7. Governing in the Arctic will require difficult choices that must grapple with different and sometimes conflicting priorities. The resilience approach helps capture the complex interrelated processes that need to be better understood for effective decision-making. Participatory processes can more effectively ensure that diverse voices are represented and that all relevant forms of knowledge are included in decisions.

Governing for resilience raises questions about "resilience for whom" and "resilience of what". A useful adaptation for some people can be maladaptive when viewed from a different perspective. Socio-economic transformation can be desirable for some, but not for others. Governing for transformation can include political decisions that remove barriers to change, and inevitably include choices about a desirable future. Such choices benefit from broad engagement in decision making. Effective engagement across the Arctic requires investing in capacity-building, including skills and knowledge, and finding ways to stimulate creativity and motivation. Innovative participatory processes in the Arctic can provide examples for other parts of the world.

This summary for policy-makers is excerpted from the Arctic Resilience Interim Report 2013. Please cite as: Arctic Council (2013). Arctic Resilience Interim Report 2013. Stockholm Environment Institute and Stockholm Resilience Centre, Stockholm, pp. ix–xii.

For further information and contact details, visit: www.arctic-council.org/arr

Next steps

The present rate and extent of social and environmental change in the Arctic places new demands on society to prepare for both anticipated developments and unexpected events. This interim report has laid out a framework for understanding the interaction of social and environmental change. It has documented several environmental threshold changes and identified other potential thresholds that could yet result in major changes. It has also pointed to the importance of adaptive governance and participatory processes for ensuring the capacity for adaptation and desired transformation.

By highlighting the dynamic relationships between changes in the biophysical environment and changes in society, resilience provides a method for dialogue and integration across several Arctic Council activities. Some activities already mention resilience, including the work of the Ecosystem-Based Management Experts Group, Arctic Biodiversity Assessment, Arctic Ocean Acidification Assessment, and Arctic Ocean Review. Others provide knowledge that is essential for understanding resilience, including on-going work with the Arctic Human Development Report-II. Resilience can also be a valuable guiding concept for further work within the Adaptation Actions for a Changing Arctic initiative. In its next phase, the ARR will link closely to these other Arctic Council processes in order to fill specific knowledge gaps in the resilience assessment and analyze how resilience thinking can bring further insights to issue-specific assessments and policy-related initiatives. One major priority is to analyze cascading social and ecological effects across scales. It is also particularly important to understand the role that policy decisions play in increasing capacity for adaptation and transformation, including the provision of institutional support for sharing knowledge and experiences.

The second phase of the ARR will continue to employ its comprehensive approach of expert engagement, workshops and detailed investigation of specific social-ecological systems. To ensure that resilience assessment can be used as a tool for understanding and responding to ecological and social change after the ARR project is finalized, the second phase of the project will also continue its commitment to capacity building and engage in dialogue with decision makers.

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Summary for policy-makers

Arctic Resilience Interim Report 2013

Societies and ecosystems are interdependent, but they are often analyzed separately and managed as if they were distinct systems. The Arctic Resilience Report (ARR) is an Arctic Council project that analyses the resilience of these closely coupled social-ecological systems in the Arctic. The following are the key messages from the ARR Interim Report.

1. The Arctic is subject to major and rapid changes in social and economic systems, ecosystems and environmental processes. These interact in ways that have profound implications for the wellbeing of indigenous and non-indigenous peoples.
2. A resilience framework provides an integrative approach for assessing linked social and ecological changes across scales, identifying the risk of threshold effects, and building capacity to respond.
3. Abrupt changes have been observed in the environment across the Arctic. Such changes risk crossing environmental thresholds, which can have long-term consequences that affect options for future development.
4. Arctic change has global effects, with potential impacts on societies, ecosystems and options for development across the world.
5. Options for responding to change may be compromised by past decisions and interventions, particularly those that have eroded traditional safeguards of resilience.
6. Rapid Arctic change is likely to produce surprises, so strategies for adaptation and, if necessary, transformation, must be responsive, flexible and appropriate for a broad range of conditions.
7. Governing in the Arctic will require difficult choices that must grapple with different and sometimes conflicting priorities. The resilience approach helps capture the complex interrelated processes that need to be better understood for effective decision-making. Participatory processes can more effectively ensure that diverse voices are represented and that all relevant forms of knowledge are included in decisions.

Introduction

The ARR analyses the interdependence and resilience of human and environmental systems in the Arctic. The ARR is being developed in response to the Arctic Council's call to address the rapid changes taking place in the Arctic, as well as the increasing need to understand the cumulative impacts of these changes. The ARR is built around expert engagement to provide integrated analysis, workshops to enable engagement, and case studies to provide specific examples of resilience assessment "on the ground".

The ARR aims to:

1. Identify the potential for shocks and large shifts in ecosystem services that affect human well-being in the Arctic.
2. Analyse how different drivers of change interact in ways that affect the ability of ecosystems and human populations to withstand shocks, adapt or transform.
3. Evaluate strategies for adaptation and transformation in the face of rapid change.

