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Why we need scientists to make sustainable policies

Xiangkun Elvis Cao1,3,4,* and Phil De Luna2,3,*

The COVID-19 pandemic taught us the importance of having scientists in public health policymaking. As with the pandemic, humanity faces another crisis at a greater scale: global climate change. Here, two carbontech researchers and Forbes 30 Under 30 honorees reflect on their unique paths toward influencing sustainable policies in government and international organizations. They reason that science advice is often ignored by governments and that we need more STEM scientists in sustainability policymaking. They also offer their advice to other young scientists who are looking to make an impact beyond academia.

COVID-19 and climate crisis
Science advice is not always taken into action by governments—we all know that. But when this becomes common during a global crisis such as the COVID-19 pandemic, bad things will happen. The ongoing pandemic has taught us that society needs to get scientists directly involved in evidence-based policymaking for complex problems and situations (e.g., global health crises). During COVID-19, we have witnessed the indispensable role of scientists in public health policymaking and public communications. For example, Dr. Anthony Fauci, the Director of the National Institute of Allergy and Infectious Diseases, also serves as the explainer-in-chief to ease the fear and anxiety of the public during the pandemic and encourages them to adhere to public health measures that save lives.

As with the global pandemic, human beings face yet another complex crisis that is equally, if not more, devastating: global climate change.1 Whereas technical advances, including discoveries of new energy materials, bring potential solutions to existing climate problems, to enable a near-term impact and meet the timeline set by major economies around the world to reach net-zero emissions by the middle of this century calls for more scalable and disruptive technologies in climate and sustainability. In the recent book “How to Avoid a Climate Disaster,” Bill Gates illustrated that human beings need to reduce their annual carbon emissions from 51 billion metric tons to zero to avoid a climate catastrophe.2

Due to the nature and scale of the climate problem, we have reasons to believe that we need more science-driven policymaking in this sector. Various examples have shown that scientists in Science, Technology, Engineering, or Mathematics (STEM) can play a vital role in making sustainable policies. During Dr. Steven Chu’s tenure as the 12th US Secretary of Energy under President Barack Obama, renewable energy deployment doubled, with a 10-fold increase in solar energy utilization.3 The recent appointments of Dr. Frances Arnold to co-chair the US President’s Council of Advisors on Science and Technology (PCAST) and Dr. Eric Lander as the Science Advisor to the President provide excellent examples of scientists in making policies. Other countries also have similar programs to engage scientists in policymaking: Chief Science Advisor (Canada), Government Chief Scientific Adviser (United Kingdom), and Council of Science and Humanities (Germany), to name a few.

Climate change mitigation is complex, and we need science-driven policymaking
Clean technology alone is not enough to solve climate change. You can develop the world’s best material for a battery or a hydrogen catalyst, but unless you have a market to buy it and policy to support it, you will likely never cross the valley of death on the technology readiness journey from discovery to commercialization. This development barrier is particularly true for capital-intensive clean energy technologies that require millions of dollars for first-of-a-kind demonstration projects. The effect on climate change can only happen at the nexus of technology, business, and policy. This nexus, if successful, can enable a near-term impact in the real world. The science behind lithium-ion batteries—which power the latest Teslas, for example—was developed in the early 1980s by Goodenough, Whittingham, and Yoshino, and only recently was awarded the Nobel Prize. The journey from laboratory to roadster only took approximately 40 years!

Private investment from venture capital firms, pension funds, and institutional investors into cleantech is surging. For example, the Bill-Gates-led Breakthrough Energy Ventures recently raised another $1 billion USD to invest...
in clean technology startups. The business world recognizes the opportunity in the coming sustainable transition and is acting quickly to capitalize on it. However, policymakers and governments have not been as quick to act. Policymaking should catch up with technology and business development. Fundamental science and translational research both need the right policies. Policy helps spur markets, business is the engine for action, and technology is the catalyst for change. Like Anthony Fauci’s role in public health policymaking during the COVID-19 pandemic, we need more scientists from sustainability to step up and contribute their expertise in making sustainable policies, whether in elected office or in leadership positions within our institutions. Even current “pure scientists” could benefit by framing their research with policy in mind. As an example, the journal Chem asks authors to align their works with one of the UN’s Sustainable Development Goals.

