Knowledge co-production: Cautionary stepping stones from Arctic social science

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Co-production of knowledge and collaborative methods have emerged as increasingly prominent approaches in academia. In this article, we examine knowledge co-production by first outlining its societal and political context and contemporary relevance. Our aim is to explore how co-production offers both new opportunities and emerging challenges for Arctic social science research. Engaging with recent academic debates, we draw on our experiences with co-production in Arctic research projects to identify and analyse seven stepping stones: when to initiate co-production; whom to involve; the trust challenges; how to bridge distances; the outcome of co-production; how to manage risks and building a legacy. Building on these insights, we critically reflect on the power relations and political dimensions embedded in co-production, while also considering its potential to generate productive friction and more robust research practices in Arctic social science.

Introduction

Co-production of knowledge have emerged as promising approach in academia for examining and addressing complex societal and environmental challenges. Although co-production occurs at many scales, for example, between governments, Indigenous organizations, industry, policy actors, or across knowledge systems operating at regional, national, or international levels, the call within academia to engage and initiate in such, is rather new. Some scholars even refer to a recent "turn to co-production" (Facer & Enright, 2016). In this paper we draw on our experiences from tourism research in the European Arctic and engage in the type of knowledge co-production initiated by and involving researchers. Such knowledge co-production can be understood as a scientific practice involving collaborative and interactive processes through which diverse stakeholders jointly produce context-specific knowledge, understanding, and insights (e.g., Monakhova et al., 2026; Norström et al., 2020). This approach emphasizes the importance of incorporating diverse perspectives (Sannö et al., 2019).

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Co-production challenges conventional models of academic knowledge production in which knowledge is generated solely by scientists. Instead, it seeks to democratize knowledge creation, enhance accessibility, and increase both the legitimacy and salience of knowledge (Nogueira et al., 2021). It acknowledges that citizens and other stakeholders possess valuable forms of knowledge and aims to mobilize these insights to support meaningful and inclusive changes. Ideally, co-production processes empower participants to influence and shape their immediate environments (Bell & Pahl, 2018).Funding agencies increasingly promote knowledge co-production through collaborative and participatory project designs, encouraging engagement with the public at various stages, for instance, through citizen science, community meetings, living labs, and preliminary fieldwork.

The European Arctic has emerged as both a resource frontier and a site for new industries, each associated with distinct interests and knowledge systems. At the same time, the region is undergoing rapid environmental change, warming at up to four times the global average (Rantanen et al., 2022). In addition, the expanding tourism sector contributes to environmental pressures both directly and indirectly (Olsen et al., 2026). Efforts to support the green transition, such as the expansion of hydropower and wind energy, have further intensified debates around green extractivism and colonialism (Hanacek et al., 2024).

Addressing these interrelated challenges requires more inclusive and equitable integration of non-academic knowledge to better capture the complexity of socio-environmental change and to inform policymaking and governance (e.g., Yua et al., 2022). While social scientists have long collaborated with Indigenous and local communities in Arctic Europe through community-based and participatory methodologies, there remains a need for new tools and approaches to bridge local knowledge systems with scientific knowledge.

As an alternative to linear models of knowledge production, in which scientists act as producers and others as users, knowledge co-production seeks to integrate diverse forms of knowledge. This approach is particularly relevant in the Arctic, where Indigenous and local communities possess generations of accumulated environmental knowledge and direct experience of what may be termed "Arctic realities." Such knowledge holds significant epistemological value and can inform both risk assessments related to climate and broader socio-environmental change, as well as the co-development of adaptive strategies and practices to enhance community resilience.

Despite its promise, co-production should not be regarded as a universal solution. Turnhout et al. (2020: 15) caution against treating it as a "silver bullet," noting that important questions remain regarding how and why co-production processes fail. Although the concept offers potential benefits, its practical implementation is often challenging. In response, this article directs attention to the "messy" dimensions of knowledge co-production, including *stepping stones* associated with dilemmas and uncertainties. We explore these stepping stones through empirical examples situated at the intersection of academic project logics and the needs and expectations of local contexts. Our analysis draws on experiences from multiple research projects informed by knowledge co-production in the European Arctic.

