

Informed Decisionmaking for Sustainability

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# Building Common Interests in the Arctic Ocean with Global Inclusion

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# Chapter 35

## (Research): Conclusions: Building Global Inclusion with Common Interests



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**Abstract** The premise for Building Common Interests in the Arctic Ocean with Global Inclusion recognizes the Arctic is being transformed profoundly with immediate implications for the residents and our world. The Arctic Ocean is at the center of the Arctic region, which is home to Indigenous peoples for millennia as well as more recent arrivals. The Arctic Ocean also is a bellwether, reflecting the urgent need to produce informed decisions that operate short-to-long term. In the Arctic, the maturing focus on climate – as a “*common concern of humankind*” since the 1992 *United Nations Framework Convention on Climate Change* – exemplifies our quest for coordination and cooperation, locally, regionally and more broadly across our world, identifying essentials with the United Nations Sustainable Development Goals “*for the benefit of all on Earth across generations.*”

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## 35.1 Building the Future

The premise for Building **Common**<sup>1</sup> Interests in the Arctic Ocean with Global Inclusion recognizes the Arctic is being transformed profoundly with immediate implications for the residents and our world. The Arctic Ocean is at the center of the Arctic region, which is home to **Indigenous peoples** for millennia as well as more recent arrivals. The Arctic Ocean also is a bellwether, reflecting the **urgent** need to produce informed decisions that operate short-to-long term. In the Arctic, the maturing focus on **climate** – as a “*common concern of humankind*” since the 1992 *United Nations Framework Convention on Climate Change* – exemplifies our quest for coordination and cooperation, locally, regionally and more broadly across the **Earth**, identifying essentials with the 17 United Nations **Sustainable Development Goals** (SDG) from 2015.

The primary conclusion of this book is that informed decisionmaking requires science as well as diplomacy with international, interdisciplinary and **inclusive** integration, noting inclusion is the biggest challenge. In the absence of inclusive considerations, informed decisionmaking is incomplete and sub-optimal in the complex global **system** that we now inhabit.

The inescapable truth is we now live in an interconnected world, but plagued with nationalism and the perpetual problems of systemic exclusion. We also are in the midst of a global pandemic, when lives and livelihoods of people are compromised everywhere, revealing once again that **survival** is a common interest among all of us. How can we build the future to address challenges and opportunities inclusively? Addressing this question is the outcome of this second volume in the initial trilogy of the book series on Informed Decisionmaking for **Sustainability**.

Anywhere can hold lessons for humankind, contributing insights for our world with nearly eight billion people today. Every moment also can hold lessons, especially since human populations began accelerating across billions of people, starting around 1800 at dawn of the Industrial Revolution. Inclusively in view of time and space – the Arctic Ocean presents a case study for humankind because it illustrates diverse perspectives with science<sup>2</sup> in a scalable manner, addressing **change** with **research** and **action** to produce informed decisions.

The **holistic** (international, interdisciplinary and inclusive) process with informed decisionmaking in the Arctic Ocean and elsewhere on Earth starts with **questions**.

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<sup>1</sup>Search terms (bolded) were discovered comprehensively to reveal relevant chapters (see Table of Contents) with the KnoHow™ knowledge bank (<https://knohow.co>) for Volume 2. Building Common Interests in the Arctic Ocean with Global Inclusion, using the final PDF files for the initial book compilation to weave these conclusions with all chapters in many contexts, inclusively. The relevant chapters for each search term are indexed below in alphabetical order in the Chapter References (By Search Term).

<sup>2</sup>Science as the ‘study of change’ includes natural sciences, social sciences and Indigenous knowledge as complementary research systems that reveal patterns, trends and processes (albeit with different methodologies) that serve as the bases for decisions.

Questions also are core to any negotiation and all transdisciplinary dialogues, fueling the engine of **science diplomacy**<sup>3</sup> to address immediacies as well as eventualities with knowledge co-creation and co-production. Questions ultimately can give rise to **governance** mechanisms, and built **infrastructure** as well as their coupling with **economic**, societal and environmental considerations for sustainable development. In a world where everyone is looking for answers, questions are the differentiator to facilitate dialogues that build common interests, which are herein recognized as the key to being inclusive.

