



Research Translation Increasing the Impact of Natural Science Communication from Evidence-based Finding to Policy Action

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Received: 6 December 2022

Accepted: 15 January 2023

Published: 31 May 2023

Abstract

Research translation helps to fill the gap between what natural scientists discover and what policymakers take action on or employ in policy. This is called in short as the “know-do gap”. This gap is one of major problems for users and practitioners in many fields including natural science communication. In natural resource stability, practices that are not based on the most current research, for instance miscommunication in agroecosystem properties, climate and land use change can be life threatening, lead to biodiversity loss and livelihood insecurity, which are consequences from multi-hazard risks and improper reactions. Thus, if natural science programs and policies are not effectively developed as evidence-based, this issue can be the cause of worsening research outcomes. Suitable natural science development programing can have mighty benefits on the quality of life for vulnerable and rural communities in the nation. Therefore, a research translation framework is proposed to improve natural science communication. Illustration of windows of opportunity, knowledge cycles and increased natural science communication impact through research translation were incorporated and discussed in this article. Building trust is key to the success of natural science communication from evidence-based findings to policy action.

KEYWORDS: research translation, natural science communication, window of opportunity

Introduction

Natural science communication is the communication of natural scientific findings to people who are not researchers or scientists. Natural research translation helps the general public understand research findings, encouraging them support evidence-based decision making. Research translation is a dynamic process involving interaction between researchers and end users (Milat and Li, 2017). They help bridge the gap to understanding natural scientific facts. In addition, the ability to explain natural science in terms and ideas that various types of audience can understand. This is an ability that needs to be trained with support from donors and policymakers to communicate natural research findings more (Bickford *et al.*, 2012).

Natural science communication gives visibility to policymakers and makes natural science accessible to the general public by informing, entertaining, and educating science communication (Mauranen, 2013; Pérez-Llantada, 2021). Empirical evidence suggests that academics and scientists value public communication of science even if “social media usage has yet to be widely adopted” (Collins *et al.*, 2016; Pérez-Llantada, 2021). To communicate natural science to a wider audience particular for students and youth, it often helps to have fun with science and still get its natural science knowledge across (Gross, 2015).

Research evidence-based findings were published in scientific journals, book chapters

and conferences proceedings, which focus on citations, impact and H-index among academic society and scholars. Therefore, research translation was explained in this article to increase research impact.

Research Translation Concepts

Research translation has various definitions that are obtained from research literature reviews. A common understanding of the term focuses on the communication side—it is either a process that transforms research findings into a form that is comprehensible and relevant to research users or a process that conveys the interest and concerns of users to researchers (Hirschorn and Geelan, 2008). Research translation can simply be thought of as a series of actions through which the research-policy gap is bridged (Hirschorn and Geelan, 2008). Natural research translation is the process by which natural research findings are taken up by users (policymakers, practitioners, or other researchers) and appropriately used to inform practice, policy, or further research (Devine, 2020).

The research translation process was investigated at different stages of the research cycle by adopting and modifying the Canadian Institutes of Health Research (CIHR) framework as a reference for this article, given its broader focus on knowledge translation along the entire research cycle (Figure 1).

Generally, research translation is thought of as a unidirectional pathway from researchers to other audiences. In the other hand, the trans-

lation of policy and practice priorities, and evidence gaps to inform the work of natural researchers are taken into account. Research translation, therefore, is a dynamic, iterative process that occurs throughout the research cycle (CIHR, 2007; CIHR, 2012). Hence, natural research translation is the process by which natural research findings are taken up by users and appropriately used to inform policy, practice, or further research. In this definition, research users can include policymakers, program designers, practitioners, and the general public.

The research translation framework (Figure 1) emphasizes on six opportunities throughout the research cycle where key natural communication and elements can support impact knowledge translation namely: 1) Defining research and methods; 2) Conducting research; 3) Publishing natural research findings in plain

language and making it simple to access; 4) Placing research findings into the context of other knowledge and sociocultural norms; 5) Taking action based on natural research findings; and 6) Influencing subsequent research based on the impacts of knowledge use. (Devine, 2020; Islam *et al.*, 2020).

