

# **State of the Arctic Coast 2010: Scientific Review and Outlook**

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# The Arctic coast is



takh Island, Laptev Sea (Siberia)

Rachold, August 2002

- ⊖ a key interface in the Arctic environment,
- ⊖ a complex of distinctive processes and hazards shaped by the cold,
- ⊖ a rich band of biodiversity, critical habitat, and high productivity,
- ⊖ a locus of human activity,
- ⊖ among the most dynamic components of the circumpolar landscape.

# As noted by Arctic Climate Impact Assessment (ACIA) and Arctic Human Development Report (AHDR)

Very large proportion of Arctic residents live on the coast and many derive their livelihood from marine and coastal living resources.



Hall Beach, Nunavut

© DLF, GSC, August 2007



Youth and Elders Camp,  
Herschel Island, Yukon

© GKM, GSC, July 2007

# and is particularly sensitive to climate change

➡ It is thus a high priority for change detection and awareness-raising.



Collecting shellfish during storm at Hall Beach NU  
Forbes, GSC, 2008

Massive ice in cliffs, Tuktoyaktuk NWT  
© S.M. Solomon, GSC, 2002



# Objectives

## State of the Arctic Coast 2010 Scientific Review and Outlook



- ≡ Five years on from the ACIA, to review the state of physical and ecological systems and human communities and activities on the Arctic coast as of 2010
- ≡ To identify knowledge gaps and research priorities relevant to Arctic coastal vulnerability
- ≡ To develop a road map for integrated approach to research on coupled social-ecological-physical systems on the circumpolar Arctic coast

# Background

## State of the Arctic Coast 2010 Scientific Review and Outlook



- ❏ Originated at two workshops on Arctic Coastal Zones at Risk, Tromsø, Norway, October 2007 and January 2008
- ❏ International writing team with lead authors and 33 contributing authors representing at least 15 countries, including some northern resident contribution



## **2 State of the Arctic Coast 2010 - A Thematic Assessment**

## 2.1 Physical Perspectives

- ☐ Climate and Weather
- ☐ Waves
- ☐ Sea Ice
- ☐ Ice Shelves
- ☐ Sea Level
- ☐ Freshwater, solute and SPM fluxes
- ☐ Arctic deltas
- ☐ Unlithified coasts
- ☐ Permafrost and ground ice
- ☐ Gas hydrates
- ☐ Bedrock coasts

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Holmes, T.S. James, G.K. Manson, J.W.  
McClelland, D. Mueller, R. Ødegård, S.  
Ogorodov, A. Proshutinsky, S. Wetter*

*„The evolution of Arctic coasts  
over the coming decades will  
strongly influenced by changing  
the natural environment caused  
by the effects of climate  
warming.“*



## 2.2 Ecological Perspectives and Coastal Ecosystems

### ≡ State of knowledge – habitats and species

- Coastal seas
- Coastal wetlands, deltas and other habitats
- Marine mammals
- Fish distribution
- Seabirds
- Shorebirds and waterfowl

### ≡ Ecosystem services

### ≡ Processes, Drivers and Pressures

### ≡ Management responses

- Oil spill response facilities
- Coastal protected areas
- Coastal zone management

*Lead Authors: Christoph Zöckler and  
Thomas Douglas*

*Contributors: B. Collen, T. Barry, D.  
Forbes, J. Loh, M. Gill, L. McRae,  
Sergienko*

*„Arctic coastal habitats are  
the prime lifeline for Arctic  
communities. They support  
very large populations of fish  
mammals and birds that are  
harvested by Arctic and non-  
Arctic communities and  
provide a wide range of  
ecosystem services.“*

## 2.3 Social, Economic, and Institutional State of the Circum-Arctic Coast

- ⊟ Data challenges
- ⊟ Social conditions and human development
- ⊟ Economic conditions and economic systems
- ⊟ Subsistence economies
- ⊟ Social-Ecological Couplings in the Arctic
- ⊟ Changes in industrial activities due to climate change
- ⊟ Governance, planning and politics
- ⊟ Summary discussion

*Lead Authors: Eirik Mikkelsen and  
Alf Håkon Hoel*

*Contributors: L. Hacquebord, B.  
Poppel, J. Nymand Larsen*

*„Although climate change and  
other processes impose large  
impacts on quality of life and  
economic activity for  
communities on the Arctic coast,  
other factors and processes  
often be more important.“*