The goal of this concluding chapter is across the gamut of questions (as **fil rouge**) to reveal scalable elements of inclusion that can be illustrated with this book about building common interests in view of the Arctic Ocean as a test case for informed decisionmaking. The illustrations about the six elements of inclusion (i.e., fundamental questions) emerge from individual chapters and their juxtaposition, converging with content (who, what, when and where) and process (how and why) questions inclusively. Because they are interlinked, the proposition is that all of these questions are required to be inclusive, as a necessary step to both promote cooperation and prevent conflict. Testing this proposition broadly is among the **options** (without advocacy), which can be used or ignored explicitly, to facilitate inclusion with **respect** for the institutions as well as the decisionmakers and those reading forward.

Options (without advocacy) guide diplomacy, helping governments and others to navigate the winds of the present into the future with informed decisions, addressing urgencies that extend from **security** to sustainability time scales. The options transform **evidence** into decisions, transforming the **data** that arise to answer questions with research into actions by institutions. As a region raising local-global questions about inclusion, the Arctic Ocean is ripe for consideration to awaken informed decisionmaking for the benefit of all on Earth across **generations**.

## 35.2 Inclusion Element 1: Who? (Crossing Boundaries)

Inclusion extends across boundaries temporally, spatially, culturally, chemically, physically, economically, socially and naturally with any other ally that can be imagined. The boundaries define systems, such as our Solar system with the Earth system and the Arctic Ocean system embedded at different scales through to communities and people as well as the species and habitats on which they depend. Each system has its own internal dynamics, which in turn are influenced by external forces with varying intersections. The reference points to interpret change within and across these systems involves each of us as observers, asking and answering questions with diverse methodologies for research.

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<sup>3</sup>See Chap. 1 about the theory, methods and skills of informed decisionmaking as the engine of science diplomacy to build common interests and enhance research capacities, transforming research into action with the apex goal of informed decisions that operate across a ‘continuum of urgencies’.

The opportunity to be an observer is self-selected, but limited by boundaries across systems, where transparency and access are the challenges. Solutions for transparency certainly involve the development and application of **observing** systems and networks. However, the challenges to open doors of transparency and access are far more basic with systemic racism, exclusion, prejudice and injustice that continue to infect our world at all levels. With respect for the self-selected **identity** of individuals and institutions, the trick is to facilitate dialogues that build common interests, empowering observers to contribute as participants with capacities that create inclusion.<sup>4</sup>

Inclusion in this book is built with common interests, expressed with the insights of **youth** alongside others across society at local, national and international levels. As an example of institutional inclusion, the **Arctic Council** that was established in 1996 is a system in which the eight **Arctic States** and the six Indigenous **Permanent Participants** grant access to **Observers**. With the Arctic Council, informed decisionmaking is stimulated by “*sustainable development and environmental protection*” as “*common Arctic issues*” framed by the 1996 **Ottawa Declaration**.

In the Arctic, Indigenous peoples arose from the first humans in the region with communities connected to the Arctic Ocean. Other Arctic residents are distributed within the boundaries of the eight States who have territories north of the Arctic Circle. In view of the Arctic Ocean, the **challenges** involve diverse **stakeholders**, **rightsholders** and other actors.

Despite the flaws of humankind and our history, the richness of our world is its diversity. Looking across time, we are awakening to the necessity to act as stewards, with compassion for each other and all that surrounds us, short-to-long term. Seeking to be inclusive, any observer can raise questions. The trick is to facilitate dialogues that build common interests, moving observers into the realms of participants, transforming research into action with science diplomacy in an holistic process to deliver informed decisions at local-global levels.

### 35.3 Inclusion Element 2: When? (Past, Present and Future)

Time is the essence of change and also the biggest challenge to address at all levels. The meaning of short-to-long term depends on the questions, complementing the dimensions of informed decisions at all scales. With inclusion, weighing the past and future in view of the present underlies a fundamental source of inquiry as an egalitarian framework for lifelong learning.

In the Arctic, research stimulated by questions reveals insights about the drivers and impacts of change to address with **innovation** over security to sustainability time scales: **days; weeks; months; years; decades; centuries** and even **millennia**.

