blog is an adaptation of the author's remarks.*

When NSF was founded in 1950, it represented a transformational shift in the relationship between the federal government and the research community. Fundamental research became a government priority on the same level as national defense, economic stability, healthcare, and social well-being. The effect was profound because research investments drive the success of national priorities like defense, health, and economic growth.

Today, more so than ever, the scientific enterprise is critical to our national health and prosperity. Prosperity does not only mean economic prosperity but also societal prosperity that comes from having access to technology and applications that science and engineering enable. And at the heart of the research enterprise are people. NSF has continuously invested in people and their ideas for the past 70 years. We are at the threshold of revolutionary advances because of decades of growth in our scientific knowledge and engineering capabilities that has been enabled by NSF.

We are at a pivotal moment with tremendous opportunities ahead of us. To fully realize all of the potential progress that is possible, I have a vision for how to strengthen NSF at speed and scale. The three pillars of my vision are:

1. Advancing the frontiers of research into the future

2. Ensuring accessibility and inclusivity

3. Securing global leadership

Essential to my vision for NSF is addressing the Missing Millions—talent that has been left behind for far too long. Talent in the broadest sense, that spans the richness of socioeconomic demographics, as well as geographical diversity of our nation. When we bring these millions of capable people into science, technology, engineering, and mathematics (STEM) communities, they will bring transformative insights, creative new ways of thinking, and brilliant ideas with them. We must do more to be inclusive and broaden participation for every demographic. The future depends on bringing domestic talent out in full force, in creating an agile and adaptable workforce that

can upskill, reskill, and succeed through creative and innovative mindsets. We must inspire students through formal and informal settings and invest in training teachers. In 2016, the agency unveiled a set of Big Ideas which made inclusivity one of its top priorities and resulted in the launch of the INCLUDES initiative, a "network of networks" focused on building collaborative infrastructure to accelerate innovative solutions for inclusivity.

NSF's approach to broadening participation is a wholistic one with an agency-wide focus. We are continually looking to expand our community so that anyone—from any background and from any part of the country—who has the talent or desire to go into a STEM career is given the opportunity to do so. We need to strengthen pathways into STEM fields and expand our reach into communities where talent exists. We also need to develop new approaches and tailor educational experiences to be more effective at bringing talent into the STEM community. We are working to improve inclusivity and reduce bias by requiring our review panelists to take training on implicit bias and how it can affect the overall review process. And last, but certainly not least, we are looking at how to address systemic racism and identify remaining barriers through a newly established NSF Racial Equity Task Force. We are going to do all of this by utilizing the same approach that NSF brings to fundamental research: tackle the problem, evaluate the results, and strive to improve.

The three pillars of my vision for NSF are built upon the foundation of partnerships. We need partnerships for accessing broader networks of researchers, generating new perspectives on solving real-world problems, and leveraging unique resources. By working together we can make rapid progress, to strengthen at speed and scale.

International collaborations, for example, can be powerful platforms for discovery. Canada is an important partner with the United States and NSF in expanding the horizons of discovery and innovation. The Banff International Research Station for Mathematical Innovation and Discovery—a joint venture between the United States, Mexico, and Canada—hosts over 2,000 scientists every year to support collaboration and discovery in the mathematical sciences.

NSF's AccelNet is another example of international collaboration; this program builds strategic linkages between US research networks and complementary networks abroad to leverage resources in ways that accelerate the progress of science and engineering. Several AccelNet awards have been with Canadian connections; one project, for example, is using international collaborative networks to explore the interface between neuroscience and artificial intelligence—to translate findings from engineering of computational algorithms into hypotheses for brain function.

Science and engineering are critical tools for understanding some of society's greatest challenges and for generating innovative and creative solutions. Curiosity-driven, discovery-based exploratory research is the bedrock of what NSF is—and now we must take the parts of NSF's mission and strengthen them at speed and scale. The core driver of all our progress in discovery and innovation are the people that make up the science and engineering enterprise and the STEM community. We are going to accomplish unbelievable things in the coming years, and every big breakthrough and leap forward is going to be made possible because we are investing in people and strengthening our community by making it more inclusive.

# WHO WANTS TO PLAY?: SOCIAL SIMULATION EXERCISES CAN RAISE AWARENESS FOR THE USE OF SCIENCE IN DIPLOMACY

Hubert Brychczyński, Centre for Systems Solutions; Marie Franquin, International Institute for Applied Systems Analysis (IIASA) and Science & Policy Exchange; Sumedha Sachar, Science & Policy Exchange and Canadian Science Policy Centre (CSPC); Paalini Sathiyaseelan, Science & Policy Exchange and PhD candidate, Simon Fraser University and Uzma Urooj, Canadian Institutes for Health Research (CIHR) and Canadian Science Policy Centre (CSPC)

On November 16, 2020, the International Institute for Applied Systems Analysis (IIASA), the Institute for Science, Society and Policy (ISSP) and the Centre for Systems Solutions (CRS) co-organized Helping Societies Address Cascading Climate Risks from Outside Geopolitical Boundaries: Case Study on the Arctic (Interactive Policy Simulation) at the annual Canadian Science Policy Conference (CSPC), which offered a unique experience: a narrative role-playing serious gaming titled the Arctic Future Policy Simulation.

A total of 30 participants and 15 support actors represented various nations, countries and cultural groups. After logging into "Impacts", a fictitious diplomatic social network, they traveled in time to the year 2034, to become officials from Arctic and near-Arctic. By then, the North Pole had become ice-free in the summer. Elsewhere, as a result of widespread crop failures and food shortages, insurgents seized and blocked both the Suez and Panama canals. The tension led to an international summit. In 90 minutes, participants decided on the future of world transport and negotiated an international treaty for maritime shipping in the Arctic, while being cognizant of the impact it would have on societies and the environment.

A survey administered after the event revealed enthusiastic responses to the experience. Participants reported a plausible representation of reality that led them to feel like actual diplomats. Efficient moderation, combined with the immersive, engaging, fast-paced, and challenging nature of the game made the experience both entertaining and educational. It gave scientists an opportunity to put themselves in the shoes of policymakers and participate in the process of decision making. Participation in this simulation provided trainee and early career researchers (ECR) with a chance to learn about complex diplomacy concepts that are often difficult to conceptualize in words, such as fast-paced decision-making, the pressures of negotiating partnerships, and the key role of the media.

Participants clearly identified diplomacy challenges hindering policy implementation. For example: how to involve science in multifaceted high-stake decision-making, lack of inter and intra-communication of different departments and bustling activities on the media front were some of the challenges identified through this exercise. Participants acknowledged that, under time constraints, they felt rushed to be

acclimatized with their new role, form alliances and convince others to buy into their recommendations. They had little time left to take a step back and ask the right questions. If this experience reflects real-life diplomatic negotiations, the question on everyone's mind was how do we do better?

Despite the challenges, simulations are a great way to develop and test out strategies to ensure that they address the reality on the ground. Building a body of evidence through a systems approach can help identify challenges and solutions through a multifaceted perspective. This evidence, in turn, could resolve difficult trade-offs and conflict of interests between multiple stakeholders. Scientific evidence, additional negotiation time, clear communications and transparency can help build resilience on organizational, national, and international levels, and prepare for future crises.

Going forward, in the post-COVID world, leveraging the role of science in the international diplomacy landscape will be crucial for responsible communication of scientific evidence. Playing serious games offers an opportunity for emerging scientists to learn how science can influence decision makers. The role-playing aspect also serves to emphasize that science-based evidence and advice is only one of the many perspectives at the negotiation table.

Summary:

- Experiential learning opportunities for the next generation: Trainees and early career researchers need interactive platforms to experientially learn and grasp how scientific advice can be utilized for global decision-making to address pressing global challenges.

- Exploit the benefits of serious games: Serious games provide a quick and efficient learning experience, offering a rapid and in-depth understanding of the nuances of diplomacy and the critical role of key players in negotiating and addressing global challenges through effective diplomacy.

- International Collaboration: Online gaming platforms have a potential to promote collaborative participation from a diverse pool of interested and emerging trainees and scientists from all across the globe by offering peer-based learning, bringing the diplomatic simulation to a next level.



**Words most used by support actors to describe their experience (Monkeylearn.com)**

# TESTING THE WATERS: A SCIENCE-POLICY SIMULATION IN AN ICE-FREE ARCTIC

**Hubert Brychczyński and Łukasz Jarząbek, Centre for Systems Solutions; Nicole Arbour, International Institute for Applied Systems Analysis (IIASA) and Brendan Frank, ISSP, uOttawa**

Originally published in PaxSims on April 14, 2021

Let's travel to 2035. According to scientists, the Arctic is going to become ice-free by the end of the decade. Vessels will soon start rushing there, enticed by the promise of year-round sailing opportunities. An international organization, called the Arctic League, safeguards the region's future development while balancing economic, societal, and environmental considerations...

This is the premise to the Arctic Future simulation, which was presented during the Canadian Science Policy Conference in 2020. Coincidentally, 2020 was also the second hottest year in recorded history. With global ice reserves melting at a record rate of 1.2 trillion tons per year, we can see how the trends that inspired the simulation play out before our eyes.

## How to bridge science, policy, and society

The unprecedented rate of climate change calls for adequately unprecedented measures, especially at the intersection of science and policy. The WHO, UNESCO, and the EEAC, among others, all recognize that successful cooperation between the two areas is key for developing globally consistent and robust responses to climate change. Right now, however, the cooperation is far from ideal. There is a gap between science and "science users" (policy makers and practitioners) that prevents optimal use of existing knowledge. For example, scientists in their research activities often don't take into account what kind of results will actually be useful for science users. On the other hand, policy makers often make their decisions based on information that may not be the best available scientific knowledge. How to bridge these gaps and improve the development of both science and policy? Science-policy simulations can help. They create a safe interface for stakeholders, scientists, and policy makers to effectively work on strategies toward a better future.

## What are science-policy simulations?

Science-policy simulations are a type of social simulation. The easiest way of thinking about the social simulation is to picture it as an interactive, multiplayer role-playing game. Run either offline or online, it recreates – or simulates – the dynamics of a complex, real-world system by using game elements, such as problem cards, pictures, tokens, boards, etc.

Social simulations focus on the social aspect – the freedom of each individual to make their own decisions and explore possible options in interaction with other players and within the simulated reality.

Social simulations belong to a broader category of tools that use mechanisms known from games for purposes other than entertainment. The oldest kind are strategy games used for military purposes. In the 20th century, wargaming techniques became more and more often applied to non-military contexts. We can trace the beginnings of this change back to World War II, when the approach to wargaming shifted from "rehearsing for war" to "simulation gaming as a (...) method for military policy and planning." It was during that time that applied mathematics and engineering started to inform military strategy development more prominently. This led to the establishment of operations research, a discipline used for military planning in the US, which laid the foundation for the emergence of systems analysis and policy analysis, called "decision sciences". The two disciplines started to apply various gaming methods to non-military contexts, for example to urban and social planning, health care, and economy. As a result, policy gaming, simulation games, planning games, policy exercises, serious games and others were developed to address challenges in different fields.

Social simulation approach was heavily influenced by the abovementioned traditions, combining them with a strong role-playing and performative aspect. It puts emphasis on combining learning through direct experience with social learning – "a process of iterative reflection that occurs when we share our experiences, ideas and environments with others." This process of learning is possible because social simulations involve participants with different experiences, expertise, and worldviews, who impersonate different roles within the simulation – including research, administration, business, and NGOs. Within the confines of the simulation, they can jointly discuss problems, devise strategies, propose solutions, and diffuse tensions through negotiation and debate. They can also implement the potential solutions and see them play out right away in the condensed environment of the simulation.

Science-policy simulations build on social simulation approach, adding to it an extended narrative layer. The participants take on the roles of different policy makers, scientists, activists, and business people. They face a series of dramatic events. While this storyline unfolds, the participants work in different thematic groups to respond to the changing situation. The storyline is presented using a series of professionally-made videos, news articles, social media accounts, and other materials, such as maps or infographics. The storyline is always created based on available scientific data on the subject matter and consulted with experts from the field. Such crafted simulation allows the participants to gaze into the future and explore how to use the available scientific knowledge to craft better policies to address upcoming problems – and how to conduct research to produce results that will be actionable to support such policies.

**The Arctic Future Policy Simulation**

The Arctic Future Simulation was prepared for the Canadian Science Policy Conference 2020 in collaboration between the Centre for Systems Solutions, the International Institute for Applied Systems Analysis, and the Institute for Science, Society and Policy. It was based upon the Cascading Climate Impacts Simulation that was developed within the CASCADES project.

Building on the premise of an ice-free Arctic, the simulation explores possible challenges and tensions. Participants, assuming the roles of high officials from Arctic countries, negotiate and vote on a treaty that regulates economic, social, and environmental issues in the region. The debate, revolving around trade routes, extra fees, and marine environment, is interrupted by a series of unexpected, narrative interludes – like news about the blockade of Suez and Panama canal.

The design process of such simulation requires close collaboration between a core team of game designers, researchers, writers, filmmakers, and graphic designers, and external subject matter experts. The first step is to prepare a plausible scenario of chains of events based on available literature and expert knowledge. After a few iterations and consultations, we turned it then into a draft storyline. In parallel, we selected the organizations to be included in the simulation (national ministries, business organizations, Indigenous People's organizations, NGOs, citizen initiatives) – and then created a detailed matrix of negotiation positions for each role, with an emphasis on conflicting values and interests. Iterating the whole process allowed us to reach the desired interplay between the gameplay and narrative layer.

Striking the right balance between the exploratory function and narrative immersion was the biggest challenge in making the simulation. After all, the purpose of social simulations is to imitate a system as closely as possible and offer the participants a testing ground for problem-solving. On the other hand, the storyline had to be attractive and well-paced to keep the participants curious about what will happen next. This meant that we had to make the narrative as dramatic as possible while staying true to the scientific background it was based upon. We found this tension both challenging and fascinating.

Ultimately, the simulation was successful. In after-game surveys, the participants not only reported the representation of reality as plausible but the experience as immersive and engaging thanks to the surprising narrative elements. What's more, they felt like actual diplomats, learning about difficult diplomacy concepts in the heat of the moment.

## Summary

In our increasingly interconnected world, the need for close collaboration between science, policy, and society is only expected to grow. Science-policy simulations are a promising tool for mediating this collaboration. They offer stakeholders a safe and life-like testing ground for exploring difficult issues before facing them in reality. Moreover, such simulations are highly adaptable and applicable in many diverse contexts and environments, both offline and online. The Arctic Future simulation alone has been successfully deployed two times already. Cascading Climate Impacts – the simulation it was based upon – was also used two times, with more workshops to come in 2021. Needless to say, we plan to continue delivering such narrative science-policy simulations in the future.

# EQUITY, DIVERSITY, INCLUSION AND NEW MODELS OF DECISION-MAKING

# PERSONS WITH COGNITIVE DISABILITIES EXPERIMENT WITH A NEW WAY TO PARTICIPATE IN THE DIGITAL ECONOMY

**Prof. Lundy Lewis, Past Fulbright Research Chair, ISSP, uOttawa and Professor of Computer Information Systems, Southern New Hampshire University; Prof. Andre Vellino, Faculty Affiliate, ISSP and Associate Professor, Faculty of Arts, uOttawa**

The Government of Canada established an Accessible Technology Program (2017 – 2022) to foster inclusive participation of Canadians with disabilities in the digital economy. The Program aims to allow Canadians with disabilities to obtain better access to digital services and increase their participation in the digital economy as well as providing Canadians with the necessary skills and tools required to engage socially online, or assist them in their work and educational environments while also enhancing their employability and marketability.

Under this program, the Minister of Innovation, Science and Economic Development Canada provided a financial contribution to the ISSP to develop and test smart voice technology as a way for persons aged 18 to 64 with a cognitive disability or mental health-related disability (CMD) to engage with digital services more easily. The rationale is that laptops, tablets, smartphones, not to mention the services they provide, can be overwhelming and thus frustrating for this target population. Smart voice technology such as Alexa, Siri, and Google Home on the other hand possibly can provide better access.

The project ran from May 1 2020 to September 1 2021. In our roles as members of the ISSP, we collaborated with a social enterprise, led by Virginie Cobigo from the uOttawa Faculty of Social Sciences — Open Collaboration for Cognitive Accessibility (Open). The mission of Open is to provide a platform for technology developers, accessibility specialists, researchers, businesses, and public organizations to collaborate with persons of all cognitive abilities and co-create solutions for an inclusive community. To this end, Open provided ISSP with baseline requirements, recruitment of testers, and data collection.

The Amazon Echo Dot (a.k.a. Alexa) was the base platform due to its programmability and affordability. We set a self-imposed limit of $50 CAD as the price of the solution, excluding an Internet connection. At the time of this writing, the Echo Dot Generation 3 is $40 and the Generation 4 is $45.

Open recruited twenty-four Advisors in Cognitive Accessibility (4 Francophone, 7 Anglophone, 13 bilingual; 10 female, 14 male) aged 18 to 64 with a cognitive disability. They were given Echo Dots free of charge to use in their environments, plus installation instructions and guidelines for testing and exploration. Two advisors were given a Dot with a screen (Echo Show 5) because they could not communicate

verbally. After a month of use, each advisor was interviewed up to 4 times or until they were able to articulate likes, dislikes, intentions, and any new ideas they had for improving the Dot applications. Video recordings of interviews with advisors and/or caregivers were collected for offline analysis.