Building on these examples, we examine questions concerning when and how to initiate co-production processes; how to responsibly include diverse stakeholders; how to navigate differing temporalities and knowledge systems; and how to manage the practical limitations inherent in co-production. In doing so, we contribute to ongoing discussions on the political and power-laden

dimensions of knowledge co-production, which, following Turnhout et al. (2020), require further critical scrutiny. More broadly, this study aims to offer both a cautionary and supportive account for Arctic social science scholars engaging with the evolving dynamics of co-production research.

Conceptual Framework

In order to more effectively link knowledge with action and thereby respond to persistent and "wicked" sustainability challenges, more open and inclusive knowledge systems are required (Cornell et al., 2013). This shift is reflected in the emergence of what is termed the Mode 2 knowledge paradigm, which has gradually complemented the earlier Mode 1 paradigm. As described by Nowotny et al. (2003, p. 179),

> the old paradigm of scientific discovery ('Mode 1')—characterized by the hegemony of theoretical or, at any rate, experimental science; by an internally driven taxonomy of disciplines; and by the autonomy of scientists and their host institutions, the universities—was being superseded by a new paradigm of knowledge production ('Mode 2'), which was socially distributed, application-oriented, transdisciplinary, and subject to multiple accountabilities.

At the core of these paradigms lies a fundamental distinction in how knowledge is conceptualized: either as an objectifiable and transferable commodity (Mode 1) or as a situated practice (Mode 2), in which knowledge production and use are integral to collective activities (Hoarau-Heemstra, 2016).

As a logical extension of the Mode 2 paradigm, collaborative approaches such as co-production, and co-creation have been proposed as promising ways to generate actionable knowledge for complex sustainability challenges. These approaches aim to mobilize diverse ways of knowing and to bridge persistent gaps between knowledge and practice (Grindell et al., 2022). In this paper, we adopt the concept of co-production, drawing on the definition provided by Norström et al. (2020:5), who describe it as "collaborative processes involving diverse types of expertise, knowledge and actors to produce context-specific knowledge". At the same time, our analysis does not narrowly delimit co-production as a singular concept; rather, we use the term as an umbrella to encompass a broader range of participatory configurations, including co-creation and related approaches.

A central feature of these approaches is the disruption of linear models of knowledge production, replacing them with processes that emphasize interaction, reflexivity, and social learning. In the literature, co-production is often considered alongside related concepts such as co-design (Bellato et al., 2023). Liburd et al. (2022), for instance, examine distinctions between collaboration, cooperation, co-creation, and coordination within tourism research, and introduce the concept of collaborative design (co-design) in the context of sustainable tourism development (STD), a perspective similarly advanced by Farsari et al. (2025). Another increasingly prominent notion is that of enabling approaches (Charli-Joseph et al., 2023), which seek to strengthen "capacities that empower individuals and communities to take action on their own behalf" (Scoones et al., 2020: 67). In the specific context of tourism, Liburd and Edwards (2018: 268) argue that such approaches facilitate "a process of designing with an ethical, ongoing involvement of others through a respect for their ways of being in the world, their sense of values and aspirations."

More broadly, knowledge co-approaches refer to interconnected practices of knowledge production and application in which actors identify problems, produce knowledge, and implement solutions. The motivations for engaging in co-production are multiple: they may include enhancing the legitimacy and relevance of research outcomes, ensuring the uptake of scientific knowledge in societal contexts, or acknowledging the limitations of scientific expertise and the value of complementary perspectives. Consequently, a central question emerges: how can science be practiced in ways that effectively serve society and contribute to sustainable development? Kläy et al. (2015), drawing on Latour (2004), argue that scientists should act as conveners who create spaces in which participants can come together to reflect on knowledge and collectively engage with "matters of concern," rather than merely producing "matters of fact" (Latour, 2004: 231). This perspective underscores the need for social science researchers to adopt open, deliberative, and reflexive approaches when engaging with values, power, and politics in processes of knowledge co-production.

We approach knowledge from a sociological perspective that recognizes the complex interplay of judgments, ideas, framings, tacit skills, and values that shape what knowledge is and how it is constituted. In line with Jasanoff (2005), we argue that understanding knowledge requires attention to knowledge in the making. This entails examining the dynamic social processes through which knowledge claims are articulated, deliberated, negotiated, and valorized. Knowledge systems encompass the practices, routines, structures, mindsets, values, and cultures that influence what knowledge is produced, how it is produced, and by whom it is used. The structure and dynamics of these processes, in turn, shape whose knowledge claims are recognized as valid, as well as how such claims are constructed, evaluated, contested, and ultimately sanctioned as knowledge (Muñoz-Erickson et al., 2017). This conceptualization provides the foundation for recognizing the role of co-production in both knowledge generation and practices of knowing.

