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Inclusive stakeholder engagement for equitable knowledge co-production

Insights from the EU's *Horizon 2020* programme in climate change research

We develop and apply the concept of equitable knowledge co-production (EKC) by proposing a reflexive framework to support inclusive stakeholder engagement with diverse knowledge-holders. This framework is built on the authors' experiences of leading three ongoing Horizon 2020 projects, and its goal is to contribute to the realisation of epistemic and recognition justice in the context of large-scale research and innovation projects by raising awareness of how knowledge co-production is carried out during the project proposal and implementation phases.

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Our understanding of knowledge co-production refers to a conceptual model of the transdisciplinary (TD) research process, as proposed by Lang et al. (2012) and motivated by societally relevant problems, where we, as researchers, can explore new options for solving these problems by relying on social learning processes. Essential to the TD research process is, for example, joint problem framing for the mutual benefit of researchers *and* stakeholders (SHs) (Pearce and Ejderyan 2019). To this core understanding of TD, we bring considerations of recognition and epistemic justice to describe the concept of equitable knowledge co-production (EKC), which we define as knowledge production processes that through co-development with diverse researchers and SHs seek recognition justice, and that by equally valuing different bodies of knowledge promote epistemic justice. In knowledge production processes, recognition and epistemic justice capture both social inclusion and power dynamics, where the former focuses on *who* is included and *how this is determined* (Fraser 2009) and the latter explores how the knowledge generated and experiences that exist within diverse groups can be equally represented through and incorporated into knowledge production processes (Fricker 2007).

Overlooking inclusivity when working with SH groups from climate research can perpetuate social inequalities by, for example, enabling blindness to the needs and interests of marginalised groups in low-carbon transitions (Lieu et al. 2020). In acknowledgement of this risk of a lack of *recognition justice,* there has been an increased awareness of the need for TD research, SH engagement and co-creation processes within European Union (EU) funding programmes, such as *Horizon 2020 (H2020,* 2014 to 2020) and *Horizon Europe (HEU,* 2021 to 2027). This is observed in the funding assessment for potential research impact, which requires SH engagement,[1] as well as in the official guidance provided by the EU for proposal writing.

However, recognition justice through inclusive SH engagement alone does not ensure *epistemic justice* in knowledge production. When the knowledge or experiences of certain SH groups are unequally valued or misunderstood (Fricker 2007), it becomes challenging to incorporate different knowledge systems into decision-making processes, which can lead to an embedded bias against certain viewpoints, despite the appearance of inclusive SH engagement. Knowledge production often favours Western scientific systems (Demeter 2020). For example, peer-review pro-

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cesses are susceptible to bias, where incumbent perspectives often determine what is publishable (Ghosh et al. 2021, Bendiscioli 2019).

Thus, knowledge production on its own does not inherently provide framings for inclusive SH engagement, nor does it address the effects of power dynamics during the process, even if carried out with a TD approach (Basta et al. 2021). Thus, we argue that EKC must address these power inequalities by promoting recognition and epistemic justice, especially in large-scale research projects that are representative of Western knowledge-production processes.

Funding programmes as a mechanism for equitable knowledge co-production

The EU's *H2020* and *HEU* programmes fund large-scale research projects across and outside of Europe, placing them in a unique position to promote EKC across many countries and regions. Relatively large projects (in our experience about three to seven million euros) often involve a sizeable number of case studies to understand local contexts better in relation to a general call text, which defines an overarching research problem. The research calls can help reach the overarching goal set by the European Commission, in discussion with diverse sectors of society and with significant input from academia. In addition, budgets are intended to codesign, codevelop and co-create new knowledge with diverse SHs and to enable application of this knowledge for societal and scientific aims.

Introducing a reflexive framework for equitable knowledge co-production

We propose a reflexive framework to help researchers responsible for realising large-scale projects in the *H2020* and *HEU* programmes reflect on why and how TD research is being carried out, who is doing so and for what purpose and whether EKC is being applied in research projects (table 1). The framework makes explicit the often-tacit processes of these projects, fostering awareness of which may lead to greater clarity as to whether

recognition and epistemic justice are being realised in projects. This framework is based on the authors' experiences in EU *H2020* projects and draws on questions inspired by Pohl et al. (2017) to include recognition and epistemic justice considerations in TD knowledge co-production. The EKC framework is organised into six areas of consideration:

- ■ ***Why:*** What is the purpose of knowledge co-production in the project, exhibited by its intended outputs?
- ■ ***What:*** Which disciplines or areas of knowledge are relevant to the project?
- ■ ***Who:*** Which researchers are involved in the project?
- ■ ***Who with:*** Which SH groups are involved in the project?
- ■ ***Whose funds:*** What is the funding source of the project?
- ■ ***How:*** What are the practices, tools and methods used for knowledge co-production?