Our examination of these interviews yielded the following observations and recommendations:

All the advisors liked the experience and the use of Alexa, even if some were limited to very basic uses. They found value in the Dot for a variety of reasons:

1. The performance of simple information-retrieval tasks by asking common questions such as "what time is it?", "what is the weather tomorrow?", "how many days until my birthday?"

2. Serious question-answering such as health-related questions like "I can't sleep" or "I feel sick" or "I have a fever"

3. Setting reminders (e.g. to take medicine, attend meetings, wash hands every hour and walk through "routines", a list of tasks at a specified time of day)

4. Setting alarms

5. Playing music

6. Telling jokes and having fun, (e.g "will you marry me?")

7. Serving as a social companion (in one case, a Francophone advisor who was experimenting with an Echo Dot Show, which also has a display screen, used it as an educational tool to learn arithmetic)

The views of their caregivers were consistent with these assessments. Caregivers found the Dot useful as a tool to assist in routine support (e.g. providing consistent, periodic reminders of routine tasks). Further, they found the Dot to be a more safe and trustworthy environment than laptops, tablets, and other devices. No specific concerns were raised regarding invasion of privacy or exploitation. Finally, we observed that neither the type of cognitive disability nor the age impacted the use of the Dot; rather, the level of communication skills and digital literacy skills impacted its use. In some instances, a mixed-mode (voice-screen) method of interaction is preferable to a voice-only mode.

Given the affordability, simplicity, and potential value of the Dot for our target population, we recommend that the Dot be made available to persons aged 18 to 64 with a cognitive disability, albeit with the following considerations to help set expectations:

• Although the Dot can understand and speak both Canadian French and English, it is better at understanding English. For either language, we recommend saying "Alexa, learn my voice" upon which the Dot will ask 5 common questions. The answers are used as a baseline to help the Dot understand the speaker's voice and begin to learn the nuances in the voice over time.

- For persons with a speech impairment but with good verbal comprehension, an effective use of Alexa is as an assistant to the caregiver who can program alarms, schedules, and routines.

- While the Dot is fairly straightforward to use and learn and the documentation we provided for setting up the devices and experimenting with them were adequate, we believe that introductory video tutorials that illustrate the range of tasks that the Dot can perform would further enhance the experience. These tutorials could include instructions to ask questions as simply as possible, (e.g. "Alexa chanson", "Alexa rappel", "Alexa temperature").

- Often people with the Dot will use the word "Alexa" in ordinary conversation, thus inadvertently triggering a response from Alexa. Other people might have trouble saying the word "Alexa." If either is the case, caregivers are advised to change the trigger word to "Echo." It is easy to do.

- The Alexa platform has interfaces to other devices such as light switches, vacuum cleaners and TVs. Some assistance by an experienced user would be beneficial for setting up these sometimes error-prone couplings.

- The Dot might offer suggestions for further use during a session. If that is disruptive or annoying, caregivers are advised to turn on "Brief Mode" in the Alexa app. It is easy to do.

- Our study found that many caregivers themselves found value in the Dot for providing day-to-day support. In general, we recommend that caregivers become familiar with the Dot both so that they can help the target population appreciate its value and to lighten their load as caregivers.

Lastly, the advisors and caregivers came up with some interesting applications of the Dot:

1. A mobile, non-tethered Dot in the form of a bracelet or necklace

2. An ability to connect to other devices so that they can control them with voice

3. An ability to provide local transportation information (e.g. when is the last train to Clarkesville, how much time to bus #32 arrival at this station)

4. The attachment of a robot body to Alexa

Studies like this show the value of in situ user participation in the design and evolution of technology. Further, it shows the value of collaboration among several kinds of experts: technology, cognitive disability, business, and care.

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## INCLUSION IN THE WORKPLACE IS A SAFETY ISSUE

**Bob Watts, Vice-President, Indigenous Relations, Nuclear Waste Management Organization and Former CEO, Assembly of First Nations**

Neuroscientists from UCLA have demonstrated that the brain experiences "social pain" when a person feels excluded or rejected. In fact, being left out lights up the same areas of the brain known for processing physical pain. From an evolutionary perspective, this makes sense. Long ago, in hostile environments, being part of a tribe offered protection from intruders and predators. Tribal membership provided physical safety. For most people in today's world, being included in a tribe is much more about psychological comfort than physical safety. But however it manifests, the underlying need to belong to a group is hardwired in us—and that includes in the workplace.

Why should organizational leaders and managers care that their team members feel a sense of belonging and feel like they matter? In short, because pain, whether social or physical, has a negative impact on human performance. The brain does not have unlimited resources. When it has to address pain and danger, it hinders performance in other areas. When team members are not performing to the best of their ability, neither is the team. Inclusion is both a safety issue and a performance issue.

Companies can benefit from actively fostering an inclusive environment where everyone feels comfortable sharing their perspectives, experiences and voices. Research shows that diversity of thinking is a wellspring of creativity that can boost innovation and improve revenues by about 20 percent. It also enables groups to spot risks and it smooths the implementation of decisions by creating buy-in and trust.

To foster this environment of inclusion, leaders must understand how cultural differences can impact the way workers see safety at an organization. For example, certain cultural backgrounds see questioning authority as the wrong thing to do. When a worker is given a task and it is not safe, they may carry out the task because raising any concerns could be construed as disrespectful. To foster an inclusive environment, leaders must meet their employees where they are at.

What distinguishes highly inclusive leaders from their counterparts? Deloitte's research identifies six signature traits, all of which are interrelated and mutually reinforcing:

1. *Commitment: They are deeply committed to diversity and inclusion because it aligns with their personal values, and they believe in the business case for diversity and inclusion. They articulate their commitment authentically, bravely challenge the status quo, and take personal responsibility for change.*

2. *Courage: They are humble about their own capabilities and invite contributions by others.*

3. *Cognizance of bias: They are conscious of their own blind spots as well as flaws in the system, and work hard to ensure opportunities for others.*

4. *Curiosity: They have an open mind-set; they are deeply curious about others, listen without judgment, and seek to understand.*

5. *Culturally intelligent: They are attentive to others' cultures and adapt as required.*

6. *Collaboration: They empower others and create the conditions, such as team cohesion, for diversity of thinking to flourish.*

It is also important for leaders to understand that inequities in the workplace often reflect greater inequities within society. For leaders, thinking about inclusion means focusing on the people who face greater harms, greater risks and greater burdens. For leaders, understanding these inequities, their histories and trends, is key to effectively protecting the safety and wellbeing of employees.

People who genuinely feel like they are part of a group will have a much easier time contributing to that group. It's not uncommon for employees from marginalized groups to refrain from voicing their opinions because they feel like the organization isn't making an effort to be inclusive. In many instances, the loudest opinion isn't the most widely-shared opinion. Generating change and innovation from within requires truly listening to those who haven't necessarily always felt comfortable speaking up.

## ALIGNING SCIENCE, SOCIETY AND POLICY IMPERATIVES THROUGH PARTICIPATORY ACTION RESEARCH

**Prof. Josephine Etowa, Faculty Affiliate, ISSP, Full Professor, School of Nursing, Faculty of Health Sciences, uOttawa and Ontario HIV Treatment Network (OHTN) Research Chair in Black women's health/HIV care**

On November 17, 2020, the ISSP hosted a panel entitled Aligning Science, Society and Policy for the Grand Challenges of our Time at the Canadian Science Policy Conference. This blog is an adaptation of the author's remarks.

Participatory action research is a partnership approach to research, where the researchers work collaboratively with interest groups in communities that are affected by the work and the findings. In the case of my research program, this methodology allows us to align science, society and policy imperatives to produce better health outcomes.

Social determinants of health are influenced by a number of factors, both at the systemic level and the individual level. Participatory action research builds capacity for communities and empowers them to understand their challenges for themselves, and in many cases, feel compelled to do something about the issues that they see. It gives people a voice and it mobilizes them for action. These three factors, education, investigation and action, are a powerful combination.

Engaging in this kind of work, I have seen just how impactful this approach has been in the Black community over the last decade. I have seen people engaged in research move on to community work or even run for local office. Once researchers see what is happening on the ground, they start asking themselves what they would do to change the situation. I see a lot of that kind of consciousness raising that motivates people to get involved.

Participatory action research brings diverse perspectives to the table to actually change the situation, to help people understand why certain things are the way they are and to take ownership of the research itself. It helps communities to understand the process, be part of the process from the beginning of the research design all the way to knowledge translation. I have been involved in projects where community members actually decided to write and stage a play, or sew a quilt based on the findings while the academics were busy presenting at conferences.

Participatory action research moves beyond simple research participation. Community members are fully integrated into the process of research. In the discipline of health, the process maximizes the number of perspectives that can bear on this particular issue. We must not only consider the etiology of a particular disease, but also examine it from a sociological perspective and a psychological perspective. Bringing all of these players together really highlights the many social determinants of our health, whether it's education, employment, income, housing. When we see somebody show up at the hospital, whether it's a simple physical condition, one infection, it helps us to really understand the myriad of issues and the social conditions that bring that person to the hospital. It also allows us to ask what the effects of a given policy may be on these social determinants. Health is so much more than physical illness.

For a more concrete example, I point to my work on HIV/AIDS in Ontario's Black community. Despite accounting for only five percent of the province's population, the Black community is overrepresented among those living in poverty and those living with HIV/AIDS. We brought in Black men from across the province to do concept mapping using the Groupwise mapping software. We presented our findings and asked them to use the findings as the basis to develop the best practice model for addressing HIV vulnerability among Black men in Ontario. It is essential to meaningfully mobilize and engage the community to generate tools that they would find effective and will be used to design and implement policies that they support.

Bringing that diversity and social inclusion is central to actually addressing our community health challenges. Participatory action research engages people not only in the research, but in the creation of knowledge and policy. You give people who have been forgotten or marginalized in past policy decisions a voice, a chance to create new knowledge and impact the implementation of that knowledge, a chance to spark a change in thinking or change the thinking of someone else, and a chance to contribute at different policy tables and engage the next community. To navigate the grand challenges of our time, participatory action will be vital.

## INTEGRATING COMMUNITY KNOWLEDGE AND CONCERNS INTO POLICY MAKING IS CHALLENGING. IT'S ALSO ESSENTIAL.

**Prof. Kelly Bronson, Canada Research Chair in Science and Society, Core Member of the ISSP and Assistant Professor, Faculty of Social Sciences, uOttawa**

On November 17, 2020, the ISSP hosted a panel entitled Aligning Science, Society and Policy for the Grand Challenges of our Time at the Canadian Science Policy Conference. This blog is an adaptation of the author's remarks.

With any technology there come gains as well as new ethical and social justice issues. We know this from historical experience, such as the widespread application of computer technologies, which has been enabling for some (e.g. allowing many "creative economy" workers to operate remotely) but disabling for others (e.g. technological unemployment for some labourers). It is important to anticipate the social and ethical issues that arise from technologies and ideally to do so before we implement and scale them so that risks can be managed. History has shown the downsides of not doing this critical forecasting and risk mitigation: loss of faith in science and technology, legitimacy crises with institutions responsible for governing science and technology.

Stakeholder engagement (SE) is one mechanism for anticipating the social and ethical dimensions of technologies. Integrating the feedback of ordinary citizens, and especially members of communities who will be acutely affected by technologies, accomplishes several things. First, SE can uncover risks that otherwise would not come to light and thus fill gaps in regulatory and other policy knowledge.

Decision-makers are not always aware of on-the-ground or lived realities that are important for assessing risk. For example, my qualitative research with farmers protesting GMOs revealed that at root of public protest was a desire among citizens to have their political and economic concerns around seeds heard. Politicians and regulators were largely ignorant to the social and political effects because they assumed that public concern centered on environmental or human health harms. Second, SE can engender trust among stakeholders who have diverse value positions on technologies, and the engagement itself can encourage people to come to less polarized positions.

Indeed, my work on public engagement with hydraulic fracturing policy in New Brunswick demonstrated that even if the resulting decision did not please everyone (and it never can), people had a sense that "procedural justice" was achieved. SE allows people to listen and to feel heard. Third, SE is simply the right thing to do especially when it comes to consequential technologies. We know that marginalized and vulnerable peoples most often bear the brunt of risks arising from technologies.

If there are so many benefits to SE, why is it not standard practice in technology design and technical policy-making? Well, it is not easy. Sometimes what citizens bring to the table goes against the desired path for policy-makers. Also, SE processes have to be designed well, otherwise they can not only be ineffective but actively harmful. Take for example impact assessments (IA) of large energy projects like pipelines: even though Canadian legislation calls for "meaningful public engagement", my research shows that in practice more could be done to ensure that during consultations attention is given to status-based inequalities that occur due to groups being accorded less esteem and prestige than others, and also to fundamental differences in worldviews among participants.

Efforts to meaningfully engage Indigenous Peoples in IA have been hamstrung because organizers, participants, or decision-makers often do not treat Indigenous knowledge systems on an equal basis with western assessments of things like harm. In fact, I am currently working with the Office of the Chief Scientists and Impact Assessment Agency of Canada to develop a tool for adjudicating the rigour and validity of social science used in IA decisions, which can be treated poorly if assessed according to the same (positivist) standards used for quantitative studies like ecosystem analysis.

As a researcher, this work is time-consuming and labour intensive and does not always fit with the pressures on academics to publish a lot and quickly. SE research starts with relationship building, which takes time. COVID-19 is a complicating factor in this regard; the virtual world is simply not the same as face-to-face contact. This research also requires a lot of listening and facilitating across differences, disciplinary worldviews, and interests.

I am in a great place to conduct this type of research at the University of Ottawa, as a Canada Research Chair in Science and Society, and with the ISSP. In addition to research, the ISSP fosters these convergences and creates spaces for interdisciplinary conversation. Our location in Ottawa also enables my links to government. Canada is a thought leader on inclusiveness and responsible innovation and we ought to be proud of the commitments of our government and funding agencies, such as our Directive on Automated Decision-Making. ISSP Core Member, Dr. Jason Millar, and I recently finished a collaboration related to this Directive where we worked with Treasury Board Secretariat and Canadian School for Public Service on a "toolkit" for doing peer review of automated decision tools used in government.

As progressive as Canada is, we could do more to accelerate innovation policy that puts justice front and centre. We should explore developing a concrete mechanism within government to fund alternative S&T trajectories. Funding patterns, incentive systems, and even civil society pressure can push toward selective aspects of investigation leaving whole areas of S&T neglected. For instance, my work on agricultural technologies reveals that small, organic and agro-ecology farmers are not able to engage with emergent tools in sensing, big data and machine intelligence. Corporations are making these innovations specifically for large-scale and resource rich farmers and a gap or need is left. Who will fill this gap?

More inclusive innovation in these areas can help Canada make good on commitments to inclusive growth, climate change mitigation and reconciliation. When we work with the public, a diversity of stakeholders (or "rights holders") we more effectively anticipate both their concerns and their technological needs, and we get stronger and more durable outcomes.

**Prof. Kelly Bronson, Core Member, ISSP, uOttawa**

## PROTECTING OUR FISHERIES THROUGH INCLUSION

**Celeste Digiovanni, PhD Candidate in Environmental Geography, Department of Geography, Environment, and Geomatics, uOttawa**

*On April 15, 2021, the Institute for Science, Society and Policy at the University of Ottawa and the [Institute for International Science and Technology Policy at the George Washington University](#) hosted Sethuraman Panchanathan, the Director of the U.S. National Science Foundation (NSF), as part of the [2021 Bromley Memorial Event](#). This blog is an adaptation of the author's remarks.*

When I started in the field of Science Policy, I was not convinced that my research interests fit. My academic career began at the University of Toronto where I earned an Honours B.A. in Sexual Diversity Studies and Sociology. I changed my interests when I came to the University of Ottawa to study Environmental Sociology. I used this pedagogical background to inspire the creation of my first business, and the subject of my M.A. Thesis, [H$_2$Ottawa](#). When my supervisor suggested that the crux of my PhD dissertation research actually belonged in a field called "Science Policy", everything that I thought I was trained for came into question.

My dissertation research investigates ancillary outcomes within the collaborative management of salmon fisheries on the west coast of Vancouver Island. Undoubtably, the relationships between people and their land, or oceans in this case, fit within the fields of geography and sociology. But what about science policy?

I defended my comprehensive exam in 2020. I was speaking about the applications of "hard science" on communal life, when I was interrupted by one of my committee members, also an incredibly successful researcher. She said, "Are you insinuating that the social sciences are soft?". I know that my work is not soft. It's implementable, it's practical, and it has the potential to change lives. It was in that moment that I realized: my work is not based upon science but synonymous with it.

The field of science policy enables researchers to use scientific data as inspiration for policy. In my research, the natural state of fisheries is a condition that sociologists consider in relation to the communities that rely on it. When it comes to impact, policy makers take this data to inform how to best manage the resource. Without science, I would not have the information required to understand the state of the resource. Without sociology, I would not understand how and in which ways this may impact communities. Without both, there is no informed impact.

When I started my PhD, I journeyed out to Vancouver Island on a federal government grant. The assignment was to interrogate the processes of fisheries management. When I arrived, I had the privilege of sitting in on various roundtable meetings. These meetings were premised upon the idea of collaborative management. Canada's Department of Fisheries and Oceans, which is a federal institution, funds these meetings. They do this because their mandate includes "ensuring that Canada's aquatic ecosystems and fisheries are sustainable and economically successful."

