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3RD INTERNATIONAL CONFERENCE ON ARCTIC RESEARCH PLANNING

Arctic Sustainability Research: Agenda 2025

A White Paper for the International Conference for Arctic Research Planning ICARP III

SUMMARY AND KEY FINDINGS

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Arctic Sustainability Research: Agenda 2025

Purpose

The Arctic is one of the world's regions most threatened by ongoing and increasing cultural, socio-economic, and environmental and climate changes. Over the last two decades, multiple stakeholders and rights-holders—scholars, policymakers, extractive industries, local-global governments, local and indigenous communities—have turned their attention to the Arctic, its peoples and resources, and to challenges and benefits of impending transformations. The International Conference on Arctic Research Planning (ICARP) has now transpired three times, most recently in April 2015. Of increasing concern within the Arctic and within ICARP endeavors is addressing sustainability. This paper provides an overview of the current state of research on sustainability and sustainable development in the Arctic and identifies related knowledge gaps and research priorities for the next decade. We offer a summary of sustainability concepts in global and arctic contexts, a progress report on Arctic sustainability research, and recommendations for prioritizing research.

Process

This paper was prepared by an international and interdisciplinary team, with support from the International Arctic Science Committee Social and Human Sciences Working Group (IASC SHWG), International Arctic Social Sciences Association (IASSA) and Arctic-FROST research coordination network. To evaluate the state of sustainability research in the Arctic, the team reviewed science plans from ICARP-II (2005) and progress toward addressing sustainability and sustainable development research since then. In particular, we considered those ICARP II Science Plans focusing on economic development, indigenous considerations, social-ecological change, and research processes and communication. Through the review, we also identified future research priorities for research on arctic sustainability and sustainable development, both in areas of interest identified by the ICARP-II Science Plans and in areas that have emerged as important since 2005. The paper considers theory, methodology, synthesis, indicators, governance, and ecological dimensions of arctic sustainability science.

Input was solicited through sharing the initial draft with a broader network of researchers, as well as presenting our findings to the academic public for discussion and feedback at several venues, including the ICARP III meeting in Toyama, Japan in April 2015. The input received has been incorporated in this version,

Agenda 2025: Perspectives on gaps and future research priorities in arctic sustainability research

Key developments and progress in arctic sustainability research

Overview

A critical review of directions and achievements in the last 10-15 years of sustainability research undertaken in this white paper identified areas of substantial progress but also considerable gaps in emerging arctic sustainability science. In general Arctic sustainability research demonstrates quickly increasing volume (Figures 1 and 2), and growing theoretical and methodological strengths. If sustainability and sustainable development studies regarding the Arctic are now not only 'catching up' with similar research outside the region, in many ways they offer pioneering approaches to theory, methodology and implementation. Arctic-based research provided substantive and substantial input to our understanding of coupled human-environment interactions from multiple perspectives, especially from standpoint of resilience, adaptation and ecosystem stewardship approaches. Arctic researchers have made contributions in developing social and environmental indicators and implementing community-based methodologies of community-oriented, community-relevant research. Arctic sustainability research is becoming a leading regional contributor to the global knowledge system about sustainability.