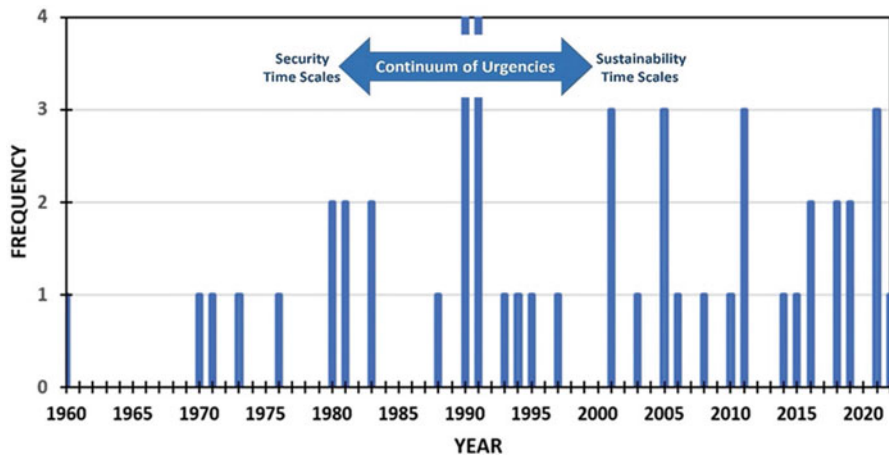
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<sup>4</sup>See the *Informed Decisionmaking Pyramid* (Fig. 1.6) in Chap. 1.

Others are listening to the world’s varying paces, trying to make sense of the rhythms of discourse and events now conveyed at the electronic speeds of **social media** with constantly flashing reactions.

Treating the chapters in this book as data, the most frequently cited unit of time is years, with more references to decades than months. These data suggest there is a tendency to address issues with longer time horizons than years, as with the United Nations Millennium Development Goals (2000–2015) and SDG (2015–2030) or the United Nations Decade on Ocean Science for Sustainable Development (UNDOS – see Appendix). This hypothesis is strengthened by the time series of International Decades since 1960 (Fig. 35.1), just after the International Geophysical Year of 1957–1958 and its preceding International **Polar Years** (IPY), revealing a step-change with common-interest building since the end of the Cold War, as a signal with informed decisionmaking into the future across the Earth.

The Arctic Council reinforced this observation about operating over longer periods in adopting its first long-term strategic plan at the biennial Arctic Council Ministerial Meeting in May 2021, a plan that will cover the ensuing decade.<sup>5</sup> Inclusion involves the sort of continuity that can only be achieved over significant periods of time. It takes time to generate informed decisions, recognizing that decisions are unformed if they only operate at a particular moment, excluding considerations of either the present or the future. Lengthening the timeframes of initiatives (Fig. 35.1) is a key metric in assessing informed decisionmaking.



**Fig. 35.1 Frequency of International Decades**, based on their year of origin as compiled by the United Nations (<https://www.un.org/en/observances/international-decades>), with end of the Cold War in 1991, enhancing capacities of humanity to operate across a ‘continuum of urgencies’ with sustainability since the Second World War (Chap. 1)

<sup>5</sup>2021 Arctic Council Ministerial Meeting documents can be found at: <https://oaarchive.arctic-council.org/handle/11374/2586>

The challenge with time is to operate short-to-long term, whatever that means to you or anyone else, correctly setting expectations that progress takes time to mature, often more slowly than desired. Consequently, inclusion is the responsibility of all, highlighting the vital importance to enhance the common-interest building capacities of next-generation leaders, recognizing young adults today will be living into the twenty-second century. Whoever is involved, operating across time enhances the opportunity to transcend business as usual.

### 35.4 Inclusion Element 3: Where? (Marine and Terrestrial Ecosystems into Outer Space)

On Earth, space is generally easier to comprehend than time, largely because we actively can visualize the surface of our planet as well as peer from outer space with sub-meter **satellite** resolution. Across our home ('eco') with its diverse **ecosystems**, **water** is the fundamental driver of life in oceanic, continental and atmospheric areas of our planet. Humankind created **ecology** and economics for the study and **management** of our home systems, respectively. Understanding our home becomes increasingly vital as we venture across the curvature of spacetime into the universe, which is where humankind is headed, turning science fiction into science reality.