The roundtables on the west coast of Vancouver Island that I work with are geographically situated in close proximity to the fisheries in question. Third party facilitators are hired to engage Indigenous groups, fisheries stakeholders, scientists, and civil servants, to collaborate in the well-rounded management of fisheries. This is important because they bring a diversity of knowledges into conversation. In other words, the people who are impacted and who impact these fisheries are given voice.

The Department of Fisheries and Oceans historically, did not want to relinquish their control of fisheries management. Essentially, fisheries policy—across the entire nation—was made in Ottawa. Scientists were stationed across the country to observe the status of fisheries at predetermined times, but there was little to no communal engagement. This style of management contributed to in the East Coast cod collapse of 1992, which devastated the impacted communities. Understanding the state of a resource requires consistent monitoring. The Department took this as a lesson and adapted their style of management, engaging Indigenous groups and fisheries stakeholders across the country to act as their eyes and ears. Creating a space where different knowledge groups can explain their insights and why they believe them to be true is integral to the creation of effective and just policy.

On the plane ride home, my mind was a sea of ideas. I heard sad stories, like one Indigenous person who told me that they used to be able to walk across streams on the backs of salmon because they were so abundant. They explained the all-encompassing pain from the lack of salmon returns, not only from an economic perspective, but because this was intrinsic to their worldview, spirituality, and way of life. There were also happy stories, like one stakeholder who told me that when a certain plant blooms in their yard, it meant that the spring salmon would be returning. And of course, there were technical stories, like scientists explaining best practices for optimal yields. For me, all of these experiences together create a story; the whole is greater than the sum of its parts.

So, let's bring it back. What is science policy and why is it important to society? Because it's mutually beneficial. We have our problems. Take the diminishing salmon returns. Scientists discover what is going on in nature, building a basis of understanding, and social scientists discover how to adapt that reality to lived experiences. Here, there isn't a dichotomy between "hard" and "soft" science. Working in those silos will only contribute to events like the cod collapse. To achieve effective policy, we need to work in evolution with one another, using our skill sets to complement one another for the greater good.

# WE MUST RECKON WITH THE HISTORY OF MEDICAL RACISM AND VIOLENCE IN ORDER TO ADDRESS VACCINE HESITANCY IN AFRICAN, CARIBBEAN, BLACK AND INDIGENOUS COMMUNITIES

**Stephanie Wiafe, Communications and Engagement Officer, HealthBridge Foundation of Canada, and Stacey Smith?, Faculty Affiliate, ISSP and Full Professor, Disease Modelling, Faculty of Science, uOttawa**

Vaccination is extremely effective in controlling and preventing outbreaks of diseases when administered to a substantial percentage of the population. Sufficient vaccination can achieve herd immunity, but a significant challenge in effective coverage is vaccine hesitancy, the reluctance or refusal to be vaccinated. Any and all forms of vaccine hesitancy should be taken seriously by healthcare decision makers.

There are many different possible contributors as to why someone may be hesitant to receive a vaccine. These include worries regarding possible side effects, exposure to and beliefs in misinformation and disinformation (such as government surveillance), as well as conflicting religious or philosophical beliefs. However, due to historic medical violence, vaccine hesitancy — and general distrust in the health and medical systems — amongst African, Caribbean, and Black (ACB) and Indigenous communities is rarely discussed or addressed by healthcare decision-makers. The global ACB community's distrust of health and medical systems in the global North is rooted in an often-ignored history of medical racism, violence and violations of human rights.

Much of the history of medical racism and violence is not taught in the health and medical fields. As with many issues related to injustice — especially outstanding and unrepaired injustice — the details, depth and breadth of medical racism and violence is frequently ignored, leading to further silencing of and ignorance to the issues. This practice is dangerous, both for the health of ACB and Indigenous communities and for larger health concerns such as reaching critical vaccination thresholds across Canada.

The health and medical community needs to understand and address the ways in which anti-ACB and Indigenous racism has been and remains insidious in health and medicine. Without doing so, racism and racial medical violence, in addition to residual and persistent ideals of white supremacy in health and medicine, will continue to be upheld and harm racialized communities.

Medical racism and violence is rarely a benign experience for racialized people. It has had serious, lifelong and lethal effects on both health and well-being. An overt and widespread form of medical racism and violence subjected upon ACB and Indigenous peoples is forced and coerced sterilization, a permanent medical procedure that prevents pregnancy.

Forced and coerced sterilization of Indigenous peoples in Canada has obvious systemic roots; the violent and racist medical practice was legislated in Alberta (1928–1972) and British Columbia (1933–1973), although it occurs both within and outside of legislation, as a part of a eugenic movement to prevent Indigenous people from reproducing. Ultimately, forced and coerced sterilization goes far beyond a violent act at an individual level, instead seeking to break Indigenous lineages and dismantle and destroy Indigenous cultures and communities.

The lack of culturally responsive health care services to people of African descent living in Canada has been a long-standing barrier to health care. The lack of research and culturally relevant health resources has been identified as health issues of concern in the African Canadian community. There is an urgent need for healthcare professionals to develop awareness, sensitivity and knowledge about the needs of the clients from different cultural backgrounds.

Traumas experienced by individuals and generations of ACB and Indigenous people — who were subjected to various tortuous forms of medical violence, mostly from white colonizers — not only lead to adverse health effects but can be passed down from generation to generation through epigenetics, resulting in intergenerational racial trauma. Such trauma, coupled with knowledge of the violent history of medical racism and violence that ACB people have experienced, has contributed to widespread vaccine hesitancy amongst ACB and Indigenous communities in North America. Medical racism has a recent history and also persists today, creating new generations of ACB people with racial trauma and fuelling distrust in health and medical systems. Ignorance, indifference and ultimately failure to recognise the history and present-day manifestations of medical racism among healthcare providers perpetuates distrust, racist medical practices and current disparities in health.

Acknowledging the history of medical racism and violence in the medical system is necessary but not sufficient. Healthcare decision-makers, clinicians and practitioners need to actively dismantle racism in health and medicine (which will also address distrust, vaccine hesitancy and disparities in health). Systems, structures, practices and procedures need to change in order to provide the most comprehensive and intellectually honest care.

While many healthcare professionals may be aware of how various forms of racism (including interpersonal, institutional and systemic) lead to adverse and long-lasting negative health outcomes amongst racialized individuals and communities, ACB and Indigenous communities in North America are still disproportionately at risk for, and suffering from, an array of diseases. For instance, ACB communities are disproportionately affected by COVID-19, and distrust is a barrier to accessing and receiving quality care. Vaccine uptake in Indigenous communities has traditionally been significantly lower than throughout the rest of Canada.
Healthcare provided to ACB and Indigenous people must include a culturally and racially appropriate approach, which considers local contexts, historic and present manifestations of racism in medicine and healthcare, in addition to acknowledging and addressing distrust. Such culturally and racially appropriate care should be community-focused and community-led.

For example, healthcare decision makers can address vaccine hesitancy among ACB and Indigenous communities, from a structural level, by fostering trust with such communities and by collaborating with community leaders and members on vaccine distribution, information and implementation.

Community-focused health programming has seen great success in vaccine engagement among marginalised populations in the global South; lessons learned from success stories in places with more experience in vaccinating large populations should be considered in a Canadian context.

To work upstream in preventing ACB and Indigenous people from disproportionately suffering during public-health emergencies, we also propose that federal, provincial and municipal governments not only acknowledge this history but also outline how they will address it in future public-health emergencies and in medical systems in general. Without an explicit acknowledgement of past wrongdoing and a community-focused, bottom-up plan for avoiding previous mistakes, little will be accomplished, the status quo of medical racism and violence will persist, and many lives will be lost.

# SCIENCE AND TECHNOLOGY IN DOMESTIC AND INTERNATIONAL POLICY

# BRINGING SCIENCE AND TECHNOLOGY TO THE POLICY TABLE

**Dr. Sylvain Charbonneau, Vice-President, Research, uOttawa**

*On April 15, 2021, the Institute for Science, Society and Policy at the University of Ottawa and the [Institute for International Science and Technology Policy at the George Washington University](#) hosted Sethuraman Panchanathan, the Director of the U.S. National Science Foundation (NSF), as part of the [2021 Bromley Memorial Event](#). This blog is an adaptation of the author's remarks.*

Since the outbreak of the global pandemic, the general public has been fed an incredible amount of scientific data. This information is often delivered by our countries' top medical scientists, who have experienced unprecedented levels of visibility. Both the American chief medical advisor, Dr. Anthony Fauci, and our Canadian public health officer, Dr. Theresa Tam, have become household celebrities!

Despite several dissenting voices, our fellow citizens look ever more to science to find answers. In turn, they have become increasingly aware of how critical research is to shaping and implementing public policy, including strategies to overcome this pandemic. Bringing science and technology to the policy table to better inform science policies, and to improve society, is fundamental to this endeavour.

The integration of science and technology with policy is likely what inspired [David Allan Bromley](#), the brilliant Canadian-born Yale physicist, after whom [the Bromley Memorial Event](#) is named. He was a trailblazing director at the White House Office of Science and Technology Policy during the Bush Administration in the 1980s and 1990s. Dr. Bromley's position mirrored that of Canada's Chief Scientific Advisor, Dr. Mona Nemer, who happens to be my predecessor at the helm of the University of Ottawa's VP Research Office.

Building on our wealth of talent, our strong vision for innovation, our commitment to bilingualism and our strategic access to national decision-makers, research at the University of Ottawa aims to help our nation meet domestic and international challenges of the 21st century knowledge economy, by informing and shaping public and science policy. Our strategic research approach is aligned with our [Transformation 2030](#) roadmap for the next decade, which prioritizes excellence, relevance and impact, as well as interdisciplinarity, international collaboration, knowledge mobilization, and inclusion.

Transformation 2030 will be largely carried out through our research and teaching centres and institutes, such as the ISSP, which enable rich student experiences and build bridges across campus, among the academic, public, private and civil society sectors, while ensuring greater equity, diversity and inclusion (EDI) in research. Building a more inclusive science and engineering community that reflects the diversity of our societies is an indispensable component of transforming decision-making to meet the grand challenges of our time.

Taking action to allow a more diverse and equitable participation in our respective research ecosystems, is indeed a fundamental requirement, if we aim to drive research into a brighter future. While we have embarked on the journey to bring about change by tackling systemic barriers, we remain mindful of how much further we have to go, particularly in STEM, and are all the more committed to keep our eyes on the prize.

It is precisely why events like the [Bromley Memorial Event](#) continue to be an important forum for conversations on Canada-US relations in science and science policy. In keeping with Dr. John de la Mothe's vision, this annual joint event continues not only to reinforce the collaboration between our two nations and between both our academic institutions, but also to strive to be a renewed source of inspiration for the next generation of scientists and science policy professionals who participate every year.

# GRAND CHALLENGES ARE ALSO GRAND OPPORTUNITIES FOR CANADA'S S&T COMMUNITY

**Robert walker, Senior Fellow, ISSP, uOttawa and Retired Senior Executive**

On November 17, 2020, the ISSP hosted a panel entitled Aligning Science, Society and Policy for the Grand Challenges of our Time at the Canadian Science Policy Conference. This blog is an adaptation of the author's remarks.

It seems that the world is awash these days in grand challenges. But perhaps grand challenges also present grand opportunities. For Canada's Science and Technology community, let's look at where the grand opportunities may lie.

A first place to look is with respect the relationship between the S&T community and governments. I expect we would all agree that governments should play a crucial role in addressing the grand challenges facing society. No doubt we would also agree that Canada's S&T community has much to offer to governments in helping address these challenges, from climate change to national security. The question then becomes, how do we do so, or how do we do so better?

I'd suggest there are two interrelated dimensions to this relationship. First, the federal government is a funder of the nation's S&T enterprises, their capabilities and capacity. Secondly, the federal government is a customer of the products of the S&T community's research—its knowledge, evidence, technology, ideas, innovations, advice and talent.

We would do well to give more thought to how this customer-supplier relationship can work better, and therein lies an opportunity. I do worry that the S&T community too often focuses on the first perspective, while casting the second in the language of science advice or the science-policy interface. There is need for more nuanced thinking.

To first order, the federal government organizes its machinery around four big portfolios that provide complementary lenses on the national interest, the so-called "public good": the economy; public health and environmental stewardship; public safety and national security; and the nation's social well-being.

All of these portfolios are customers of S&T, but the customer needs have significant differences. Through the lens of S&T, what are the emerging opportunities for economic prosperity? What are the emerging risks to public health and/or to the environment, and how can these be mitigated? Are there new threats to public safety and national security, and how can S&T help us better understand and address them? What are the systemic barriers to equitable opportunity for Canadians, and how can we do better?

And here's the rub. Grand challenges don't make it easy for us to stay in one of these four lanes. Indeed, with grand challenges we see crosswalks between all of them. Take the COVID-19 pandemic. It is a public health crisis, yes, but it is also significantly disrupting many sectors of the economy and the nature of work, it has laid bare threats to national security through over-dependence on offshore supply chains and has further exposed social inequities that leave the most disadvantaged in our society as the most vulnerable to the negative impacts of the virus.  While the S&T community is not the only source of new ideas to address such issues, it most certainly can play an important role.

Rethinking this customer-supplier relationship is an important opportunity for increasing the impact and relevance of S&T, in essence by considering these multiple customer perspectives at the same time as we pursue our science. Of course, there are many complexities and open questions as to how best to deliver such S&T. These conversations are beginning. This approach picks up on the thinking behind big ideas such as inclusive innovation, sustainable development goals and convergence research, each of which advocates for S&T-enabled outcomes that have simultaneous positive impacts on multiple dimensions of the public good.

But what are the aspirations of Canada and Canadians with respect to the public good? This question brings me to a second grand opportunity, one that relates to the relationship between our national S&T community and society.

I expect we would all agree that there is a long list of challenges where there is a pressing need for national, inclusive conversations that transcend the echo chambers and polarization that too often constrain us.  Conversations about where we are as a society today, where we aspire to be tomorrow, and what the journey could look like.  We are not going to necessarily agree on the destination or what the journey should look like. But we have a growing obligation to listen to different perspectives, hear alternative views, and understand where our aspirations may have unintended consequences.

There is an important opportunity for our nation's S&T community to be a convenor and facilitator of such conversations. I have been pleased to see many of Canada's universities embrace the UN's Sustainable Development Goals — a buffet of grand challenges. These goals are being used as a platform for both informing new approaches to cross-disciplinary experiential learning for the student population and next generation of scientists, and also for providing a unifying set of targets for the university's research enterprise. This approach is already stimulating new conversations across our campuses and resembles what we need nationally. It falls to our national S&T community comprising academia, public and private sector scientists and our fourth-pillar science-based organizations to come together and leverage such experiences into enabling even more inclusive conversations.

Grand challenges are also grand opportunities. The nation's S&T community should seize them. Canada will be the better for it.

## A CLEAR AND PRESENT OPPORTUNITY: RENEWING THE CANADA-U.S. SCIENCE AND TECHNOLOGY PARTNERSHIP

**Paul Dufour, Senior Fellow, ISSP, uOttawa and Principal, Paulicyworks**

If scientific leadership and global knowledge partnerships are to be the benchmarks of a new post-pandemic image then clearly both Canada and the US have an opportunity to reimagine their unique science and technology relationship. The bilateral summit held on February 23 between Justin Trudeau and Joe Biden mapped out some key areas of interest, many of which will require attention to ongoing and long term investments in knowledge and research.

As the Canadian and US federal governments continue to integrate, and otherwise harmonize economic, security and environment approaches within the CUSMA agreement, the pandemic crisis and the US's new approach to statecraft has created a window of opportunity to strengthen the Canada-US research and innovation space. After all, it is arguably the world's most extensive knowledge relationship. We combine for more than one-third of the world's R&D and over one-half of all Canadian scientists who co-author internationally do so with US counterparts. (Between 2017 and 2019, Canadian scientific publications co-authored with the US numbered 65,364. The next collaborator was China at 26,604.)

The new President is working to re-establish America's ties with the world and underscoring the need for science leadership in key technologies. The US Congress is also moving ahead with an agenda to strengthen American S&T leadership. Indeed, the budget appropriations of 2020 outlined significant increases in basic research and innovation, including a 9% increase for the National Institutes of Health (now at US$43B, larger than Canada's total national R&D spend of CDN$34.5B); a multi-billion total increase in the budgets of the National Science Foundation over 3% (now at US$8.4B); a boost to the Department of Energy's science programs; an 8% growth to NASA for space science and lunar mission (along with celebrating the recent Perservance landing on Mars); and a US$1B planned hike in science, engineering and math education (STEM) to prepare students and citizens for the future. In short, basic research support is on the rise and future science budget appropriations are also likely to see increases as more investment is targeted to tackling the Covid-19 crisis and post-pandemic research and innovation, especially in biotechnology, AI and cyberspace.

It is worth remembering in this context the 2011 statement issued by a bipartisan group of well-respected politicians and research leaders who made the case for stronger use of science in U.S. foreign policy: "Many of our most pressing foreign policy challenges—energy, climate change, disease, desperate poverty, and underdevelopment, and WMD proliferation—demand both technological and policy solutions. In these and other areas, U.S. national security depends on our willingness to share the costs and benefits of scientific progress with other nations."

With the Covid-19 crisis, investments in research and knowledge have taken on a much larger impact in both Canada and the US, as has the joint collaboration between the two research ecosystems on vaccines, biomanufacturing, genomics, and other health and social sciences related issues. As Prime Minister Trudeau said on February 23 in the meeting with President Biden, "The President and I discussed collaboration to beat COVID-19—from keeping key supplies moving and supporting science and research, to joint efforts through international institutions. We're standing united in this fight."

