

Namminersornerullutik Oqartussat
Greenland Home Rule

INUSSUK • ARCTIC RESEARCH JOURNAL 1 • 2005

Socio-Economic Research on Management Systems of Living Resources

Strategies, Recommendations and Examples

Proceedings of the Workshop on 'Social and economic research related to the management of marine resources in West Greenland' organised by and held at the Greenland Institute of Natural Resources, Nuuk (Greenland), 18–20 November 2003

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(Eds.)**

Socio-Economic Research on Management Systems of Living Resources

INUSSUK - Arctic Research Journal 1 - 2005

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Adaptation: Anne Lise Sørensen

Typeface: Ariel

Print: AKA Print A/S, Århus

Ed. and issue 1

Circulation: 500 copies

ISBN 87-90948-10-6

ISSN 1397-7431

Excerpts including figures, tables and quotes are allowed with distinct reference to the source. Copies of publications referring to, reviewing or quoting from this publication will be most appreciated.

INUSSUK - Arctic Research Journal is published by the Ministry of Culture, Education, Research and Church.

It is the purpose of this journal to disseminate results of research in Arctic regions to the population of Greenland as well as research communities in Greenland and Denmark. The journal wishes to contribute to strengthening the cooperation of Arctic research in particular within humanities, social sciences and public health.

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Preface

Ludger Müller-Wille, Michael C.S. Kingsley and Søren Stach Nielsen
Montréal (Québec) Canada and Nuuk, Greenland

'Ecogreen' was originally conceived as a medium-term integrated program of research into the structure and function of the West Greenland marine ecosystem. The initiative came from senior levels within Grønlands Naturinstitut, and the overall vision was to establish a scientific basis for an ecosystem-based management of natural resources, sustainable over the long term, in West Greenland waters. This implied also an improved knowledge of physical and biogeochemical interactions as well as ecosystem structure and functioning. A workshop was held at the end of November 2001 to discuss research priorities and attracted nearly 40 marine scientists.

Social, institutional and economic scientists were not present at that first workshop. However, it was observed towards its close that if such a research program was to be directed toward enabling sustainable exploitation of resources, it was inevitable that the social and economic aspects of resource use and its management should be an integral part of it. Therefore, social and economic studies were incorporated into the research program that was subsequently written, and it was agreed that research topics should necessarily include the structural and institutional drivers of human behaviour as well as the economics of interactions of human activities and the ecosystem. In order to review the suggested outline for a socio-economic research program, a workshop was planned to prioritise research areas and topics. The present document reports on that event.

This second workshop was designed to allow for presentations and discussions as well as for group and plenary sessions on the formulation of research strategies and recommendations. The moderator, Ludger Müller-Wille, invited by the Institute for this purpose, guided the participants through this social process by dividing them into three different groups for two sessions, each time with a changed membership of six to eight people. The groups had the same tasks for each session and each group reported back to the plenary following it. For the last plenary session each group presented in writing key words and phrases covering the following points: (1) general concepts and their explanations, (2) research areas—the large questions, (3) geographical and socio-political scale of research, and (4) research questions. Time permitting, these brief texts were discussed in general terms and agreed upon for further action.

The report comprises four sections. Section I presents strategies and recommendations formulated by the participants during and after the Workshop; it is followed by

Section II with papers on the human dimensions of the utilisation of living marine resources and Section III with contributions based on social and economic research on the management of marine resources. Section IV contains the actual workshop programme and the list of all participants who engaged in the workshop's activities during and after the event.

Views expressed in the articles included here are those of the authors, not necessarily shared by the editors, the Greenland Institute of Natural Resources or the Nordic Council of Ministers.

It was difficult to reach, as a final product from the Workshop, a clear blueprint for a planned and prioritised research programme. First of all, the very reason for the Workshop was to bring together a group of people working in a broad spectrum of social and economic domains. In this we were successful, as this resulting report verifies; but this diversity of viewpoints and experience was difficult to blend into a coherent view of research priorities. Furthermore, this Workshop was a first attempt at setting priorities for social and economic research related to the management of living resources in Greenland over this wide spectrum of possible fields, and we regard it, and its report, as a first step in a continuing development of such research—and plans for it—in Greenland.

The workshop was funded by a grant obtained from the Nordic Council of Ministers. In the preparation of this publication editorial and linguistic assistance by Linna Weber Müller-Wille (St-Lambert, Québec, Canada) is gratefully acknowledged. The editors express their gratitude to the participants and organisers of this workshop and to the Greenland Institute of Natural Resources, in particular, for the hospitality that all of us received during our sojourn at the Institute's facilities in Nuuk. Next to the presentations and discussions, the ambiance of the atmosphere and the excellent food in the Institute's cafeteria and the unforgettable gale of 20 November, against which some of us tested our mental and physical strength (only to lose ...) will be remembered.

Opening address

Klaus Nygaard

Director, Greenland Institute of Natural Resources

On behalf of the Greenland Institute of Natural Resources it is a great pleasure for me to welcome you all to this workshop on social and economic research related to the management of marine resources in West Greenland. A special welcome is given to those of you who have travelled far to join efforts with us in Nuuk during the next couple of days.

Being so heavily dependent on the outcome of living resources, Greenland society has a strong incentive to find effective and sustainable ways of utilisation in a constantly changing environment—both nature-wise and economically. The same goes for all fishing nations, but the need is more pronounced in small societies like the western Nordic countries, which are fully dependent on marine resources.

Interactions quickly become very complex, even if we only speak of biological interaction between two species; but the relatively less complex structure of both ecosystem and society in Greenland provides us with an excellent opportunity for studies.

This is some of the background of the integrated research program 'Ecogreen', which has been initiated by the Greenland Institute of Natural Resources. The scope of this program is to encompass a wide range of research covering climate, ecosystem and humankind.

The first workshop on Ecogreen was somewhat biased towards climate and biology. This second workshop aims at providing more balance, recognising that 'Eco' stands for economy as well as ecology.

With West Greenland as a study area models for processes and interactions can be developed for a broader use, and hence visions for the outcome go beyond this geographic area. This is one of the reasons why the workshop has been sponsored by the Nordic Council of Ministers in an effort to develop models for ecosystem based management of marine resources.

Building bridges among natural and social sciences and economics and making scientists work together across disciplines is of obvious importance. Nevertheless it is not a straightforward task. I am, however, convinced that the curiosity towards each other's areas is strong. Therefore I anticipate that this workshop will bring us another step forward. Further, it is my humble hope that it could even be 'A beginning of a great adventure'.

I. Strategies and recommendations for socio-economic research on management of living marine resources in West Greenland

1. Goals

Research dealing with human-environmental interactions, such as the management of resource utilisation, must, from the start, be founded on cooperation and partnership between 'practitioners' (defined by us as users, i.e. fishermen and hunters, but also the managers and administrators they interact with), social scientists, and natural scientists. This ensures that scientists can maximise sets of knowledge about, and understanding of, existing socio-economic and political structures and functions, which in turn can lead to the resolution of conflicts in use of resources and conservation of ecosystems. Such conditions create a research situation conducive to openness and fairness, help to preserve cultural, as well as biological, diversity, and facilitate sustainable exploitation.

The research programme proposed here on socio-economic and political conditions for the utilisation of living marine resources in West Greenland is intended to be integrated and expanded as a part of the proposed Ecogreen programme. The Ecogreen proposal for ecological research was developed by a consortium of 33 European and North American research institutions including the Greenland Institute of Natural Resources (Ecogreen 2003; also cf. Jarre 2002). It focused on the functioning of the marine ecosystem and the ecological aspects of managing living marine resources. Some aspects of the human dimensions of ecosystem management were included with the intention of better understanding socio-economic dynamics and diversity in villages and urban centers in West Greenland. However, the research program lacked direct involvement and cooperation of the social scientists and practitioners; both are needed to study and understand social interdependence in the utilisation of living resources and the management of exploitation in all its various forms and different scales along the West Greenland coast.