Methodology

The co-authors of this article are social science researchers with extensive experience in co-production research across multiple case areas in the European Arctic, and all have been engaged in research activities in these regions for several years. More recently, the authors collaborated on a research project examining cruise tourism development in the European Arctic. The study was conducted in four communities in Northern Norway, Iceland and Norway (Olsen et al., 2026) to explore sustainable cruise practices in collaboration with local cruise stakeholder, such as harbors' employees and tour operators and community members. The results of the project were discussed with communities during the community meetings and presented at local schools, media and conferences. As part of this project, principles of knowledge co-production were incorporated, while also—consistent with the central argument of this article—being subject to ongoing negotiation, adaptation, and, at times, compromise in practice.

In the development of this article, we reviewed scientific literature addressing knowledge co-production practices and principles in studies of socio-ecological change in the Arctic. This literature was then contrasted with our own empirical experiences and reflections derived from our joint participation in the Arctic cruise tourism project, as well as from other co-production-oriented research initiatives. These experiences provided the co-authors with opportunities—both before, during, and after project implementation—to critically reflect on situations that illustrate the complexity, richness, and often paradoxical nature of co-production processes.

To articulate and further develop these insights, we engaged in a collective and reflexive process within the authorship group. This involved discussing and revisiting project experiences, as well as sharing and analysing situations that exemplified recurring challenges, tensions, or dilemmas—such as moments of paradox, uncertainty, or difficulty. Through iterative deliberation and collaborative writing, we synthesised these reflections into a set of seven key "cautionary stepping stones." These were selected and defined on the basis of their capacity to capture recurrent and challenging aspects of knowledge co-production encountered in our research practice, which are not necessarily intended as sequential stages in a co-production process. In the following section, we present and discuss these stepping stones in greater detail.

Our cautionary stepping stones of knowledge co-production

1: Initiating co-production

When does a project start? While this may appear to be a straightforward question, it admits multiple answers. In the context of contemporary academic practice, a pragmatic response might be: when funding is secured. However, most research projects have extensive prehistories that often span several years, involving the gradual development of ideas, the formation of research consortia, and ongoing engagement with potential stakeholders. Repeated cycles of application, rejection, and resubmission further extend these timelines, meaning that many projects remain in preparatory phases for long periods, while numerous others never receive funding and remain unrealized.

As knowledge co-production has increasingly been incorporated as both an ambition and, at times, a requirement in Arctic social science research, an additional layer of complexity is introduced to this extended pre-project phase. This raises the question: when does co-production actually begin, and, relatedly, who should initiate it? Ideally, knowledge co-production should commence at the earliest stages of project formulation by incorporating the perspectives and priorities of non-academic actors, including community members, industry representatives, and other relevant stakeholders. Through such early engagement, participants can collaboratively define problem statements by exchanging perspectives and aligning concerns.

A genuinely co-productive process therefore implies that both researchers and non-academic actors are involved from the outset of project planning, jointly identifying knowledge gaps, articulating local concerns, and shaping research questions. In practice, however, realizing this ideal can be highly challenging. For example, how can individual community members or small business owners be motivated to participate in often time-intensive preparatory processes without compensation and without any guarantee that the project will ultimately be funded? As funding bodies increasingly emphasize co-production, small Arctic communities, and particularly Indigenous actors, are frequently approached by researchers seeking collaboration. This growing demand raises important questions regarding what incentives, conditions, or forms of engagement would make it both meaningful and worthwhile for these actors to invest their limited time and resources in project development processes that may not come to fruition.

At the same time, the absence of early involvement from local communities and Indigenous rightsholders raises critical concerns about the relevance and legitimacy of research projects. Without their input, how can researchers ensure that proposed research questions meaningfully reflect local priorities and concerns? Moreover, if such actors are not involved in the formative

stages, there is a risk that key decisions have already been made before co-production is formally initiated. In this sense, initiating co-production in a timely, fair, and transparent manner may seem both intuitive and necessary. In practice, however, determining when to "open up" the process—balancing the risks of engaging too early, thereby potentially wasting time and resources, against engaging too late, thereby limiting ownership, relevance, and societal impact—remains a complex and unresolved challenge.