Research translation concepts would be introduced to natural scientists to be able to communicate their research findings to various levels of audiences, stakeholders, policy makers and practitioners. Research translation is coherent with science communication, which can be improved by capacity building and partnership development. Keep natural research findings short and simple for the users. A participatory approach and workshops at local levels must be conducted for final knowledge dissemination.

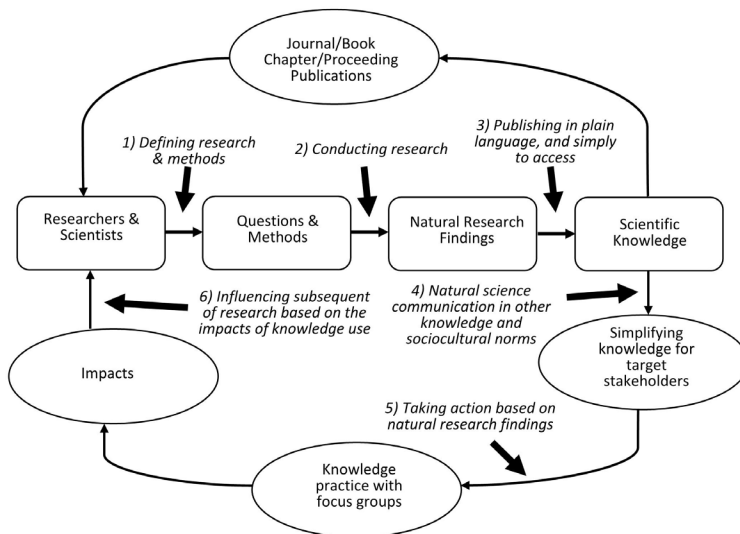


Figure 1. Research translation framework as nonlinear process. Modified from CIHR, (2007). Knowledge translation within the research cycle chart. Ottawa, Ontario: Canadian Institutes of Health Research.

Good Practices in Aligning Knowledge Produced with User Needs

There are several methods that knowledge producers can arrange their work to be suitable for the needs and priorities of users. Collaboration throughout the entire research cycle is critical to align funders, researchers, and users to increase the effectiveness of research use (WHO, 2006; Panisset *et al.*, 2012; Islam *et al.* (2020). Forums, workshops, conferences, roundtable discussions, and debates are recommended options of engaging with users throughout the research, analysis, dissemination, and utilization stages (WHO, 2006; Ashford *et al.* 2006; Peters, *et al.*, 2013).

Gross (2020) reported that scientific

societies can play a key role in bridging the research and practice of public audiences, which corresponded with the studies of Braha (2017).

Islam *et al.* (2020) explained seven steps of good practice for research translation that donors, researchers, and policymakers can employ to increase their understanding of their roles and responsibilities as indicated in Table 1. Language is a means of transmitting information to the partnership. Thus, the ability to share information via language leverages the value of acquiring new knowledge and skills need to be trained. Language not only lowers the cost of acquiring a complex skill but multiplies the benefit. The knowledge not only can be exploited to manipulate the environment, but it can be shared with stakeholders and other cooperators.

Table 1. Good practices for research translation in natural science communication. Modified from Islam et al. (2020).

Practice	Donors	Researchers	Policymakers
Require natural science research to develop a dissemination action plan during the pre-research planning stage.	✓		✓
Fund national-level consortia to create platforms for collaboration and transparency of natural science research activities.	✓		✓
Improve natural science research questions and priorities using the characteristics and needs of natural research context and practice.	✓	✓	✓
Employ technology to develop mechanisms for information sharing in real-time (e.g., platform of research findings or researchers engaged in research activities within natural science sector.	✓	✓	✓

Table 1. Good practices for research translation in natural science communication. Modified from Islam *et al.* (2020) (continued).