1.1 Focus:

Research based in the social sciences is necessary to a complete understanding of the utilisation and management of living resources as part of the dynamics of socio-cultural, economic and political systems, by studying:

- human behavior within various forms of cultural expression and social organisation;
- socio-cultural, economic and political values, including the valuation of marine resources and of access to them;
- the interactions between different groups of practitioners;
- the functioning of governmental and management institutions, their decision-making processes, and their interactions with users;
- cause-effect relationships within and between economic, social, political and cultural systems and the way in which resources are managed; and
- technological development and its consequences for human living conditions, the utilisation of living resources and related management practices and institutions.

The suggested approach needs to conduct research on currently relevant levels of ecology, human society with its value systems and related management practices, and technological advance, but in connection with broad historical baseline studies. The goal of understanding society, management systems and applied regimes aims to improve human well-being by adding social and cultural dimensions to an otherwise strictly biological 'ecosystem approach' to management, in order to ensure that the outcome would also be socially and economically feasible and acceptable to the people concerned.

1.2 Relations between ecosystem and social system:

Ecosystems and social systems intertwine and influence one another. Management systems cannot be successfully implemented unless the content and dynamics of both the ecosystem and the social system are understood. The primary research goal is to increase the level of knowledge and to expand the understanding of the ecological conditions, as well as the socio-economic structures relevant to governing the use of living marine resources. The anticipated research process will highlight concerns over management systems and their implementation as regimes through adjustable and adaptable regulations on resource utilisation, and will seek to identify the benefits for the local population along the West Greenland coast.

The intricate dynamics of the ecosystem and the social system, and the role of technology, need to be understood by the parties involved—users, politicians, natural scientists and social scientists—in order to develop and negotiate credible and acceptable management systems. This would allow utilisation of the living marine resources to be not only sustainable, but also adjusted to ecological, cultural, socio-economic and political circumstances.

The question arises whether research results could or should define or recommend a 'fair' distribution of products and benefits based on an increased return from the utilisation of marine resources. The answer is that scientists need to be committed to assessing their own position within the broader societal context, and they also need to see their research results in relation to a change in the extent of ecosystem utilisation and the perceived ecological and socio-economic limits.

1.3 Strategic approach:

In the following sections, a possible research program on cultural and socio-economic aspects of the management of living marine resources is outlined. The program concentrates on societal and institutional issues that can be dealt with under the designation of an 'ecosystem approach to management' (EAM), which subscribes to an ideal of sustainable resource utilisation. The expected research results would help in formulating advice or options for the implementation of an EAM with its associated cultural, socio-economic and political consequences.

This not intended as a detailed plan for research activities; but rather suggestions for guidance towards the development of concise research projects to be conducted under the Ecogreen umbrella. This process will require considerable reflection, re-thinking and creativity, leading to changes in the way research is conducted, how its results will be applied, and their impact on Greenland society.

2. Contexts and Concepts

The research programme outlined here faces significant challenges to meet societal demands for more integration of and cooperation between the social sciences (including humanities), the natural sciences, and the communities who use the ecosystem and its resources. To achieve this goal, broad reflections and discussions on contexts and concepts are needed so that scientists with different disciplinary backgrounds can come to understand and respect one another's basic assumptions and positions.

Most of the indigenous peoples in the Arctic have recently experienced rapid changes, which have deeply affected their lives. They have adapted their traditional life styles, and many of them now mix wage employment with traditional activities. In the context of sustainable development, it is important to study how these events at the system level affect dietary habits, consumption patterns, occupational conditions, incentive structures, and, as an extension of these factors, relationships with resources. When the concept of sustainability does not relate exclusively to animals, plants and minerals, but also to human beings, it becomes relevant to study how these events have affected their living conditions—health, opportunities for work,

housing, level and sources of income, educational level, family structures, social networks—as well as their attitudes, values and priorities in general.

The following paragraphs identify, in key phrases, a number of themes related to integration and cooperation. The range of highlighted items is not exhaustive; rather the statements outline the most pressing needs for deeper enquiry. This process transcends the intellectual as well as physical boundaries that scientific enterprise has created over time with its definitions of disciplines, institutions, rules, territories and niches of study. These circumstances are dynamic in nature and liable to constant change: rearranging and constructing the world of scientific endeavour.

2.1 Conjunction of sciences and the practical world:

The following steps can lead to a conjunction of sciences and the practical world:

- review the evolution of disciplinary boundaries and their institutionalisation in social sciences and natural sciences, and the consequent raising of barriers to communication and cooperation;
- develop means to overcome these barriers through joint research programmes;
- propose ways of communicating to understand each other's disciplinary languages and terminologies;
- develop mechanisms to ensure the participation and partnership of social scientists, natural scientists and resource users in the formulation and investigation of research problems related to interactions between humans and their environment;
- create partnerships between natural scientists, social scientists and practitioners to participate in research that evolves from both inside and outside, is conducted jointly by all partners and is scientifically valid in its conduct and ethical principles, methods, analyses and interpretations;
- expand existing institutional structures, or create new ones, to provide for participation and cooperation, while admitting different approaches to the conduct of research;
- intensify communication and co-operation among scientific institutions to avoid duplication and waste;
- discuss the usefulness of terms such as 'multidisciplinary,' 'interdisciplinary,' 'crossdisciplinary' and 'transdisciplinary' for the operation of large-scale research programs;
- identify separateness and isolation in the sciences, and question the usefulness of research institutes with narrow scientific outlooks in relation to the study of human-environmental interactions;

- present solid, sensible and responsible arguments for necessary research funding seen in relation to societal expectations and demands;
- enhance expanded and continuous discussions of ethical principles in the conduct of research, the relevance of its results, and the researcher's role, position, responsibilities and academic freedom within an open society.

2.2 Systems approach:

The 'systems approach' is seen as a feasible avenue for the study and assessment of living marine resources and their utilisation, as well as the design and implementation of management systems and their regimes, although this cannot or should not be the sole approach taken. However, it was felt important to raise the awareness of the definitions of certain concepts, their implications, and whether they should be applied within the context of the widest integration of approaches and scientific cooperation.

In the context of West Greenland's living marine resources and their utilisation and management the following 'systems' are recognised that form a useful basis for organising our thinking about research activities: ecosystems; cultural and social systems and technology; economic and political systems; and management systems.

2.2.1 Ecosystems:

- the components of nature, their distribution, density, transition zones (ecotones) and boundaries, as well as their interconnectedness and interactions;
- issues of terminology and usage in reference to 'ecosystem-based management' (EBM)—understood as engineering the ecosystem to recreate pristine nature ('wilderness', theoretically)—distinguished from an 'ecosystem approach to management' (EAM)—an intention to maintain and preserve ecological and socio-economic characteristics of an ecosystem (FAO).

2.2.2 Cultural, social and technological systems:

- types of socio-cultural systems and their expressed values, diversity, dynamics and adaptability, influenced by technological development and innovation;
- processes and changes in social networks, emphasising societal components such as institutions, behavior, other cultural elements, and their interrelationships;
- human identity and practices, perceived as elements of cultural and socio-economic communities that are connected and embedded in time and space;

- recognition of the diversity of actors in society (women, men, children in family and kinship networks; users such as hunters and fishermen; entrepreneurs, administrators and politicians; grass-roots organisations, elites and others);
- significance of gender issues related to the circumstances of immigration and emigration, employment opportunities, levels of education and the production of knowledge;
- socio-cultural systems of sharing the proceeds of resource utilisation, based on reciprocity, informal means such as sharing networks, more formal barter, or most formally cash marketing;
- role of cultural and linguistic expressions and identity in minority-majority settings with aboriginal and non-aboriginal populations;
- recognition of cultural values, cultures in contact, linguistic shifts, the role of culturally based sets of (Inuk, Greenlandic) knowledge and their various expressions, power bases and influence.