2: Selecting and inviting into knowledge co-production

A second stepping stone in initiating co-production concerns the selection of participants and decisions regarding whom to collaborate with, and under what conditions. This raises important questions about how to identify key knowledge holders to "invite in," and how to ensure that such invitations are extended in ways that are open, transparent, and fair, while still allowing the process to remain manageable. Should a project begin with an open invitation to a community, aiming to include as many participants as possible—despite the risk of creating a highly complex and potentially unwieldy process? Alternatively, should participation be more strategically curated through targeted invitations, thereby risking the exclusion of relevant or marginalized voices?

These questions are deeply embedded in broader concerns about power and access to resources. Given the limited availability of research funding, inviting non-academic actors into the process effectively redistributes resources and may challenge existing power relations within research projects. Moreover, incorporating alternative forms of knowledge can potentially destabilize dominant academic epistemologies, highlighting the close interconnections between knowledge production, inclusion and exclusion processes, and wider societal power relations. In this sense, "knowing differently" becomes a powerful—yet also potentially disruptive—force.

In the Arctic context, issues of access and inclusion are further shaped by structural conditions such as sparse populations, vast geographical distances, and often limited or costly connectivity. Physical co-presence, which is frequently central to co-production processes, can therefore be difficult to achieve. Travel may be expensive, time-consuming, and logistically demanding for both researchers and participants. In addition, current funding structures often make it difficult, if not impossible, to compensate non-academic participants for their time, thereby effectively excluding many from meaningful participation. As suggested by Olsen et al. (2025), pre-proposal and pilot funding schemes may help mitigate some of these challenges. Ren and Merrild (2020: 149), writing in the context of Greenland, further observe that participation in research is frequently constrained by everyday realities:

> Their availability to participate could also be obstructed or at least influenced by remoteness, inadequate infrastructure, and simply the way of life, where hunters and fishermen are away from home for long periods. In that sense, not all community members have equal access to research or to sharing knowledge, or any access at all.

At a more practical level, seemingly minor decisions can significantly influence participation. For example, choices regarding when meetings are scheduled—whether during weekdays or weekends, daytime or evening hours—may enable or constrain participation for different groups. Similarly, decisions about language are crucial. Should meetings be conducted in English, the dominant language of academia, which may be less accessible or comfortable for local participants? Or should local languages be prioritized, even if this limits participation by some researchers? In practice,

English or other non-local languages often become the default due to considerations of cost, convenience, or insufficient attention to these issues.

A further challenge relates to the notion of "community." While communities are often imagined as cohesive and harmonious entities, this is rarely the case (Meyer et al., forthcoming). Instead, communities consist of diverse actors with differing—and sometimes competing—interests and priorities. As a result, co-production processes must navigate these internal differences, balancing competing perspectives and, at times, mediating conflicts. Project leads must therefore carefully consider how to create spaces in which divergent viewpoints can be expressed, while also ensuring that participation remains equitable and does not inadvertently exclude certain actors.

3: Build trust and relations in knowledge co-production

Knowledge co-production, implicitly or explicitly, relies on the principle of sharing, which in turn depends fundamentally on trust. Trust requires time to develop; accordingly, sustained engagement—through spending time together, building relationships, and fostering mutual understanding—is central to meaningful co-production. However, time is often a limiting factor in research projects, which are typically constrained to short durations, often around three years. This challenge is particularly pronounced in Arctic contexts, where researchers frequently do not reside in the communities they study, and where access may be intermittent or difficult.

Academic temporalities present a paradox. On the one hand, they are often very long: funding decisions may take months or even years, and the production of academic outputs—such as journal articles—can be similarly time-intensive. As a consequence, the urgency or relevance of the research focus may change, or even dissipate, for community participants during the course of a project. Stakeholders may therefore experience frustration when the primary outputs take the form of academic publications rather than more immediate or tangible outcomes.

On the other hand, academic timeframes may also be perceived as too short. Researchers are typically able to engage in co-productive work only for the duration of a funded project. Once funding ends, opportunities to continue engagement may be limited. For local stakeholders, however, the issues under study are not temporary research topics, but part of their everyday lives, livelihoods, or institutional responsibilities. From this perspective, researchers appear as temporary participants—entering and exiting just as relationships and processes begin to develop. Consequently, aligning the temporalities of academic research and stakeholder engagement is often difficult, if not impossible.