Rebranding Canada's image as a tech-savvy science leader needs to be taken more seriously. Clearly, investments in knowledge can be an important entrée as a strong global partner. Canada can take advantage of its large investments in science from the 2018-2019 budgets (and selected health-related research spends in 2020), as well as new provincial and industrial initiatives. As I have written for years, Canada should be ramping up efforts for joint knowledge cooperation and help shape a revitalized North American research and innovation space.

**What will it take?**

A roadmap with a long-term strategic focus would help, not to mention more resources in consulates and the Embassy in the US to take advantage of emerging developments and new opportunities—with staff knowledgeable about science, public health and technology—not just trade. (Currently, Global Affairs Canada has eight counsellors in various US posts dedicated to technology related relations and a full-time science policy diplomat in Washington, DC.) It also requires recognition that investing in science and innovation with our southern partner (and others) is a long-term proposition involving significant and sustained funding of both the domestic science base and skilled people, starting with the research granting councils and universities and colleges, and academies, but also including the federal government research labs and other key institutions such as Genome Canada, CIFAR, CFI, Mitacs and the National Research Council.

At the heart of all of this is the need to pay attention to the next generation of talent. As John Stackhouse and others have noted, there is a significant potential with the Canadian diaspora studying in US universities and colleges including the entrepreneurship pool based in the US. Canada has key platforms around which to grow and enhance its talent pool through research chairs and superclusters, among other incentives. According to recent data, Canada is the second most preferred destination for US students after the UK. As Canada's chief science advisor remarked in her May 2018 Science editorial Canada's Call, "With science and technology playing a prominent role in everyday life, access to science education and to science-based careers is ever more essential for inclusive growth and for women's empowerment."

Second, any renewed continental focus, in addition to key leadership and sustained commitments from all sectors, will require a well-articulated strategy for a successful partnership. For instance, the funding councils under the Canada Research Coordinating Committee and its support for international, interdisciplinary, high-risk research, could work more closely with counterparts in the US in shaping this new research agenda (along with the provinces and states who already actively engage in various joint technology ventures and skills cooperation).

It also means taking up the foreign policy challenge to enhance existing cooperation in key areas where both countries are already quite active. These include Arctic research, AI, advanced manufacturing, space science, environment, green energy, natural resources, the ICT and quantum computing arenas, where Canada and the US increasingly share common platforms for digital media and health security linkages. For example, the Mission Innovation and Clean Energy Dialogues, AI, quantum science, and oceans agendas from a previous White House Office of S&T Policy could serve as models to explore strategic engagement via major bilateral programs.

The Biden administration can build upon these models, along with other areas such as climate change and environment including water quality and shared management of the Great Lakes, fisheries and wildlife protection, and parks. Of course, all of these opportunities must embed and build on the extensive social sciences and traditional knowledge research cooperation that exists between each country. A multidisciplinary and EDI focus is the new mantra for more effective results.

Since the US and Canada are both keen to ally with other emerging players in selected technology areas, why not piggyback on these ventures and foster tri-lateral or multi-party partnerships where appropriate? One could envisage such existing arrangements with the US and Mexico where a good deal of trilateral activity already exists. This could form the basis of a key agenda for the revival of the North American Leaders' Summit touted by the two leaders in February.

Finally, with the well-established reputation in supporting science and technology for capacity building in the developing world, Canadian institutions such as IDRC and Grand Challenges Canada could link up with US partners in strengthening knowledge capacity within regions in need, including of course, through the global efforts of multilateral institutions to develop more effective pandemic responses.

It is a reality, not mere rhetoric, that science and innovation operate in an open and global environment. Well-designed science diplomacy can be a key platform for new research and outcomes for mutual benefit. The American Association for the Advancement of Science's recent science diplomacy events—which have featured Canada's chief science advisor— and the ongoing Carnegie Group meetings of science ministers are two recent examples that can certainly can give impetus to this enhanced collaboration.

There is a history of efforts to strengthen the bilateral relations around science and diplomacy, some of it encouraged by previous joint meetings of the US and Canadian science advisory councils and between science advisors and ministers. Further down the road, efforts to increase research linkages could lead to a re-imagined science diplomacy partnership with the activist AAAS, the National Academies of Science as well as with NASA, NSF and NIH.

The August 2021 INGA conference slated for Montreal might also provide some opportunities for enhanced engagement on both the science diplomacy and advisory fronts. This April's annual, student-focused Bromley Memorial Event, a collaboration between two capital universities, the University of Ottawa and George Washington University, offers another mode of engagement for our next generation of scholars and researchers.

The Canadian foreign policy statement of 50 years ago presciently stated that "Canada's most effective contribution to international affairs in the future will derive from the judicious application abroad of talents and skills, knowledge and experience, in fields where Canadians excel or wish to excel." Let's put this to the test today, making Canadians healthier, wealthier and wiser, while also responding effectively to Canada's global responsibilities for the SDGs and other grand challenges. A reimagined Canada-US partnership is a clear and present opportunity.

## OF ROADMAPS AND RELIABLE COOPERATION: A CLEAR AND PRESENT OPPORTUNITY

**Paul Dufour, Senior Fellow, ISSP, uOttawa and Principal, Paulicyworks**

*"The National Science Foundation (NSF) has a rich history of not only pursuing direct partnerships with other agencies, private industry and like-minded countries, but also fostering environments where partnerships thrive, because they are powerful ways to leverage resources and deliver results. We need partnerships for accessing a broader network of ideas, innovations and experiences to address and solve real-world problems."*

(Testimony by NSF Director Sethuraman Panchanathan to the Subcommittee on Commerce, Justice, Science and Related Agencies Committee on Appropriations United States Senate, 13 April 2021)



President Biden's FY22 Budget Request (% change from FY21 enacted)

* NIST and NOAA are part of the Commerce Department, NIH is part of the Health and Human Services Department, and the Office of Science is part of the Energy Department. Figures represent proposed changes to discretionary budgets.

American Institute of Physics | aip.org/fyi
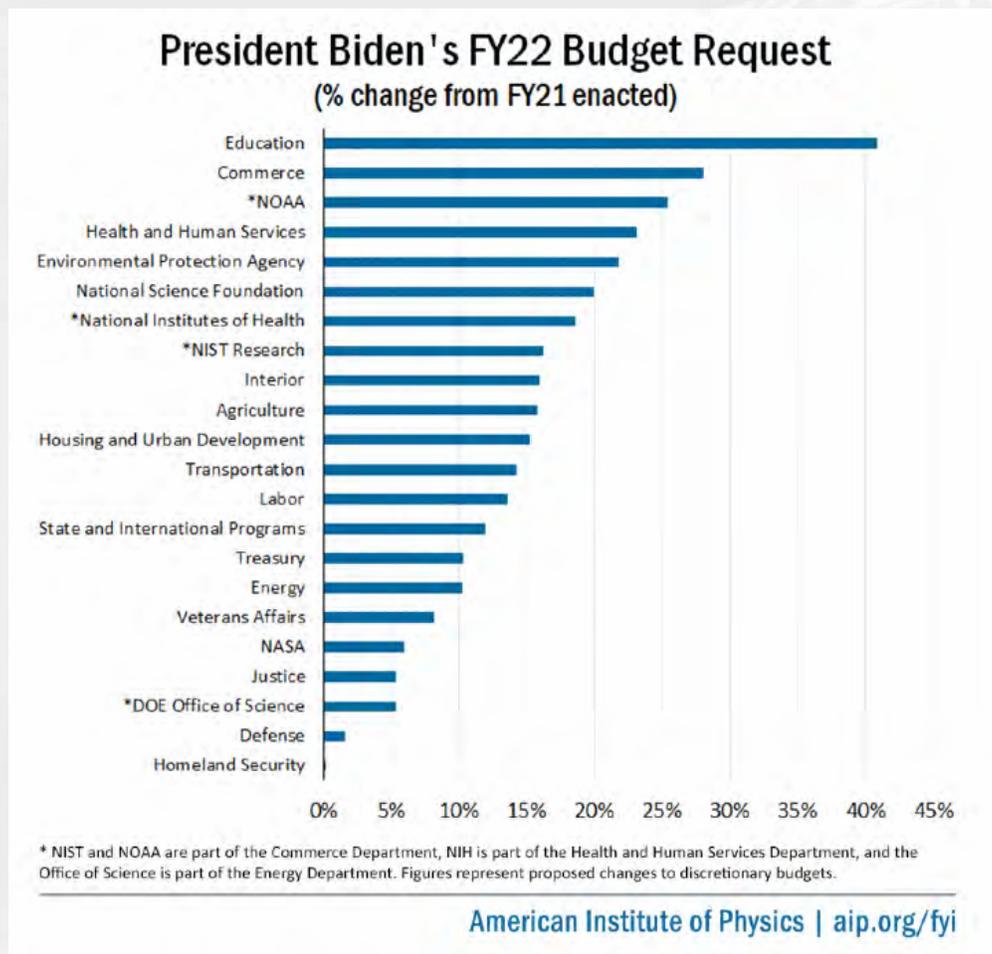
The NSF Director cited above, an alumnus of the University of Ottawa, delivered a dynamic and passionate keynote lecture on April 15 for the [Bromley Memorial Event](#), in which he picked up this notion of partnerships—especially with Canada. Science and research partnerships between the two countries have a long and rich tradition. [Allan Bromley](#), the Canadian-born science advisor to President George H.W. Bush, was a major exemplar of this.

The US, as Dr. Panchanathan underscored in his remarks and as the chart below highlights, is undergoing a profound shift in how it will approach its governance, funding and architecture within its knowledge and innovation ecosystem.

Canada has a clear and present opportunity to take advantage of this potentially significant new funding with the US. Part of this is a result of the recent federal budget, but a more strategic approach and reformed knowledge architecture will be needed—with key leadership and support within the respective knowledge communities.

## Considerations for a Smarter Partnership

The 2021 February statement from the White House on a Canada-US Partnership Roadmap has laid out a refreshed agenda for joint mutual interests. Roadmaps are not new between the two countries—there is a longstanding partnership that encompasses an array of common goals. Geography, culture, economics, history all matter. So too do the shared visions of prosperity, diversity, equity and justice for all citizens.

But the Americans' fresh approach to statecraft along with massive injections of funding into R&D has created a window of opportunity to strengthen the Canada-US research, science and innovation space. After all, it is arguably the world's most extensive knowledge relationship. We combine for more than one-third of the world's R&D, and over one-half of all Canadian scientists who co-author internationally do so with US counterparts. (Between 2017 and 2019, Canadian scientific publications co-authored with the US numbered 65,364. The second most frequent collaborator was China at 26,604.)

Grand challenges such as the current pandemic, future pandemics, and climate change, offer a new window of opportunity for increased cooperation—as do joint efforts centred on global health security. (A reminder that both countries experienced this vividly 20 years ago following 9/11 where the two scientific communities undertook collaborative efforts to address biological, chemical and other threats from terrorism).

Today, a touchstone for a renewed partnership needs to focus on the next generation of talent. This is what Canadian-born science advisor to the US President embodied in his efforts to enhance and build a greater Canada-US STI partnership.

As John Stackhouse and others have noted, there is significant potential for more technology and research linkages with the Canadian diaspora studying in US universities and colleges, including the entrepreneurship pool based in the US. Canada has key platforms around which to grow and enhance its talent pool—through its research chairs and superclusters, among others. According to recent data, Canada is the second most preferred destination for US students after the UK. And as Canada's chief science advisor remarked in an editorial in the journal *Science*, "With science and technology playing a prominent role in everyday life, access to science education and to science-based careers is ever more essential for inclusive growth."

Second, any renewed continental focus, in addition to key leadership and sustained commitments from all sectors, will require a well-articulated strategy for successful partnerships. It also rests on a recognition that investing in science and innovation is a long-term proposition involving significant and sustained funding of both the domestic science base and its skilled people. This starts with the research granting councils along with universities, colleges, and the academies. For instance, the funding councils under the Canada Research Coordinating Committee and its support for international, interdisciplinary, high-risk research, along with a new EDI manifesto that parallels the NSF mission, could work more closely with counterparts in the US in shaping this new research agenda.

It is also critical to partner with the provinces and states who already actively engage in various joint technology ventures, research and skills cooperation.

A smarter partnership means taking up the foreign policy challenge to enhance existing cooperation in key areas where both countries are quite active. These include Arctic research, AI, advanced manufacturing, space science, environment, clean energy, natural resources, quantum computing, and networks where Canada and the US share common platforms for digital media and health security linkages.

The Biden and Trudeau administrations will likely be building upon these ventures, along with other areas such as climate change (the subject of the global summit hosted by the President on April 22) and environment, including water quality and shared management of the Great Lakes, fisheries and wildlife protection, and parks. Of course, all of these opportunities must embed and build on the extensive social sciences and traditional modes of research cooperation that exists between each country. A multidisciplinary and EDI focus is the new mantra for more effective results.

Since the US and Canada are both keen to ally with other emerging players in selected technology areas, why not piggyback on these ventures and foster tri-lateral or multi-party partnerships where appropriate? One could envisage such an arrangement existing between Canada, the US and Mexico, where a good deal of trilateral activity already exists. This could form the basis of a renewed agenda with the revival of the North American Leaders' Summit touted by the two leaders in the February roadmap.

Canadian institutions such as the IDRC and Grand Challenges Canada have well-established reputations in supporting science and technology for capacity building in the developing world. These and similar organizations could link up with US partners to strengthen knowledge capacity within regions in need, including of course through the global efforts of multilateral institutions to develop more effective pandemic responses.

**Collaboration for Smarter Science Diplomacy**

It is a reality, not mere rhetoric, that science and innovation operate in an open and global environment. Well-designed science diplomacy can be a key platform for new research and outcomes for mutual benefit. The American Association for the Advancement of Science's science diplomacy events—which have featured Canada's chief science advisors and science ministers in the past—and the ongoing Carnegie Group meetings of G7 science ministers are two recent examples that certainly can give impetus to this enhanced collaboration.

Canada and the US also have a long history of efforts to strengthen bilateral relations around science and diplomacy, some of it encouraged by previous joint meetings of the US and Canadian science advisory councils and between science advisors and ministers. Further down the road, efforts to increase research linkages could lead to a re-imagined science diplomacy partnership.

The next generation agenda remains critical for moving past the pandemic and enhancing the respective joint approaches as partners for progress. Organizations like Science and Policy Exchange, the Canadian Science Policy Centre, ST Global consortium and others can bring fresh perspectives to the bilateral agenda.

One area worth developing further is science advisory mechanisms and youth councils. How can the exchange of ideas between the science community, the next generation and public policy makers be encouraged? Can this advice and its implementation fit more strategically within the decision-making structures, across national borders, for everyone's benefit?

A constructive agenda awaits. As a Canadian foreign policy statement once underscored:

*"The most effective contribution to international affairs in the future will derive from the judicious application abroad of talents and skills, knowledge and experience, in fields where Canadians excel or wish to excel."*

Let's put this to the test today, making citizens healthier, wealthier and wiser. A reimagined Canada-US partnership is a clear and present opportunity.

# ALL CANADIAN UNIVERSITIES MUST CRITICALLY REASSESS THEIR COLLABORATIONS WITH CHINA

**Margaret McCuaig-Johnston, Distinguished Fellow with the Asia Pacific Foundation of Canada and Senior Fellow, ISSP, uOttawa**

Originally published in the Globe and Mail on June 18, 2021

Canada is proud to have one of the world's best research environments for cutting-edge development in technology and science. But recent media reports have documented the risks of a system where Canadian researchers may collaborate with China.

As the new China of President Xi Jinping has become more aggressive in acquiring technology from other countries, we have found that China's military scientists – as well as companies implicated in the regime's surveillance state, such as iFlytek, SenseTime, Alibaba and BGI Group – have established research relationships with Canada's top universities and research centres.

Canadian researchers partnering with colleagues in China in areas such as artificial intelligence, nanotechnology, biotechnology, photonics, quantum computing and advanced materials may not realize that their great ideas shared with Chinese colleagues may be going out the back door into military applications. Mr. Xi's ramped-up policy to integrate civilian and military technology development means Chinese civilian scientists cannot refuse to partner with their military counterparts.

As Innovation Minister François-Philippe Champagne has been saying for months, "the China of 2021 is not the China of 2016." We are seeing efforts by this new China to acquire Canada's most advanced technologies for its military-industrial complex and for the intensive surveillance of Chinese citizens, including the persecuted Uyghur population.

In effect, Canada's open system of academic exchange is now being used to turn our innovations into tools of repression, and potentially to create weaponry against us and our allies.

This should be a wake-up call of the first order, but it is also a cold shower for academic institutions in Canada. Academic freedom is the very foundation of university life in Canada, and science is international by its nature. It is accepted culture that Canadian scientists can partner with whomever they wish.

At the same time, Canadian scientists should not want their advanced innovations going into Chinese military applications, even when the collaboration will advance their research objectives. They need to raise their personal awareness of how this is

happening in China. There is also a public policy imperative that Canadian taxpayers' money not be used to build China's military and surveillance state.

Coming to terms with this new challenge means being transparent about the areas in which collaboration with China is happening, and about the funding involved. It has been concerning to see that some universities have been concealing the funding they are getting from Chinese sources, which is frequently the case when sensitive technologies are involved. But information on all such funding should be publicly available.