2.2.3 Economic and political systems:

- recognition of variations in the criteria for evaluating the governance of ecosystem utilisation and conservation with applied coordinating mechanisms, evaluation procedures, capacity to adapt and securing of monetary funds;
- expectations of parity in living standards and welfare throughout a community (aboriginal, local, national or otherwise) with abolition of regional disparities and discrepancies within a democratic political system;
- function of a capitalist economy, such as large investment in industrialisation, with emphasis on production and export for profit;
- distribution of costs and benefits among the parties throughout the community, i.e. income levels, and the sharing of wealth and decision-making power;
- impact of democratic processes in resolving conflicts over delocalisation which shape the development of techno-bureaucratic procedures;
- position of scientists in formulating their research results as advice on management schemes to politicians and administrators.

2.2.4 Management systems:

- modification of interactions between ecosystem and social system to optimise and maximise ecologically and economically possible returns from resource utilisation, implicitly under a constraint of sustainability;
- practices based on the understanding of ecosystem pressures and socio-cultural dynamics of societal units at different scales;
- diversity of resource utilisation, for example in West Greenland, through small-scale, inshore, and offshore fishing as well as professional and individually licensed (subsistence) hunting in villages and urban centers;

- diversity of regulatory regimes and their implementation, licence and quota practices, territorial restrictions and types of fishing and hunting.

3. Themes

The purpose of this section is to introduce a range of major themes that identify the urgency for research initiatives and activities around human-environmental interactions in the near future. Again, this is not an ultimate review of issues; rather it was felt that these themes represent the current thinking with respect to assessing the management of living resources.

3.1 Social structure and the interface with management:

- identification of coherent groups of practitioners and their expectations, values, activities, interests and objectives in utilising marine resources;
- users' capacities to participate, either proactively or reactively, in management systems;
- assessment of the validity of self-interests, e.g. the preservation of local resources as the crucial driver in locally managed utilisation to safeguard appropriate levels of food security and income;
- analysis of structures and functions of social organisations at different scale such as settlements, communes, or urban centers;
- evaluation of philosophical, cultural, social and economic differences between settlements of different sizes in West Greenland (village, town/city, metropolis) and the influence of these differences on shaping management policies.

3.2 Value systems and the interface with science:

- value systems and utility functions—what people really want, for what reasons and purposes, in relation to existing opportunities and what is socially and ecologically feasible;
- understanding of the contemporary and continuing importance of hunting and fishing to Inuk and Greenlandic community and society;
- legitimacy and usability of generated sets of knowledge, either scientific (formal) or practical (informal) in their bases.

3.3 Community systems and the interface with processes of globalisation:

- focus on the importance of issues around regional identity, sense of place, democratic political processes and technological innovations;
- evaluate the continuation of villages as viable communities in a world of globalisation (villages as a keeping place for subsidised inhabitants with little

generated income, if economic feasibility is uncertain but the continuation of the village desirable);

- probe into the effects resulting from wide access to high-quality education leading to the emergence of mobile social or political elites and possibly to their emigration from dispersed communities with small populations;
- analyse the impact of competition between localised and globalised products.

4. Geographical, Social and Political Scales

The following scales of research are identified for the Greenlandic context reaching from the local (micro) to the global (macro) levels with influences working in both directions. Choices or conflicts can be envisaged between research at a local scale, giving a detailed understanding of a restricted area which however may not be easy to generalise, and large-scale studies yielding overall results which may not apply exactly in any particular place.

4.1 Geographical scale:

- place and space;
- settlement, urban center, metropolis;
- regions (West Greenland), country (Greenland);
- continental and global scales.

4.2 Social scale:

- cultural and linguistic dimensions as an encompassing frame;
- family in various socio-economic and cultural forms;
- household as an economic and social unit;
- kinship networks socially, economically and spatially;
- community (village);
- ethnic and regional identities.

4.3 Political scale:

- village or settlement as an entity with common political interests;
- municipality or 'kommune' as a structured political, administrative and spatial structure;
- the nation state (Greenland and its relation to the Kingdom of Denmark);
- the capital (Nuuk) as a dominating socio-economic and political entity;
- regional relations and systems with external influences (Nordic Council, European Union, organisations with a North Atlantic focus);

- global bodies: international conventions, dimensions, and networks.

The different views of the possible scales of research are not independent of one another, but rather are linked with each other in many intricate ways through the various systems that are mentioned in Section 2. Careful consideration has to be applied to decisions on the scale at which research should be conducted in order to obtain conclusive results.

5. Problems and questions—towards concrete projects

The listing of research problems and questions that follows below is the result of a concerted effort by the workshop participants to identify the realms of enquiry within social sciences. Again the listing focuses on the specifics of the utilisation and management of living marine resources in West Greenland. It serves as a guideline to direct the development of specific projects within the context of the Ecogreen science plan and elsewhere and concentrates on (1) the functioning of household, settlement and region, (2) culture, social system and the fishing-hunting complex, (3) culture, social system, and the management of exploitation and (4) management institutions and their rules and values, influenced by human behavior.

5.1 Understanding the functioning—both economic and cultural—of household, settlement and region:

- study the development of Inuk and Greenlandic kinship and family models, based on an empirical verification of the system;
- study processes of empowerment and its societal distribution, and its importance in social cohesion and dynamics as well as its effects within the community;
- how do people see themselves in relation to their social and environmental surroundings (commitment to place) and their expectations in life?
- study the diversity in perspectives on gender- and generation-related issues;
- what kind of community and lifestyle do people expect or want for themselves in the future, on what premises are their aspirations based, and who (or what) is going to fulfil their expectations?
- define and analyse important forces for change and their impact on living conditions, and discuss types of irreversible social change and their cultural and economic outcomes;
- describe and analyse current practices with respect to the inclusion of users in the formulation, implementation and conduct of research projects in West Greenland.

5.2 Understanding the relations between culture, social system and the exploitation of marine resources, including the fishing-hunting complex:

- social organisation of hunting and fishing: what is a community, what is the nature of social organisation and diversity within the community, what are social and cultural meanings people attribute to resource activities?
- analyse the distribution of rights and resources among practitioners, households, communities (villages) and regions;
- provide socio-economic and cultural data on resource users and practitioners, including the composition of households in relation to resources;
- assess and evaluate the social value of hunting and fishing for the society as a whole, including cultural interests in resources;
- discuss the different perspectives of the interpretation of 'effective' and 'optimal' utilisation of resources;
- highlight local perspectives on sustainable livelihoods;
- analyse existing exchange values assigned to natural resources or rights of access to them, and compare them with other values within the barter economy;
- assess modern structured markets in the context of 'smallness'—few people, isolated communities, conflicts, inappropriate culture—and describe the social value of the informal, barter, economy;
- analyse the functioning of types of fishing: relations between the large-scale industrial complex, the community-based in-shore fleet, and small-scale fishing and hunting.

5.3 Understanding interactions between ecosystems, culture, and social systems with the intention of improving the management of fishing and hunting:

- discuss what 'crisis' means for the parties involved (when is a situation seen as a crisis and by whom; how does one overcome crises and when does one know that a crisis is over?)
- include human activity, politico-economic systems, cultural conditions, and technological aspects in the concept of sustainability in order to understand resource regulation, past, present, and future;
- analyse the different views and understanding of the basic ecological units used in the management system;
- attain a deeper understanding of the implications of resource management for lifestyles and levels of well-being;

- describe experiences with the application of local knowledge in resource management in West Greenland and other places; predict the consequences of management by the community itself?
- does resource management restrict and constrain opportunities for other activities and their development or, conversely, does it provide such opportunities?
- analyse the different effects of different management systems in the socio-economic and cultural spheres, study contemporary perceptions of the existing systems locally, and identify conflict areas within management systems;
- develop bio-economic models for the various types of fisheries;
- evaluate the possibility that the fishing industry should pay for research and monitoring studies, stock assessment and quota determination, and quality control;
- develop scenarios for radical changes in resource management policies, e.g. selling access to resources to foreigners in order to balance costs/benefits and provide certain income levels throughout the population, or applying Individual Transferable Quotas (ITQs) or other resource allocation methods.