This framework can be a starting point for researchers to consider whether EKC is sufficiently considered during the proposal stage, and it can be applied during the project implementation stage to reflect critically on whether EKC processes support recognition and epistemic justice in SH engagement processes.

In the following sections, we describe how each aspect of the EKC framework can be applied to three *H2020* projects in the proposal writing or project implementation phase. *TIPPING+* (2020 to 2023)[2] focuses on assembling and analysing regional narratives from both mainstream and marginalised groups and explores if coal and carbon-intensive regions have reached social-ecological tipping points. Meanwhile, *LANDMARC* (2020 to 2024)[3] explores land use technologies and practices based on SH knowledge of the land, addressing calls to remove carbon from land use. Further, *ENCLUDE* (2021 to 2024)[4] focuses on defining and mobilising inclusive energy citizenship for decarbonisation, addressing calls to understand citizens' role in a just energy transition. Considering these three projects, we summarise the insights in table 2 derived from applying the framework in table 1.   **>**

1 *https://ec.europa.eu/newsroom/informatics/newsletter-archives/43800*
2 *https://tipping-plus.eu/home*
3 *Land Use Based Mitigation for Resilient Climate Pathways, https://www.landmarc2020.eu*
4 *Energy Citizens for Inclusive Decarbonization, https://encludeproject.eu*

TABLE 1: Framework for equitable knowledge co-production in large-scale research programmes. SH = stakeholder.

WHY	WHAT	WHO	WHO WITH	WHOSE FUNDS	HOW
use of equitable knowledge outputs	inclusion of knowledge	researcher positionality	inclusive SH engagement	sponsors	knowledge co-production
■ motivated by social inequality ■ knowledge of local relevance	■ equitable treatment of diverse knowledge	■ awareness and acceptance of reflexivity ■ positionality of the researchers in scientific knowledge production	■ inclusion of SH perspectives and interests ■ specification of SH positions in research: fore-/background ■ make power dynamics transparent	■ make the funders explicit ■ acknowledge power inequalities with funders and knowledge users	■ diverse knowledge and methods ■ inclusion of historically marginalised groups

TABLE 2: Comparison of three *Horizon 2020* projects applying the equitable knowledge co-production framework. SH = stakeholder, TD = transdisciplinary.

	TIPPING+	LANDMARC	ENCLUDE
WHY use of equitable knowledge outputs	The outputs co-produced with SHs aim to provide policy advice for a socially just and economically viable transition to clean energy, reduced CO_2 emissions and sustainable development in the region.	The outputs for landowners and policy makers aim to reduce and sequester CO_2 emissions and contribute to social, economic and environmental sustainability.	The outputs are aimed to create a decision-making heuristic for local policy decisions concerning how/whether to incorporate the concept of energy citizenship as a part of local initiatives for decarbonisation.
WHAT inclusion of knowledge	*disciplines*: economics, sociology, political science, human geography, social psychology and anthropology *methods*: participatory research, TD research, SH interviews, SH workshops, policy analysis and policy design	*disciplines*: ecology, engineering, climate sciences, earth observation sciences, agronomy, economics and social sciences *methods*: modelling, soil sampling, earth observation tools, participatory research, policy analysis and policy design	*disciplines*: human geography, sociology, social psychology, energy modelling and energy engineering *methods*: machine learning, TD research, participatory research, policy analysis and policy design
WHO researcher positionality	disciplinary experts, some with interdisciplinary experience and a few with TD experience nine universities, three NGOs, three private research/consultancy institutes and one association partners: thirteen from EU countries, one from Canada and one from Indonesia	disciplinary experts, some with interdisciplinary and practical TD experience five universities, five private research institutes, five small and medium enterprises, three NGOs, one government research group and two regional networks partners: six from EU countries, two from the Americas, three from South East Asia, three from Africa	disciplinary experts, many with significant interdisciplinary and TD experience six universities, four private research/consultancy institutes and two NGOs partners: nine from EU countries, one from the Americas and two from non-EU associated countries
WHO WITH inclusive SH engagement	SHs from twenty case studies in Europe, Canada and Indonesia national, regional and local policy makers, civil servants, NGOs, academia, industry and cultural entities	SHs from fourteen case studies in Europe, Africa, Asia and the Americas farmers, forest and parks managers, local and Indigenous rights holders, land use managers and policy makers local to EU	SHs as participants and co-designers of the ENCLUDE Academy, recruited from twenty-seven countries across the EU and the world policy makers and technical and policy experts from the energy sector and NGOs
WHOSE FUNDS sponsors	European Union Executive Agency for Small and Medium-sized Enterprises, Directorate-General for Research and Innovation, SHs in "who with"	Directorate-General Climate Action,	Directorate-General for Research and Innovation,
HOW knowledge co-production	top-down development of project proposals; implementation and dissemination co-shared with SHs	co-development with SHs from proposal stage to implementation and final research outputs	co-development of ENCLUDE Academy with NGOs and testing of interim outputs with local decision-makers