Responsibility in this field is shared between the federal government, which provides research funding to universities, and the provinces, which have jurisdiction over universities. Federal granting councils and departments have reviews underway, and the government of Alberta recently imposed a freeze on new or renewed university collaborations with China while the province undertakes a review. That is a good model for other provinces to follow, though it should apply not just to university-to-university collaborations.

There are direct collaborations happening between Canadian scientists and Chinese military researchers. The Australian Strategic Policy Institute identified 84 joint publications between Canadians and Chinese military researchers in 2017, and 106 the year before that.

And those were only the collaborations that led to publications. The University of Waterloo, University of Toronto and McGill University were in the top 10 universities in the world with such collaborations. ASPI's list of 160 military-affiliated Chinese institutions is a good checklist for our universities to avoid. But Chinese students and researchers have been known to obscure their affiliation by naming a different home institute – not very transparent!

Given that some Chinese funding to universities has been concealed, government measures to address the issue must go beyond conditions tied to provincial and federal grants, to include any research that involves Chinese companies, research institutions, donors or initiatives.

One such example is China's Thousand Talents Plan, designed to attract top researchers from abroad, which in some cases pays a full Chinese salary on top of a professor's Canadian salary, plus funding for their Canadian lab and sometimes funding to the Canadian university for overhead.

To be clear, much collaboration with China is welcome, including in areas such as environmental science, big science and most medical research. But Canadian researchers should always proceed cautiously. The transfer of personal genomic data of Canadians to China, as reported recently, is of particular concern. And adding human genes to monkey embryos, as Chinese researchers have done, would not happen here either.

Ethical lenses need to be applied, and key strategic, emerging and enabling technologies should be identified by the reviews underway, with measures taken to prevent any contribution to China's military and surveillance state.

## SUPPORTING A MORE INCLUSIVE SCIENCE AND TECHNOLOGY COMMUNITY

**Brennan Hoban, Masters candidate in International Science and Technology Policy, Elliott School, George Washington University**

*On April 15, 2021, the Institute for Science, Society and Policy at the University of Ottawa and the [Institute for International Science and Technology Policy at the George Washington University](#) hosted Sethuraman Panchanathan, the Director of the U.S. National Science Foundation (NSF), as part of the [2021 Bromley Memorial Event](#). This blog is an adaptation of the author's remarks.*

This is a really exciting time for science. We're on the verge of finding solutions to many of the major issues the world is facing—in security, health, energy and more. There's no clearer example of the impact that science and technology solutions can have than the ongoing COVID-19 pandemic response, including the accelerated vaccine development.

This success would not have been possible without the professionals who dedicated themselves to the response. To accomplish the country's science and technology ambitions, it's crucial that we have a strong workforce that includes an incoming pipeline of students and researchers with diverse backgrounds, perspectives, and passions.

In the United States, our science and technology workforce is not as strong as it can be. There are people throughout the country who are capable of succeeding as scientists and engineers but do not have access to the pathways that lead into those careers. [Sethuraman Panchanathan](#), the Director of the National Science Foundation, calls these Americans the "missing millions." By addressing these "missing millions" and creating more pathways for people of all backgrounds to join the science and technology workforce, we can unlock the potential to accomplish more of our ambitions.

To make this happen, it's very important that we make the science and technology workforce a welcoming place for everyone. In my research for UNESCO with Professor Vonortas and Connor Rabb on how the US is fairing on a number of science technology indicators, it's clear that while there have been some increases in the number of women and other underrepresented groups in the science and technology workforce, we are not making progress at the pace needed to address the world's problems.

This is why I really admire Sethuraman Panchanathan and the Biden Administration's commitment to improving the speed and scale at which we address inclusivity. Right now, the science and technology workforce is only 30 percent women and only 13 percent people of color—much lower than each group's representation in both the US workforce and the US population overall.

What we've learned about how we can address this challenge is that people need to be supported through a variety of channels. This can be done through relationships, mentorships, and allyships, which I've been really fortunate to have found at GWU. Universities play an important role in welcoming new entrants to the science and technology community, and the experience that students and researchers have there is the first step to whether they feel included and at home in this field. When universities are inclusive and supportive, they provide important pathways for future scientists and engineers, especially through partnerships with industry and government. But it needs to be a concerted effort and also a very conscious effort. This is exactly why platforms like the Bromley Memorial Event are so important. This is where we grow our networks and our relationships, including between generations and across geographic divides.

This is especially important in the context of COVID-19, which has made relationship building efforts both more important and more challenging. The pandemic has had a disproportionate impact on women, people of color, and other vulnerable populations that are underrepresented in the science and technology field. While engaging virtually, it can be more difficult for these groups to find the relationships and support that they need to be successful in this industry.

We are facing an uphill battle, but it is inspiring to see the commitment of everyone here to encourage the next generation, by building relationships with the next generation of students and researchers, so that everyone can be welcome in this field and picture a career and a future for themselves here. As a young person and as a woman, I'm very excited for what my generation and the future generations can accomplish with the support of the science and technology community.

# COVID-19 SHOWS THE IMPORTANCE OF EVIDENCE-BASED DECISION-MAKING

**Dr. Kimberly Girling, Member of the Advisory Committee, ISSP, uOttawa and Senior Research & Policy Analyst, Office of the Chief Public Health Officer of Canada**

On Thursday, September 24, the ISSP hosted Food for Thought event Science, Society and Policy in the Age of COVID-19: What Changes will Stick? Which will Prove Fleeting?. This blog is an adaptation of the speaker's remarks.

Since the emergence of COVID-19, we have seen some clear and encouraging examples of how science and evidence-informed policy have shaped Canada's response to the pandemic. Public health officials have been given a platform, ensuring that scientists are actually delivering messages to the public and providing them with the knowledge they need to make informed decisions. New tools are emerging to help governments find and use evidence more effectively.

For example, chief and departmental science advisors have led the development of CanCovid, a platform that uses Slack and digital tools to help scientists across Canada expedite science communication and the use of science in decision-making. We have also seen the emergence of task forces and advisory panels to help bridge the gap between the researchers and decision-makers on critical scientific issues. On top of this, we have seen significant new investments in science research for treatments and vaccine development, demonstrating an emphasis on the importance of science to help address this crisis.

Of course, to do good evidence-informed decision-making, we need good evidence. Yet COVID-19 highlights some of our shortcomings with respect to data. For example, a new study from Ottawa Public Health shows that 66 percent of people in Ottawa who have tested positive for COVID-19 are part of racialized groups. This statistic emphasizes just how important it is to have access to robust and disaggregated data to help us better understand how COVID-19 is truly impacting diverse populations.

We also need stronger testing and contact-tracing data to better understand where and how the disease is moving and create strong models and predictions. All of this requires better data collection and data management, and good tools that allow evidence creators to get that evidence to policymakers and the public. All of this is really hard to do effectively, especially when we are looking at something like COVID-19 where information is changing so rapidly and our data needs are so high.

While we've seen some encouraging steps taken in Canada during COVID-19, there are still major challenges facing science and evidence-based decision-making moving forward. We are seeing in real time how misinformation can make it really difficult for governments to find and use the best available science, especially when there is so much public fear and anxiety. In recent days, public health officials have received death threats because they're advocating the use of masks.

These challenges are becoming more pervasive with the increase of digital communication, where scientists as well as bad actors alike can so easily communicate with large audiences. While we are seeing investments in these areas, like Heritage Canada's new fund to support combating misinformation, this problem is not going away.

Trust is another huge issue. While recent polling from 3M indicates that the pandemic is leading to increases in trust in science, challenges still remain with respect to trust in institutions and experts. For example, the Edelman Trust Barometer for 2020 shows that only 53% of Canadians trust core institutions like government, a 3 percentage point decline from last year. Situations like COVID-19, where the science is rapidly changing and the public is anxious and fearful, can undermine evidence-informed decision-making, even if we have the right tools for it.

COVID-19 has shown the benefits of using evidence as the foundation of decision-making in very clear and sobering terms. Our response has not been perfect, but it's been clear that Canada's approach has been rooted in science and evidence. Canada has good tools to help inform evidence-based policy, but we need to ensure that those tools are protected and continue to develop. If we want to increase the use of evidence-based decision-making, for COVID-19 and beyond, we need to sustain the public demand for it.

# GRAND CHALLENGES

# COVID-19

## QUIT MOCKING "ANTI-VAXXERS" AND UNDERSTAND ROOTS OF VACCINE HESITANCY

**Prof. Michael Orsini, Faculty Affiliate, ISSP and Full Professor, Feminist and Gender Studies, Faculty of Social Sciences, uOttawa**

Has a smugness washed over the COVID landscape with news that a vaccine is on its way?

Yes, there are logistical challenges related to the rollout. Will there be enough vaccine? Who will get it first? Will countries hoard it for their own citizens? These questions require attention, but a vaccine is a game-changer, right? There is no sense in quibbling about the small stuff.

Not so fast.

Vaccines only work when we achieve 'herd immunity', which "happens when a virus can't spread because it keeps encountering people who are protected against infection." Scientists estimate that 70- 80 per cent of a population must get immunity, preferably from a vaccine, in order to achieve herd immunity from COVID-19. This threshold varies depending upon the reproduction number (the number of people that a positive person can infect), and the vaccine's effectiveness.

Will enough citizens simply agree to roll up their sleeves? Well, that depends on a few things.

First, the public will need assurances that the vaccine is safe and that it works. One study published recently in Nature Medicine presented some sobering data in this regard. Canada ranked 12th – even behind the US - out of 19 countries surveyed in terms of the percentage of respondents who agreed with the statement: "If a COVID vaccine is proven safe and effective and is available, I will take it." Just over two-thirds (68.7 per cent) of Canadians surveyed said they would. This may not seem catastrophic - that percentage may shift upward once we move from the hypothetical to the real - but it should be cause for concern.

Lest anyone be fearful of a draconian public health response, Alberta Premier Jason Kenney was first out of the gate to soothe his base with word that Alberta would not mandate COVID-19 vaccination. The governments of Ontario and Saskatchewan quickly followed suit. To wit: no one actually threatened to impose blanket vaccination mandates. Rather than fan the flames of fear, governments can expend energy on how to communicate with citizens who may have legitimate concerns about a COVID-19 vaccine.

Identified as one of the top global health threats by the World Health Organization (WHO), vaccine hesitancy "refers to delay in acceptance or refusal of vaccines despite availability of vaccination services", and "Includes factors such as complacency, convenience and confidence."

A singular focus on individual behavior, however, can overlook other factors that might account for the rate of vaccination coverage, such as the influence of social determinants. In addition, the painful legacies of racism and medical experimentation may explain the reluctance of some Black, Indigenous and racialized communities to get vaccinated.

It might be comforting to dismiss people who are vaccine hesitant as irrational, yet none of this really helps us to understand the emotional terrain on which vaccine hesitancy operates. People who are hesitant may not even know what they do not know. And we should properly distinguish people who are categorically opposed to vaccination from those who are genuinely unsure or indecisive. Lumping them together only muddies the water.

Vaccine hesitancy (and outright refusal) may be thriving in this era of post-truth, but it existed long before it. Indeed, conspiracy theorists have spent years tapped into longstanding anxieties about vaccines, including the now-debunked theory of the link between MMR vaccine and autism. While the journal retracted the study years ago, it persists in the public imagination.

"We shouldn't fight fire with fire", says health law professor Timothy Caulfield. "We should fight fire with science-informed fire." The "information deficit" model incorrectly presumes that uninformed or misinformed people will be swayed by hard facts alone. We need to understand how to inform the public in compelling ways, recognizing that people reason with emotions. Social scientists can be indispensable in this regard, suggests University of Edinburgh sociologist Martyn Pickersgill in a letter to *the British Medical Journal* urging the government to engage researchers who understand the complex politics of vaccination uptake.

As sociologist Arlie Hochschild explains in her account of polarizing debates in US politics, emotions help us to understand the deep stories that structure people's lives. "A deep story is what you feel about a highly salient situation that's very important to you. You take facts out of the deep story. You take moral precepts out of the deep story. It's what feels true. I think we all have deep stories, whatever our politics, but that we're not fully aware of them."

So what should be done? The first step consists in probing these "deep stories", which may help us to understand individuals' reluctance or hesitance to vaccinate. A small subset of people is likely unreachable but for the others, it is not too late.

# CANADA'S HUMAN RIGHTS FAILURES ON COVID

**Prof. Errol Mendes, Member of the Advisory Committee, ISSP and Full Professor, Faculty of Law, uOttawa**

On Thursday, September 24, the ISSP hosted Food for Thought event Science, Society and Policy in the Age of COVID-19: What Changes will Stick? Which will Prove Fleeting?. This blog is an adaptation of the speaker's remarks.

When COVID-19 was declared a pandemic, everyone was saying that we are all in it together. Six months in, it is clear that we are not. We have seen huge disparities in terms of the impacts of this virus on the elderly, the unemployed and underemployed, women, Indigenous peoples and racialized minorities. In other words, the majority of our population.

Let's start with the elderly. Across the country, between 77 and 80 percent of COVID-related deaths have come from long-term care facilities. It is stunning that this is still going on and it is reinforced by the failures of government to acknowledge the role that they have played in it. According to the Globe and Mail, the Ontario government is not guaranteeing the health and safety of residents in these facilities, stating that the responsibility lies with those who actually run and operate them. Keep in mind that the Ontario Ministry of Long-Term Care regulates, licenses and inspects the province's 623 long-term care homes. They are now being sued for $500 million for their role in these deaths and this suffering.

I was pleased to see an acknowledgment of these issues in the Speech from the Throne. We may see national standards for long-term care homes or even consideration of criminal prosecutions against those who actively cause deaths and severe suffering of the elderly. But will responsibility fall to the individual overburdened caretakers, or will it be the organizations who run these facilities? That has not been determined.

If we turn to unemployment, we again see incredible disparities. Let's first consider women, the majority of this country's population. Women with higher-paying jobs have, to a large extent, not suffered as much as women with lower incomes, especially those with children. The aggregate hours worked by mothers of children under six is down 17 percent compared to just 4 percent of men with children under six.

If we turn to race, some stunning unemployment figures are coming out of Statistics Canada, which only started conducting race-based analysis of the labor market in July. All non-white racial groups are experiencing much higher levels of unemployment than their white counterparts. South Asians and off-reserve Indigenous workers were at the greatest disadvantage, with unemployment rates at 17.8 percent compared to 9.3 percent overall. The picture for gig workers is even worse.

I was again pleased to see the Speech from the Throne acknowledge that women have faced a larger burden in this, along with the interesting statement that there is going to be a feminist intersectional approach to remedy these inequalities. There was also acknowledgement of discrimination, but nothing much in terms rectifying the employment challenges that racialized groups face in the long term.

Here lies the rub. How do we reconcile ourselves as a country that pays attention to inequality, that tells the rest of the world that we are champions of inclusion and human rights for all, and tell the rest of the world that they should do better? We have a lot of work to do.

We need a massive build out of our social infrastructure to meet these fundamental challenges of governance and regulation. If we do not, this is not going to be the last catastrophe we will face. Some scientists say that there are multiple pandemics lining up behind this one. Getting in front of the next crisis will require profound examination and preparation by our best minds and our best practitioners. In the long run, all Canadians must rethink our social infrastructure and our governance structures. The question we must now ask ourselves is whether we are capable of that.

For higher-paid workers, the recession caused by the pandemic ended in August. The rest of the population is still suffering great economic and social distress. New social infrastructure must focus on raising the economic and social floor for the majority of the population. This would require giving a greater voice to those that are willing to challenge the present structures that entrench inequality. Measures designed to "raise the floor" for the majority of Canadians could include the establishment of a Universal Basic Income and free post-secondary education for those that cannot afford to pay. We are also seeing greater demand for more progressive judicial rulings and new mechanisms and funding to combat systemic discrimination against women, racial minorities and the elderly in employment, education, the criminal justice system, housing and health care.

These are not options to consider after we have defeated the pandemic. It is essential to "raise the floor" at the height of the pandemic because COVID-19 has a compelling moral impact. If it results in massive and unequal suffering, it could confine the whole country to an increasingly fractured social, political and economic future long after we have beaten this virus.

# COVID-19: THE GOOD NEWS, THE BAD NEWS AND THE UNCERTAINTY

**Prof. Stephen Blank, Senior Fellow, ISSP, uOttawa**

On Thursday, September 24, the ISSP hosted Food for Thought event Science, Society and Policy in the Age of COVID-19: What Changes will Stick? Which will Prove Fleeting?. This blog is an adaptation of the speaker's remarks.

When thinking about which trends will stick in an age of COVID-19, I see bad news and good news. Whether we should be more pessimistic or more optimistic remains deeply uncertain. But even if the pandemic can be brought under control (a mighty assumption), the knock-on effects are grim.

## Poverty

The U.N. recently reported that the number of people suffering from acute food insecurity could double by the end of 2020 to more than 250 million. The New York Times recently reported that there are now about 45 million more poor in Latin America. Poor equals hunger equals malnutrition equals disease, and not just COVID.

I expect waves of disease over the next year and a scaling-back of campaigns to reduce poverty, hunger and disease such as HIV and malaria. The Gates Foundation says that the percentage of the children who received all of their recommended vaccines has declined to where it was 25 years ago. In short, we can expect the knock-on effects of the pandemic lead to much greater global disease and perhaps even more pandemics.