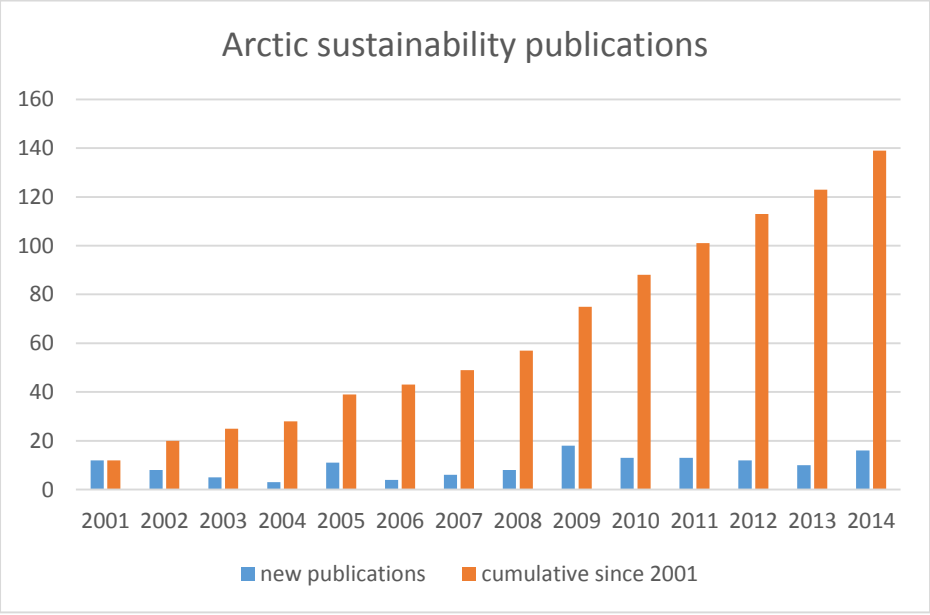

Figure 1. Literature on Arctic Sustainability 2001-2014 (Source: Google Scholar, "Arctic" and "sustainable", titles only)

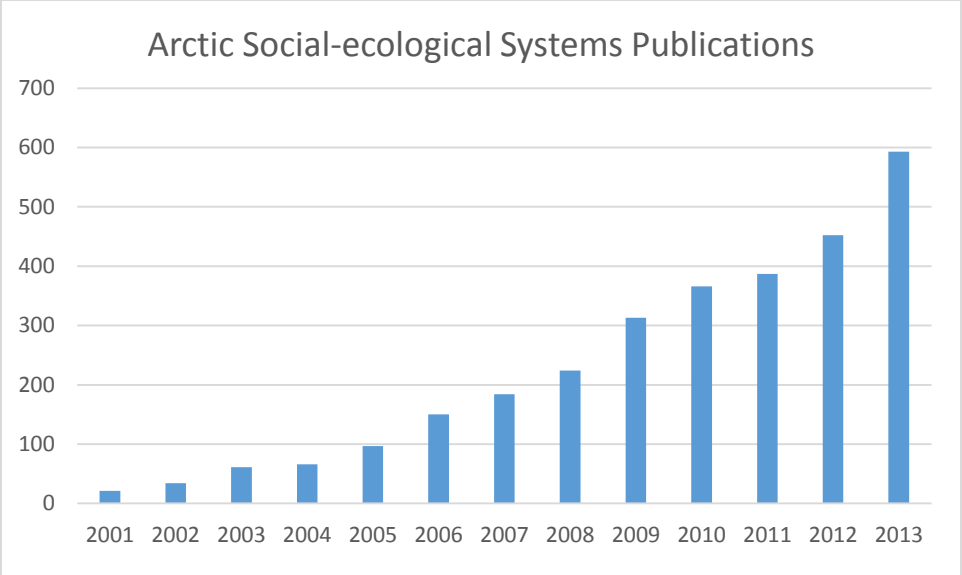

Figure 2. Literature on Arctic Social-Ecological Systems 2001-2013 (Source: Google Scholar, all text)

Progress in theory and emerging features of Arctic sustainability science

Studies in sustainable development and sustainability in the Arctic showed rapid development in many different directions. Following are the key elements we consider most notable. First, the theoretical crystallization of Arctic sustainability research has been tied to the evolution from generic sustainability science approaches or purely localism to the notion of arctic uniqueness among global connectedness. The general path of theoretical evolution to advance systematic understanding and interpretation of biogeophysical and human processes in their interaction. The progress in the last decade was quite rapid and included several major conceptual shifts (Figure 3). The first shift was from 'loose coupling' that considered primarily 'human dimensions' of environmental change and impacts of humans on biogeophysical processes to the focus on coupled human-environmental systems. The next shift firmly placed social-ecological systems at the center of inquiry and increasingly adopted resilience and vulnerability as frameworks for analysis. The third shift, still underway, aimed for the incorporation of traditional knowledge in sustainability research and for emerging complementary and integrated system of human-nature knowledge.

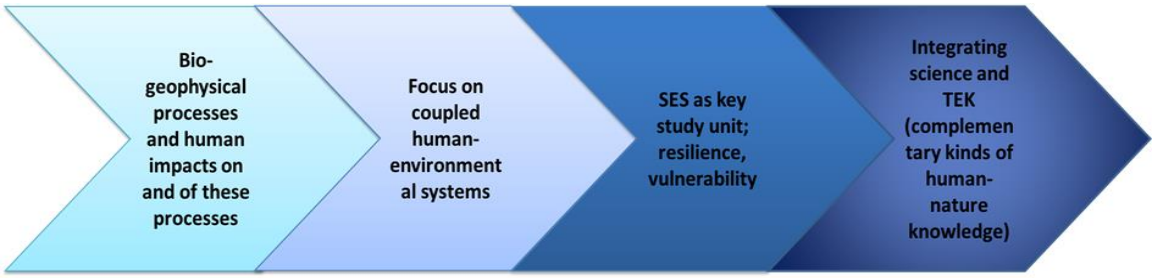

Figure 3. Conceptual shifts in Arctic sustainability research (2000-2015)