Like time, space is embedded: **centimeters**, **meters** and **kilometers** with bigger and smaller to explore. Across the physical dimensions of our globally-interconnected civilization are artificial boundaries imposed by humankind to protect and exclude interests, resulting in the **ecopolitical** dynamics that we see at all scales. These ecopolitical scales are paralleled by **nations** as the basic jurisdictional unit since the 1648 *Treaty of Westphalia*. Subnational levels of governance range from **families** to **cities** and other governments across larger **regions**. **International** levels of governance include transboundary as well as global institutions affiliated with the **United Nations**.

The Arctic Ocean is a case-study with diverse spatial boundaries, both natural and anthropogenic, involving systems that are interconnected across the Earth. Progressing from the **North Pole** as a geographic point, there is the surrounding **sea ice** that is diminishing and beyond there is **open water** in the **Central Arctic Ocean** (CAO). Superimposed, there is the CAO **high seas** and surrounding Exclusive Economic Zones as well as other international maritime zones north of the Arctic Circle under **law of the sea**.

Surrounding the Arctic Ocean are land areas with **glaciers** and **permafrost** that also are diminishing, just as ice in the sea. Compared to the lower latitudes, Arctic marine and terrestrial areas are responding to climate warming with amplification, reflecting connections between these biogeophysical systems. Superimposed on the terrestrial areas are the jurisdictional boundaries of the eight Arctic States as well as the areas of the Arctic represented by the six Indigenous Peoples' Organizations.<sup>6</sup>

<sup>6</sup>See Fig. 1.1 in Chap. 1 as well as the book cover.

Beyond the Arctic are **non-Arctic** areas that also are included to interpret biogeophysical and socio-economic changes in the high north. The context of the Arctic and non-Arctic areas, inclusively, is the Earth. Beyond Earth is outer space, noting the Earth-Sun connections that have been explicitly researched on a global scale since the first IPY in 1882–1883, following the Little Ice Age that ended in the nineteenth century with humanity warming to the fact that global climate and local **weather** are connected.

### 35.5 Inclusion Element 4: What? (Natural Sciences, Social Sciences and Indigenous Knowledge)

In view of who, when and where to include – what are the issues, impacts and resources to consider and how do we measure them? Responses to this open-ended question can be considered inclusively, involving research to reveal patterns, trends and processes that ultimately become the bases for informed decisionmaking at any scale.

Building on the concept of systems that are bounded across space and time, internally there are the components that reflect their dynamics. Some of the components that move through systems occur naturally, such as **species** and water with its liquid, solid and vapor phases. Some components are introduced internally and externally from anthropogenic sources, as in the Arctic Ocean, where there are **chemicals**, **plastics** and other **pollutants** as well as **ships**. **Human** presence in the Arctic also involves exploitation of living and non-living **resources**.

Each of these Arctic system components can be measured to create data, which can be used to address questions with diverse methodologies that include hypotheses, values, ethics and cultural wisdom. The data come from the natural and social **sciences** along with **Indigenous knowledge**. Moreover, the data range with granularity from the metric system to the different Inuit words for snow, revealing system dynamics that underlie evidence for decisions, as actions by individuals and institutions. Further illustrating inclusion, seeking an umbrella framework, science broadly is the ‘study of change’ (symbolized by the Greek letter delta  $\Delta$ ) with basic and applied research that together contribute to informed decisions, especially in preparing next-generation decisionmakers.

Importantly, Arctic systems represent a special class of change, which happens when boundaries are altered, as with sea ice in the ocean and permafrost on land. Such environmental state-changes create new systems (e.g., there is a new Arctic Ocean without multiyear sea-ice predominating), representing inherent **risks** of instabilities with immediacies, which define security time scales (Fig. 35.1) that connect to consequent urgencies short-to-long term in view of sustainability time scales across generations.



### 35.6 Inclusion Element 5: How? (Governance, Infrastructure and Sustainability)

The proposition is sustainability operates across generations. If we think it, we can build it!

But, how do we operate at the time scale of generations, noting there are somewhere between five and six 20-year generations of people alive at any time? How do we convey urgencies across decades to centuries while extinguishing brushfires of the moment?