Practice	Donors	Researchers	Policymakers
Invest in capacity-building activities that increase technical natural science knowledge among stakeholders.	✓		✓
Train natural scientists/researchers to communicate effectively and develop user-friendly methods to disseminate products.	✓		✓
Develop clear policy priorities and communicate them to natural science researchers.	✓		✓

Natural science communication associated with good practice for research translation is the combination of processes by which evidence acquired from research is appropriately used to guide the work of policymakers, practitioners and the future work of researchers (CIHR, 2007; CIHR, 2017). Therefore, knowledge translation as a nonlinear process (Figure 1) plays an essential function at each stage of a research initiative, from its design to the communication of natural research findings (Islam *et al.*, 2020). In the case of the COVID-19 pandemic, if practices not based on the most updated and proven research can have life-threatening consequences, while infodemic, also can have a tremendously negative impact on large portions of the anthropogenic community, such as health, education, and livelihoods of vulnerable and marginalized populations worldwide. This is why it is crucial to leverage knowledge and evidence generated through research grounded in the perspective of users to inform them of these activities (Devine

et al., 2020).

Although many stakeholders have a willingness to participate in forums, others may need incentives to participate. In some ASEAN countries, high-level policymakers are inaccessible due to unavailability or competition for their time and attention. Reputable knowledge brokers who have established networks with these stakeholders or the means to reach them should be leveraged in such situations. If endorsements of high-level policymakers or practitioners can be achieved, it should be leveraged into gathering further support for natural research translation and policy implementation (Devine, 2020). In regards to good practices in research translation for natural scientists, for example how research findings can be used to make policy or change behavior, the key answer is, it must be translated in audience knowledge and their sociocultural norms, effectively communicating it to the public.

A Framework for Research Transformation into Policy Action

In order to address the challenges of translating research into action within complex policy contexts, Islam *et al.*, (2020) reported that we have to think strategically about how to leverage windows of opportunity (Figure 2), as systems approach which can help navigate the nonlinear aspects of policy reform. Policymakers negotiate competing interests, agendas, norms, and contested resource allocation to satisfy their constituencies. Researchers balance funding opportunities, policy mandates, and their own interests in specific research topics (Islam *et al.*, 2020). Agenda-setting, coalition-building, and policy-learning are effective measures for creat-

ing windows for policy change. Agenda-setting assists policymakers select and prioritize which natural research problems to address and is dependent on factors such as the presence of clear, measurable indicators to describe the issue and the involvement of political entrepreneurs. Agenda-setting is about capturing the awareness of policymakers, whereas coalition-building is an exercise in mobilizing and sustaining attention across a broad range of stakeholders. All of this is made possible by effective policy-learning, whereby technical evidence and research findings are translated into an appropriate form for stakeholders, and political and economic constraints are sufficiently communicated to natural science researchers (Ashford *et al.*, 2006; Devine, 2020).

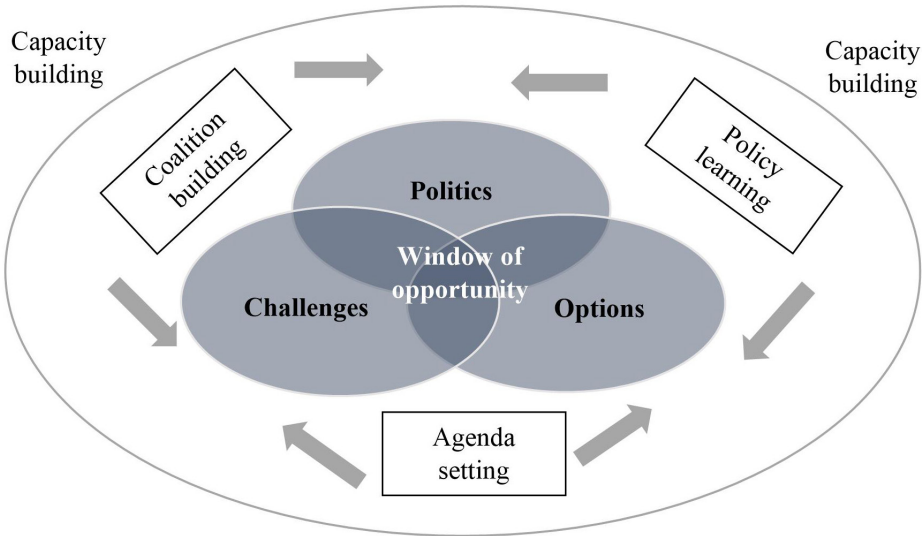


Figure 2. A framework for the transformation of knowledge into policy action. Modified from Ashford et al. (2006).