What are the core features of the contemporary sustainability science and sustainable development research in the Arctic? First is the focus on social-ecological system as the primary unit of analysis, a concern with long-term interactions of human and natural systems (Insert 1). This entails a deep engagement of inter- and transdisciplinary approaches in research and a fundamental interest in systematically addressing linkages in SES. Second, arctic sustainability research deals with "wicked problems" associated with non-linear processes, changes and transformations, as well as with uncertainty in drivers and outcomes. Third, arctic sustainability research is largely problem-focused and orients itself as addressing 'grand challenges', such as climate change, well-being and economic development, and the integration of western and traditional knowledge systems to aid decision-making, adaptive co-management and governance.

Insert 1 Emergent features of arctic sustainability science

- **Addresses the long term interactions of People and Ecosystems**
  - → Social-Ecological Systems (SES) - primary unit of analysis
  - → Inter- or Transdisciplinary
  - → But challenges implied in systematically addressing these linkages
- **A Complex Systems Focus – "Wicked Problems"**
  - → Non-linear changes and transformations
  - → Uncertainty in drivers and outcomes
- **Problem-focused: addresses "grand challenges"**
  - → Climate change – The Arctic as a "bell weather" region
  - → Well-being and economic development
  - → Integrating multiple ways of knowing about systems
  - → Adaptive Co-management, Adaptive Governance

Progress in methodologies and four epistemological transitions

In respect to methodological advances, we note three key conclusions. One is that Arctic sustainability research actively employs methodologies that stem from various fields, thus tapping rigorous mixed methods, and inter- and transdisciplinary methodological apparati. Another is that cutting-edge approaches and methodologies increasingly emanate from the Arctic. Arctic sustainability research offers and tests novel approaches and methodological frameworks. Examples of these include knowledge co-production, social and ecological indicators development, and community-based research methods.

Four epistemological transitions evident in arctic sustainability research reflect the directions in which methodologies are evolving. Transition one constitutes the move to integrated trans/interdisciplinary and mixed methods research, connected to the theoretical evolution of the study of coupled systems (SES) (Figure 1), using methods from multiple discipliners, which require integration. In the literature analyzed we found that integrated and mixed methods approaches are considered the most effective. Transdisciplinary scholarship goes beyond interdisciplinarity in involving and engaging a variety of stakeholders and rights-holders. Rather than having individual disciplines contribute separately, it tries to weave in varying methodologies and approaches to truly get at the nature of complex, or wicked, problems.

Transition two is the re-orientation from looking at sustainable development as an outcome to studying it as a process. A growing understanding is that sustainable development is concerned with solving problems that are often not fully understood, or even identified. Interest in the process of sustainable development is also associated with a rise of 'action research' that is designed to deal with addressing immediate circumstances rather than with possible distant outcomes. This trend is in part summoned by rapid changes in Arctic societies and environments, and the necessity to quickly understand and address specific, urgent problems. An interesting element of this "process-based" research agenda is the understanding of successes and failures in achieving sustainable development outcomes. The careful analysis of success stories and failed projects can be very informative in respect to improving our knowledge about the processes, agents and factors of sustainable development,. For example, sustainability research may involve an examination of how institutional context, socio-economic dynamics and personal characteristics of individuals contribute to sustainability.

Transition three is the rise of knowledge co-production as a central epistemological paradigm. Knowledge co-production has been identified as a prerequisite for sustainability transformation. "Co-production" refers to a joint process between academics and various partners (e.g., communities, governments, private industry) of planning, carrying out, and disseminating research. Dimensions of co-production include the gathering, sharing, integration, interpretation, communication and application of knowledge. Knowledge and research that are community-informed are indeed better suited to address complex sustainability challenges. In addition,

important ethical implications for research occurring in northern spaces (especially indigenous ones) that can in part be addressed through processes of co-production.

Transition four is the evolution of indicators research, from an initial concern with either social or environmental indicators towards integrated systems of SES indicators. The rise of indicators research is partially related to the connection of sustainability scholarship with vital stakeholder interests and decision-making in the face of 'grand challenges' and immediate action needs. Indicator systems have improved considerably on both social and physical sides, and are becoming components of the integrated apparatus designed to measure and characterize dynamic, coupled social-ecological systems.