5.4 Understanding management institutions as a set of rules and values governing human behaviour relevant to the marine ecosystem, together with the social and organisational entities that have responsibility for their implementation:

- compare and contrast traditional Inuk or Greenlandic concepts of user rights with imported concepts of property rights and trading privileges, and consider types of ownership structures and possible changes and adaptations;
- study the effect that rights to resources, and different views of those rights, have when implemented as components of management regimes;
- identify and define the involved parties and processes that initiate, formulate, substantiate and implement bodies of regulations (regulatory regimes) for the utilisation and management of living marine resources;
- study the involved parties' perceptions of their roles, investments, responsibilities and possibilities in the system;
- concentrate on rules and values present in the system and how they function and are negotiated;
- identify and describe the conflict areas within the present management processes, and identify their causes, including different perspectives on effectiveness, optimality, and sustainability;

6. Priorities and decision-making process

The process of setting priorities in research is complex. It cannot be prescribed but needs to allow for free and open reflection. Within communities and institutions research priorities are proposed, negotiated and agreed by interested parties. These include scientists within their disciplinary structures, research funding organisations, administrators and managers (public servants), politicians, commercial entrepreneurs and resource users (fishermen and hunters) who are directly involved in the use of living marine resources. Each of these interest groups develops its own priorities. Once the complexities of issues and conflicts relating to resource utilisation and management are recognised, the requirement to develop external links for negotiation and cooperation becomes apparent if demands and expectations are to be met, and impediments overcome, so that appropriate approaches to ecosystem management in which all actors can confidently join are achieved.

The workshop participants concluded that they would not suggest specific priorities for socio-economic research on management systems of living marine resources in West Greenland. Rather it was felt that outlining strategies and recommendations, along with some specific examples of research on these matters, would encourage reflections by the various actors and, thus, might result in a broader understanding and acceptance of each other's positions which will stimulate negotiation, collaboration and cooperation to further our insight into the interplay between humans and their environment.

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II. Human dimensions of the utilisation of living marine resources: some examples

Integration of socio-economic and ecological research in Ecogreen

Mark Nuttall

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At a time of rapid and dramatic social and environmental change in the Arctic, the need to be thinking across the boundaries of the natural sciences and the social sciences is an urgent responsibility. The changing Arctic, in all its human and physical dimensions, challenges the natural and social sciences to forge collaborative partnerships across disciplines, as well as strong partnerships with the peoples of the Arctic.

Understanding the processes driving social, cultural, economic and environmental changes in the Arctic and assessing their impacts demands the development of innovative multidisciplinary collaboration and research methods, for example through the integration of different kinds of knowledge—scientific, social-scientific and local. This collaboration enhances understanding of the complex interaction between human societies and the environment, and its value is underscored by its relevance for policy making. Collaboration between the natural sciences and the social sciences is an essential step for improved communication and collaboration between researchers, communities, stakeholders and policy-makers on crucial questions concerning the formulation of ecosystem-based advice for management.

Climate change, loss of biodiversity, atmospheric pollution and global warming are of concern to social scientists because they are social as well as ecological issues. Complementing scientific research on global environmental change, the social sciences offer a vital perspective on understanding the relationship between climate, environment, politics, economy, society and human behavior (e.g. Rayner and Malone 1998; Redclift and Benton 1994). Environmental perspectives in the social sciences contribute to understanding both the causes of global environmental change—by focusing on processes connecting it to human activity—and the human responses: policy solutions, public opinion and action, social movements, and environmental management systems. As disciplines concerned with *inter alia* understanding social complexity, cultural diversity and the interrelationships between society, economy and nature, the social sciences appear apt to contribute to integrated assessments

of environmental change. This is particularly the case when regional studies of climate change are contextualised within the global perspective (Rayner and Malone 1998), as the Arctic Climate Impact Assessment shows for the circumpolar North (ACIA in press).

Integrating the natural sciences and social sciences in Ecogreen

The marine region of West Greenland has large and important living marine resources, on which the livelihoods of many people living in coastal communities in West Greenland primarily depend. Economic and cultural practices range from marine mammal hunting and small-scale fishing to large-scale capital-intensive commercial fisheries. Marine mammal hunting is carried out primarily for local, regional and domestic consumption, whereas most of the fish caught commercially along the West Greenland coast is exported. Many small communities have mixed economies that are vulnerable to changes caused by regional and global influences on markets, technologies and public policies, as well as pollution and climate change. Furthermore, local ways of life based on the harvesting of living marine resources are also being challenged from within, by changing community dynamics and the transition from traditional local practices of hunting and fishing, based primarily on kinship and other forms of close social association, to large-scale capital-intensive fisheries based on more formalised contractual relations.

Community viability in West Greenland depends on the long-term sustainability of local livelihoods and economies based on the resources of the sea, but ecosystem-based advice for resource management needs to be informed by in-depth understanding of the social and cultural dynamics of living marine resource use and of the social organisation of communities that depend on the sea for a living. While the West Greenland ecosystem is poorly understood in biological terms, so too are the social, economic and cultural aspects of West Greenland coastal communities, especially in terms of their interactions with living marine resources and the social and cultural importance of hunting and fishing.

The uses of living marine resources have different, albeit interrelated, meanings in West Greenland: as a way of life and basis for social and economic identity; as a basis for the economic sustainability of communities, especially in smaller settlements; and as one basis for national economic development.

In designing an integrated program of research into the structure and function of the West Greenland ecosystem, the recent and ongoing environmental, social, economic, political and technological changes challenge the natural and social sciences to forge collaborative partnerships across disciplines as well as with various stakeholders (Lange et al. 1999). Understanding the processes driving climate change or the

over-fishing of vulnerable fish stocks, or assessing the impacts of social and cultural change on local communities of hunters and fishermen, demands the development of a clear plan of integrated research combining perspectives from both the natural and social sciences. Integrated research programmes of the type envisaged in Ecogreen offer advantages in this regard, claiming as they do to be interdisciplinary as well as multidisciplinary.

For example, scientific research on ecosystem processes that focuses only on the quantitative aspects may greatly enhance our understanding of, say, the climatic and environmental consequences of greenhouse-gas emissions, but such research is nonetheless limited unless it also involves social scientists and considers social, economic, political and institutional processes (Nuttall and Callaghan 2000: ix). Complementing the natural-science work on the West Greenland marine ecosystem, social scientists would typically consider a range of issues, such as resource-use practices, human modification of the environment, social and cultural understandings of the marine environment and resources, the social organisation of fishing fleets, and the roles that cultural and institutional processes play in local and regional decisions about marine resource use and management. Such interdisciplinary research not only enhances understanding of the complex interface between human societies and the environment, but also has wide policy relevance (Nuttall and Callaghan 2000).

As the very term 'natural environment' suggests, however, issues of ecology, trans-boundary pollution and global environmental change have been considered as lying outside the competence of the social sciences, just as social scientists accept that natural sciences should not get involved in debates about society and social life. If it *is* science that offers a powerful means of understanding environmental issues, why and how should social scientists contribute to research on the environment?