This temporal disconnect is further reinforced by the episodic nature of fieldwork. Researchers often engage with communities in relatively short, intensive periods, producing "snapshots" of local realities. This mode of engagement may contribute to feelings of abandonment among local participants once projects conclude, thereby undermining trust. Effective co-production, however, typically requires long-term and sustained relationships that extend beyond individual projects. Current funding structures, which prioritize short-term project cycles, may therefore inadvertently hinder trust-building efforts.

One domain in which these temporal constraints may be less pronounced is education. In our experience, researchers, in their roles as educators, can leverage educational activities as a platform for building trust and fostering long-term relationships that may also support research. Collaboration with external actors is often encouraged within higher education, providing

opportunities to develop sustained partnerships over longer timescales than typical research projects allow. Educational funding is often more stable, and regular activities such as field trips and student excursions can serve as a basis for ongoing engagement and early-stage co-creation. Such practices may blur the boundaries between research and education—something that may challenge conventional academic structures, but which is often less problematic from the perspective of societal actors, who do not necessarily distinguish between co-production in these different domains.

4: Bridging distance in knowledge co-production

A fourth stepping stone in co-production concerns the notion of distance, encompassing both physical and metaphorical dimensions. The context-specific nature of co-production processes is closely linked to situated knowledge (Norström et al., 2020:187) and raises questions about how to design interaction processes in which local actors can meaningfully participate as co-producers of knowledge. As Merrild and Ren (2020) note, research in Arctic contexts has often been characterized by externally driven agendas, where researchers collect data during brief visits and conduct analysis elsewhere, reflecting what may be described as a "fly-in/fly-out" model and, in some cases, reproducing a form of "colonial gaze."

Addressing this issue requires careful attention to how knowledge production is situated and facilitated within Arctic communities. Designing interactions that effectively bridge the gap between the production and use of knowledge (Turnhout et al., 2013: 354) is essential for developing robust and contextually grounded research. Such interactions may take multiple forms, including community visits, fieldwork, workshops, interviews, and participant observation. Projects may involve both experienced researchers with long-standing engagement in the region and newcomers with more limited contextual understanding.

For early-career or newly engaged researchers, networking platforms—such as ArcticNet (Canada), the Svalbard Science Conference, Arctic Frontiers and High North Dialogue (Norway), Greenland Science Week, and the Arctic Circle Assembly in Iceland—offer important opportunities to connect with local stakeholders and collaboratively develop research initiatives. Additionally, seed funding for preliminary engagement, such as community visits, may be available through initiatives like the Svalbard Science Forum, UArctic, or institutional funding schemes.

Despite these efforts to reduce distance and foster engagement, funding mechanisms seldom support extended stays in communities or repeated in-person interaction over time. As a result, much Arctic research continues to be conducted at a distance, limiting opportunities for sustained co-production. This highlights the ongoing need to strengthen funding structures and institutional arrangements that can better accommodate the additional costs and time requirements associated with meaningful co-production processes.

5: Values of co-production and 'good outcomes'

A further issue concerns how to conceptualize and evaluate the outcomes of co-production across different stakeholder groups. What constitutes a "successful" project, and how should value creation be assessed? Wenger et al. (2011) propose a useful framework that distinguishes between multiple forms of value, including value generated within a community of practice (inward-facing) and value associated with the expansion of networks (outward-facing). They also differentiate between immediate and more intangible forms of value. Immediate value typically refers to visible

project activities—such as meetings, workshops, and events—which are relatively easy to measure quantitatively. In contrast, more subtle forms of value, such as the development of knowledge capital, are less readily quantifiable but may be equally or more significant.

Such knowledge capital may not always be directly realized, yet it can still hold considerable value—for example, by enhancing preparedness or informing future responses to crises. Even when not explicitly utilized, the mere existence of knowledge can influence practices and improve performance in other areas. Participation in co-production processes can also lead to shifts in understanding, prompting participants to reconsider their activities and underlying objectives. These less tangible and longer-term outcomes are often among the most meaningful effects of co-production. Recent work by Poort (2026), drawing on Wenger et al. (2011), demonstrates how co-produced initiatives—such as those exploring regenerative tourism—create spaces in which participants can critically reflect on their practices and motivations. Participants themselves frequently identify such reflective processes as among the most valuable outcomes of co-production.