Recommendations for Writing for a Policy Audience

1. Use nontechnical language

Assume you are explaining your natural research findings to a professional who does not work in your expertise. Write in a conversational style (PRB, 2022). For example, instead of writing, “Ichthyologists applied remote sensing to estimate spatial distribution of exotic aquatic flora,” try writing, “Fisheries biologists applied satellite images to study patch distribution of aquatic invasive alien plants.” Spell out acronyms when they are first used and then use the abbreviation thereafter. Provide a list of definitions in the beginning that includes two- to three-sentence explanations of all natural science research terms and research methods used.

2. Use subheadings to break up information

Busy policy-makers tend to browse documents, rather than reading throughout information. They skip around searching for what is most interesting or relevant. Descriptive subheadings help them find what they need. If you get them to start reading even in the middle of your research policy brief (Doydee, 2017) they might continue to the end. This is particularly true when writing for the Web, where experts estimate the average viewer reads just 25 percent of content per page. A descriptive heading will help readers decide which parts to read and might help draw them in to read further. Asides from using headings such as “Introduction,”

“Methodology,” “Results,” and “Conclusion,” be creative and to the point. For example, instead of “Analysis,” write the exact technique used in the heading (i.e., using difference dates of satellite images to estimation change in mangrove ecosystem tsunami devastated (Doydee *et al.*, 2011)).

3. Use data visualizations to communicate quantitative data whenever appropriate

There is increasing evidence revealed that readers are more able to interpret data visualized in a graph than in a table (Midway, 2020), as the mind is able to more quickly identify patterns than statistics. When creating visualizations, determine key messages you want to convey. Move detailed tables with all natural field survey data into the annex. Recommendation no. 2 also applies for tables, charts, and graphs. Instead of writing “Table 1. Findings,” write out the main message of the graph (i.e., Tilapia fishes in treatment earthen ponds had a higher growth rate than other Tilapia in control earthen ponds).

4. Obtain feedback

Before finalizing the written product, obtaining feedback from audiences can ensure the product is ready for dissemination (Tandoc and Ferrucci, 2017; PRB, 2022). Some key questions, ask your “test audiences” to tell you (i.e., is it accessible and readable? what are the key messages? are they clear? Are the arguments or recommendations persuasive?)

Jucan and Jucan (2014) explained that being good communicators in general will help

natural scientists to be better science communicators in order to: help the public understand natural science as part of their livelihood; see not only the importance of the science and its source of pleasure and wonder, but also to be able to make decisions about it as citizens, policymakers, funders, etc. and help in educating citizenry, concerned about the threats facing our environments to better shape the direction of political and policy decisions.

Overall, of four recommendations for writing policy audience that were explained will increase natural science research impact to the right target audiences. However, the truth of research findings must be the same for all languages and platforms without distorted knowledge.

Knowledge to Action (KTA) Framework

The KTA framework was developed by Graham *et al.*, (2006) and applied by Moore *et al.*, (2022). The framework has two components namely: 1) knowledge creation, and 2) action cycle which each components containing multiple phases (Figure 3). Knowledge creation includes knowledge inquiry, knowledge synthesis and the creation of knowledge tools. The knowledge becomes more refined as it funnels through each stage of the process, resulting in tools for decision making such as clinical practice guidelines or patient decision aids.