## Migration

We cannot look at the coronavirus alone. Our climate is changing more rapidly than anticipated even a few years ago and the poorest segments of the world are the likeliest to suffer. The number of people forcibly displaced worldwide has doubled over the past decade to 80 million. We are just beginning to estimate the impact of climate driven migrations, and not just in poorer countries. Think of the U.S. Gulf Coast or the 500,000 people in Oregon who had to be ready to leave their homes because of fire and the multiyear extreme drought in the US Southwest. These migrations also raise the possibility of disease outbreaks in encampments like those in Syria, Greece and Sub-Saharan Africa. As Al Jolson said, you ain't seen nothing yet.

## Inequality

The most significant trend of the past decades has been the decline of people living in extreme poverty. The Gates Foundation reports that this trend has been halted. Poorer communities in poor and wealthier countries alike have been hardest hit by the virus.

In many wealthier as well poorer communities, urgent time has been lost. A survey by Common Sense Media showed that 66% percent of US teens in private school said they were connecting with their teachers once a day or more during the pandemic, versus

31% of public school students. In terms of access to computers, Internet, broadband and even learning pods, the difference between wealthiest and poorest is vast. Globally, UN officials estimate that at least 24 million children will drop out of school and get sucked into work because of the virus.

The growth of inequality in the US is stunning. Our 643 billionaires have racked up $845 billion in collective wealth gains since March. Half of that $845 billion was captured by the 15 wealthiest on the list, and Jeff Bezos, Mark Zuckerberg and Elon Musk captured 16% by themselves. The richest Americans get richer while 21 million Americans are unemployed.

**Innovation**

The good news is that COVID has created enormous space for innovation. Many new tools are at hand and there's no shortage of capital for investment. All aspects of human interaction may be well transformed in the next decade.

Until recently, I saw a doctor in the same fashion as my father's patients in 1936—make an appointment, wait at the office, see the doctor. I now see my oncologist by tele-medicine; my Apple Watch warns me if it thinks I am having atrial fibrillation; toilets in Japan can screen you for cancers. All this is just the beginning of an enormous transformation in health care.

For education, the possibilities for mixing and matching between digital and physical is enormous. In a few years, just like computers and flip phones, the tech we are using now will seem primitive, even quaint. The arts and cultural institutions face the similar challenge of choosing among a vast array of alternative technologies to improve the accessibility of their holdings and extend their reach outside of the brick and mortar institutions.

**Uncertainty**

The uncertainty is this: will these innovation be widely available? Higher education could be much less expensive with new technology, or the best technology might be found only in the wealthier schools. Medical procedures and treatments could be much less expensive with new technology, or new technologies might be found only in the wealthiest hospitals. There is enormous opportunity to improve access to education and health care, which are critical sources of inequality.

I often talk with my students about building the first Model T. Henry Ford had to construct a whole factory, train thousands of workers, develop supply chains, and bring in the rubber and iron to build those cars. Many of today's innovations are based largely on software. The upfront investment is modest compared to what was needed to launch industrial projects, the ability to correct as we go along is great.

This is really a question of whether social policy will track or lead technological innovation, or whether social policy will fall behind this wave of innovation. Put it another way: Will some (or any) of the emerging innovations be treated as public goods? Or will most (or all) be seen as marketable commodities? Will innovations, for example, that profoundly improve access to healthcare and education be seen as public goods, available at low or no cost to all? Or will they be viewed as luxury products available only to those who can pay for them?

## CANADA NEEDS A NATIONAL DATABASE TO TRACK COVID-19 VACCINATION

**Prof. Michael Wolfson, Faculty Affiliate, ISSP, and Member of the Centre for Health Law, Policy and Ethics, uOttawa**

Originally published by The Globe and Mail on December 15, 2020

With the first Canadians getting the COVID-19 vaccine this week, the importance of effectively monitoring the rollout of vaccinations is coming to the fore. The federal government has recognized the importance of monitoring data, at least within federal jurisdiction, and the Prime Minister himself recently emphasized the federal government will "be a partner with the provinces ...[for] better co-ordination of data."

The government response nicely recognizes the lead role of the provinces in setting priorities for vaccination. And the federal government appears sanguine about the existing jumble of layers of vaccine-monitoring data systems, including for adverse reactions.

This co-operative federalism is wonderful – when it works. However, for anyone with experience in software, databases and statistical analysis, the vaccination monitoring described sounds like a dog's breakfast. That's not good enough when lives are on the line.

Standard adverse-event reporting systems in the U.S. and Canada missed the scandalous connection between Vioxx and heart attacks. Something more reliable is essential for COVID-19 vaccinations, not only for safety but to avoid misinformation from anti-vaxxers.

Canada has world-class potential for statistical surveillance of adverse health events in the electronic health databases housed in each province. But these data often reside in multiple impenetrable silos within each province.

The COVID-19 pandemic has dramatically increased the urgency of breaking down these data silos. One of the most important blockages has been provincial insistence that health care is their show; the only role for the federal government is to hand them more money, no strings attached.

This has to stop.

Specifically, for a vaccine registry and monitoring, the obvious solution is a single standardized system, mandated by the federal government using its constitutional jurisdiction for statistics. The federal government could commission an organization – Statistics Canada is an obvious choice – to immediately develop a secure, real-time data-collection portal or site for critical information on every person who is vaccinated for COVID-19.

This software system would be used in clinics, doctors' offices and drugstores. The nurses and other health professionals giving the vaccination would enter information, exactly as done for flu vaccinations. But now, some of the information would be federally mandated, over and above anything recorded for patients' medical records and provincial billing purposes.

Decades of experience have shown that rhetoric about federal-provincial co-operation has continually failed, resulting in the patchwork of incoherent and incomplete data that have been limiting too much of the science for managing Canada's pandemic, and the health-care sector more generally.

The federal government was successful in eliminating doctors' extra billing by holding back transfers to the provinces. But with no strings attached, a number of provinces have been shamefully clawing back some of the COVID-19 cash payments the federal government has sent to the neediest Canadians by reducing or cancelling their social assistance. To ensure effective implementation of this monitoring solution, strong fiscal sanctions should be included if provinces do not co-operate.

Real-time federally mandated vaccine monitoring will provide crucial information on vaccination take-up not only by province, but also by neighbourhood, type of vaccine, race/ethnicity and occupation – enabling provincial and local public-health authorities to target vaccinations to the vulnerable. This is not federal intrusion into provincial jurisdiction; it is simply the most efficient constitutionally enabled way to provide critical information.

There is no reason that this kind of software could not be adapted and made available across the country for vaccinations in a matter of weeks, along with speedy agreements on data standardization.

While confidential personal data are involved, Statistics Canada has for decades collected exactly such data in the monthly labour-force survey (recently doing so online), with exceptionally strong safeguards for security and confidentiality.

There are obvious privacy concerns. However, we must be careful not to allow them to overshadow the potentially huge benefits. The framers of Canada's constitution, over a century and a half ago, recognized the fundamental importance of critical statistical information that is national in scope.

While the proposed data flows may raise concerns among provinces and territories regarding ownership, these can be ameliorated with clear ground rules on how they can access these data.

Privacy commissioners across Canada have adopted the principles of necessity and proportionality as the central criteria for data collections that raise privacy concerns. For pandemic vaccination, with the deaths of potentially thousands of Canadians in the balance, these criteria would clearly be met.

Now, more than ever, Canada needs a strong national approach for monitoring data to ensure vaccination proceeds effectively, fairly and safely.

## MOBILIZING AFRICAN, CARIBBEAN, AND BLACK (ACB) COMMUNITIES FOR EFFECTIVE COVID-19 RESPONSE

**PROF. JOSEPHINE ETOWA, FACULTY AFFILIATE, ISSP, FULL PROFESSOR, SCHOOL OF NURSING, FACULTY OF HEALTH SCIENCES, uOTTAWA AND ONTARIO HIV TREATMENT NETWORK (OHTN) RESEARCH CHAIR IN BLACK WOMEN'S HEALTH/HIV CARE**

As we mark Black History Month, we are reminded of the increased burden of COVID-19 on African, Caribbean, and Black (ACB) communities and the urgent need for evidence-based, racially responsive healthcare. In both the ACB and healthcare provider communities, pandemic-related challenges are real and mounting. ACB people are confronted with different realities, including closeness to hotspots due to poor employment situations, use of public transportation, and denser housing, all of which make social distancing far more difficult. Healthcare providers are also pointing to the limited resources available for culturally safe COVID-19 care for ACB people.

These intersectional problems are the basis for the COVID-19 ACB Providers Project (CAPP), a new collaborative initiative spearheaded by uOttawa's CO-CREATH lab, a hub for community-based researchers, students, and professors conducting critical research to advance health equity and transformative community engagement. We are collaborating with the HIFI lab at St. Michael's Hospital and the Canadians of African Descent Health Organization (CADHO). Together, we are engaging ACB communities and healthcare providers to examine the challenges they are facing and identifying strategies to build capacity to address COVID-19 related-health outcomes.

To date, we have surveyed 249 primary, secondary and tertiary healthcare providers in Toronto and Ottawa. Respondents cut across various healthcare providers, including doctors (17%), nurses (54%), and others, including pharmacists, respiratory therapists, community health providers, and public health experts (29%). Most (72%) respondents reported that almost half of their patients are African Caribbean and Canadian Black. We have also conducted about 80 individual interviews with ACB community members, health care providers and policymakers in Ottawa and Toronto. All three groups acknowledged the disproportionate impact of COVID-19 on the ACB community and have pointed to systematic racism, comorbidities, and social conditions as key causes.

Discrimination is a barrier affecting access to healthcare services, and it is vital that healthcare providers better understand the needs of ACB patients. ACB interview participants pointed to the importance of more meaningful engagement with healthcare providers in developing strategies, policies, and programs to better address these needs, including COVID-19 testing, treatment, and vaccination rollouts. As my collaborator Dr. Ruby Edet, Vice President of CADHO, has noted, ACB professionals must be at the forefront of creating solutions for their communities and tailoring interventions.

Our preliminary findings underline how factors such as socioeconomic vulnerability, comorbidities, critical health literacy, and discrimination affect healthcare access and outcomes in ACB communities. They also highlight the need for anti-racist healthcare knowledge, training, and service provision to ACB communities in both Ottawa and Toronto.

Data collection for the COVID-19 ACB Providers Project is ongoing. We are targeting 600 surveys of healthcare providers and 100 in-depth individual interviews with ACB community members, health care providers, and policymakers. Our hope is to develop a rich dataset that covers topics such as COVID-19 knowledge and practices, provider preparedness, cultural safety, discrimination, and access to COVID-19 related services for ACB people. Properly mobilized, this research can help create more just and more equitable health outcomes for some of Canada's most vulnerable populations.

# MINORITY HEALTH DISPARITIES AND COVID-19

**Prof. Rukhsana Ahmed, Faculty Affiliate, ISSP, uOttawa, and professor, University at Albany, State University of New York; Prof. Jeanette Altarriba, and Prof. Dina refki, University at Albany, State University of New York**

On Thursday, January 28, at 12:00 PM, the ISSP hosted [Food for Thought: Uncovering Health Disparities among Immigrant Communities during the COVID-19 Pandemic](). This blog is an adaptation of the lead author's remarks.

According to the [2019 American Community Survey](), there are 44.9 million foreign-born people in the United States—roughly 13.7 percent of the total population. Of this foreign-born cohort, 44 percent are Hispanic or Latino, 27 percent are Asian, 17% are white, 10% are Black; 51.6 percent are naturalized citizens, and 48.4% are non-citizens. There is also an estimated 10.5 million unauthorized immigrants. It is a huge and growing slice of the United States.

COVID-19 has inflicted [disproportionate harms]() on these communities, from poorer health and education outcomes to higher unemployment. What are the structural causes for health disparities in these communities? Over the past several months, we have undertaken a series of interdisciplinary projects focused on COVID-19 and its effects on immigrant populations, and especially population groups with Limited English Proficiency (LEP). In this blog, we will discuss recent findings on some of the structural barriers that are driving these health disparities in the United States, and approaches to addressing them.

Language can be an enormous barrier. Non-English-speaking populations tend to be of working age, yet participate in the labour force [at a lower rate]() than English-proficient counterparts. They also tend to lack access to health insurance, public assistance, and linguistically and culturally appropriate services. Limited English proficiency puts them in a vulnerable position, particularly when it comes to accessing health care. For undocumented immigrants, there is also [a fear of being deported]() and separated from families. So this population opt to be invisible and live in the shadows which further compounds health disparities. They tend to rely on emergency rooms for their urgent care which in turn exacerbates costs.

The literature shows that poor communication in health care can impede access to preventive care and lead to poor health care experiences and [treatment outcomes]() for immigrant populations. Oftentimes, medical ethics can be compromised, arising from a lack of understanding and access to culturally and linguistically appropriate services. These groups are also less likely to be able to provide [informed consent]() and therefore are more likely to undergo costly and unnecessary diagnostic tests. Often, these groups are also mis-diagnosed, as well. We have seen cases of malpractice, negligence, legal liability, and lower overall patient satisfaction. All of these factors eventually lead to higher health care costs.

So what to do to address the situation?

Evidence-based interventions can help us mitigate, manage, and prevent these minority health disparities. The literature shows that the use of health navigators, community health workers, trained interpreters, and home visiting programs can all be effective. In the United States, this would include culturally and linguistically competent and trained community health workers who are able to deliver information and culturally appropriate services to clients. Achieving this goal necessitates working with them and their families in their native language on health prevention, education, insurance, and enrollment and treatment plans.

Trust is a crucial piece of engaging and mobilizing LEP patients. Trusted cultural workers must proactively reach out to and serve immigrants where they live. *The pandemic has revealed a lack of trust in public health systems among immigrant communities*. Community partnerships and cross-sector collaborations have successfully improved health outcomes and are in fact mutually beneficial, allowing all partners to advance their mission more effectively. One successful example is the Australian Changing Cultures Project, which used partnerships between health, education, and resettlement sectors to integrate language literacy, mental health services, and basic education into workforce development initiatives. Community partnerships can also involve organizations that focus on faith, senior members of a cultural community, and revered members or leaders who possess the trust of community members. Processes that engage those community representatives would favor and hasten behaviors that would lead to greater utilization of services and completion of effective intervention programs.

For organizations working on this outreach, proactive policies and programs can help as well. For example, human resource policies can diversify staff to reflect the communities they are serving and allocate more resources to trained interpreters who are proficient in different languages and medical terminology. Governments can also be more proactive. Is attention being paid to proactive outreach to immigrant populations? Are issues of diversity, equity, and inclusion and language assistance being incorporated into strategic plans? Are there proper structures for social programs, collaborative governance, public consultation and recruitment and diversification of the public workforce? Moreover, we know that individuals may also posses challenges identified as disabilities or impairments (e.g., deafness) that adds an additional concern when mapping out health related policies and protocols.

There is significant overlap between core aspects of the immigrant experience and social determinants of health. The immigration process itself can be a social determinant of health, in addition to economic instability and a lack of access to housing, employment opportunities, food, financial services, education, and culturally and linguistically competent services. COVID-19 has demonstrated just how interconnected these determinants are, and has made the search for evidence-based solutions more urgent than ever.

## THE PANDEMIC: A HALF-TIME REPORT

**Dr. Nigel Cameron, Senior Fellow and former Fubright Research Chair in Science and Society, ISSP, uOttawa**

**Managing risk, one year on**

When Dr. Anthony Fauci was asked some weeks back when he thought a semblance of normality would return, he replied Q3 or Q4 of 2021; now he's less sure, as the emergence of new variants bringing increased transmissibility and/or vaccine resistance has thrown a series of spanners in the works. But his remarks offer us a ballpark expectation from the expert best-placed to judge; all being well, we're around half-way through. UK Prime Minister Boris Johnson's slick assertion that it will be "over by Easter" looks like just another mendacious crowd-pleaser.

Hard to believe it's been nearly a year since I wrote my last ISSP blog on the challenges Covid-19 posed to governments. As the virus continues to snake around the planet and forcibly seize our attention, time has seemed both to stand still and slip past at an unnerving pace. Our lives have been radically re-focused by the interplay of three forces: the virus itself, this deadly thing with its tricky transmission and myriad symptoms; the efforts of governments, from shrewd to bumbling and worse, to manage its impact; and our personal and familial assessments of risk, informed by our coping resources, financial and psychological.

It's an especially curious experience for those of us professionally engaged in discussing science and technology and policy. We're rats in our own lab. As the gantries proclaim over US freeways, we want to Arrive Alive!

Like you, perhaps, I keep turning to Fauci for vaccine prognostications but also news of his personal approach to risk management—which includes 6,000 IUs of Vitamin D, and entertaining guests outside. (In case you did not know, this exemplary human being has been working 16-hour days, every day, since January. Death threats mean he has a 24-hour security detail. On Christmas Eve he celebrated his 80th birthday.)

Like you, perhaps, also, I've been tracking the personal responses of people I know and admire, like storied Harvard geneticist George Church, who has "hardly left his home" since last March. I've been particularly interested by the survey of hundreds of epidemiologists and virologists conducted by The New York Times, which asked them some pretty direct questions about their behaviours and expectations. Here's a sampling from December:

"I am optimistic that the encouraging vaccine results mean we'll be back on track by or during summer 2021," said Kelly Strutz, an assistant professor at Michigan State University.

But epidemiologists are a very cautious group. Most said that even with vaccines, it would probably take a year or more for many activities to safely restart, and that some parts of their lives may never return to the way they were.

Karin Michels, professor of epidemiology at UCLA, said it would probably be many years until it was safe enough to "return to approximately the lifestyle we had… We have to settle to live with the virus."

I'm not quite as risk averse as George, but close. In the meantime, I'm sending my kids and their families goody bags of medical-grade PPE and HEPA filters—and more good advice than they have appreciated!