The growing emphasis on knowledge co-creation is reflected in contemporary research funding calls, evaluation criteria, and project designs, all of which increasingly stress the inclusion of multiple voices. This involves not only different scientific communities of practice but also stakeholders from outside academia, including businesses, non-governmental organizations, and public authorities. These actors bring diverse knowledge needs, institutional cultures, and expectations, all of which must be negotiated. For instance, while academic value is often measured through peer-reviewed publications, such outputs may be of limited relevance or accessibility for practitioners. Consequently, decisions regarding how co-produced knowledge is represented and communicated should be integrated into project design, encompassing questions of format, language, and audience.

In our own project, academic outputs—such as journal articles—were initially perceived as the most significant deliverables. However, we also produced reports, newspaper articles, and policy briefs based on our analyses. Engagement with stakeholders, for example through presentations at meetings of the Northern Norwegian Cruise Network (in 2024 and 2026), proved to be particularly impactful. In retrospect, these outputs—initially seen as secondary—were often the most relevant and valuable for local communities.

This illustrates a central tension in co-production: project outcomes are frequently evaluated according to the standards of a single community of practice—typically academia—while broader forms of value, particularly those relevant to practitioners and policymakers, may only become visible over time and through less easily measurable forms. Returning to Wenger et al.'s (2011) framework, such outputs may represent precisely the outward-facing and intangible value that co-production is uniquely positioned to generate.

6: Managing risks in co-production projects

Risk management permeates all aspects of co-production projects, including relationship management, resource allocation, time planning, and budgeting. Conventional project management emphasizes adherence to predefined timelines, budgets, and scopes; however, uncertainties and risks often challenge such plans. For instance, the COVID-19 pandemic significantly disrupted research timelines, particularly with regard to fieldwork and in-person interaction, while also raising

concerns about safety in travel and meetings. Similarly, events such as the critical tourism studies conference in June 2022—which resulted in a COVID-19 outbreak among attendees—illustrate how participation in academic activities may entail both risks and costs. Geopolitical developments, have also reshaped research collaborations, in some cases leading to institutionalized disconnections between researchers.

These examples underscore that risk is both a situational condition and a socially constructed phenomenon. Within co-production processes, not only knowledge but also perceptions of uncertainty, acceptable risk, and appropriate responses are collectively shaped. Decisions are often made under conditions of ambiguity and evolving circumstances, requiring flexibility and adaptive learning. Reflective social learning and collective sense-making can therefore support more responsive and timely decision-making (Perminova et al., 2008).

This raises important questions regarding the management of co-produced projects: should risks and mitigation strategies be fully integrated into project design from the outset, or should risk be understood as a dynamic and collectively negotiated aspect of the process? While strategic planning remains important (Mintzberg, 1994), early-stage planning alone is insufficient to ensure project success in the context of complex, unpredictable environments. Project leaders must often make decisions based on incomplete information, adapting plans as circumstances evolve.

Standardized procedures, lessons learned from previous projects, and flexible resource allocation can help mitigate risks. At the same time, uncertainty can also present opportunities. In our case, the pandemic prompted a shift in focus—from examining overtourism to exploring how communities respond to the sudden absence of tourism and envision future development pathways. Through ongoing exchanges between research teams and stakeholders, projects can adapt to changing contexts. In this sense, co-production projects may be more accurately understood as exploratory processes that require continuous reflection, adaptability, and learning.

7: Building the legacy for knowledge co-production

While research projects formally conclude when funding ends, the outcomes of co-production may extend far beyond the lifespan of a project. When co-production successfully bridges the gap between knowledge production and use, its impacts are sustained not only through academic outputs but also through ongoing relationships and networks among stakeholders. In our project, for example, collaborations established between researchers and industry actors have continued beyond the project's duration, facilitated through recurring meetings such as the Tourism Seminar at Greenland Science Week, as well as through invitations to contribute to policy and strategy discussions and the development of new joint initiatives. Continued engagement through presentations at cruise network conferences demonstrates the enduring relevance of these relationships.