Key knowledge gaps and future research directions in arctic sustainability science

A number of identified key knowledge gaps suggest future pathways for Arctic sustainability research. Some are long standing and were already articulated in ICARP II Science Plans. Others are products of evolving research, changing methodological frameworks and our improved understanding of the nature of Arctic social-ecological systems. Key elements important for future research planning include:

- identifying knowledge gaps, both general and Arctic-specific;
- establishing research priorities for the next decade; and
- determining actionable research directions to pursue and funding agencies to support, to serve the priorities.

General knowledge gaps (within and beyond the Arctic)

General knowledge gaps are the unresolved deficiencies in our knowledge about sustainability and sustainable development in general, irrespective of regional application. In other words these are non-Arctic specific gaps that would require the efforts of all sustainability scholars, including Arctic sustainability researchers, to be filled. The following general knowledge gaps were identified as they have been reflected within the Arctic sustainability scholarship:

- **Insufficient research dealing with historical understanding of sustainable developmen**t in the Arctic. The importance of such history directly relates to the legitimacy of the sustainable development concept in the Arctic; only a thorough, critical understanding of its beginnings, antecedents and various trajectories of implementation may ensure the development of a

decolonizing approach to sustainable development. While multiple histories of science, policy and traditional societies exist, critical historical analysis has by no means been exhaustive. Along with other approaches to of arctic sustainability research (such as community-based nature, knowledge co-production paradigm, etc.), the building of complete understanding of the historical development of sustainability research and sustainable development initiatives will be critical to avoid the imposition of 'sustainability' from afar. One arctic resident warned: "They first wanted to modernize us, now they want to make us sustainable."

- **Insufficient examination of different spatial and temporal scales, limited inter- and intra-scale linkages**: Palsson and others (2013:7) note how "acts that are legal, and sometimes even virtuous, under the current economic system, because of their contribution to job-creation and economic growth, have flip sides that, if they were registered as instantaneous acts, would be criminal"[1]. Likewise, acts that contribute to sustainability at the community level may not promote sustainability at the regional or international level, just as acts that appear sustainable over generations may seem to compromise immediate accomplishment of sustainability.
- **Weak linkages between spatial and temporal studies**. Related to the above point, most studies deal with either space or time and do not explore space-time linkages to the extent necessary to describe dynamic and scale-dependent nature of SES and sustainable develop processes.
- **Limited (although improving) integration of methods and disciplines**, including interdisciplinarity and, co-production of knowledge. Although we observed the epistemological transition towards such integration, much remains undeveloped in respect to mechanisms and modalities of inter- and transdisciplinary research.
- **Relinking social-ecological systems to pillars of sustainable development**. Although there has been a change in understanding of sustainable development through the prism of socio-ecological systems, it should be re-linked to the three pillars of sustainable development (economics, ecology, equity) with a renewed re-emphasis on interdependence rather than competition between them ("holistic approach").
- **Emerging but yet underdeveloped notion of the new study triangle**: economics, ecology, and equity. The stylized understanding of sustainability is somewhat challenged by incorporating various other elements, such as ethics into the scope of consideration. In addition, it is argued that 'trade-offs' between the 'pillars' of sustainability may be not as important as the integration that focuses on interdependence rather than competition between them to achieve sustainability outcomes.

[1]Palsson, G., B. Szerszynski, S. Sörlin, J. Markes, B. Avril, C. Crumley, H. Hackmann, P. Holm, J. Ingram, A. Kirman, M. Pardo Buendía and R. Weehuizen (2013) Reconceptualizing the 'Anthropos' in the Anthropocene: integrating the social sciences and humanities in global environmental change research, *Environmental Science and Policy* 28: 3-13.