**An astonishing variety of responses – to the same thing**

In their speedy and incisive new book The Wake-up Call Adrian Wooldridge (of The Economist) and John Micklethwait (Editor-in-chief of Bloomberg) set our pandemic management in the context of the long-term decline of the West and its institutions. The blundering response of most western nations to the crisis stands in stark contrast to the competence of China and Singapore and other Asian spowers, and also to two "Western" nations, Australia and New Zealand. They are both island states, which is quite a plus for border control. But there again so is the UK. Both Canada and the US share these advantages of distance and potential isolation. It looks like Belgium, with 1,847 deaths per million, (where I now live) and the UK, with 1,632/million (where I was born), are at the top of the death table (with tiny Slovenia squeezed between them), even if the United States, with 1,366/million (and where I lived for 30 years) has been the most anarchic.

While the US (until January 20) has been conspicuous for its lack of policy, the UK plainly takes the biscuit for too much, and ensuing chaos. Some kind person recently calculated that since the pandemic started the UK government has shifted its Covid policy no less than 64 times. Add the revelation that the Prime Minister missed the first five Covid meetings of his COBRA emergency committee, and then backed a key advisor who had shamelessly broken the Covid rules, and you begin to see why things quickly went south. In a public health crisis simplicity, consistency of messaging, and trust are the vital currencies.

Canada has fared better, at 541 deaths per million, despite hard-hit outlier Quebec (1,155/million). But the antipodean contrast with Europe and North America is extraordinary. Australia? 35.84/million. New Zealand? A mere 5.08/million. (Most of these figures from Statista, February 4, 2021.) The differences across the Five Eyes, which have so very much in common, are rather remarkable.

There's been a shocking lack of interest in Europe and North America in how countries that have handled Covid best are faring. Our governments have been happy to shelter behind the notion that if they've done badly it's because everyone has done badly. Yet some countries have done extraordinarily well. Greater press interest in how they have managed things would have put pressure on western governments to shift their approach, as they have struggled with mass infections and fatalities, including the scandal of the slaughter in care homes (here's a Canadian perspective).

It's worth a quick look at some success stories before we look ahead. Since China's claims may be suspect, what about Singapore and South Korea? Using deaths/million as our guidepost, Singapore is at 5.08 (identical to NZ), and South Korea at 28. As others have pointed out, these Asian societies may be more conformist with better-behaved citizenry, and of course Singapore tends toward heavy-handed government. Yet the foresight and competence of these governments are striking. As Micklethwait and Wooldridge point out, Singapore began taking the temperatures of passengers arriving from China **on January 22 of last year**. By the middle of February, South Korea had closed airports, schools and military bases and advised quarantines in two major cities. Italy announced a lockdown on March 9. France finally imposed a lockdown on March 17. The UK, where PM Johnson insisted on shaking hands with everyone when he visited a hospital, waited one further week—a deadly delay that caused thousands of deaths. In the first three months of 2020, more than 18 million people flew into the UK, including on hundreds of flights from Wuhan. In Hong Kong, despite its integration into mainland China, there have been only 185 deaths to date; fewer than 25/million.

Back to the Five Eyes, and in particular the antipodean pair. How has Australia, with 25 million people, managed to keep total fatalities below 1,000? And New Zealand, with 5 million, to suffer just 25? As we have noted, they are islands. The key difference between them and the UK has been their capacity for agile policy development, a focus on data, and trust-building across political divides and the national/federal levels (for which Australia convened a "National Cabinet"), per a McKinsey review. Together with these competencies has gone a commitment to eliminate the virus. This is the core issue. Not merely, as in the UK and most western nations, merely to "contain" it—and control the flow of victims into hospitals, ICUs, and graves—but to get rid of it.

## Science and policy choices

Policymakers and scientists engage with one another continually. The special issue for us is the role of science and scientists at a time of crisis, where governments face urgent policy choices. The climate crisis offers a partial parallel, though it's a slow burn. Our once-in-a-century pandemic is shining bright light on the proper role of science and its practitioners, and it's plainly not simple. Since the Second World War, when Vannevar Bush in the US and Churchill's friend Frederick Lindemann played outsize roles in advising their respective leaders, it's been plain that science has a key role in government.

But what? At one extreme, in Sweden, policy leadership on the Covid front seems to have been placed in the hands of epidemiologist Anders Tegnell—who according to a recent article in Foreign Policy "botched" the response, which even the King has declared a "failure." According to the article, from the start he and colleagues took the fatalistic view that the virus would sweep the population and eventually establish herd immunity, so Sweden's restrictions were among the lightest in the developed world. As a result, they suffered many more casualties than the other Nordic countries (1,160/million compared with 372/million in Denmark, 124/million in Finland and 107/million in Norway). The big surprise is that the Swedes also suffered a greater drop in GDP than either Finland or Norway.

At the other extreme is the United States. The Trump administration was engaged in an almighty tussle with scientists like Fauci and the CDC while the President touted crank cures, and alternated between "declaring war" on Covid and describing it as fake.

Somewhere in between, Boris Johnson has well illustrated a clear problem by [constantly claiming](#) to be "following the science" while actually hiding behind it as a cover for dithering, U-turns, and cherry-picking. (Micklethwait and Wooldridge dismiss him summarily as "incompetent.") Small surprise that this chaos has given rise to an act of rebellion by the government's former Chief Scientific Advisor, the formidable Sir David King. The official government advisory committee is referred to by the cringe-worthy acronym SAGE ("Scientific Advisory Group for Emergencies"). Sir David has called together a distinguished alternative group of scientists and named it "[Independent SAGE](#)". They write their own reports, and host a weekly 90-minute Zoom call, open to the press and public, where they review the latest data, and critique the government. Their core recommendation? That the UK needs a "zero Covid" policy. In other words, in the language of epidemiology, a strategy of "elimination" or "suppression", rather than "containment", much like Australia, New Zealand, and the Asian nations.

With all of this in mind, some facts have become increasingly clear.

1. Sweden has demonstrated two useful data points. First, their "light" approach to restriction has not brought any economic advantages. This shows that policymakers are not confronted with a competition between public health and the economy. The two will sink or swim together. Secondly, the idea that "herd immunity" can be built by permitting the circulation of the virus through the population is a dangerous fallacy. Sweden sought to do this, and early on the UK flirted with the idea. But at what cost? [According to WHO](#), while the figure for Covid is not yet known, measles requires 95% and polio 80% population exposure. Plainly, for Covid, the costs in terms of infection and death of achieving immunity in this way would be very high. In any case, we don't know how long immunity acquired in this way will last. The evidence increasingly suggests not long.

2. The general "containment" strategy adopted in Western Europe and North America, with a focus on aligning disease prevalence with available healthcare resources, has—entirely predictably—led to the emergence of variant strains of the virus with increased transmissibility, which makes it far harder to keep the R0 below 1. It also imperils vaccine effectiveness. The less circulation, the less opportunity for the emergence of variants. As I write this, [South Africa is abandoning its use of the AstraZeneca vaccine](#) in light of a study pegging its effectiveness against the "South African" variant at just 10%.

3. The competence of governments in applying a "containment" strategy has varied, with the worst-affected countries (notably Belgium and the UK, as we have seen) experiencing very high fatality levels. Political pressure on governments to lessen the impact of restrictions has led to constant shifts in policy, with loosening of rules continually leading to an upping of R0 and their being tightened again. We have noted the UK's 64 policy shifts. In Belgium, where infections remain very high, the government is re-opening of hairdressers and tattoo parlours—against the advice of its expert committee. Even within the European Union there is wide divergence. In Germany, which has a lower incidence of infection, all schools remain closed. In Belgium, not only are schools open but parents have been threatened with expulsion or worse if children do not attend.

4. The global economic impact has plainly been enormous, though far from uniform. As a recent report from the Brookings Institution points out, Covid has devastated sectors focused on the movement of people, while leaving largely unscathed those focused on the movement of information. According to a recent review in Forbes, developed economies contracted in 2020 by 4.7%; developing economies (excluding China) by 8.1%. China, remarkably, has kept growing.

**Looking forward**

What lies ahead? Until the emergence of the new variants it seemed likely that—as in the movie Contagion—vaccines would end the crisis. But the combination of more transmissible variants and vaccine-resistant variants (Moderna and Pfizer are working on updates), with the vacillations of government policy in country after country, increasingly suggest otherwise. As leading expert Ali Mokdad has put it: "It's a grim projection, unfortunately.... This virus is here to stay.... We're not going to reach herd immunity... It's going to be seasonal, and it's going to be like the flu, and we're going to need to be ready for it," he said. If he's right, it will indeed be like the flu—except with a higher case fatality rate (for which there are many estimates; a complex issue, well discussed here).

As we approach halftime, five points stand out for policy-makers.

1. **It's not too early to start post-mortems.** The botched responses of many governments to the pandemic need to be scrutinized as a matter of urgency. In due course many nations will wheel out cumbersome Royal Commissions and Judicial Inquiries and whatnot. This process should start now, and ask searching questions of decision-makers whose decisions, starting in the early weeks of 2020, have got us where we are now. We need to shine light on poor choices and poor decision-makers precisely because we are not out of the woods. I'd like to know, for example, how many heads of government and health ministers have actually read, cover-to-cover, John Barry's definitive study of The Great Influenza. Anyone who has not should be summarily fired. How many have called on the governments of Australia and NZ for aid in their decision-making? And, of course, how many have claimed, like Boris Johnson, to be "following the science" at every twist and turn, when that plainly has been dishonest? The inquiries need to begin in parallel with our management of the continuing pandemic.

2. What policies have our governments have actually been pursuing? insofar as there has been any policy beyond seeking to avoid the overwhelming of health systems, for which "containment" is a polite term. After initial lockdowns and travel restrictions, last summer saw the disease on the ropes in many places; so—surprise!—policy-makers decided to open everything up again. **The lessons from the Spanish flu are not that complicated.**

3. As the cautionary tale of Sweden shows, **handing science advisors the actual policy-making role may not be a good idea**, since scientists have highly particular expertise and their views on anything beyond it can be as good or bad as anyone else's (the classic case is that of James Watson, of Watson-and-Crick fame; his racism and eugenicism have long been well-known). A post-mortem of the UK's experience here may prove instructive. The "SAGE" group's work has been secretive, and occasionally leaked. Early on the PM's top advisor, Dominic Cummings, attended their meetings. At every stage, the PM has put the Chief Scientific and Chief Medical Advisors on the podium beside him as he has issued constantly shifting pronouncements. There may be no ideal model. But the gross politicizing of "the science" as cover needs to be outed. One would have hoped that senior scientists would step away publicly from leaders who are incompetent and seeking political cover. Yet Whitty and Vallance, Johnson's press conference props in the UK, are still in post.

4. With the EU and UK at unseemly loggerheads, **vaccine wars are already breaking out.** This is just the beginning. The developed economies are banking on re-opening as vaccines are rolled out. Poorer nations? WHO is urging vaccine sharing with the developing world. But it's hard to see the UK holding off on vaccinating 30-year-olds in the summer so they can send the precious shots to old folk in Malawi. Of course, such a move would not simply be an act of charity. If Covid is to be suppressed, and ultimately eradicated, the effort must be global, or the resurgence of fresh contagion will be a constant threat. The eradication of smallpox took an enormous effort.

5. While our attention is focused, **this is the time for policy-makers to revisit the question of pandemic and wider disaster-preparedness**, not simply by building proper stocks of PPE but addressing asymmetric threats of other kinds. Chief among them is the coming antimicrobial crisis as the world heads toward what former WHO director Margaret Chan has called a "post-antibiotic era." Meanwhile, there will likely be other zoonotic diseases. Covid-19 could be followed by Covid-21. But nothing will come close to the end of antibiotics. Just perhaps, the terrible cost of this pandemic could leave us better prepared to head that off.
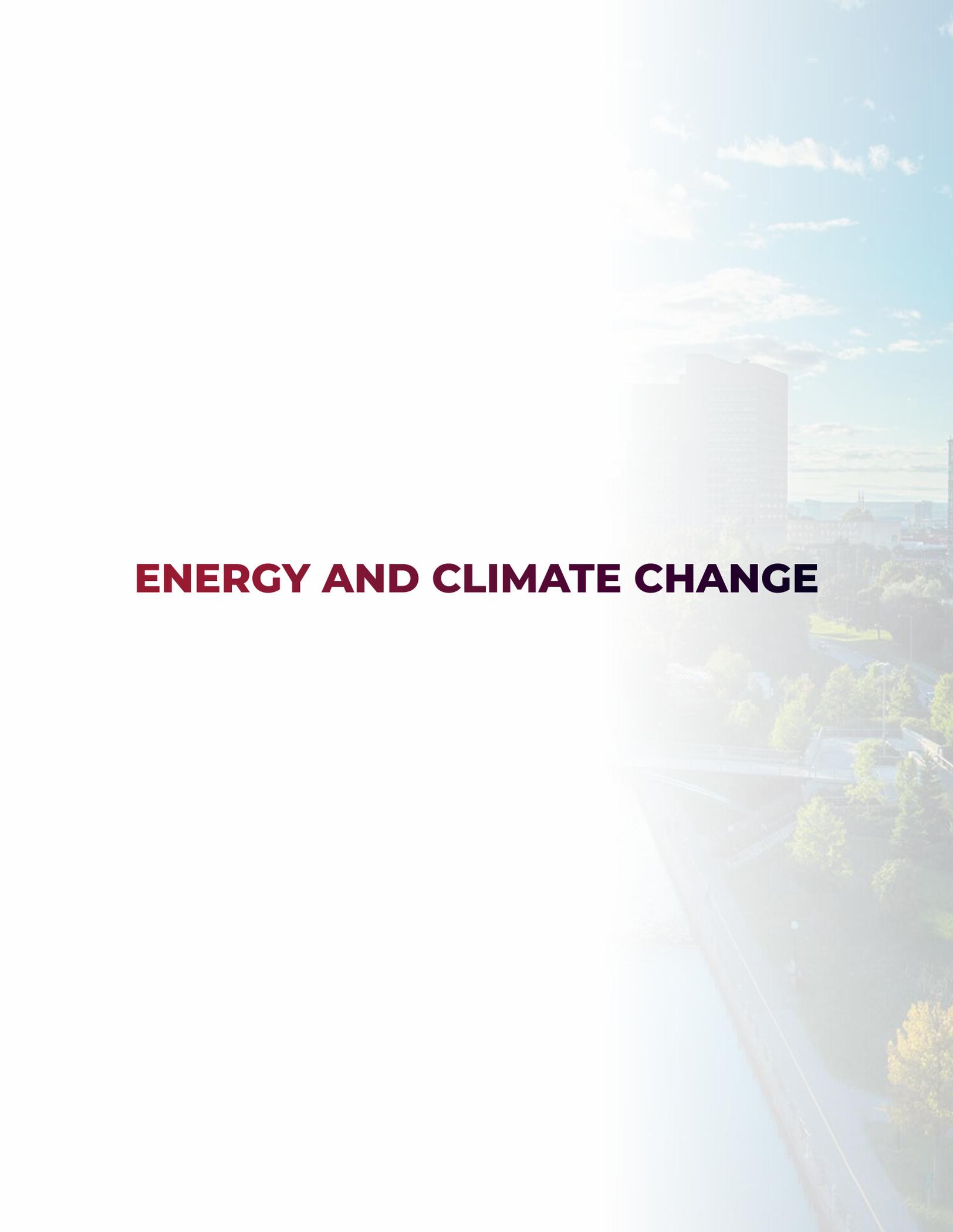
# ENERGY AND CLIMATE CHANGE

## ALIGNING SCIENCE, SOCIETY AND POLICY FOR THE ENERGY TRANSITION

**Ginny Flood, Chair, Clean Resource Innovation Network (CRIN)**

On November 17, 2020, the ISSP hosted a panel entitled *Aligning Science, Society and Policy for the Grand Challenges of our Time* at the Canadian Science Policy Conference. This blog is an adaptation of the author's remarks.

Canada's energy future will be very different than we know it today. The future will include both clean hydrocarbon energy and renewable resources. It is vital that our policy environment allows for diverse and inclusive pathways built through collaboration to achieve our Paris targets and beyond.

Policy will shape how we approach the grand challenge of reaching net-zero, and it will also inform public perceptions. In 2015, I moved to Alberta to join the oil and gas sector and have come to understand the diverse views that drive conversations about oil and gas and the energy transition.

I believe we need be open to all solutions, rather than choosing one way over the other. If we put all of our eggs in one basket, limit our pathways, and mandate specific outcomes, it cuts off opportunities and innovation. An inclusive approach includes Canada's oil and gas companies, who spend more annually on clean tech innovation than most other sectors. At the same time, we also have to realize that it is not just one sector, region or group that will drive emissions reductions. We must ask how policy can support diverse, collaborative and science-intensive efforts.

We're stronger working together. This is the philosophy we have adopted at the Clean Resource Innovation Network(CRIN). Our approach is a Team Canada approach, focused on diversity and inclusion across all sectors, regions and perspectives.

We are bringing in a multitude of different interests that traditionally wouldn't sit at the same tables to talk about clean energy innovation. We are connecting oil and gas with academia, governments, investors, incubators, SMEs, clean tech companies, and Indigenous communities and businesses, with a focus on accelerating the research, development, deployment, and most importantly, the commercialization of clean technologies. We are a convenor, a connector of the nodes within our innovation ecosystem.