A key is to learn from the cultural wisdom of Indigenous peoples, revealing resilience across generations with grandparents, parents, yourself, children, grandchildren and great-grandchildren included. The Arctic offers a special example for our world, as the six Indigenous Peoples' Organizations share decisionmaking responsibilities about the destiny of the region with the eight Arctic States through the Arctic Council, addressing "*common Arctic issues*" as well as "*issues of common interest*" and "*common concern*" expressed in the 2021 *Reykjavik Declaration* along with "*common priorities*" through the *Arctic Council Strategic Plan 2021 to 2030*. In view of the Arctic Ocean as a case study, together these signatories of the 1996 *Ottawa Declaration* also "*remain committed to the framework of the Law of the Sea*", as shared in their 2013 *Vision for the Arctic* with the "*Arctic region as a zone of peace and stability... at the heart of our efforts.*"

These efforts progressed significantly at the 2009 Arctic Council Ministerial Meeting, when **peace** first was introduced into a declaration from the eight Arctic States. The 2009 *Tromsø Declaration* changed the dynamics of the Arctic Council, opening the door to task forces that would produce three binding agreements with all of the Arctic States across the following decade. Such convergence reflects common-interest building with knowledge co-production of governance mechanisms as an arena of informed decisionmaking.

Thinking short-to-long term, the 2011 and 2013 emergency response agreements anticipate issues and impacts with the changing Arctic. The 2011 *Agreement on Cooperation on Aeronautical and Maritime Search and Rescue in the Arctic* addresses questions of **safety** of life at sea. The 2013 *Agreement on Cooperation on Marine Oil Pollution Preparedness and Response in the Arctic* addresses sources and threats of **pollution** with impacts that are both acute and chronic. These agreements are complemented by the *International Code for Ships Operating in Polar Waters (Polar Code)* that entered into force in 2017 with the Arctic States and broader international community through the International Maritime Organization.

Effectiveness of these governance mechanisms depends on the **platforms** that exist for their implementation from paper to practice. In this direction, the Arctic States produced the 2017 *Agreement on Enhancing International Arctic Scientific Cooperation*, supporting access with research, observing, communication and other information systems as elements of built infrastructure, which require **technology** plus **investment**.

In the Arctic Ocean, as elsewhere, there are questions about sustainable yields of **fish**. Fish are symbolic of all living resources harvested by humans, including

considerations about species' recruitment and production across generations in view of their ecosystems. Most importantly, to create sustainable fisheries requires restraint to operate short-to-long term, being both tactical and **strategic**.

With CAO high seas fisheries, there is opportunity to learn about the species' dynamics in their changing ecosystems before any exploitation, remembering 1970s lessons of El Niño and the Peruvian anchovy with periodicities as well as impacts in the absence of informed decisions. To avoid another “Donut Hole” catastrophe, which happened with the pollock fishery in the high seas of the Bering Sea in the early 1990s, Arctic and Non-Arctic States signed the 2018 *Agreement to Prevent Unregulated High Seas Arctic Fisheries in the Central Arctic Ocean* that entered into force on 25 June 2021. The 16-year moratorium that is mandated with this agreement is an essential step to prevent unregulated commercial fishing activities in this Area Beyond National Jurisdiction (ABNJ), evolving a **precautionary approach** with worldwide precedent (See also the Appendix of Chap. 1 that elaborates international legal institutions with the precautionary approach and principle). Precaution provides time to:

- build common interests and raise the questions of common concern;
- generate the necessary data with appropriate methods to answer the questions of common concern;
- transform the data into evidence in view of the institutions that will make decisions about governance mechanisms and built infrastructure;
- couple decisions about governance mechanisms and built infrastructure to achieve progress with sustainable development; and
- ultimately reveal options (without advocacy) for humans to operate short-to-long term with informed decisionmaking.

The precautionary approach with research and action inclusively is an example of informed decisionmaking under international law – as illustrated by the CAO High Seas fisheries agreement as well as ongoing negotiations toward a global agreement on Biodiversity Beyond National Jurisdiction (BBNJ).

### 35.7 Inclusion Element 6: Why? (Balancing National Interests and Common Interests)

Inclusion involves **balance**. Over time, balance and resilience in the face of change produces sustainable development across generations. Systems that are out of balance are unstable, requiring processes to address diverse and often unknown urgencies over time (Fig. 35.1), which is why institutions and governments emerge with legacy responsibilities. A key feature of such processes is their scalability in an holistic manner.