- **Lacking connectivity between social and physical indicators for sustainability**. Although we have experienced a boom of indicators research in the last decade, there still an acute shortage in frameworks that successfully integrate qualitative and qualitative indicators of social and biogeochemical components of SES.
- **Failure to address inter-generational and gender issues**: To date, we have a limited understanding of the gendered nature of vulnerability to climate and other change in the Arctic, and an inadequate understanding of the gendered dimensions of adaptation and resilience. Our understanding of how sustainability is experienced and performed across generations is also circumscribed. We need to know more about gendered and generational differences in cognition and behavior related to rapid socio-ecological change. Differential migration, educational attainment, and capacity for adaptation across genders and generations influences the sustainability of households and communities in the Arctic.
- **Limited connectivity between conceptual work and empirical work**. Current scholarship is not fully utilizing its capacity to inform, guide and generate action. Despite advancements in action research in the last decade, researchers still need to need to consider more closely opportunities for transformative change in terms of their/our outputs, outcomes and processes.
- **Minimal role of humanities in sustainability research**. In interdisciplinary efforts, social sciences and humanities research are often relegated to "an auxiliary, advisory and essentially non-scientific status" (Holm et al. 2013:26)[2]. IF collaboration between social and natural/physical sciences have experiences some progress, inclusion of humanities research remains negligible, indeed usually fully absent. Yet humanities are sorely needed to address sustainability transitions. Contributions from communications, cultural studies, ethics, history, law, literature, linguistics, and philosophy are required to fully understand how to identify, promote, incentivize and reward sustainable behaviors and the barriers to them. We know that people's attitudes and actions are far less affected by rational arguments than by emotional, instinctive reactions. We need to understand the cultural and cognitive factors, the personal and societal motivations, as well as the institutional conditions that contribute to, or thwart sustainable development. As noted above, the very concepts of sustainability and sustainable development undergo metamorphosis depending on translation of key terms. Linguistic research into understandings and nuances of these concepts, and challenges of communication is critical. Research into semantic clusters and metaphors can reveal how people, both within and beyond the Arctic think about the Arctic and its future.

[2] Holm, P., M.E. Goodsite, S. Cloetingh, M. Agnoletti, B. Moldan, D.J. Lang, R. Leemans, J.O. Moeller, M. Pardo Buendía, W. Pohl, R.W. Scholz, A. Sors, B. Vanheusden, K. Yusoff and R. Zondervan (2013) Collaboration between the natural and human sciences in Global Change Research, *Environmental Science and Policy* 28: 25-35.

Arctic-specific gaps

In addition to general gaps, we have identified research gaps that pertain to issues unique or specifically important in the Arctic. These gaps will have to be filled by the efforts of the Arctic scholarship and they also inform our recommendations on how to move forward.

- **Lacking knowledge about urban areas, urban-rural connections and dynamics.** While the majority of Arctic residents are urban dwellers, the sustainability literature pays negligible attention to urban areas and urban-rural relationships in the Arctic. Studies to date are few, and mostly lacking a clear sustainability perspective, even when focused on sustainability-related concerns, such as climate change policy. Most case studies dealing with selected rural settings fail to connect to other rural contexts or make linkages to urban realms.
- **Limited knowledge about non-indigenous people in the Arctic.** The vast majority of arctic sustainability literature deals with indigenous communities and societies. While this research must continue, more knowledge is also needed about non-indigenous societies.
- **Rudimentary understanding of non-resource, non-traditional economies (such as knowledge economy, arts and crafts, etc.).** Most research is focused on sustainable development in the context of either the extractive (renewable and non-renewable) resource economy or the traditional (subsistence) economy. While particular attention to the mixed economies in the Arctic communities has flourished, we lack a full understanding of other important sectors, such as cultural, knowledge and service economies. These sectors, play an important role in sustainable development
- **Lack of integrated understanding of socio-ecological transformation in the Arctic, of how the Arctic is transforming and the consequences thereof in and beyond the Arctic.** Despite some efforts to provide inter-regional, integrated analysis of socio-ecological transformations in the Arctic (for example, through circumpolar assessment, such as AACA, AHDR, etc.), there is still limited integration and synthesis of case studies and findings from disciplinary research.

Priorities: Agenda 2025

Selecting priorities for future research

In our selection of research priorities for the next decade we closely followed the ICARP III charge, avoiding the replication of science plans published in 2005 and the creation of extensive lists of possible research questions and approaches. We did not aim to produce a prescriptive list of research themes. Rather, we focused on identifying a few actionable research priorities. These priorities were selected based on the following criteria: (1) they address identifiable knowledge gaps; (2) they build on progress over the past decade; (3) they are actionable on a decadal basis; (4) they are relevant to society, in the sense of having practical applicability.

Insert 2. Agenda 2025: research priorities

- Integrated analysis of existing and new data longitudinal and comparative synthesis
- New methodologies able to assess process and outcomes of sustainable development in an interdisciplinary manner (natural And social sciences)
- Design of sustainability indicators and monitoring systems
- Governance, justice, equity, legitimacy, power
- Study of connectivities (scales, regions, time)
- Re-conceptualize relationships between sustainability research (SES) and practice ('trade-offs') and re-link recent development with actions by re-emphasizing interdependence rather than competition among 'pillars of sustainability.'