Why we engaged in knowledge co-production

When the purpose of knowledge co-production is primarily driven by scientific outputs, such as journal articles or other academic publications, SHs' interests may be overlooked. For the three projects, the purpose of knowledge co-production is to improve the equitable use of knowledge outputs, such that the goals of SHs who work and live outside of academia are also included in how the research aims and objectives are framed, as well as in the types of outputs.

TIPPING+ co-produces outputs with SHs to create visions of a social and economically viable clean energy transition, while *LANDMARC* aims to produce knowledge for landowners and policy makers to reduce and sequester CO_2 more efficiently. Meanwhile, *ENCLUDE* aims to create an integrated platform through which knowledge of energy citizenship can be provided to local decision-makers to help them identify and mobilise energy citizens in their own communities.

Within each of these projects, epistemic justice was addressed in the framing of the research questions at the case study level. In the proposal stage, these questions and objectives were intended to be inclusive of the possibly overlooked needs and perspectives of SH groups who have been marginalised. During the implementation stage, the initial perception of these needs was verified against actual experiences, and they are now being included in the production of project outputs.

What disciplines or areas of knowledge are relevant?

TD research intends to transcend disciplinary biases (Rosenfield 1992) by bridging academic bodies of knowledge with those that have been marginalised (Zurba et al. 2022). Thus, ex-

periential and contextual knowledge of diverse SHs is considered on equal footing with scientific knowledge (Scholz 2000).

Each of the three projects is interdisciplinary, including various natural science and social science disciplines, as well as SH engagement methods and quantitative modelling approaches (table 2). Due to the interdisciplinary nature of the projects, one to two years have been spent learning across disciplines in each project, especially between modellers and those with SH engagement experience. We provided training on TD methods and co-development methods, and we shared good and bad practices for SH engagement. In *LANDMARC,* quantitative tools are valued more during the proposal stage. Thus, upon reviewing the proposal, the national contact point indicated that the technical requirements specified in the research proposal call were not sufficiently emphasised. To appease the strong technical focus of the call, SH engagement was repositioned from the foreground to the background of the proposal, although engagement methods remained unchanged. Such practices can reinforce epistemic injustices, favouring quantitative science over qualitative methods that include SH knowledge. However, during implementation, a project reviewer acknowledged the value of SH engagement for research impact, recognising that this research process requires more time to produce scientific outputs. In *TIPPING+* and *EN-CLUDE,* social science and TD approaches are encouraged in the call text, but recognition justice is not inherent. Thus, we aim to emphasise the inclusion of historically marginalised groups in SH engagement planning processes. For example, in *ENCLUDE,* the recruitment of a citizens' academy involved partnering with non-governmental organisations (NGOs) to identify energy citizens from across the globe for the design of locally relevant solutions for confronting problems related to equitable access to sustainable energy.