![Figure 1. Notable political figures and policymakers with scientific backgrounds](image)

There have been quite a few notable political figures and policymakers with scientific backgrounds in the past (Figure 1). Regardless of politics, they have played a crucial role in implementing evidence-based policies, communicating science to their peers, and having a lasting impact on their country.

Unfortunately, we currently lack scientists in policymaking positions. Scientist candidates for the US Congress fared worse than expected in 2020, and only 7% of Members of Parliament have a STEM background in Canada. We must encourage more scientists to enter politics and policymaking if we want a robust and resilient government.

**How we contributed to sustainability policymaking as scientists**

We both share a research background in carbontech, working on converting waste CO₂ emissions into fuels and feedstocks during our Ph.D.s at Cornell University (Elvis) and the University of Toronto (Phil). Our advisors founded separate startups from our research that were selected into the final round for the $20 million NRG COSIA Carbon XPRIZE, a global competition to develop breakthrough technologies for CO₂ conversion. Due to our impact in the sustainability sector, we were both selected as 30 Under 30 in Energy honorees for North America by Forbes Magazine in the same year.

As carbontech researchers that have tried to break through into the world of policymaking, we offer our experiences and advice on how scientists can make a greater impact on the policies and institutions that underpin our society.

For Elvis, he got involved in sustainability policymaking in the last year of his Ph.D. when he was invited to join a UN Technical Working Group on Energy Transition for the High-Level Dialogue on Energy. At first, he was unsure about what to expect but thought this could be an excellent opportunity to make an impact. He worked with senior professionals and academics to develop an action-oriented global roadmap on energy sector decarbonization strategies to dramatically increase the application of renewable energy and energy efficiency. Elvis intervened with his proposal to scale up Capture, Utilization, and Storage (CCUS) technologies during the group discussion co-led by IRENA, UNEP, and UN ESCAP, and his proposal has been included in the roadmap on global energy transition.

Having realized that one of the most significant issues in the conversation around sustainability is the limited mention of the economic benefits, Elvis founded a non-profit initiative, C2X, aiming to change the narrative surrounding large-scale sustainability operations and to redefine CO₂ as a resource, not a liability. With his initiative, Elvis recently engaged various stakeholders in the climate sector. He served as a panelist for the Global Policy Dialogues for Climate Action by UN DESA, contributed blogs on CCUS technologies and climate actions to UNICEF and Lindau Nobel Laureate Meetings, and joined discussions with BP’s CEO on the role of greening companies in a just energy transition during a Table Talk that was distributed to over one million people.

Elvis was recently named an MIT Climate & Sustainability Consortium (MCSC) Impact Fellow in the inaugural cohort by the MCSC, and he was selected into the Future Energy Leaders Programme (FEL-100) by the World Energy Council (WEC). He plans to collaborate with colleagues at MIT and WEC on pathways...
for achieving carbon neutrality at the intersection of translational research, social engagement, and policymaking in sustainability.

For Phil, he became the youngest-ever Director of the National Research Council of Canada (NRC), Canada’s national lab system, shortly after graduating from his Ph.D. Phil always thought he was going to be a professor and was working toward a career in academia. However, he decided he wanted to stay in Toronto to be with his fiancée rather than move away for a post-doc and professorship. The NRC was the perfect opportunity to make an impact in technology development while allowing him to keep Toronto his home. He built and led a $57 million collaborative research program focused on developing made-in-Canada clean technology for hydrogen production, CO₂ conversion, and artificial intelligence for materials discovery. He served on the board of the carbbotech non-profit Carbon Management Canada; worked with the OECD on a policy report on collaborative platforms for materials discovery, the Creative Destruction Lab as a mentor to help science-based startups scale; and the Canadian Commission for UNESCO on artificial intelligence to advance sustainable development; and worked as an Action Canada Fellow where he co-wrote a report with recommendations to lower barriers of entry for new farmers—especially women, visible minorities, immigrants, and indigenous peoples.

Phil recently took a leave without pay from the NRC to run for office as Member of Parliament as a candidate for the Green Party in the next federal election. Phil is focused on three issues: green jobs that leave no one behind, supporting our essential workers, and housing that all can afford. He’s running to bring more diversity to Parliament and more science to politics.

Despite our different paths to impact, we both share a desire to make our world a better place and recognize that the best solutions occur at the interface of disciplines.