Although institutional constraints—such as funding structures and differing temporalities—can complicate collaboration between academia and external stakeholders, academic work is also characterized by the capacity to engage with particular topics over extended periods. Unlike many non-academic actors, whose activities may be shaped by shifting priorities or resource constraints, researchers can maintain long-term intellectual engagement, accumulating expertise and connecting insights across multiple projects and collaborations.

Over time, sustained co-production efforts can yield not only robust, practice-oriented knowledge but also increasingly resilient forms of collaboration. In such cases, trust developed through prior engagements may result in academia being actively "invited in" to future initiatives. Co-production thus evolves into an ongoing process that transcends individual projects, with knowledge creation and collaboration continuing in new forms and configurations across successive research endeavors.

Discussion: reflections

Despite the growing adoption of the co-production approach, driven by its considerable potential to advance Arctic social science research, researchers continue to encounter substantial challenges in integrating it across all phases of the research process. As noted by Turnhout et al. (2020), much of the methodological literature on co-production fails to provide a sufficiently robust account of why and how the application of this approach falls short in practice. One key reason for this limitation, as they argue, lies in the insufficient attention paid to the roles of power and politics in shaping co-production processes. In this article, we address this gap by demonstrating how structural barriers, project temporalities, and power dynamics intersect and influence co-production across all stages of a project, from its initial formulation to its implementation, conclusion, and afterlives. At a structural level, we identify several key barriers, including limited time for preparation; insufficient opportunities for learning and reflexivity both within and across project teams; inadequate funding mechanisms to support the participation of non-academic knowledge holders and collaborators; and the broader "projectification" of academic work.

Co-production further requires that researchers relinquish exclusive control over the research process, moving away from unilaterally defining research agendas, questions, publication formats, and the allocation of resources. This shift brings underlying power asymmetries between researchers and participating communities or stakeholders into sharper relief. Critical proximity through trust and shared interpretation strengthens the knowledge co-production. Close, recurring relationships can help avoid research with no 'social license to operate' and encourage socially relevant and actionable accounts (Ren and Thomsen 2020). Still, even when co-produced knowledge is socially robust and contextually relevant, it may not align with dominant academic norms and reward structures, such as expectations regarding publication outlets, authorship, or criteria for career advancement. Thus, many institutional arrangements within academia remain in tension with the principles and practices of co-production. Rather than interpreting these tensions solely as obstacles or limitations to research, we propose that they be reframed as co-productive "stepping stones." These moments—when co-production processes slow down, encounter friction, or deviate from linear trajectories—should not be understood as failures, but as integral and potentially generative aspects of the process. Importantly, we do not view such "stones" as inherently negative; instead, they hold productive potential by fostering new reflections, relationships, and possibilities (see Tsing, 2005). Precisely because of this generative capacity, such stepping stones warrant careful engagement and critical reflection and in Table 1, we synthesize how they can serve as entry points for reflecting on what co-production approaches promise and how they unfold in practice. We argue that it is only by "staying with" these tensions and misalignments that co-production processes can be transformed into productive frictions—creating space for critical inquiry, reflexivity, and the reconfiguration of research practices.

Table 1. Navigating co-production. Promise vs. reality.

Stepping stones	**Promise**	**Reality**
Co-production period	The co-production starts during or prior the project proposal stage and lasts beyond the project end period	Co-production period is often limited to the (funded) project period with some exemptions
Selection of knowledge co-producers	Inclusive process, aims to involve all relevant stakeholders	High dependency on funding opportunity, time for involvement and (in some occasions) avoidance of conflicts
Building trust	Continuous, long-term interaction creation long-term relationships and mutual sharing	Academic structures, not least funding, prevent continuous interaction, and require that researchers find other ways, for example education as a venue to create lasting relationships
Bridging distance	Continuous presence of researchers in communities	Long physical distance makes it practically and financially challenging for researchers to spend time in field
Values and outcomes	Mutual benefits	Most benefits for researchers come in form of new data and publications. Less benefits for communities. Common frameworks for measuring value miss what can be beneficial for communities
Managing risks	Plan for risk mitigation	Unpredictable risk which can change the nature of the project and the problem statement, e.g. COVID-19
Building the legacy	Academia becomes ´invited in´ by stakeholders for continued co-production	Institutional barriers in form of funding opportunities and differing temporalities challenge the ability to engage with particular topics over extended period of time.