Who we are, who we work with and whose funds we use

Reflections on the "why" and "what" concerning climate science are highly dependent on the "who." Thus, we explore three aspects as follows:

1. *Who we are:* researchers' positionality (Holmes 2020), values and role in the research.
2. *Who we work with:* SHs, including their perspectives and priorities – in consideration of intersectionality (Crenshaw 1991) – as well as those excluded from mainstream knowledge production.
3. *Whose funds we use:* making explicit to whom the research is accountable, the knowledge users and potential power dynamics or conflicts of interest.

Abbott (2004) conceptualised a research problem as having a foreground and a background, where different perspectives are positioned to (de)emphasise problems. We are aware that asking who is involved in the research shows that the starting point is driven by researchers. Thus, we must be careful when claiming that science and practice have equal footing, especially when the funders are from EU organisations with a history of colonisation.

Who we are: We acknowledge that our culture, social norms and cognitive biases influence our research (Van de Ven 2007). Coming from interdisciplinary backgrounds, our experiences span Europe, the Americas and Asia. We are all female; we represent local peoples, Indigenous peoples, immigrants and settlers; and we are at various stages of the research trajectory. Due to our diverse backgrounds, we place a strong emphasis on inclusive SH engagement in each project. In *TIPPING+,* early career researchers promoted EKC using TD methods by training more senior disciplinary researchers. Their leadership roles in the project have helped promote recognition justice within the consortium, such as by valuing early-career researchers' knowledge and experience through their role as co-editors of a special issue in *TIPPING+.* However, recognition and epistemic justice in the project partnership were not always possible. One potential partner from Latin America declined to participate in the proposal, citing European colonisation and centrism as deterrents and illustrating the impact of historic injustices on a project's capacity for inclusive partner representation.

Who we collaborate with: The European Commission required all projects to consider gender in the proposal, which helped trigger a wider discussion on intersectionality and inclusive SH co-development. In each project, researchers were explicitly asked to consult with SHs considering diverse genders, socio-economic statuses, ages and historical marginalisation (e.g., senior women and Indigenous people). Some case studies in *TIPPING+* foregrounded alternative narratives from these groups, where SH co-development features in *ENCLUDE's* design and implementation in consideration of age (youths) and social inequalities, and SH insights were considered in the design of a learning platform. In *LANDMARC,* proposal ideas were co-developed with land-use SHs, and case studies focused on their interests. That is, while the topic was mandated by the European Commission in the call for proposals, the actual research topic at the case study level was developed with SHs. However, the SH-led focus created some uncertainties during project implementation, as a few case studies changed their direction after a year into the project due to SHs' inputs. However, epistemic justice is highly valued in the project, and it takes priority over efficiency in data collection.

Who funds the project: While the European Commission requires heavy reporting in their *H2020* and *HEU* projects, there is flexibility in project implementation, which allows for some changes within the existing budget. Major changes can be requested via a grant amendment, and this process can accommodate the flexibility needed for SH co-development. For instance, *LAND-MARC* was granted permission to include another case study in   >

Ukraine in the middle of its implementation due to the relevance of the war to Ukraine's land use, food security and environment.

How we apply practices, tools and methods for knowledge co-production

The "how" encourages us to explore methods for the critical re-design of SH engagement methodologies through reflexive enquiry, which can involve envisioning alternative futures and challenging collective assumptions (Kortantamer et al. 2021). In *TIP-PING+,* the coordinating team worked closely with researchers, providing them with guidelines on inclusive SH engagement in a workshop setting. Including early career researchers in leadership and facilitation roles promoted more innovative SH engagement methods due to their openness to experimentation. Together with early career researchers, a common language was developed based on narratives for future pathways, emphasising those developed by non-mainstream groups, which may identify potential alternative transition pathways that are often ignored or unanticipated and that may hold potential for just transformations.

The implementation of *LANDMARC* relies on cooperation with SHs, as facilitated by a research team experienced in co-development with SHs who have been marginalised. For instance, Indigenous knowledge of fire management is being respectfully incorporated alongside scientific knowledge to scale up mitigation actions (Bilbao et al. 2019). Partners carried out comprehensive SH mapping in case studies by including SHs (in)directly involved in nearly all parts of the value chain, thereby encouraging recognition justice. Data on SH engagement is also being collected to monitor the types of SHs engaged, as well as their genders. We observe that females and landowners are still not well represented in some case studies and as such have asked case studies with more inclusive engagement to share their practices with others. We are also promoting epistemic justice by developing methods with modellers to document how we are including knowledge from societal SHs in our climate model scenarios, rather than depending solely on researchers' expertise.