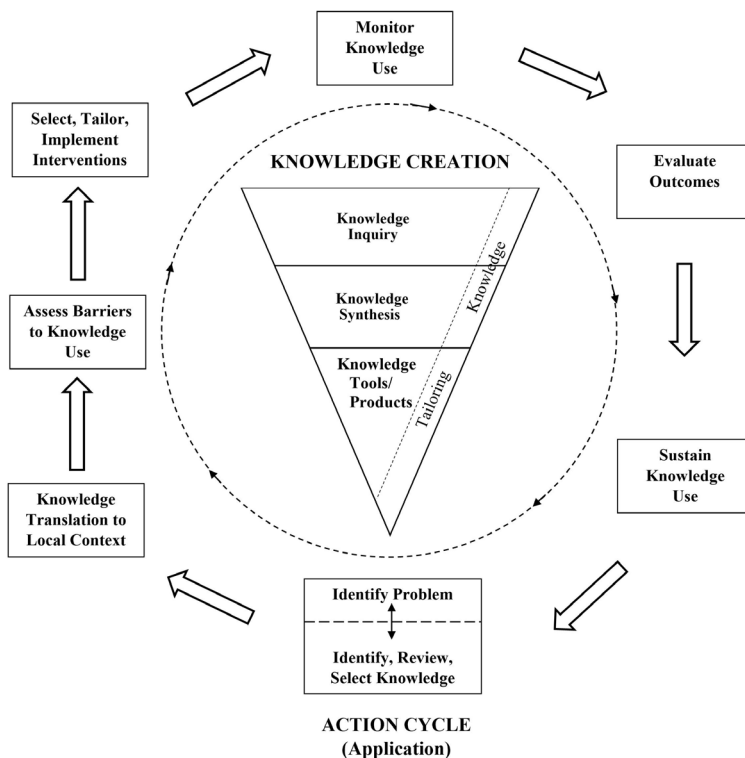


Figure 3. Knowledge creation to action process. Modified from Graham *et al.*, (2006)

The action cycle has seven phases, namely: 1) identify problem associated with review, select knowledge; 2) knowledge translation to local context; 3) assess barriers to knowledge use; 4) select, tailor, and implement interventions; 5) monitor knowledge use; 6) evaluate outcomes; and 7) sustain knowledge use which guides the application of the identified and refined knowledge (Figure 3). The phases can occur sequentially or simultaneously, and the knowledge phases can influence the action phases at any point in the cycle as dynamic and can influence each other. Knowledge is adapted to the local context, and barriers and facilitators are assessed. Involvement of stakeholders and tailoring of knowledge to the target audience is critical. The KTA framework has been used widely to transfer research findings including natural science communication into practice by organizations such as the Canadian Institutes of Health Research (CIHR, 2007; CIHR, 2012).

Generally, a broad understanding of natural science research findings that we have discussed in previous context, is considered as research knowledge for natural science as “evidence based” science. Thus, challenges were how to turn such scientific knowledge into action for example in terms of local policy briefs (Doydee, 2017) and for behavior change, for instance, to adapt or appropriately employ natural science knowledge by specific users. This tends to be a challenge when it comes to linking knowledge to action in natural science because often researchers, scientists, and orga-

nizations are subjected to knowledge creation, while action cycle must be implemented by natural science network coordination.

Conclusions

The gap between research findings and practices is a serious issue. Policies that are not developed by evidence-based research can generate ineffective outcomes or be of less benefit to the targets. The question is how knowledge can have an impact through policy in action. Natural science communication and research translation are the pathways to connect research and policy, and it serves as key strategies for bridging evidence-based and policy action. Scientists need to improve science communication to create effective decisions based on both of natural sciences and the needs of the local community. This article explained how evidence influences policy and practice. However, evidence alone is not enough to create policies that improve development outcomes. Thus, the concept of windows of opportunity is explained, for example researchers write proposals for funding opportunities from the donors, while policy makers provided their own interests in specific research topics. Donors, researchers, and policymakers have their roles for research translation in natural science communication and was described in this article. Moreover, the relevant actors/stakeholders such as academia, private entities, and locals also can help bridge between research and policy.

Acknowledgements

This study was supported by the Japan-ASEAN Science, Technology and Innovation Platform (JASTIP) JASTIP-Net 2019-2020.

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