### **3 Integrated assessment and response to Arctic coastal change**

## 3.1 Integrated approaches to coastal change in the Arctic

- ⊟ Arctic coasts as complex social-ecological systems
- ⊟ The need for an integrated approach to Arctic coastal change
- ⊟ Combining western science and traditional knowledge for enhanced understanding of change
- ⊟ Integrating science into Arctic policy and decision-making

*Lead Authors: Andreas Kannen and Donald L. Forbes*

*Contributor: J. Salamon*

*„The health of Arctic coast and marine ecosystems is increasingly under pressure putting at risk ecosystem goods and services that support coastal communities.“*

## 3.2 Monitoring, Detecting and Modelling Change

- ∃ **Monitoring and detecting biophysical changes**
  - Data mining and re-analysis
  - Field-based monitoring
  - Remote sensing
- ∃ **Monitoring change in human communities and populations**
  - Community-based monitoring
  - Health monitoring
- ∃ **Integration of monitoring strategies in local to global scale frameworks**
- ∃ **Modelling and projecting Arctic coastal change**

*Lead Authors: Hugues Lantuit and Nicole Couture*

*Contributors: J. Ford, A. Kannen, J. Syvitski, A. Yefimenko*

*„Reduction of negative impacts through adaptation to climate change requires new approaches in monitoring strategies to detect and track changes in the Arctic coastal environment. Understanding and prognosis of change is an essential component of resilience in Arctic coastal communities.“*

### 3.3 Vulnerability, Adaptation, Adaptive Capacity and Resilience

☞ Vulnerability and Adaptation

*Lead Author: Norm Catto, Kathlee Parewick*

☞ Resilience and adaptive capacity in Arctic coastal communities

*Contributors: : B. Bowron, S. Gearheard, G.K. Hovelsrud, L.A. Pugh, D. Mate, J. West*

☞ Summary discussion

*„Many Arctic coastal communities are experiencing vulnerabilities to decreased or less reliable sea ice, greater wave energy, rising sea levels, changes in winds and storm patterns, storm-surge flooding or coastal erosion, with impacts on travel, subsistence hunting, cultural resources and housing and infrastructure in communities.“*

## 3.4 Governance and adaptation

*Lead Author: Alf Håkon Hoel*

- ☐ Dimensions and scales of governance
- ☐ Arctic challenges and current institutions for governance
- ☐ Best practices

*„National agencies are the main actors in regional governance. In some areas such as northern Canada, regional (or in this case, territorial) agencies may play equally important part. At national and international scales, almost all international land boundaries are settled, meaning that national jurisdiction at the coast generally clear.“*



## 4 SYNTHESIS AND FUTURE DIRECTIONS

### 4.1 INTRODUCTION

### 4.2 ICARP-II SCIENCE PLANS

*4.2.1 Monitoring coastal change in the circumpolar Arctic*

*4.2.2 Measures for assessing human community issues in the Arctic coastal zone*

### 4.3 KNOWLEDGE GAPS AND RESEARCH PRIORITIES

*4.3.1 Physical State of the Circum-Arctic Coast*

*4.3.2 Ecological State of the Circum-Arctic Coast*

*4.3.3 Social, Economic, and Institutional State of the Circum-Arctic Coast*

*4.3.4 Integrated Assessment*

*4.3.5 Monitoring, Detecting and Modelling Coastal Change*

*4.3.6 Vulnerability, Adaptation, and Resilience*

*4.3.7 Governance and Adaptation*

### 4.4 BUILDING A ROAD MAP TO INTEGRATED COASTAL SYSTEMS RESEARCH IN THE ARCTIC

### 4.5 SUMMARY DISCUSSION



# Review Process

## State of the Arctic Coast 2010 Scientific Review and Outlook



- ⌘ Draft presented at IPY Oslo Conference (June 2010), chapters 1 to 3 on-line at [www.arcticcoasts.org](http://www.arcticcoasts.org)
- ⌘ Full draft text posted on 15 August 2010
- ⌘ Two months public review period until 15 October 2010
- ⌘ Parallel peer-review

available in PDF at [www.arcticcoasts.org](http://www.arcticcoasts.org)

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