Fundamental questions about the nature of the social and the natural lie at the very heart of the relationship between the social sciences and environmental research in particular, and between most social sciences and the natural sciences in general. In classical social theory, the natural environment has been presented as being outside human agency or intervention. Many of our disciplinary boundaries can be traced back to the nineteenth century and, while social scientists are often fond of criticising other scientists, it is the founders of modern sociology and anthropology who have to take much of the blame for driving a wedge between the social and natural sciences when they defined the natural environment—negatively—as that which is not social. The sociological world-view was premised on the separation between the social and the natural—with the social being the legitimate professional territory of the sociologist and other social scientists, and the natural that of the natural scientist. One important element within this disciplinary definition has been the intellectual attempt

to separate our social selves from our biological selves and from our relationship with nature.

A persisting assumption that the social and the natural are separable—even though the prevailing feature of modern social life is its blurring of such boundaries—continues to prevent social and natural sciences from engaging in dialogue on the environment. But many phenomena presented as natural are also social in origin and character, so we are challenged by these very distinctions that have been built up between the social and natural sciences. If natural scientists and social scientists are to engage positively with Arctic environmental issues and with issues of social and economic change throughout the North it is vital that they re-evaluate some of the assumptions that are taken for granted within their disciplines.

The separation between the social sciences and the natural sciences has been due in part to an intellectual (or epistemological) division of labor, carving out the social and the natural as two distinct realms which are the concern of two distinct scientific traditions: the social sciences and the natural sciences. The opposition between nature and culture (or society) made room for the social sciences as distinct autonomous disciplines. The problem of this heritage is evident in the way this dichotomy between the social and natural sciences constrains the possibilities for social scientists to engage with questions of the natural and vice versa.

The separation of the social from the natural, biological and scientific has of course been effective in establishing disciplinary boundaries within which careers are forged and reputations established, and may be useful and convenient in allocating research funds and knowing where to place people's academic articles in disciplinary journals. But it causes difficulties when confronting environmental questions.

In the Arctic, and elsewhere in the world, the present-day realities of social, cultural, economic and environmental change suggest an urgent need for us to transcend, and not be constrained by, established intellectual and disciplinary boundaries. Such a fusion might have serious consequences and implications for entire disciplines, but might lead to valuable new perspectives on understanding the Arctic and advising policymakers on appropriate actions.

The task at hand is therefore for us to challenge the established dichotomy between the social and natural sciences, and this requires us to challenge the distinction between the social and the natural upon which this dichotomy depends. We also have to challenge assumptions about where we get our authoritative answers to environmental problems from. For example, conventional accounts stress the role of science in providing a rational basis for environmental policy and management. While science may have a crucial role to play it cannot be looked to for clear solu-

tions—indeed does more science, stricter regulation of fisheries etc., tighter institutional control, solve problems, or only create more?

In his famous book *The Risk Society*, the sociologist Ulrich Beck argued that environmental problems are not problems for our surroundings, but in their origins and through their consequences are thoroughly *social* problems, problems of *people*, their histories, their living conditions and their relations to the world and reality, their social, political and cultural situations. He argues that nature is society, and society is also nature, and this argument is in keeping with perspectives on nature and the environment as assuming an appearance of reality only through human action, modification, interference—and through the activities of science. At the same time, others such as Latour argue that we are witnessing a collapse of existing categories such as ‘Economy’, ‘Culture’, ‘Politics’ or ‘Science’. Although current thought and academic disciplines still seem to insist that we can divide the world into established divisions, environmental problems illustrate that reality cuts across conventional boundaries of thought and academic disciplines (Irwin 2001).

Present-day environmental issues transgress boundaries—climate change, contaminants and transboundary pollution in the Arctic illustrate this. This asks us to question and possibly even deny the validity of boundaries between the social and the natural. If these boundaries are blurring or collapsing, then so too must the boundaries between disciplines that, built upon them, drive a wedge between the social and the natural and legitimise these distinctions. Within the physical sciences environmental problems frequently transcend disciplines—studies on pollution, climate change, ozone depletion and so on often require investigative approaches from several disciplines. But issues that are seen as exclusively the preserve of science have a call upon the social sciences as well. We are dealing with changing rather than fixed categories in the world.

Increasingly the recognition that environmental problems cannot be ‘solved’ by the natural sciences has brought some of the social sciences closer to a problem-centered view of the issues. Environmental management and evolving forms of environmental governance assume urgency as we become more aware of what is going wrong in our relationship to the environment.

At the same time, however, environmental discourses have precipitated shifts within the social sciences that are linked to the science agenda, and a number of social sciences have reached a point of convergence from different points of departure. It is here that we begin to see how integration and interdisciplinarity might work. Of course we need to be grounded in our own disciplines—from different points of departure can we explore and meet on common ground. It is on this common ground,

for example, that a growing body of knowledge and explanation of ecosystem processes, or sustainability, or climate change can be found.

The representation of socio-economic processes in Ecogreen as an integrated research programme

As natural and social scientists develop multidisciplinary (and interdisciplinary) methods to study the impact of social and environmental change on Arctic ecosystems and societies, integrated assessment models have particular limitations and, from a social-science perspective, are far from being reliable in their representation of social and economic processes. These models may provide thorough descriptions of cause-and-effect situations and of the interactions between social and physical processes, yet these are, of necessity, simplified representations of complex relationships. In many parts of the Arctic, for example, local land-use and resource-management practices have resulted in major changes to local and regional natural ecosystems, which have affected trace-gas exchanges. Socio-economic studies concerned with trace gases and climate change in Northern wetlands would be concerned with gaining an understanding of the choices and decisions people make in relation to local environments, in both historical and contemporary perspectives. Integrated research is therefore challenged to gain a greater understanding of the relationship between land and marine use practices, resource management choices and environmental change.

Rotmans and Dowlatabadi (1998: 357–8) state that integrated assessment modelers face challenges in building a relevant knowledge base and designing models that reflect reality. They argue that knowledge of the key dynamics of social systems is limited, creating problems in socio-economic modeling. Understanding the environmental, social and economic consequences of climate change in the Arctic and seeking to design appropriate policy responses is difficult without knowing about regional socio-economic conditions and the problems of the study areas selected. To rectify the dearth of basic socio-economic data, integrated research programs such as Ecogreen will need to build up a socio-economic profile of each locality, looking at settlement patterns and demographic changes, and showing the extent to which social and cultural understandings of resources and the environment have been shaped by socio-economic development at local, regional and national levels. In particular, an integrated research program on the structure and function of the West Greenland marine ecosystem needs to be concerned with seeking answers to many questions, including:

- what are the major settlement patterns and economic activities along the West Greenland coast and how have they changed over the last fifty to one hundred years?

- what are the demographic characteristics of each area and how have settlement, infrastructure and the local economy been affected by in-migration and out-migration?
- what impact is rapid economic growth, or even decline, likely to have on the use of living marine resources along the West Greenland coast?
- how could human activities in the future, such as increased commercial fishing and hunting, recreational hunting and fishing, and tourism, place greater stress on natural and social systems in West Greenland?

Furthermore, socio-economic studies of marine resource use and management need to provide basic data for integrated assessment modelling by focussing on institutional factors, such as resource ownership, licensing and regulation, paying particular attention to their influence over the past few decades. A social-science perspective on marine resource use recognises that its shape and direction depend largely on who has the authority to make decisions about it. Thus it is crucial that integrated research in West Greenland also investigates property regimes and patterns of ownership, rights and social organisation of communities in relation to marine resource use in historical and present-day perspective, addressing such questions as what are the specific institutions of marine resource ownership and control that affect particular regions, and how do they contribute to, modify or mitigate social and environmental change?

