Transdiciplinary Research as a Collaborative Strategy Between Scientists and Policymakers for Effective Climate Change Mitigation Policy Development

Renee Cosme

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Introduction

The scientific consensus is that climate change is real, and that it has the potential to do great harm, threatening both the natural environment and human health. Even corporations are starting to take notice of climate change consequences. In 2017, the Asset Owners Disclosure Project (AODP) conducted the Global Climate 500 Index initiative, which showed that, of the world's 500 biggest asset owners, 60% of them recognize the financial risks of climate change. Concern was even greater among the 50 biggest firms (responsible, collectively, for $43 trillion in assets), with only three firms taking no action with regards to climate change.[1,2] A large segment of the general public also believes in the realities of climate change.

Effective policy development is vital to successfully mitigating the consequences of climate change. However, barriers between scientists (which, for the purposes of this report, includes researchers and specialists working, representing, and/or studying the topic of climate change mitigation) and policymakers may exist, leading to ineffective, delayed development of climate change mitigation policies. Luckily, transdisciplinary research (TR) may help bridge the communication and knowledge barriers between scientists and policymakers. TR may be described as scientific research that is intended to solve current issues in society and/or the environment, and involves collaboration between stakeholders and interdisciplinary researchers.[3] This report will discuss the viability of TR as a strategy to engage policymakers and scientists in the effective development of climate mitigation policies. Furthermore, this report will provide several recommendations to maintain transparency during the TR process. Overall, policy development for climate change mitigation is a complex task that requires concise communication between scientists and policy makers, with zero conflicting interests.

Why Have Some Climate Change Mitigation Polices Failed?

Howes et al. (2017) conducted a literature review of 94 articles that identified the effectiveness or failures of environmental sustainability government policies, plans, or strategies. It was observed that failed polices, which was defined as the inability to satisfy environmental objectives, address environmental sustainability, or overcome barriers which prohibited implementation of future policies,

was a result of:

- Structural factors, such as economic or political motivations.
- Implementation traps, which included conflicting objectives or communication failure (presumably among decision makers, the community, and other professionals).
- Knowledge and/or scope issues such as lack of policy comprehension or evaluation.[4]

Moreover, the literature suggests that miscommunication is a concern between policy makers and scientists. Recently published academic literature can provide valuable research information about current, real-time trends on global climate change, but is often inaccessible to policy makers. Moreover, scientific information presented to policy makers in the form of popular news articles, oral presentations, or written reports, may be biased, providing information based on the author's personal experience and knowledge, omitting other valid opinions that can alter policy development. On the other hand, scientists may be forced to provide simplified summaries or models of their research data upon collaborating with policy makers, possibly omitting significant details of their results.[5,6]

Transdiciplinary Research as a Network Strategy for Effective Climate Change Mitigation Policy Development

Although the precise definition of TR and its methodologies is currently ambiguous, Lang et al. (2012) provide a three-phase model to describe an ideal TR process, which involves:

1. Identification of the real-world problem via collaborations among interdisciplinary researchers and actors (i.e. institutions, media, politicians, administrations, NGOs, corporations, and media).

2. Collection of diverse knowledge bodies, defined as system, target, and transformation knowledge (Figure 1), applying these bodies to scientific methods.

3. Application of the collected knowledge into scientific research or societal needs.[7,8,9]

According to Brandt et al. (2013), in recent years, the TR approach has garnered more attention in the scientific community and academia.[8] However, there's always a possibility that

participating in TR may not be of interest to or a priority for policymakers, or even some scientists. Sugiyama et al. (2017) organized a workshop for diverse stakeholders and interdisciplinary researchers, as part of a TR approach to developing 40 "socially relevant research questions" related to climate engineering, and encountered several stakeholders that declined to attend the workshop, since they perceived the opportunity as irrelevant or in conflict with their interests. Engagement strategies such as monetary compensation or incentive programs should be considered as a method for recruiting stakeholders and policymakers into TR for climate change mitigation policy development.[3]

Maintaining Transparency and Including Public Engagement to Transdiciplinary Research

Ultimately, maintaining transparency is vital to developing genuine and effective climate change mitigation strategies using TR methodology. Therefore, TR groups for climate change mitigation policy development should only consist of policymakers and scientists who do not possess any conflicting interests or opportunities for direct benefits from the policy they develop. The 'Preserving Scientific Integrity in Federal Policymaking Lessons from the Past Two Administrations and What's at Stake under the Trump Administration' report by the Center for Science and Democracy at the Union of Concerned Scientists provided recommendations to current United States President Donald Trump for preserving integrity in scientific research, which included (but not limited to):

- Independent scientists should be consulted regarding policy decisions, due to their credibility and liberty to express personal perspectives on scientific affairs due to minimal stress from political or financial pressures.