The first phase of the project (November 2011 – May 2013) focused on developing a methodological framework and addressing the first two aims. Its results are presented in this Arctic Resilience Interim Report 2013. The second phase will be completed in May 2015.

This Summary for policy-makers presents seven key messages from the first phase of the ARR, and a discussion of priorities for the second phase.

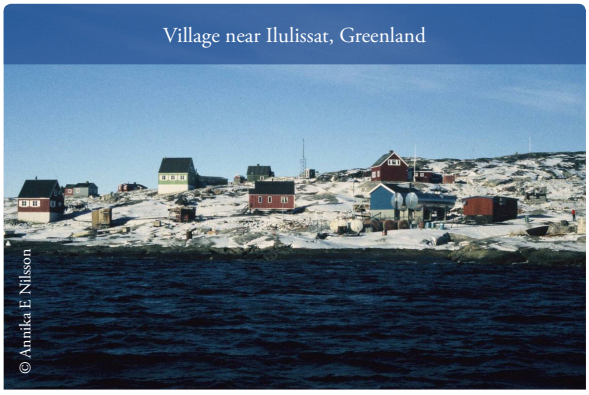
What is resilience?

Social-ecological systems are interwoven systems of human societies and ecosystems. The concept of a social-ecological system emphasizes that humans are part of nature and that these systems function in interdependent ways.

Resilience is a property of social-ecological systems that relates to the capacity of the system to cope with disturbance and recover in such a way as to maintain its core function and identity, whilst also maintaining the ability to learn from and adapt to changing conditions, and when necessary to transform.

A resilient Arctic system is thus better able to absorb disruptions in the form of both abrupt disturbance events as well as more gradual forces of change. Furthermore, a resilient Arctic system is capable of persisting within a broad range of conditions, and adjusting in a relatively smooth manner to varying circumstances.

When a system is no longer able to adapt, it is likely to experience a transformation. Transformations are fundamental changes in social-ecological systems that involve crossing a threshold to a new "regime" characterized by a different set of critical interactions. While transformations can entail considerable disruption, they are not always undesirable. In some cases they may lead to greater future resilience for certain components of the system.



Village near Ilulissat, Greenland

1. The Arctic is subject to major and rapid changes in social and economic systems, ecosystems and environmental processes. These interact in ways that have profound implications for the wellbeing of indigenous and non-indigenous peoples.

The Arctic is changing rapidly in ways that interact and fundamentally affect the region's ecosystems and societies. Climate change is important, but it is not the only driver of rapid change in the Arctic. In many contexts, social, political and economic drivers may be of greater importance than global warming. Social processes driving Arctic change include increasing demand for resources and need for transportation, migration, geopolitical changes, and globalization. As a result, many Arctic social-ecological systems are facing multiple social and environmental stressors at the same time.

Functioning ecosystems serve as a foundation for human wellbeing by providing basic necessities such as food and water and other ecosystem services. Moreover, for indigenous peoples and many rural communities, culture is constructed around livelihood activities such as reindeer husbandry, farming, fishing, and hunting and gathering. Changes in the environment can thus lead to the erosion or loss of core elements of culture.

Adaptive capacity is based on many factors, such as knowledge (including traditional knowledge and languages), a capacity to work collectively as a group to solve problems, skills and leadership, financial resources, and infrastructure. Adaptive capacity also depends on the availability of and access to diverse ecological resources. Social change can affect many of these sources of resilience. Moreover, economic development leads both to new opportunities and to increased competition for resources, including the risk of loss of ecosystem services that provide options for future adaptation.

A major task for the second phase of the ARR is to analyze how environmental and social changes affect adaptive capacity, and how adaptive capacity can be strengthened.

2. A resilience framework provides an integrative approach for assessing linked social and ecological changes across scales, identifying the risk of threshold effects, and building capacity to respond.

While some changes in the Arctic are already upon us, others will be avoidable, and yet others are necessary in order to ensure the long-term viability of Arctic social-ecological systems. For example, observations show that the Arctic climate is changing, but the ultimate amount of warming and the nature of society's response to anticipated changes are largely matters of societal choices and capacities. An understanding of resilience – the ability of human and natural systems to adapt or transform in the face of change – is essential for such choices. Society's options for action can be shaped by an understanding of resilience and the risks associated with crossing thresholds of change.

The resilience concept focuses on change, and how social and environmental processes interact across time and space in ways that can reinforce change, potentially causing abrupt and irreversible shifts or threshold effects. It also includes attention to how social and environmental changes shape the capacity to respond. The resilience approach recognizes that dynamics of change are shaped by feedbacks that can act at multiple scales of space and time. For example, global trends are playing out in the Arctic, while at the same time changes in the Arctic can have consequences on larger scales. Understanding the coupled social and environmental dynamics of Arctic change is an important step toward identifying and implementing strategies for adaptation and transformation.