Social, economic and political factors influencing marine resource use

When people change marine resource use practices or modes of livelihood, their decisions are often made on the basis of culturally transmitted information. While ecosystems, settlement patterns and hunting and fishing activities can be studied scientifically, a social-science perspective recognises that much of the environment is a human system and a practical understanding of past and current relationships between environmental and human systems is necessary. For example, people may modify their environments and resource use activities for easier access to hunting grounds, but they may also do so in response to climate changes and fluctuations in stocks. Integrated research should investigate local perceptions of the environment, in particular by examining the ways in which local people attribute social, cultural and economic value to the marine environment and the living marine resources they hunt and fish, and by asking how and why local people make strategic choices and decisions about their environments, why they modify their environments, and who makes the decisions to do so. In this way, integrated research on the West Greenland ecosystem can contribute to a greater understanding of the social uses of the environment and the cultural values attached to it, and determine why it is that certain areas are exploited while other areas are left alone.

Any adequate integrated socio-economic and ecological model will need to draw on insights from zoology, marine biology, historical ecology, sociology, ecological anthropology and economics to analyse changes in living marine resource use and management and evaluate the relationship between ecosystem, animal populations, climate, economy and society. Through the use of historical and contemporary scenarios of resource use practices, integrated socio-economic and ecological models will need to show how these changes result from, and how this relationship is influenced by, the political, economic and social institutions which develop in response to meeting the challenges posed by both the natural environment and human needs and wants (in regional and global perspective). For example, the socio-economic dimensions of hunting and fishing practices in West Greenland are poorly understood. Integrated research will therefore produce an assessment of the socio-economic impacts of marine resource use that may be highly significant in terms of the consequences for local livelihoods.

Integrated assessments, local people and the inclusion of environmental knowledge

To be effective, integrated socio-economic and ecological research must involve local people: residents, resource managers, and policy-makers. Successful stakeholder involvement in integrated global-change impact studies in the Arctic has been described by Lange et al. (1999). The integration of local people's knowledge can augment and enrich scientific knowledge, but integrated ecosystem research must not only look at local systems of environmental knowledge, but also at local management regimes. It should examine patterns of change in local production systems, and determine whether those changes are the result of ecosystem and climatic factors, technological innovations, or fluctuations in human population dynamics and ecosystem interactions. It may well be useful for integrated research to use insights from anthropological perspectives that do not view the human understanding of the environment in materialistic terms, but which focus on social agency, human intention, action and purpose in economic production. In this way, integrated research may well contribute to a greater understanding of how people view their own relationship to their environments and how this informs and underpins the kinds of choices people make with regard to marine resource use and resource management.

Integrated ecosystem research in West Greenland requires researchers to work with local people at community level and seek to understand how they view the potential impact on the environment of current practices in the use of marine resource. At local, regional and national levels, it is also crucial to identify the extent to which decision-makers and policy-makers are concerned with considering the opportunity costs and benefits of focusing attention on issues of social and environmental change. However, attitudes to the dynamics of socio-ecological interactions and

appropriate policy responses are likely to be contested, and the attitudes and agendas of various interest groups and stakeholders in each locality need to be understood. By bringing together local people, policymakers, scientists and social scientists, integrated research will work out ways of how to develop a truly participatory approach to the environmental, social and economic dimensions of the structure and function of the West Greenland ecosystem. In doing so, researchers will begin to reach a greater understanding of how local people interpret and understand the workings of the West Greenland ecosystem in terms of their own systems of environmental knowledge, social values and cultural practices.

Integrated assessments and the complexity and unpredictability of social systems

Integrated research within Ecogreen will need to grapple with the problem of how to take into account the significance of environmental change for local people in relation to other pressing and immediate everyday concerns. Given the extent, nature and rapidity of social, economic, political and technological change throughout Greenland, it may well be that socio-economic and political issues are more pressing concerns for local residents than ecosystem change. In turn, these issues become the primary focus of much social science research. For example, although there is concern that climate change will have an adverse effect on fish stocks in the Arctic, many problems in Northern fisheries must be seen in relation to the global restructuring of fisheries—i.e. the balance of competition between different species and fishing areas, the internationalisation of the sourcing of supplies for processing plants and retail markets, and the redistribution of wealth from traditional actors (fishermen and local processors) to global players in the form of transnational corporations (Symes 1998). Local coastal communities may be put at risk by environmental change, but they are also, and more immediately, put at risk by the interplay of global forces, by environmentalist action and by the broadening scope of fisheries policy. Local fishing communities are also being challenged from within, by changing community dynamics and by divisions within and between local and national fishermen's organisations. A social scientist concerned with the impact of climate change on the livelihoods of fishing communities will be aware that the sustainability of fish stocks and local ways of life are threatened more immediately by management systems, such as the individual transferable quota (ITQ) system, which has transformed fish from resources which were subject to common-use rights to privately-owned, divisible commodities subject to rational management regimes (Helgason and Palsson 1997). It is important to be reminded of the much broader horizons of fisheries management by examining the process of negotiation and decision-making in the fishing industry and paying particular attention to the changing roles of community and culture in forming a consensus over the legitimacy of current fishing policy and

practice (Nuttall 2000). Integrated research will need to capture the complexity and specificity of these kinds of social, economic and political processes. At the same time, it is important to understand how the nature of socio-economic and technological change, the forms of society emerging under conditions of modernity, and global human population dynamics may in turn contribute to major changes in local and regional natural ecosystems. One challenge for integrated research on ecosystems processes in West Greenland, therefore, is how to take satisfactory and explicit account of rapid social and cultural change and human/environment dynamics.

Although there has been considerable recent scientific research on the environmental consequences of environmental change in the Arctic, very little attention has been given to the potential social and economic impacts and how local people perceive, interpret and understand environmental change as it affects the milieux on which they depend for social well-being and cultural survival. Rotmans and Dowlatabadi (1998: 359) point out that a major challenge for integrated assessment modelling is how to represent uncertainty, and one aspect of uncertainty, seldom considered, is the extent to which people understand and interpret scientific scenarios of environmental change. While there is some knowledge about how people at local level make choices about marine resource use practices and resource management, there has been little research that has sought to establish how far they will accept that environmental change is a pressing issue that needs rapid mitigation.

By taking an anthropological perspective and pursuing in-depth micro-scale research at local level, researchers need to investigate how local people understand not only environmental change itself, but also the scientific and political discourses. In other words, whom do local people believe about environmental change and its consequences? Because social, economic and political change occurs faster than environmental change, it may well be that rapid social change is a more pressing daily issue than environmental-change forecasts based on scientific research.

Conclusions

Effective dialogue between researchers in the social and natural sciences must centre on how best to integrate natural- and social-science research that will demonstrate the impact of the interactions of climate, human activities and socio-economic processes and institutions on the environment. By examining these complex interactions, researchers will be in a far better position to assess how the sustainability of local livelihoods, cultures and economies could be affected by global environmental changes that may impact upon marine resource use practices. Understanding these linkages will enhance the knowledge bases that are necessary for defining and assessing policy options, human choices and the assessment of risk in a context of change. The relevance of integrated research in West Greenland is not limited

to the circumpolar North, but points to the importance of understanding the social, cultural, political, institutional and economic pressures that act as driving forces of environmental change in broader regional and global terms.

A crucial element of an integrated marine research program in West Greenland is to investigate how a community's prospects for sustainable use of resources are influenced, limited or constrained by markets, state controls, international regulations, trade barriers, global processes (such as the global restructuring of fisheries) and environmental changes. Furthermore, studies of the historical and contemporary dependence of selected communities on living marine resources will shed light on the role of family, kinship and households and the central place of the marine environment in the social and economic strategies of families. At the same time, it is necessary to investigate and analyse the institutional settings in which communities are placed.