The overarching research priority should be an integrated analysis of existing and new data as a part of longitudinal (back and forward) and comparative syntheses. This requires both making further use of existing case study research and moving beyond these studies. We believe that next most important methodological developments will be able to interactively assess the process and outcomes of sustainable development in an inter- and transdisciplinarity manner, i.e. through involving social, physical, natural sciences and the humanities together with societal stake- and rights-holders. We should continue to develop sustainability indicators that better link social and ecological processes developments and, systems, and employ these indicators for long-term monitoring across the Arctic. We urge an emphasis on equity, legitimacy, power and agency and a channeling of research efforts to improve understanding of how current and changing power relations (including along gender, age, cultural and other axes of difference) affect sustainability outcomes and processes. Another useful but currently understudied general approach is the study of connectivities (at different scales and how they interact in lieu of economic, cultural, ecological, atmospheric, climatic, and other processes), how they can be measured and what this means for sustainable development and sustainability in the Arctic and beyond. We further suggest that we need to prioritize inquiry into Arctic urban sustainability, social, ecological and economic processes affecting urban sustainable development, urban-rural dynamics and interface, and regionalization of sustainability. Progress in sustainable development research is not thinkable without closely considering the role of governance, e.g. role of governance in the dynamics of social-ecological systems. Finally, in the next decade we need to carefully reconsider and possibly re-conceptualize relationships between sustainability research (that primarily investigates social-ecological systems and their dynamics) and sustainable development applications (that deal with the traditional three pillars of sustainable development, often in the form of 'trade-offs'). In other

words, we need to address an emerging change in the understanding of sustainable development through the prism of socio-ecological systems and re-link this understanding with the three pillars of sustainable development in a way that re-emphasizes interdependence rather than competition between them (Figure 3). While the traditional "trade-offs' approach may be adequate for short-term sustainability goals, this re-linked re-conceptualization better reflects a long-term perspective on sustainable development.

Actionable research directions

Based on priorities outlined above and considering the recent trends in the Arctic sustainability research, as well as needs expressed by communities and other Arctic stakeholders, we also developed a list of actionable research directions for the next 10 years. These directions can be used by various research agencies and organizations to streamline their scholarly activities. We believe that attention to and investment in these research items ensure efficiency and effectiveness in respect to moving sustainability science forward and serving needs of various Arctic constituencies. The actionable research directions we identify below include general suggestions on how to frame sustainability research in the Arctic. Following this we note research themes best designed to address current scholarly and practical tasks.

Actionable research directions include:

- The consideration of sustainability and sustainable development in a more reflective manner. This implies considering historicity, pluralism and ethics in the use and manipulation of the concepts of 'sustainability' and 'sustainable development' in research, policy and practice. Mechanistic usage of these concepts without critical re-evaluation may lead to further erosion of their theoretical rigor and practical benefit. A 'cookie-cutter' approach to sustainable development is not adequate, as it often precludes the engagement of different 'voices' and knowledge systems in the process of sustainable development and may serve as an inadvertent source of marginalization and (re)colonization.
- The examination of power relationships vis-à-vis sustainable development and devotion of more attention to equity as a key component of sustainable development. This direction will produce a more nuanced and comprehensive understanding of sustainable development as a process and its outcomes.
- Greater efforts regarding the co-production of knowledge as a leading methodological framework of sustainability research. This includes fundamental, methodological and applied study of knowledge systems, methods of performing co-production and its applications to address specific sustainability challenges.
- The engagement of multi-scalar research that links scales and explores spatiotemporal dimensions of sustainability and sustainable development.

Proposed of key research themes

Within these four major directions, we identify a number of priority research themes that respond to key gaps in knowledge, providing valuable and urgently needed contribution to theory and practice. Although the list is not exhaustive, it can serve as guidelines for prioritizing research activities and setting funding targets. These themes include:

- Development of integrated sustainability indicators
- Examination of sustainable development as process: examine success stories and failures, longitudinal analysis (both back and forward) of sustainable development
- Examination of the linkages between climate change and sustainable development
- Examination of the role of institutions in sustainable development
- Examination of sustainable development in urban areas and relationships between rural and urban
- Examination of the role of resources, traditional and emerging economies (creative, arts, high tech) as factors and instruments of sustainable development
- Examination of role equity, agency, power and justice along key axes of difference in the Arctic – gender, age and identity.

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