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Editorial

Shaping Tomorrow's Arctic

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This Special Issue "Shaping Tomorrow's Arctic" explores the past, present and future of Arctic sustainability. Decisions made now are fundamentally shaping the multiple Arctics of 2050. In looking forward, what can we learn from past experiences, as well as from recent responses to change? What steps should we be taking now to lay the foundation for equitable, just and inclusive Arctics? How might futures differ for multiple Arctic populations, economies, cultures and governance (Figure 1)? These are some of the profound questions we ask in this Special Issue.

We invited contributions that advance our understanding of Arctic sustainability from all disciplines, and from local, national, regional, and international perspectives. We were eager to include commentaries as well as research articles and reviews. The community responded with a range of analyses and perspectives, including from Indigenous and early career, as well as senior, scholars. As a result, the scope of "Shaping Tomorrow's Arctic" extends from the need to restructure for societal and economic equity, to ways to build capacity for adaptation, knowledge co-production for resilient futures, and Arctic-global repercussions.

Restructuring for Societal and Economic Equity

Exploring differential national relationships to their Arctic regions and communities, Young [1] asks " . . . do we need to acknowledge that the Arctic encompasses a number of different subregions whose futures may diverge more or less profoundly?" He continues: " . . . some observers take the view that we need to think more about future Arctics than about Arctic futures". While people living in the northern regions of Finland, Norway, and Sweden are comparatively more integrated with their southern compatriots, the Arctic has historically been viewed as a region distinct from the rest of the country and more of a hinterland for Russia, Canada and especially the United States [1]. Huntington [2] reflects on the legacies of colonialism that are pervasive in many regions of the Arctic. The Sámi, the Indigenous people of Fennoscandia, along with the Indigenous peoples of the Russian North, the Inuit, Aleut, Gwich'in and Innu of the North American Arctic, and the Kalaallit of Greenland, have all been exposed to aggressive colonial practices that led to assimilation, loss of land, language, and culture. Colonization and the initiation of trade routes situated much of the Arctic at the "mercy of distant market forces, on which the Arctic had little or no influence" [2].

Both now and in the future, another outside force—climate change—is reshaping the Arctic, including the environment, societies, and development. Young [1] notes: "A striking feature of this development is the strengthening of linkages between the Arctic and the outside world". As we head towards those futures, Huntington [2] points out that: "The current path is one of incremental and reactive compromise, which leads not to sustainability, but to an inevitable decline". He proposes instead that " . . . perhaps shaping tomorrow's Arctic should be reframed as creating the conditions that will allow

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tomorrow's Arctic the greatest scope for shaping itself". Huntington [2] calls for a core commitment to equity, "specifically a commitment to living equitably within the social and ecological bounds of the Arctic, from which specific policies and actions can be developed and adjusted as needed".

Figure 1. Sidney: "*My picture shows what I think it will look like in the future. It might be like a city*". *The visions of the children as painted tell of a future of multiple-coloured snow, sea level rise, urbanisation and houses of distinct colours—reflecting multiple pathways for this strong Norton Sound community might take in the future.* Sidney, an Indigenous Alaskan child from Unalakleet, drew the future of his home community as a part of Snowchange community work in 2020, showing the awareness and issues the youth of the Arctic have today. (c) Snowchange, used with permission. http://www.snowchange.org/2020/02/children-of-unalakleet-alaska-paint-their-future-2020/ (accessed on 23 September 2022).

Oddsdóttir et al. [3] stress the need to focus on equity, specifically as related to gender. They point out that " ... economic development throughout much of the region affects men and women differently. It is a cause for concern that future development in the North, for the most part, focuses on traditional male sectors such as oil and gas, mining, shipping, and tertiary industrial development". They raise the issue that if we are not sensitive to gender and other inequalities, we can inadvertently exacerbate vulnerability: "Adaptation to climate change, in Arctic research and policy, should thus be reframed to systematically account for health, education, food security, and Arctic economies, all of which are simultaneously differentiated by gender". They call for " ... evaluating the effects of all actions, policies, and programmes on all genders to ensure that decisions do not perpetuate existing inequalities and create new ones".

Rozanova-Smith [4] takes up the youth perspective, with a focus on two Russian cities, and with applications across the Arctic. Through her research she found that "the Arctic communities face tremendous risks associated with youth "flight", making their future social sustainability uncertain". She calls for " ... the engagement of young people in

defining problems and drawing up policies is vital to allow younger generations to have control over their own futures in the Arctic and responsibility for the future and social sustainability of their communities" [4].

Building Capacity for Adaptation

How do we build capacity to adapt to changes in ways that will set the stage for both Arctic communities and environmental systems to thrive? National and international interest in Arctic renewable and non-renewable resources continues to grow, posing challenges to local, regional and larger-scale adaptation strategies, while path-dependencies confound urgently needed transformations. Yet opportunities exist both for restoring time-honored traditional practices and fostering new ones that address socio-cultural and environmental adaptation requisites.

Tackling this question of capacity-building requires understanding and dealing with systemic issues caused by colonialist legacies. Tabata [5] considers contributions of natural resource extraction, focusing on mining, oil and diamonds, to the economic development of the Sakha Republic, in Russia. Mustonen and Van Dam [6] observe that in Alaska dependencies on cash economies and firearms, as well as epidemics and the takeover of resources and cultural practices, contribute to the loss of self-governance. The consequence is that "mining, energy and infrastructure projects have thoroughly altered the . . . land and lifescapes" [7].