- Government employees who were involved with any political party as an employer or client within the last two years should not be eligible as a member of scientific advisory committees.

- Conflict of interest waivers that outline stipulations for permitted participation of scientific advisor committees, and made available for public scrutiny.

- Information of members for governmental scientific advisory committees should be publicly available via online portals (i.e. Integrity.gov), which includes work/funding histories,

qualifications, and potential conflict of interest waivers.[10]

The aforementioned recommendations are highly applicable to maintaining transparency throughout TR process for climate change mitigation policy development. Moreover, these recommendations indicate that the general public is also involved in preserving the integrity of scientific research.

"Opening up federal decision-making to public scrutiny is an effective and inexpensive means of fostering public trust and exposing and eliminating political interference in science and in how science informs policy decisions."

–Center for Science and Democracy at the Union of Concerned Scientists, Preserving Scientific Integrity in Federal Policy Making (2017)

Policy makers and scientists may also consider including public participation during policy development, which may instill a sense of trust in the government and scientific community from the public. Specifically, policy makers and scientists should consider using social media and technology to engage the public. Broadcasting House debates or meetings through online streaming may attract a diverse demographic of citizens, such as youth or marginalized groups. Popular social media platforms like *Twitter*, can translate "…online chatter…into useful input, [and] the government can allow a more diverse set of stakeholders to participate on a more level playing field." (Center of Science and Democracy at the Union of Concerned Scientists, 2017). Moreover, user-friendly websites, such as Regulations.gov, can provide a forum for public users to electronically view and provide real-time feedback on government policies, reports, and documents using a searchable database.[10]

Conclusion

Transdiciplinary research to develop effective climate change mitigation policies can create a platform for policymakers and scientists to effectively collaborate and generate innovative ideas that can be realistically implemented to protect the environment. However, the parties involved in the development of climate change mitigation policy may not share identical values, such as economic prosperity or environmental sustainability, possibly leading to conflicting interests that can damage the overall effectiveness and integrity of the policy itself. Thus, strategies to avoid conflicting interests and promote participation from stakeholders, policymakers, and scientists alike, should be considered

when conducting TR. Moreover, other hurdles besides communication and knowledge barriers can complicate the policy development process. Howes et al. (2017) observed in their literature review that 51% of the articles they reviewed identified economic factors as a culprit for failure of effective government policy, in addition to legal, technical (time constraints, resource availability), and political hurdles.[4] Overall, policy development for climate change mitigation is a crucial conundrum in the 21st century that demands meticulous collaboration and negotiation from policy makers and scientists with diverse values and interests.

Renee Cosme is a Graduate Fellow at The Climate Institute.

Appendix

System Knowledge
- Identification of the system's current condition and natural/social factors which causes the system to change.
- What is the concentration of greenhouse gas emissions for frelated to food consumption (i.e. agricultural activities)?

Target Knowledge
- Potential problem-solving strategies to solve system knowledge, formulated from collaborator interests and natural/social limitations.
- Can decreased meat consumption in daily diets lower GHGs emissions?

Transformation Knowledge
- Evaluations of target knowledge to transform the problematic system into a desired state or condition.
- How can policy makers encourage a low-meat diet to the public?

Figure 1. Knowledge bodies can be defined as the different types of information or insight that may be acquired through collaborations between interdisciplinary researchers and actors that will contribute to effective strategies and solutions to real-world problems, either through societal application or scientific research.[7,8] A simple example of each knowledge body is provided, which the addresses the research topic of 'altering the human diet to mitigate greenhouse gas emissions'.[11]

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