With international, interdisciplinary and inclusive considerations – as illustrated with sustainable development in homes and villages to nations and the world – at all

levels, there is urgency to balance economic, societal and environmental considerations. This is the gift of the SDGs, building common interests from the United Nations across nations into communities, necessitating progress upwards and downwards in both directions. Moreover, urgencies with sustainability are continuous short-to-long term, characterizing the ubiquitous need for informed decisionmaking.

The challenge remains to balance national interests with common interests that include each of us across the spectrum of subnational-national-international jurisdictions. Such balance is the objective of science diplomacy as a means of enhancing informed decisionmaking to promote cooperation and prevent conflict, recognizing that nations always will look after their national interests first and foremost.

Into this history of humanity, inclusion and balance are illustrated in the Arctic with science to build common interests as a necessary step, before it becomes possible to balance national interests. A high-level example is with the Arctic Council and its six scientific working groups, progressing with biennial declarations from the foreign ministers of all eight Arctic states, who declared again in 2021 their *“commitment to maintain peace, stability and constructive cooperation in the Arctic.”* The 2017 Arctic Science Agreement uses the same language of peace, further emphasizing the common-interest building contributions of science among all Arctic States and Indigenous Peoples’ Organizations, *“using the best available knowledge for decision-making.”*

Global relevance of Arctic science is maturing with the Arctic Science Ministerial process that welcomes contributions from the six Indigenous Peoples’ Organizations and non-Arctic States, with vision of human capacities to address climate change and other challenges. In particular, with global application, common-interest building is highlighted under law of the sea, surrounded by **Superpowers**, accentuating the North Pole as a **“pole of peace”**.

## 35.8 Lifelong Learning with Global Inclusion

This book series seeks to produce insights about Informed Decisionmaking for Sustainability that can be developed, applied, trained and refined, inclusively. We create the ‘rules of the road’ to steer a safe course into the future, maneuvering in view of the red lights ahead. Where the rules are exclusive, systems transform, like nations producing different constitutions. The underlying process has always worked, at least since origin of the Socratic method, starting with questions and research to inform decisions.

Once in a hundred generations – from stone to clay to papyrus to paper to digital – humankind invents a new medium to create and communicate knowledge. Today, with digital technologies, we can communicate across the world with information access that is effectively instantaneous and infinite, looking backward and forward across time inside and out of phenomena at all scales with unprecedented clarity. The consequences of our digital era are open-ended, involving artificial intelligence, cryptocurrencies, nanomedicine, renewable energy, robotics, social media, 3-D

printing and all other manner of built infrastructure. With exponential growth of computing capacities across years to decades, science is expanding as a public good, opening the door for everyone to contribute as both an observer and participant with data, primed with transformational capacities at local-global levels.

However, the reality is humankind still is in its infancy to operate on a planetary scale. For example, there is still debate about our interconnections across the Earth as revealed by human population and atmospheric carbon dioxide increasing exponentially in parallel over decades to centuries since beginning of the Industrial Revolution. Our interconnections are even more evident over shorter periods, as harshly introduced by the COVID-19 pandemic with human infections and deaths increasing exponentially over months-years across the Earth.

With **hope** as much as certainty, COVID-19 impacts will decelerate, just as with the Spanish Flu a century ago and other plagues in human history. The advancement now is we have vaccines to hasten arrival of the global inflection point,<sup>7</sup> awakening the challenge and opportunity for great nations, especially the three Superpowers, to end the COVID-19 pandemic together. Such global inclusion is illustrated in the Arctic, where nations are balancing national interests and common interests, operating short-to-long term with informed decisionmaking.

Responsibilities to produce informed decisions extend especially to the people living today who will be alive in the twenty-second century. Such longevity includes month-years, years-decades and decades-centuries: across time scales with global impacts from humankind during the **Anthropocene**, raising questions across lifetimes about effective coupling between governance and infrastructure to achieve progress with sustainable development. Elaborating lessons about inclusion and common-interest building, the third volume in this trilogy will focus on Pan-Arctic Implementation of Coupled Governance and Infrastructure.