Focusing on the perspective of wild reindeer and their interconnections with biological, cultural and linguistic diversity as well as food security, Mustonen et al. [7] observe

> Traditional skills do not necessarily disappear during industrial modernization. Instead, in certain encouraging conditions, they can re-emerge and pave routes to endemic futures". The conditions they derive for successful emplacement: (1) surviving natural core ecosystems, (2) engagement with cultural landscape knowledge including social-ecological networks) and (3) agency to renew endemic links and direct adaptation, can be considered a framework for post-extractive futures across the Arctic. [7]

Furthermore, Mustonen and Van Dam [6] position "Indigenous resurgence, restoration and wisdom" as necessary to thriving futures in the face of climate change.

Fresco et al. [8] also focus on Alaska, but explore the potential for farming and gardening through the lens of "cultivating opportunities" in the face of climate change. They find

> . . . many new possible avenues for expansion of Alaska's agricultural potential at the local scale". . . . "Especially in the context of climate-related agricultural uncertainty, challenges in other regions and possible climate-related needs for greater local autonomy (due to disruptions in supply chains and/or reduced use of fossil fuels for transportation of crops), and the need to diversify Alaska's economy [offer] new opportunities for farms and gardens . . . [8]

Knowledge Co-Production for Resilient Futures

Wilson [9] observes that "Balancing community-based and community-driven research with the academic freedom to pursue curiosity-driven research will be a difficult and increasingly contentious task in the future . . . There is both room and a need for both types of research". Historically, both types of Arctic research were controlled and dominated by scholars, funding, and publication venues partly outside the Arctic. With respect to community-relevant research, " . . . we have seen a profound shift in attitudes on the part of academic researchers from being in control of the research process from start to finish, to co-producing research with local partners and conducting research that meets the needs of communities" [9].

Degai et al. [10] raise the critical question with respect to "securing a sustainable Arctic tomorrow. Ultimately, we call on individual researchers to ask themselves: what can I do to make this happen?" They call out the need for a more just understanding of co-production, stating that "Co-production should imply co-identification of research needs, co-creation

of research ideas, co-design of research questions, co-definition of research objectives, co-development of research programs, co-authorship of research results, co-implementation of research projects and co-evaluation of research outcomes" [10].

Turning attention to the critical issue of broadening education about the Arctic, Wilson [9] observes that:

> One of the most important roles played by post-secondary educators and, indeed, one that is often overlooked is to inform post-secondary students and the broader public about the issues confronting the North. . . . It may seem like a very small and inconsequential act compared to the important work being done in the North by organizations and governments but raising awareness about the North among students, a group of people who will be the country's future political leaders, businesspeople, activists and citizens, will pay dividends in the years ahead. [9]

Perrin et al.'s [11] contribution focuses on integration of research advances into policies, actions and decision-making. "Engaging stakeholders that will be involved in incorporating results into decisions or programs during early stages of project development can promote knowledge transfer later in the project" [11].

Arctic-Global Repercussions

Schlosser et al. [12] and Bodansky and Pomerance [13] argue that while most people in the world outside the Arctic do not realize it, their current and future livelihoods and circumstances are now vulnerable to an increasingly forceful and erratic warming Arctic. "The unraveling of the Arctic is bad enough for the Arctic itself, but it will have enormous consequences for the entire planet since the Arctic is a crucial component of the global climate system" [13].

Both papers argue for aggressive action. As Schlosser et al. [12] put it "We are now in the decisive decade concerning the future we leave behind for the next generations. The Arctic's future depends on global action, and in turn, the Arctic plays a critical role in the global future". Schlosser et al. [12] focus on the critical need for investment in scaling up carbon capture and sequestration in order to reduce the rate and magnitude of warming.

Bodansky and Pomerance [13] are concerned that even scaling up decarbonation may not happen fast enough, and that we need more tools that we can deploy:

> Most of the emission pathways considered by the IPCC to achieve the 1.5 °C target assume that we will initially overshoot the target and then need negative emissions to bring temperature back down. The problem is that some of the harm from overshoot will be effectively irreversible in meaningful time frames, such as the release of carbon dioxide and methane from thawing permafrost and the disappearance of Greenland and other Arctic—as well as Antarctic and mid-latitude—glaciers . . .

Solar climate intervention is perhaps the most controversial proposal to address climate change but may be the only means of cooling the earth quickly enough to save the Arctic. [13]

Looking Ahead

The concept that we could 'Shape Tomorrow's Arctic' seems at odds with the extraordinary complexities facing the world today—global pandemic, Russian invasion of the Ukraine, as well as climate change breaking record after record for heat waves, floods, fires, etc.

Yet this is exactly what these articles are about. They present enduring foundations for future research and decision-making that can guide us through this complexity, to think ahead, co-produce approaches, and try to make the better choices—not just for us and now—rather systematically, for the most vulnerable, and into the future.

But things are changing far too slowly. We are literally losing ground, as the Arctic thaws and melts. Some attribute this to a mismatch between those who know and those who decide, others attribute it to timescales in decision-making processes, and others to

inertia where the path of least resistance is the path that is easiest to follow. These all are true, and yet they don't have to be. We know our prior paths have led us to the uncertain present and a perilous future. It is time to make intentional choices to shape thriving Arctic futures.

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