**Tips for young scientists interested in policymaking**

Youth will have to live with the consequences of climate change, a crisis brought by and exaggerated by the human-related activities of their elders. Youth care about topics related to climate and sustainability, and youth participation in making sustainable policies enables self-development for the young and creates opportunities for dialog between youth and adults to incorporate different perspectives and generate solutions for a shared problem. While there are several examples of meaningful youth participation in policymaking processes like Greta Thunberg and “The Greta Effect,” one of the common barriers for the young is the lack of access to resources and guidance in this process. We aim to advise young people, especially early-stage scientists in this sector, on various pathways to get involved in sustainability policymaking with concrete examples.

There are several ways to make an impact in policy with a scientific background (Figure 2). At the core of this is the ability to take the strength of scientific training—the value of evidence-based decision making, the rigor of the scientific method, and the understanding that opinions should change with new information—and apply it beyond traditional academic institutions.

First, they can volunteer for existing non-profits or non-governmental organizations (NGOs) with an established network and good track record in sustainability policymaking. This will also be a helpful learning experience for youth to acquire skills. Some organizations have ongoing projects engaging youth in sustainability policymaking. They include Student Energy, Sustainable Energy for All (SEforALL), and the Atlantic Council Global Energy Center (GEC), to name a few.

Second, young scientists can seek to participate in and lead some local sustainability-related efforts to gain initial experience working alongside different stakeholders. One typical example of local sustainability efforts includes working with the campus sustainability office to design and implement strategic projects on procurement services to decarbonize the institution’s supply chain or participating in community gardens.

Third, they can also run their own sustainable initiatives to leverage their impact and pave their way in policymaking. The initiative doesn’t necessarily need to have a fixed format—it can be a social campaign, an NGO, a non-profit, etc. Some skills acquired in this process are directly valuable for policymaking, and these include but are not limited to the following: how to raise money, how to build a sustainable business model, and how to establish a meaningful partnership with external agencies representing different stakeholders in this sector.

Fourth, young scientists can also consider running for political offices to get direct experience in sustainability policymaking. They can also volunteer on political campaigns for candidates who advocate for sustainable policies.

Lastly, they can always use their technical expertise to provide consultation within their field. These efforts can happen at various levels, from within a school to a region, to a country, and to an international setting. One example at the regional level is contributing to the local Energy Roadmap by evaluating available energy resources and identifying pathways to reduce carbon emissions for local industrial operations. Examples at the international level include climate-centered policy dialogs by the United Nations.

The common ingredients of success for a young scientist include strong enthusiasm for sustainability. Further, the skills in communicating science to the
public and fundraising are also essential to one’s career progression. Young scientists with a genuine interest in policymaking should be adaptable to different paths, based on their current available resources and the stage of their professional development.

Conclusion
We both became scientists because we wanted to see fundamental discoveries get translated into real-world action. As we’ve ventured past the traditional scientific world of academia, we’ve realized that translating discovery to action is not easy or straightforward. Policymakers and politicians often have to balance scientific evidence with a range of other factors such as public opinion, economic feasibility, and political will within their own parties. Just because the best evidence and data is available does not necessarily mean our policymakers will follow it, with the COVID-19 pandemic and climate change being the most obvious examples.

A new generation of STEM scientists are entering the workforce, a generation that is diverse, is well-rounded, is motivated by impact, and recognizes the urgency with which we need to act to tackle complex problems like climate change, global pandemics, and rising inequality. Universities and supervisors should support this new generation by encouraging them to explore opportunities that allow them to apply their research to policymaking. Simply put, there are not enough professor positions for the number of Ph.D.s being trained every year. Policy is one area where these highly qualified people can use their skills to make the world a better place.

ACKNOWLEDGMENTS
Elvis wants to acknowledge his mentors, particularly Prof. David Erickson, his Ph.D. advisor; and Prof. Christopher J. Hernandez, the former DGS of Cornell MechE. He also wants to thank Dr. Jan Allen, Ms. Susi Varvayanis, and Ms. Patti M. Wojcik for their continuous help and support. Their roles have been instrumental in his Ph.D. study.

Phil wants to acknowledge his mentors, particularly Prof. Ted Sargent, his Ph.D. advisor; Dr. Susanna Laaksonen Craig, Dr. Andrew Johnston, and Dr. Michel Dumoulin, his supervisors at the National Research Council; and Dr. David Winickoff, Secretary of the Working Party on Bio-, Nano- and Converging Technology (BNCT) at the OECD.

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