The rationale behind Ecogreen as a long-term integrated programme of research on the West Greenland marine ecosystem is to develop the necessary knowledge and understanding of this complex part of the Arctic to meet the need for ecosystem-based advice for management. Thinking about appropriate ways to achieve sound ecosystem management and the sustainability of living marine resource use requires a thorough understanding of ecosystem processes and social and economic dynamics. We must also engage in a necessary discussion of what exactly is to be managed and sustained. From a wider regional or even global perspective, scientists, environmentalists and policy-makers may view the goal of sustainability to be the protection and viability of fish stocks and an entire ecosystem; from the perspective of fish producers, it is the fishing industry and markets which need to be sustained; and from the perspective of the local fisherman or seal hunter, it is the viability of the family, household and community which is at stake.

One way forward towards the goal of sustainable uses of living marine resources in West Greenland is to adopt a governance approach to fisheries and the resource systems and processes that not only harvest fish, but which provide fish and fish products to consumers. This requires a fundamental shift in thinking away from a purely instrumental management approach to a more inclusive governance approach which places emphasis on aspects of living marine resource use which are seldom considered, such as the broader social institutions, rules and practices which provide the framework for decision-making and cooperation rather than the formal organisations which exist in order to address and deal with environmental issues. A governance approach to ecosystem management rejects the current instrumental emphasis of fisheries management, in particular the overt emphasis on the productive activity of fishing and its impact on fish stocks, and also recognises that while existing marine management policies and fisheries policies have their weaknesses,

one reason for their failure also lies in the administrative and political institutional contexts within which those policies and schemes arise and are legitimated. A governance approach takes a much more encompassing approach to fisheries management by looking at the institutional contexts, but also by considering the wider social, economic, political and market conditions.

By using a governance approach to conceptualising new ways of thinking about the sustainable uses of living marine resources, the focus of the research and policy-making agenda is widened to include consideration of the complex interrelationships between different species and different levels of the marine ecosystem, the assessment of pollution and climate change trends, the production and supply of fish for human food, food safety, and the interrelationships between harvesting, processing, marketing and consuming marine products. There is need to recognise that there are broader aspects to fisheries management beyond the pragmatic, rational, scientific, economic and instrumental dimensions which usually preoccupy resource managers and policy-makers. A greater understanding of the dynamics and make-up of the fishing industry itself, and of the social fabric of local communities and the networks of association in which resource users move and operate is necessary if constructive dialogue is to take place between hunters, fishermen, industry managers, policy developers, biologists and others.

As Ecogreen develops as a programme of integrated research, the social and natural sciences cannot be regarded as two independently constituted forms of intellectual endeavor. Social scientists must remain attentive to the progress of the natural sciences in Arctic research, and in turn the natural sciences must presuppose an open and definite stance towards the human dimensions of the Arctic and towards the perspectives of the social sciences.

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Greenland: a general introduction to a hunting society

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Hunters: commercial and recreational

Licences for commercial hunters are issued by the Kommune (local government) under regulations made by the Home Rule government. The following requirements must be met:

- a continuing association with Greenlandic society, i.e., for the previous two years, the applicant must have registered a permanent address in Greenland, and must within the same period have been fully liable for tax;
- no less than 50 percent of the applicant's gross income must come from hunting and fishing;
- monthly catch records must be maintained, and may be reviewed by the local hunters' and fishermen's association before the licence is renewed.

To obtain a licence as a leisure hunter, an applicant must have a Danish identity number and have registered a permanent address in Greenland. Harvest statistics are not collected separately for commercial and leisure hunters.

Table 1. Hunting licenses 1993–2000 (Grønlands Hjemmestyre 2001).

	Commercial	Leisure	Total
1993	4068	5455	9523
1994	3150	4166	7316
1995	3294	4092	7386
1996	3996	5930	9926
1997	2617	6985	9602
1998	2573	7642	10215
1999	2706	8318	11024
2000	2570	8099	10663

Holders of leisure hunting licences have smaller daily limits on sea-bird hunting than commercial hunters. Moreover, leisure hunters' participation in caribou and musk-ox hunting is more tightly restricted than that of commercial hunters. Both these species are regulated by quotas, so that apart from a valid general licence, there is also

a requirement for a special licence, which under normal circumstances is only issued to people who have been registered as residents for the previous two years.

Who is a hunter?

The question as to who is a hunter often arises both at the administrative level as well as in public debate, but there is no clear answer to the question. It becomes particularly acute in the context of quotas, regulations, and contested access to resources. As it is now there is a set of criteria an applicant must fulfil before achieving a commercial hunting license.

Currently, the principal regulations concern income sources. As indicated in the above table, the number of commercial—full-time—licences has been substantially reduced since 1993, for several reasons. Up to 1993, all persons associated with the fishing industry, including the crews of large ocean-going trawlers, had the right to hold a commercial hunter's licence. However, at about this time the criterion that no less than 50 percent of the licence holder's gross income was to stem from hunting or (individual) fishing came into force.

The withdrawal of pensioners' rights to commercial hunting licenses also contributed to the reduction. Until 1993 even civil servants could change from being part-time or leisure hunters into being commercial hunters upon retirement. Now, however, only commercial hunters are allowed to maintain a commercial hunter's license after starting to receive a pension.

But even today classifying the various occupational groups is a difficult task, as there are groups among the commercial hunters or commercial fishermen who tend to fall between the classes of any too-rigid occupational grouping. A simplified, tentative classification could, however, go along the following lines:

- hunter/hunter, i.e., someone whose income stems from hunting exclusively and all the year round;
- hunter/fisherman, i.e., someone whose income stems primarily from hunting, but who, for at least part of the year, will replenish his income by fishing;
- fisherman/fisherman, i.e. someone whose income stems from fishing exclusively and all year round;
- fisherman/hunter, i.e., mainly a fisherman, but one who also goes hunting (on a commercial basis) occasionally or seasonally.

At present, harvesting of fin whale, minke whale, walrus and polar bear is restricted to licensed commercial hunters in most of Greenland. Special rules apply to residents of Upernavik, Qaanaaq and Illoqqortoormiut communes regarding leisure hunting of

walrus, polar bear, beluga, and narwhal in the North-East Greenland National Park and in the Melville Bay Nature Reserve.

Table 2. Takes of land mammals, small cetaceans, pinnipeds and birds, 1997–2001 (Grønlands Hjemmestyre 2003).

	Reindeer and muskoxen	Small cetaceans ¹	Seals and walruses	Birds
Mean 1997–99	4172	2429	173997	444427
2000	10507	2821	191272	389038
2001	14208	2998	162143	315747

¹belugas, narwhals, common porpoises, and pilot whales.

Hunting remains an important activity in a land with few agricultural resources (Table 2). Annual takes of birds are of the order of one-third of a million, and one to two hundred thousand seals are taken annually. Reindeer hunting is a prized recreational activity, as well as providing significant quantities of meat for hunters' own consumption or to the domestic market. Muskoxen are mainly hunted by commercial hunters for the domestic market, but there is also a limited domestic demand for recreational hunting and a small international market for trophy hunts.

Greenland, as a high-Arctic community, is extremely dependent upon marine living resources. Whales have been hunted through at least four thousand years; some of the whales taken are large baleen whales. Large-whale catches in Greenland are regulated in accordance with quotas set by the International Whaling Commission (IWC), most recently in May 2002 for the period 2003–2007. The current quotas are: West Greenland minke whales, 175 /yr with a year-to-year carry-over of up to 15; East Greenland minke whales, 12 /yr with a carry-over of up to 3; and West Greenland fin whales, 19 per year.

Commercial or subsistence hunting

The subsistence economy and a commercial hunting economy can be defined in several ways, and indeed, over the years, have been. But it is difficult to distinguish hunting activities that are predominantly subsistence-oriented from those that are predominantly commercial.