Inclusion is a matter of lifelong learning (Fig. 35.2), stimulated by curiosity, questioning who, when, where, what, how and why. The journey starts with **education** to introduce theory, methods and skills, revealing options that are available to each of us, like choosing whether the glass is half-full or half-empty. The options are further informed with research and leadership, generating synergies with knowledge co-production. Such convergence is facilitated by science diplomats who can operate inclusively, as brokers of dialogues across the data-evidence interface, transforming research into action to inform decisions.

With informed decisionmaking about governance, infrastructure and sustainability – there also is a basic choice to start from a position of conflict or common interests. This choice exists even among Superpowers, as illustrated in the **Antarctic** and Outer Space with continuous cooperation throughout the Cold War. This book and these conclusions highlight global inclusion as an outcome of common-interest building, with the Arctic as a case-study, revealing the scalable implications of informed decisionmaking “*for the benefit of all on Earth across generations.*”

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<sup>7</sup>For context, in May 2021, 170 million reported COVID-19 cases represent slightly more than 2% of the 7.9 billion people on Earth.

**Fig. 35.2 Lifelong Learning with Global Inclusion**, triangulating education, research and leadership to co-produce knowledge that empowers informed decisionmaking and inclusion short-to-long term with common interests



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## Chapter References (By Search Term)

**Action:** Chapters 1, 5, 6, 7, 8, 9, 10, 11, 12, 15, 16, 17, 18, 23, 24, 25, 26, 30, 32 and Appendix

**Antarctic:** Chapters 1, 5, 8, 15, and 26

**Anthropocene:** Chapters 1, 23, and 25

- Arctic Council:** Chapters 1, 5, 6, 7, 8, 9, 15, 18, 20, 22, 23, 24, 25, 26, 29, 33, 34 and Appendix
- Arctic States:** Chapters 1, 5, 7, 8, 9, 15, 18, 24, 25, 26, 29, 32, and 33
- Balance:** Chapters 1, 3, 4, 5, 7, 8, 10, 16, 18, 19, 22, 24, 26, 27, 29, 30, 32, and 33
- Centimeters:** Chapter 1
- Central Arctic Ocean:** Chapters 1, 5, 8, 15, 16, 18, 24, 25, 26, 27, 33 and Appendix
- Centuries:** Chapters 1, 2, 15 and 33
- Challenges:** Chapters 3, 5, 6, 7, 8, 9, 10, 13, 15, 16, 17, 18, 19, 21, 22, 23, 24, 26, 30, 32, 33 and Appendix
- Change:** Chapters 1, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33 and Appendix
- Chemicals:** Chapters 1, 6, 7, 9 and Appendix
- Cities:** Chapters 1, 17, and 19
- Climate:** Chapters 1, 2, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 27, 28, 30, 32, and 33
- Common:** Chapters 1, 3, 5, 6, 7, 8, 9, 15, 16, 18, 19, 23, 24, 25, 26, 29, 30 and Appendix
- Data:** Chapters 1, 6, 7, 8, 9, 10, 16, 17, 18, 23, 24, 25, 26 and Appendix
- Days:** Chapters 3, 5, 8, 15, 26, and 30
- Decades:** Chapters 1, 6, 10, 19, 23, 24, 25 and Appendix
- Earth:** Chapters 1, 5, 6, 7, 8, 9, 23, 24, 26, 27, 28, 29, 31 and Appendix
- Ecology:** Chapters 1, 6, 9, 17, 24, 25, 26 and Appendix
- Economic:** Chapters 1, 5, 6, 7, 8, 10, 15, 17, 18, 19, 20, 22, 25, 26, 27, 28, 29, 30, 31, 32, 33 and Appendix
- Ecosystems:** Chapters 1, 6, 8, 9, 13, 23, 24, 25, 26, 29, 31 and Appendix
- Education:** Chapters 1, 4, 9, 16, 17, 18, 19, 20, 22, 32 and Appendix
- Evidence:** Chapters 1, 6, 8, 9, 18, 19, 24, 26 and Appendix
- Families:** Chapter 17
- Fish:** Chapters 1, 5, 6, 8, 9, 11, 12, 16, 18, 24, 25 and Appendix
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