ENCLUDE's research is the most conducive to EKC due to the consortium's experience in co-development with SHs. Potential energy community leaders were identified through workshops with NGOs having experience in energy, in poverty and with marginalised and vulnerable populations. Consequently, aspects of the scientific work have been redesigned to consider diverse SH knowledge in Europe and Africa.

General recommendations for equitable knowledge co-production

Reflexive thinking through asking the EKC the core questions of "why", "what", "who" and "how" can help place a greater focus on recognition and epistemic justice, so the knowledge included in science and used for decision making can be relevant for more groups. Considering these questions and our experience in *H2020* projects, we provide some suggestions for funders, reviewers and researchers:

1. allow *flexibility* at all research stages to consider co-development with SHs (e. g., changes in case study direction and budget flexibility for SH engagement);
2. address *epistemic justice* by educating reviewers to value qualitative methods that include SH knowledge equally during the proposal stage, particularly for highly technical calls;
3. promote *recognition justice* by including SHs from context-specific social intersections (e. g., gender, class and ethnicity); and
4. promote epistemic justice via *diversity in knowledge outputs,* not only in peer-reviewed publications but also in forms that benefit SHs (e. g., workshops, education programmes, plain language policy briefs, user-friendly apps).

Legitimising marginalised knowledge with equitable knowledge co-production in climate change science

Each *H2020* project included SH groups that have been marginalised, adding to the body of knowledge and solutions for addressing climate change. We call on mainstream Western knowledge production institutions, particularly in climate change science, including the European Commission and the Intergovernmental Panel on Climate Change (IPCC), to promote epistemic justice by broadening the knowledge on which policy making is based[5]. For instance, for IPCC reports, we suggest considering more diverse SH groups as a form of recognition justice to establish a rigorous body of knowledge beyond double-blinded academic publications as the norm. Robust resources are available that contribute to diverse local and Indigenous knowledge, including reports (Dooley et al. 2018, ICC 2022), peer-reviewed book chapters and insights from United Nations engagement processes (e. g., UNFCCC Talanoa Dialogue).

Final remarks in our field of research on climate change

By answering the questions "why", "what", "who" and "how" in relation to the EKC framework, we could more explicitly evaluate whether and how we have actively promoted recognition and epistemic justice when co-developing knowledge with SHs. We included SH groups that are not typically included in decision-making processes or in scientific knowledge development in climate change mitigation, despite the policy decisions being made based on climate science often impacting these SHs. We also note that knowledge co-production itself is insufficient for effective scientific and research outcomes. If only the same dominant SH groups continue to be consulted, their knowledge and the corresponding solutions will not appropriately address the needs of other groups, including those most adversely impacted, small

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5 See *Líneas de generación y aplicación del conocimiento: Centro de EcoAlfabetización y Diálogo de Saberes* by Universidad Veracruzana, *www.uv.mx/ecodialogo/lineas-de-generacion-y-aplicacion-del-conocimiento*.

in population size or experiencing marginalisation (Frantál and Dvořák 2022). Considering recognition and epistemic justice in the knowledge production processes of large-scale projects can lead to more impactful research and societal outcomes that better address climate change across multiple regions.

References

Abbott, A. 2004. Methods of discovery: Heuristics for the social sciences. In: *Contemporary societies.* Edited by J. Alexander. New York: W. W. Norton.

Basta, C. et al. 2021. Inclusiveness, equity, consistency, and flexibility as guiding criteria for enabling transdisciplinary collaboration: Lessons from a European project on nature-based solutions and urban innovation. *Frontiers in Climate* 3: 630075. https://doi.org/10.3389/fclim.2021.630075.

Bendiscioli, S. 2019. The troubles with peer review for allocating research funding. *EMBO Reports* 20/12: e49472. https://doi.org/10.15252/embr.201949472.

Bilbao, B., J. Mistry, A. Millán, A. Berardi. 2019. Sharing multiple perspectives on burning: Towards a participatory and intercultural fire management policy in Venezuela, Brazil, and Guyana. *Fire* 2/3: 39. https://doi.org/10.3390/fire2030039.

