

**CLIMATE CHANGE AND ARCTIC SUSTAINABLE DEVELOPMENT: SCIENTIFIC, SOCIAL, CULTURAL AND EDUCATIONAL CHALLENGES.**

Unesco. 2009. Paris: Unesco Publishing 376 p. Soft cover, illustrated. ISBN 978-92-3-104139-6. €22 (also available in French).

Learning about how the physical aspects of the earth, atmosphere and oceans respond and react to the changing climatic conditions has provided us with a much greater understanding of our surroundings. Climate change has long been considered an issue for physical scientists to ponder and explore. However the human dimension of climate change has been gaining more interest and the knowledge and first-hand experience that the indigenous peoples of the Arctic hold has begun to be heard.

This book is the result of the UNESCO organised international experts meeting of the same name held last year in Monaco. The book presents the various papers presented at the meeting and with them 'seeks to stimulate debate on how to ensure a sustained, comprehensive, interdisciplinary and multi-actor approach to monitoring, managing and responding to change in the Arctic' (page 3). The book begins with a variety of opening remarks and a brief introduction outlining its genesis. Eight different sections follow focusing on different Arctic research topics, from 'Ice, ocean and atmosphere' and 'Biodiversity and ecosystem services' to 'Community-level impacts and adaptation' and 'Economic development and social transformations'. The complete final report from the meeting follows the bios for all contributors in the annex.

Throughout the book, there is an emphasis on the need for interdisciplinary cooperation. Each section has papers from an interesting variety of people with varying backgrounds and areas of interest. This variety highlights the importance of multi-disciplinary collaboration in coming up with a realistic solution that works for everyone. Section one focuses on 'Ice, ocean and atmosphere' with papers ranging from explaining the positive feedback cycle of sea ice loss and the associated climatic implications to exploring the unique relationship the Inuit have with sea ice. Lene Kielsen Holm tells the story of Siku-Unuit-Hila (Sea ice-people-weather) which brings researchers and local Inuit together to exchange knowledge, inform the local communities and establish monitoring networks within the communities. She emphasises that the strength of their work comes from involving the local communities and having shared experiences between the scientists and local people shaping shared understanding. Section two looks at 'Biodiversity and ecosystem services' by examining the importance of international organisations in the coordination of monitoring these fragile environments, as well as the importance of understanding both the physical and spiritual relationships between indigenous people and their homelands. Gunn-Britt Retter, from the Saami Council in Norway, writes about the challenges faced by the small scale, traditional fisheries in Norway with increasing government pressure, but also about the lessons that can be learnt from them with increasing pressure from climate change. The third section of the book examines 'Community-level

impacts and adaptation' through five articles focusing on the importance of inclusive and meaningful research for members of northern communities. Sharon McClintock, the president of a local survey company, shares the story of two Alaskan villages threatened by climate change through increased storm and sea erosion and their difficulties in receiving aid for moving their villages. Section four focuses on 'Health and well-being' with three articles that focus on the threats and challenges climate change will bring to northern communities and how social science research can help through community empowerment. Chris Southcott, a university professor and researcher, highlights the deficit of social science research in the Canadian Arctic and the barriers to such research, and also emphasises the strength and importance of community empowerment to ensure that people can adapt and find solutions that work best for them. The fifth section, on 'Economic development and social transformation', presents five papers on a variety of political challenges stemming from climate change. Jonathan Motzfeldt, a former Greenland Home Rule Government official, provides a brief outline of Greenland's political and economic development over the last few decades and highlights the importance of local self-government and their focus on education and capacity-building in adapting to a changing climate. Section six looks at how the education system has developed differently in the north and how this local development is important for the continuation of the diverse cultural identities found there. Anastasia Lebedeva, who works in education in the Republic of Sakha, introduces us to the nomadic schools found in northern Russia that educate the children of nomadic reindeer herders, fishermen and hunters, allowing them to follow a traditional lifestyle and learn from a mixed curriculum of both traditional and western topics. Section seven focuses on the importance of 'Ethics, responsibility and sustainability in the developing North' with respect to the people, their cultures and the environment in an era of climate change. Bernard Funston, a consultant in research in the Canadian Arctic, presents the Arctic as the variety of conceptualisations it is often seen as; homeland, laboratory, frontier and wilderness. He uses these simplified 'versions' of the Arctic to highlight the difficulty we face in defining 'sustainable development' and emphasises the need for a coordinated global effort in coming up with a working idea of the term. Section eight finishes the book with a look at monitoring systems in the Arctic. It introduces several of the continuing monitoring systems already set up (SAON, ASI, AHDR, etc.) and calls for more long-term systems to be established for study. Jaon Nymand Larsen, a researcher and university professor, outlines the need for an observation network for the social sciences in the Arctic and the challenges in establishing one, including establishing appropriate indicators, data, coordination and monitoring systems. A brief biography of each of the contributors follows, with their research backgrounds and areas of interest. The book ends with a copy of the complete report submitted to institutions, member state governments and intergovernmental committees. This includes the key challenges and knowledge gaps identified through the meeting, as well as all the recommendations suggested.

The variety of articles and beautiful images throughout make for an easy read and an interesting book. The variety of contributors and the varying angles they present with their papers, although tending to agree on the challenge of climate change, offer up much to think about on how best to deal with that challenge. The debates stimulated by this book will no doubt be ones of values; environment, culture, economic, health. The danger of course, is letting those discussions and debates become academic as the world around us changes despite our sharing of ideas. I would suggest that this book would be ideally suited for use in training the next generation of northern researchers. With applications in both quantitative and qualitative field studies, Arctic studies, policy and community development, there are a wide range of university courses at both undergraduate and graduate level that this book could enrich (and stimulate debate in). One drawback the book does

suffer from is the lack of an index at the end, the inclusion of one would have increased the ease with which this book could have been referenced and used.

Overall the book is an interesting and engaging read. It serves as an interesting overview of the research being done in the Arctic and points to the future direction hoped for by the people who live there and those who study there. The success of this book will only be measured through its use the academic world, the political arena and the many other institutions around the world concerned with our changing climate and the Arctic. This volume does a good job of bringing a variety of interdisciplinary voices together to show the need for a multi-actor approach in responding to climate change in the Arctic, all that's needed now is to spread that voice and have it heard. (Erin Neufeld, Gateway Antarctica, University of Canterbury, Private Bag 4800, Christchurch 8140, New Zealand.)