Decisions about future development in the Arctic should be better informed about the risks of interacting ecological and social changes. An area of focus in Phase 2 of the ARR will be the further analysis of these interactions and how effects cascade across scales.

3. Abrupt changes have been observed in the environment across the Arctic. Such changes risk crossing environmental thresholds, which can have long-term consequences that affect options for future development.

There is widespread evidence of major changes in Arctic landscapes and marine environments. Many of these changes are abrupt, large scale, and sometimes irreversible. Some thresholds have already been crossed, and others are at risk of being crossed.

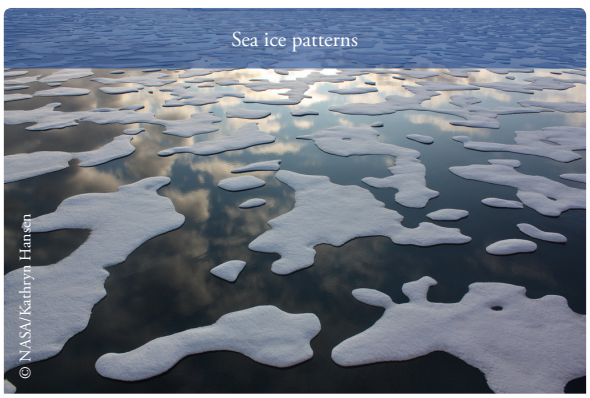
Climatic changes are affecting the Arctic cryosphere, hydrology, habitats and species. Examples of climate-related thresholds include the formation of wetlands and new lakes in some areas, and – as permafrost degrades – the rapid draining of lakes and loss of freshwater resources in other areas. Changes in temperature, sea-ice cover, snow cover and water regimes are linked to the loss of important habitats for Arctic species, as well as shifts in the species composition of ecosystems and landscape transformations, which impact on ecosystem services and livelihoods.

Ecosystem shifts often arise from extreme events. Such shifts have been observed in connection with drainage of shallow lakes, insect outbreaks and wildfires. Many Arctic species are long-lived and well-adapted to a wide range of climate variability, but cannot recover from catastrophic events beyond that range.

Phase 2 of the ARR will further analyze the biophysical and social feedbacks that increase the risk for crossing environmental thresholds.

4. Arctic change has global effects, with potential impacts on societies, ecosystems and options for development across the world.

Ecological and social changes can cascade across scales. Strong evidence points to the importance of the Arctic in the physical functioning of the Earth's climatic regulatory systems. The current sea ice loss in the Arctic may represent a threshold change of global significance. Because the ice-capped poles play a vital role in cooling the global climate, the extensive loss of ice in the Arctic is causing a positive warming feedback. It has been linked to changes in persistent weather patterns and to extreme conditions in the Northern Hemisphere. It is also an indicator that climate change is entering a new phase. Other examples of impacts of environmental change that extend far beyond the Arctic region include the role of melting ice caps and glaciers in sea level rise, and the release of carbon dioxide and methane as a result of thawing permafrost. The changing global role of Arctic natural resources in the world's economy exemplifies the importance of the links between social and ecological systems.


Sea ice patterns

5. Options for responding to change may be compromised by past decisions and interventions, particularly those that have eroded traditional safeguards of resilience.

Arctic indigenous cultures have evolved in a highly variable environment. Well-known cultural adaptations that enhance flexibility, such as nomadic lifestyles and ways of making decisions that include attention to diversity in food sources and subsistence practices, have been important sources of resilience when environmental conditions vary. Forced settlement, loss of land, and management strategies that do not allow for diversity have eroded some of this flexibility. Other policies have also eroded traditional institutions, practices, languages, and the diversity of "ways of knowing". The notion of the inherently highly adaptive northerner may no longer be valid, raising the need to better understand how policy decisions today can increase flexibility and capacity to respond to ecological and social changes in the immediate and long-term future.

Understanding traditional sources of resilience is an important part of a resilience assessment. Phase 2 of the ARR will continue to engage with and explore the role of traditional and indigenous knowledge.

6. Rapid Arctic change is likely to produce surprises, so strategies for adaptation and, if necessary, transformation, must be responsive, flexible and appropriate for a broad range of conditions.

Planning for the future in the Arctic needs to take into account rapid environmental and social change, including inevitable uncertainty about the details of future conditions. The decline in sea ice has been more drastic than anticipated and similar surprises are likely as ecosystems pass thresholds that affect their ability to provide ecosystem services. How successfully society and individuals respond is likely to depend on diverse perspectives and innovative problem solving. Some innovative adaptive solutions have already emerged in the Arctic, along with a stronger focus on co-management and social learning, the devolution of power to local decision makers, and the incorporation of local and traditional knowledge. However, more work is needed to understand and facilitate local responses to rapid environmental and social changes. New networks can build social relations and trust and enhance the ability to respond to surprises.