Crenshaw, K. 1991. Mapping the margins: Intersectionality, identity politics, and violence against women of color. *Stanford Law Review* 43/6: 1241–1299. https://doi.org/10.2307/1229039.

Demeter, M. 2020. *Academic knowledge production and the global south questioning inequality and under-representation.* Cham: Palgrave MacMillan. https://doi.org/10.1007/978-3-030-52701-3.

Dooley, K., P. Christoff, K. A. Nicholas. 2018. Co-producing climate policy and negative emissions: Trade-offs for sustainable land-use. *Global Sustainability* 1: e3. https://doi.org/10.1017/sus.2018.6.

Frantál, B., P. Dvořák. 2022. Reducing energy poverty in deprived regions or supporting new developments in growing suburbs? Regional differences in the use. *Energy Policy* 171: 113250. https://doi.org/10.1016/j.enpol.2022.113250.

Fraser, N. 2009. *Scales of justice: Reimagining political space in a globalizing world.* New York: Columbia University Press.

Fricker, M. 2007. *Epistemic injustice: Power and the ethics of knowing.* Oxford, UK: Oxford University Press. https://doi.org/10.1093/acprof:oso/9780198237907.001.0001.

Ghosh, B., M. Ramos-Mejía, R. Carvalho Machado, S. L. Yuana, K. Schiller. 2021. Decolonising transitions in the Global South: Towards more epistemic diversity in transitions research. *Environmental Innovation and Societal Transitions* 41: 106–109. https://doi.org/10.1016/j.eist.2021.10.029.

Holmes, G. D. A. 2020. Researcher positionality – A consideration of its influence and place in qualitative research – A new researcher guide. *International Journal of Education* 8/4: 1–10. https://doi.org/10.34293/education.v8i4.3232.

ICC (Inuit Circumpolar Council). 2022. *Circumpolar Inuit protocols for equitable and ethical engagement.* www.iarpccollaborations.org/updates/23022 (accessed June 30, 2022).

Kortantamer, D., J. Kalra, R. Vine. 2021. *Rethinking capabilities: Lessons for policy, scholarship and practice.* Bucks, UK: Association for Project Management. www.apm.org.uk/resources/research/published-research/rethinking-capabilities (accessed June 30, 2022).

Lang, D. J. et al. 2012. Transdisciplinary research in sustainability science: Practice, principles, and challenges. *Sustainability Science* 7/1: 25–43. https://doi.org/10.1007/s11625-011-0149-x.

Lieu, J., H. A. Sorman, O. Johnson, L. Virla, P. B. Resurrección. 2020. Three sides to every story: Gender perspectives in energy transition pathways in Canada, Kenya and Spain. *Energy Research and Social Science* 68: 101550. https://doi.org/10.1016/j.erss.2020.101550.

Pearce, B. J., O. Ejderyan. 2019. Joint problem framing as reflexive practice: Honing a transdisciplinary skill. *Sustainability Science* 15/3: 683–698. https://doi.org/10.1007/s11625-019-00744-2.

Pohl, C., P. Krütli, M. Stauffacher. 2017. Ten reflective steps for rendering research societally relevant. *GAIA* 26/1: 43–51. https://doi.org/10.14512/gaia.26.1.10.

Rosenfield, P. L. 1992. The potential of transdisciplinary research for sustaining and extending linkages between the health and social sciences. *Social Science and Medicine* 35/11: 1343–1357. https://doi.org/10.1016/0277-9536(92)90038-R.

Scholz, R. 2000. The mutual learning sessions. In: *Transdisciplinarity: Joint problem-solving among science, technology and society.* Edited by J. T. Klein, R. Häberli, R. Scholz, W. Grossenbacher-Mansuy, A. Bill, M. Welti. Basel: Birkhäuser. 117–129. https://doi.org/10.1007/978-3-0348-8419-8_11.

Van de Ven, A. 2007. *Engaged scholarship: A guide for organizational and social research.* Oxford, UK: Oxford University Press.

Zurba, M. et al. 2022. Learning from knowledge co-production research and practice in the twenty-first century: Global lessons and what they mean for collaborative research in Nunatsiavut. *Sustainability Science* 17: 449–467. https://doi.org/10.1007/s11625-021-00996-x.

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