Moving forward: concluding reflection

Our discussion above illustrates that, although the co-production approach has gained broad acceptance, it continues to raise important questions and challenges, particularly regarding its inherent complexities and paradoxes. This prompts the question of how to facilitate effective co-production while also addressing its shortcomings in practice.

One important avenue is to begin deliberate and reflexive preparation well in advance of formal project initiation. In a recent study, Ligtermoet et al. (2025) introduce a diagnostic framework designed to support research teams in preparing for co-production within interdisciplinary contexts. This framework emphasizes the importance of fostering reflexivity and critically evaluating research settings, encouraging researchers to engage with questions of positionality, the underlying purpose of co-production, power relations among stakeholders, and the organization and nature of collaborative processes. However, such preparatory work requires both time and institutional support, and it may be particularly challenging for researchers who are new to co-production to meaningfully engage in these activities.

While there are clear opportunities to further develop and improve co-production methodologies, these efforts often come at a cost, as they are embedded in broader structural conditions shaped by power and politics. For example, academic funding structures may pose significant constraints, limiting both the ability of individual researchers to engage in co-production and the likelihood of success when they do. Recognizing these challenges, several studies call for the development of institutional systems that better support and sustain co-production, including reforms to application and funding structures.

Another pathway for facilitating effective co-production lies within education, which remains a central pillar of academic knowledge production. Integrating collaboration with citizens, communities, or industry stakeholders into educational activities can provide a space in which researchers—particularly in their roles as teachers—are able to sustain and deepen relationships over time. At the same time, such integration offers opportunities to advance educational practices by enabling students to learn about co-production through active participation. In this sense, teaching co-production by doing co-production addresses a critical gap in current academic training. This highlights the important role that educational institutions can play in sustaining and strengthening co-production practices between universities and society.

In seeking to advance co-production approaches, we also argue for a more thorough engagement with their limitations. For example, when research builds heavily on community perspectives, there is a risk of reinforcing "not in my backyard" dynamics, which may be difficult to avoid. At the same time, many of the challenges faced in the Arctic require broader, systemic perspectives that extend beyond individual communities, and effective solutions may entail trade-offs or costs that are unevenly distributed. This suggests a need for further exploration of how co-production can be combined with other research approaches in ways that address its limitations without discarding its core strengths.

Co-production can also carry scholarly risks that deserve attention. Although it builds on participatory and collaborative traditions in anthropology and action research, it differs from much conventional social science in that framing and interpretation are shared with partners, not held by the researcher(s) alone. The trust and continuity that make this possible could erode critical distance: researchers may hesitate to report findings that partners could read as unflattering, and partners may, consciously or not, adjust their accounts to what they think researchers expect. Safeguards include for example 1) agreeing in advance that partners comment on but do not veto interpretations; 2) triangulating with other data; and 3) keeping reflexive notes within the team. Confidentiality also works differently than in conventional research, since co-producers are often identifiable and may wish to be named; consent therefore needs to be treated as ongoing and

identifiability discussed with partners, and in line with ethical approval. Such safeguards reduce, but do not remove, these risks, which reinforces our call for reflexivity and ethnographic sensitivity.

A further challenge concerns the dissemination of knowledge in forms that are meaningful for both academic audiences and wider societal groups. While differences in epistemologies can, to some extent, be negotiated within co-production processes, divergences in how value is defined and what constitutes a "good" result are often structurally embedded and may be more difficult for individual researchers to influence. The prevailing "publish or perish" culture incentivizes rapid academic output, which can conflict with the longer time horizons required for meaningful co-production and the diverse forms of value it generates for communities. In some cases, adhering to co-production principles may involve personal career trade-offs for researchers. This underscores the need for more innovative approaches that create value for both researchers and participating communities. Joint publications involving co-production partners—ensuring that outputs are relevant and accessible—represent one possible pathway. More broadly, there may be a need for a shift within academia to recognize and reward a wider range of research outputs, including community workshops, local media contributions, and other forms of societal engagement, as well as to develop metrics that better capture social impact.

Finally, co-production remains an evolving field, and there is an ongoing need to deepen understanding of the complexities of collaboration and knowledge creation. This calls for approaches that foreground ethnographic sensitivity, reflexivity within research teams, and systematic knowledge sharing both within and across projects. Such efforts can contribute to a more nuanced and practically grounded understanding of co-production as it unfolds in diverse research contexts.

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