Policy development has become increasingly complex and societal expectations are evolving. I often see science and data being used as a tool to support or oppose a specific policy direction, which can create a perception of misalignment between the science, society and policy imperatives. But if we can agree on desired outcomes, then innovation and policy can work together to provide the path of least resistance. While developing new climate and environmental policies, governments should focus on outcomes (i.e., reducing GHG emissions) rather than picking winners and losers.

We can think about this in concrete terms. Canadians understand climate change is real, but their opinions on how to reduce emissions vary significantly across Canada. For provinces that have significant renewable energy, it makes a lot of sense to advocate for electrification. But for resource-rich provinces, their pathways to reducing emissions are very different. Traditional sectors like agriculture, mining and oil and gas are all investing in technologies to reduce emissions. However, the public perceptions and the public acceptability of these approaches differ greatly.

Our focus needs to be on reducing emissions across all regions and sectors to achieve sustainable, long-term impacts.

That is the real challenge of this polarizing debate; we need diverse groups to approach these challenges together. Innovations in our energy sector will effectively contribute to reducing emissions, and be applicable for other sectors, when they are broad, inclusive and pan-Canadian.

# WHAT ROLE CAN HYDROGEN PLAY IN CANADA'S ENERGY FUTURE?

**Prof. Kamiel Gabriel, Senior Fellow, ISSP, uOttawa and Professor, Faculty of Engineering and Applied Science, Ontario Tech University**

On January 19, 2021, the ISSP hosted a panel entitled *Hydrogen and Canada's Energy Future: Opportunities, Challenges, Next Steps*. This blog is an adaptation of the author's remarks.

Hydrogen is an important part of Canada's energy future. A key obstacle to a full-fledged hydrogen economy lies in identifying a sustainable, low-cost method of hydrogen production with reduced dependence on fossil fuels. Globally, about 96% of today's hydrogen is derived from hydrocarbons (e.g., natural gas, gasification and coal) via steam methane reforming using natural gas. This method is not environmentally sustainable and produces large amounts of carbon dioxide as a by-product.

Although most of it currently comes from fossil fuels, there are a number of other ways to produce hydrogen. Water electrolysis with electricity from renewable sources has one of the lowest carbon intensity footprints. However, it has some drawbacks as well. There is limited capacity, it is only as clean as the electricity source, and it is more affordable in jurisdictions where the cost of electricity generation is already low. Alternatively, electrolysis via high temperature thermochemical cycles is economically one of the best options for shifting from high marginal cost generation to low marginal cost generation with no greenhouse gas emissions.

The focus of Canada's hydrogen strategy should be on meeting the current challenges in producing low-carbon intensity, low-cost hydrogen from renewables at large enough scale to meet growing industrial and transportation demands. Hydrogen is an economically viable option to solve the curtailment of electricity supply (known as the Duck Curve). The development of regional blueprints (or nodes), including unique regional opportunities in this sector, is crucial to create demand and establish a supply chain at this early stage.

Currently, Canada has globally established industries in the production of hydrogen from water electrolysis (e.g., Hydrogenics/Cummins). Yet many argue that Canada falls short of fully exploiting the technology's economic and environmental potential. In this regard, domestic deployment of hydrogen is critical to supporting the hydrogen and fuel cell sectors, as well as meeting climate change objectives by 2050. The earlier the deployment of the hydrogen economy starts, the sooner infrastructure development and end-user acceptance will come into place, allowing the full realization of longer-term projections on uptake and associated benefits.

I expect adoption of hydrogen to primarily focus on energy-intense applications where electrification is not technically or economically feasible, and where economics that rely on low-cost natural gas are more suited to energy dense fuels. This includes using hydrogen as a fuel for long-range transportation and power generation, providing heat for industry and buildings and as a feedstock for agricultural and industrial processes.

There are a number of steps that Canada can take to accelerate the deployment of a hydrogen economy. There is a clear need to demonstrate that hydrogen can be produced at low-carbon intensity and low cost. We also must establish the infrastructure necessary for large-scale deployment of hydrogen, including production, storage and transport. Lastly, investors and companies require greater encouragement to establish the full value chain for hydrogen deployment locally, nationally and internationally. It is important that industry and investors see expressed support from municipal, provincial and federal governments with targeted meaningful incentives to stimulate small- and medium-sized enterprises (SMEs) to enter this new economy with as few regulatory hurdles as possible. Spurring innovation in this sector is key. Government should consider creating a start-up fund to support SMEs seeking to take their innovative solutions to markets.

The release of a hydrogen strategy for Canada is a good first step. What we need now is for governments, regulators, industrial users, and suppliers to work together towards establishing specific goals with timelines to kickstart the implementation of its recommendations.

# ENERGY SECURITY AND THE ROAD TO NET ZERO

**Prof. Monica Gattinger, Director, ISSP, Chair, Positive Energy and Full professor, Faculty of Social Sciences, uOttawa**

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The power outage in Texas is a devastating reminder of the importance of energy security. It's a powerful cautionary tale of why decision-makers need to keep electricity reliability top of mind.

This will be key on the road to net zero GHG emissions by 2050. Energy security is often overlooked in emissions reductions decision-making – most likely because in advanced economies like Canada's, we take it for granted. That we do so is a testament to energy providers' success delivering reliable and affordable fuels and power.

But challenges to energy security will be coming at us fast and furious. If decision-makers don't attend to them proactively, it will compromise climate action, the economy and human health.

What is energy security?

The International Energy Agency defines it as "ensuring the uninterrupted availability of energy sources at an affordable price." On pathways to net zero, the availability, sources and prices of energy will be in constant motion.

Take energy sources. The International Energy Agency's Sustainable Development Scenario considers what's needed to meet the Paris climate targets. It sees fossil fuels supplying 56% of global primary energy demand in 2040 (down from 80% in 2019), with the remainder a combination of bioenergy, nuclear, and renewables. The Scenario sees electricity account for 31% of total final consumption in 2040, up from 19% in 2019. And the power sector would rely far less on fossil fuels in 2040 (24% of the generation mix, down from 72% in 2019) and far more on nuclear (19%), hydro (10%), bioenergy (11%) and other renewables like wind and solar (36%).

Similar trends are expected to play out in Canada. Recent modelling by the Canadian Institute for Climate Choices yields a number of different scenarios to meet the country's net-zero aspirations. All see lower reliance on oil and gas, the rise of alternative energy sources like hydrogen and modern biofuels, and a growing role for electricity.

Electrification is a key issue when it comes to energy availability and potential disruptions to availability. As the energy system's reliance on electricity grows, so too does its vulnerability to power outages.

The challenges here are multiple, and include climate change itself in the form of more frequent extreme weather events knocking power systems offline. The more we rely on electricity for transportation, heating and industry, the more devastating the economic and social impacts will be. This will be far more than the lights going out.

The ability to integrate intermittent sources of power like wind and solar into the grid will also shape availability. Having access to firm baseload power or largescale storage to supply power when intermittent sources cannot will underpin reliability. So will guarding against cybersecurity attacks, whether by hostile foreign powers, terrorists, ransom seekers or even disgruntled employees.

All of this depends in turn on the ability to finance and construct a mind-boggling amount of electricity infrastructure. Electrification in Canada means doubling or even tripling generation capacity – new renewables, nuclear, transmission lines, and more – at a time when community expectations for engagement and government requirements for impact assessment are growing. If supply doesn't keep pace with demand, expect interruptions.

Or soaring prices, as in Texas.

Which brings us to affordability. Energy prices are notoriously difficult to predict and are shaped by multiple factors. But one thing is sure: Canadians do not sit idle in the face of high prices. Given the central role of provincial governments in the electricity sector, people channel their anger straight to politicians. Just ask former Ontario Premier Kathleen Wynne.

Overlooking energy security can lead to calls to roll back climate commitments – even if price increases or supply disruptions are not directly attributable to climate action. Texas is a case in point, where the outage is calling into question further integration of renewables into the grid despite the fact that renewables were at most a contributing factor to the blackout.

None of the above is reason to weaken climate change action. Far from it. Rather, it underscores the importance of keeping energy security front and centre on the road to net zero.

## CANADA'S JUST TRANSITION TASK FORCE CAN OFFER LESSONS FOR A GREEN RECOVERY

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After her swearing in, Finance Minister Chrystia Freeland stated "all Canadians understand that the restart of our economy needs to be green." While Freeland is correct that Canadians are more supportive than not of this approach, support is far from unanimous.

Recent polling reveals pockets of strong opposition to addressing climate change during this recession. This is to be expected; the single biggest obstacle that prevents Canadians from supporting stronger action on climate change is concern about the economy. Given the uneven and uncertain nature of economic recovery — particularly in energy-producing provinces hit by the one-two punch of the pandemic and low commodity prices — these concerns are likely to remain for some time.

As we look forward to the speech from the throne, there is no shortage of ideas to help with the rebuild. Task forces, commissions, councils and coalitions are popping up across the country, some with explicit mandates to accelerate a green recovery. But many lack a government mandate and pan-Canadian representation or are dedicated to advancing a narrow set of interests. It is an open question whether they can effectively knit together accelerated climate action and economic revitalization and depolarize the conversation to build a more inclusive vision for our economy.

Research from the University of Ottawa's Positive Energy project due later this month can offer lessons, as leaders shift their focus to longer-term supports for workers and industries reshaped by COVID-19. We examined the Task Force on Just Transition for Canadian Coal Power Workers and Communities, a federally commissioned body that consulted communities affected by the national phase-out of coal-fired electricity. We looked for aspects of the task force's activities that could help depolarize Canada's climate and energy dialogue. Along the way, we uncovered some bedrock principles that can help assure workers, communities, and businesses that recovery efforts can be both green and inclusive.

First, meet directly with the people the task force is trying to help. Any initiative seeking to influence policymaking — commissioned or not — should include consultations as part of its mandate. Transitioning away from coal power is an active choice about the type of energy we want powering our society. Accelerating a transition to low-emissions energy involves similar choices. To enact informed and durable changes, communities must perceive the decision-making processes are

fair. If you are not a part of the process, you are less likely to believe the process is legitimate. If you don't believe the process is legitimate, you are far less likely to trust the outcomes.

Consultations can offer perspective on the human implications of policy decisions. Outcomes that appear optimal on paper may clash with community values, economic development goals, or even climate targets. This is not a technocratic problem. Lives and livelihoods are on the line; they cannot easily be collapsed into numbers. Task forces should try to hear directly from people and communities, and use their experiences to create a path forward.

Second, it is vital that any task force is viewed as an honest broker, free of bias or partisan influence. It should be a point of emphasis, and is particularly important in regions that do not share the political views of the sitting government. Positive Energy's survey research has shown that when opinions on climate and energy issues are polarized, it is most often along partisan lines. Fostering nonpartisan conversations can enhance perceptions of legitimacy.

Third, the group doing the consulting should be demographically representative of the people and communities it meets with. Given Canada's distinct regional cultures, those creating task forces, panels, and commissions should consider whether these bodies resemble the groups on whose behalf they are making recommendations and decisions. This includes geographic representation. Any group looking to make recommendations at the federal level should have representation from across sectors and across Canada, including Indigenous communities. Collaboration with provinces is particularly important. Electricity and natural resources are largely areas of provincial jurisdiction. As we rethink the industries and jobs that can thrive in a carbon-constrained world, these relationships will grow in importance.

The work of the Just Transition Task Force can offer valuable lessons for decision-makers as they try to reboot Canada's economy. Conversations around long-term recovery, particularly in carbon-intensive sectors, could prove divisive or polarizing. When it comes to fostering a climate of co-operation in a potentially polarized context, policymakers should borrow what worked for the Just Transition Task Force. Recommendations developed in a silo are less likely to be unifying and less likely to survive the long haul. Soliciting broad input from regionally, politically and demographically diverse groups will help produce outcomes that are more robust and politically durable.

# TAP INTO CARBON CAPTURE'S POTENTIAL BY BUILDING PUBLIC CONFIDENCE

**Patricia Larkin, Senior Research Associate, Positive Energy; Prof. Stephen Bird, Faculty Affiliate, Positive Energy; Prof. Monica Gattinger, Director, ISSP, Chair, Positive Energy and Full professor, Faculty of Social Sciences, uOttawa**

Originally published in Policy Options on April 1, 2021

As Canada's 2030 greenhouse gas emissions targets creep closer, our menu of technological options will grow increasingly fixed. A recent report from the Canadian Institute for Climate Choices states that most of the emissions reductions required to reach our 2030 goals will likely come from existing technologies. A cascade of new studies, commentaries and billionaire-funded competitions have put renewed focus on carbon capture, utilization and storage (CCUS). This technology is established in Western Canada but remains underdeveloped as a mitigation option for point-source, emissions-intensive industries such as oil and gas, cement, steel and chemical manufacturing.

A new study from Positive Energy at the University of Ottawa articulates what it might take to change that.

The story of CCUS to date is largely one of untapped potential. Nearly every emissions scenario where the increase in global warming is held below 2 degrees Celsius entails widespread deployment of CCUS and eventually negative emissions. Positive Energy survey research shows that 74 per cent of Canadians expect a transition to a clean-energy economy before 2050. Further, a 52 per cent majority believe that fossil fuel development is compatible with meeting the country's climate goals. Without carbon capture, this future is highly improbable. Canada's expertise in CCUS, as evidenced by multiple large-scale integrated projects, has put us in a prime position to capitalize further on the economic and environmental benefits of this technology.

Despite our expertise, Canada is in the early stages of thinking through the socioeconomic, political and policy challenges posed by CCUS, particularly the matter of public confidence. Our research identifies a number of actions that government and industry can take to better manage these risks. Without investor and public confidence in the technology and the decisions that govern it, CCUS will likely remain a story of untapped potential.

Canada needs a far more robust discussion about the non-technical risks of deploying and scaling climate solutions like CCUS. Our study undertook a comprehensive review of academic, industry and government publications, as well as in-depth interviews with decision-makers representing a range of perspectives on CCUS policy and implementation. The research revealed that effectively managing the political, policy and project risks surrounding this technology will require both policy and regulatory levers, along with co-operation from industry stakeholders.

First and foremost for public confidence is whether people consider CCUS to be "clean tech." We encountered two conceptions of clean tech in our work: one is a narrow conception focused on emissions reductions, while the other is broader and extends beyond emissions to other environmental, health or economic impacts. Which conception will dominate over time remains to be seen.

CCUS for oil and gas production intersects with debates about the future of these energy resources in Canada's economy. Positive Energy's survey research has shown that while most Canadians agree that oil and gas will be important to the country's future economy, opinions on the issue can be polarized along partisan lines. As such, it will be crucial to attend to public perception and the risk of polarization to pursue broad application of CCUS.

Participants in our study believe that CCUS meets the criteria for clean tech. The climate is, of course, indifferent to our definitions, but funding programs and government policy may not be. The acceptance of CCUS as "clean" is crucial for the acceleration of research, development and deployment.

This is where public education will matter. We found that current information and education on CCUS technologies aimed at policy-makers and the general public need strengthening. In particular, communicating that CCUS is not exclusive to fossil fuel use and production – and in fact has many potential applications for "hard to abate" sectors – is critical to improving public understanding. Abating, capturing and otherwise reducing "process emissions" from heavy manufacturing such as cement, steel and chemicals manufacturing offer clear opportunities. Demonstration and effective communication of current and potential future success stories is also pivotal to CCUS's technological and economic progress.

But it doesn't stop with public education. We identified a need for improved CCUS communications and knowledge-sharing at all levels, including international networks and demonstrations for export markets. Canada is a global leader in CCUS, so international knowledge-sharing could enhance our competitive advantage. Learning and engagement with all stakeholders and the public will be crucial going forward. The erosion of industry, stakeholder or public support (either support for specific projects or more broadly the technology itself) could put the brakes on forward momentum.

*The process of developing a national strategy would be an important public education and knowledge-sharing exercise in and of itself.*

Governments can do more to boost CCUS by creating clear and coherent climate policy, including a predictable price path for carbon and a regulatory environment that supports innovation. Consistent carbon pricing in particular will be crucial: it creates the needed price signal for investors and innovators, and underscores the necessity and value of the technology, particularly for industries where CCUS may be the only mitigation strategy. Ottawa's new path for carbon pricing, which sees the carbon tax rise to $170 per tonne by 2030, is an important step. Last week's Supreme Court decision affirming the federal government's constitutional right to price carbon in the national interest is likewise crucial.

But this must be more than just a disjointed set of actions. One of the key recommendations of our study is the need for a national CCUS strategy. Much like the roadmap and action plan for small modular reactors and the national strategy for hydrogen, this will require enhanced federal-provincial and industry co-operation, along with engagement of affected groups, stakeholders and rightsholders. The process of developing a national strategy would be an important public education and knowledge-sharing exercise in and of itself.

Several other risk-management options that we identified require joint action between policy-makers and industry. CCUS costs are declining but remain relatively high, particularly for capture. Industry participants flagged cost-sharing as a top concern to spread out risk and provide additional incentives for innovation, creativity and entrepreneurialism. Expanded analysis and development of storage strategies could also help to demonstrate the potential value of different CCUStechnologies. We emphasize again that this includes expanding our understanding of potential CCUS applications beyond the fossil fuel sector.

2030 will arrive in the blink of an eye. Plans to reach our climate targets for 2030 and beyond must take seriously the issue of public confidence in potential mitigation technologies. Polarized public opinion and politics could prove fatal to many of the breakthroughs we need to drive down greenhouse gas emissions. A wide range of actions will be necessary to fully capture the benefits of CCUS. Building public confidence is near the top of the list.

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