If we are to look for a time in which a totally independent subsistence economy was still practised, we have to go back to the time before the coming of Hans Egede

and the trade with European whalers characteristic of the late 17th and the early and mid-18th centuries. In the age of the European whalers the traditional hunting culture of Western Greenland gradually changed from being totally independent to becoming dependent upon goods available through trade.

Among other things, the colonisation of Greenland meant that a chain of missionary and trading posts was established along the west coast. Colonisation was financed by profits from trade in Greenlandic products, i.e. blubber and, later, skins and furs. As a consequence of this, the Greenlanders became involved in the European economy, and became dependent on trade with the surrounding world. Luxury items and stimulants such as tobacco and coffee drove the Greenlanders into still more trade and, in the long run, into dependence on monetary income. The structure of the hunting culture was further influenced by the introduction of more efficient hunting methods and tools such as rifles, sealing nets and, later on, harpoon guns for catching whales.

In recent times, the dependence on monetary economy has grown steadily, and its dominance has grown at the expense of the subsistence economy. At the same time, the exchange of products has become a structurally integrated part of the economy. This has clearly been the case for the last 20 or 30 years, in which period the monetary economy has become more and more dominant. Hunting can no longer be practiced without large investments in equipment such as dinghies, outboard motors, hunting and fishing gear etc. This, among other things, means that the hunter is forced to enter the commercial market with his products.

In the following, consideration will be given to three different theories, each of which has dealt with the concepts of subsistence and commercially oriented hunting and fishing economies within the Greenlandic hunting society. The first of these theories was formulated as a result of investigation of connections between hunting and wage labour in Godhavn in the Disko Bugt area (Dybbroe and Møller 1981); in the same area Dahl (1989) carried out research at Saqqaq near Ilulissat; and Forchammer (1989) carried out field work concerning occupational and social development in a Greenlandic hunting society, viz., Innarsuit in Northern Greenland.

1. In a subsistence-oriented economy, the subsistence is an integrated part of hunting and fishing, as a form of production, exercised by independent hunters and fishermen fully controlling their means of production. Even so, some measure of income, for example seasonal wage labor, is necessary for sustaining this kind of subsistence economy. Usually, one or more of the household members hold waged occupations. This form of subsistence is mainly found in the remote settlements. (Dahl 1989)

The possibility of maintaining this form of subsistence economy is conditional on the interplay between two forms of resource exploitation, viz., periods of intensive resource exploitation alternating with periods of continuous or periodical activities such as whaling or capelin fishing. This distinction can be transferred from the level of the settlement to that of the household; the first of which is more closely tied to traditional (annually recurring) hunting, e.g. collective beluga whaling. Commercially oriented hunting is rather more closely connected with the individual households than with the village collective. At the level of the household, the family unit determines whether it is necessary to sell part of the catch according to the family's food supplies and financial situation.

2. The second form of subsistence, viz., subsidiary activity, signifies subsistence activities carried out by wage labourers supplementing their incomes by hunting and fishing. (Dybbroe and Møller 1981)

This form of subsistence is best described as a contribution to the bread and butter of daily life. Dybbroe and Møller's investigation of the correlations between hunting and wage labour in the mid-1970s in Qeqertarsuaq in the Diskobugt area is still relevant. Subsistence hunting means a welcome replenishment of the diet and an opportunity for saving on food expenses, or at least so it seemed in the 70s. Typically, families or close friends, most often neighbours, collaborate in the hunt and the maintenance of hunting equipment such as boat and outboard motor, thereby sharing the economic burden with more families.

Forchammer's presentation of the concept of subsistence is more structural in that he distinguishes several aspects of the phenomenon. Moreover, in my view, he offers an excellent interpretation of the background to the developments of the 1980s. Forchammer defines subsistence like this:

3. Subsistence means productive economic activities, the produce of which is immediately consumed by the producer or the unit of production (or by close relatives or local acquaintances). The produce is not made an object of trade, it is not transformed into a commercial item. It thus follows that subsistence does not involve money, it is free of money and it results in no relations of trade, nor in any relations of wage employment. (Forchhammer 1989)

From this interpretation of subsistence versus commercial hunting Forchammer goes on to distinguish three categories of subsistence, viz., sealskin, mattak¹ (muktuk), and fishing economies, each of which can be further divided according to its degree of commerciality. Consequently, several such activities can be termed commercial

1. 'mattak' ('muktuk' in Arctic America) is the Greenlandic word for the outer skin—with some blubber attached—of narwhal, beluga, or bowhead; a highly esteemed food.

to some degree. He stresses that subsistence is inconceivable without the monetary economy, yet, at the same time, monetary economy is nothing in itself, which is to say that the existence of a monetary economy is based on the fact that subsistence necessitates monetary income.

The above definitions can be applied to the different ways of utilisation or to the different economies connected with sealskin, mattak, and fishing, respectively. Even though sealing remains the utilisation form most firmly oriented toward subsistence, it is still inextricably linked to the monetary economy. It is possible to separate the two phenomena, though only with difficulty. Thus, it is difficult to determine whether the scraping of skins belongs to the domain of subsistence or that of commerciality, in that it depends on whether the skin will be sold or used in the household. However, from a structural economic perspective, one has to maintain that subsistence activities cannot take place without the transfer of money. For example, sealing in the summer season can only be exercised from a boat. Within the last two decades, fast boats have become more and more predominant; not only in the large ice-free towns such as Nuuk and Sisimiut but also elsewhere on the coast have they become an essential hunters' tool. Yet, owing to the operating expenses connected with this form of hunting, i.e. the uneven relationship between expenses and income, only the subsistence value is left to the hunter. The subsistence value includes meat and skins for the hunter's own use. Moreover, from the late 1970s onward, this form of economy can be regarded as exclusively subsistence-oriented, as the earnings from selling the skins declined dramatically owing to international anti-sealing campaigns. Practice of the hunting profession demands the reinvestments of such a large part of the income that it is profitable only when viewed in subsistence terms.

The mattak economy is another resource-utilisation category, existing in several forms ranging from almost pure subsistence economy to almost pure monetary economy (Forchhammer 1989). In defining the various forms, attention must be given to the working time invested in proportion to the product as well as to the size of the product in proportion to the subsistence consumption. The question can also be formulated like this: how much is consumed privately? For example, whaling from the ice-edge is clearly subsistence-oriented, but hunting from dinghies often generates production that exceeds the subsistence consumption. Subsequently, a large part of the catch can be sold, not however necessarily thereby turning the hunt into a purely commercial one, but into one in which the commercial aspect predominates. More commercial forms of whaling have existed in the past, when fast boats were used for rounding animals up and driving the school toward a shallow cove. The production and the immediate subsistence consumption may appear substantial when compared with the working hours invested, but in selling the meat and the skin the commercial aspect became dominant. And another form of whaling was practised that perhaps could be considered even more commercial, in which a

cutter, with its much larger load capacity than dinghies or fast motor-boats, was used as a mother ship. These last two hunting methods are no longer possible owing to tightening of regulations. It must be added at this point that mattak from beluga or narwhal has always been valued like gold by the hunters of northern Greenland. It is in great demand all along the coast, but is produced only from Sisimiut and further north, where belugas are caught.

When it comes to the fishing economy, the subsistence value is reduced to virtually nothing. From the beginning of the 1980s, commercial long-line fishing was practised mainly by cutters. Later on, dinghies joined in. Even if occasionally one or two fish end up boiling in the fisherman's pot, this form of hunting and fishing economy is distinctly commercial.

On the basis of Dahl's overall definitions, one is obliged to conclude that irrespective of one's position within the spectrum, either as a full-, part-, or spare-time hunter, the subsistence aspect is present alongside the commercial aspect, and both are linked to the cultural dimension. In the case of the beluga whaling described by Dahl, all three aspects are present.

Dahl's definition of the concept of subsistence has a lot in common with the one put forth by Dybbroe and Møller in connection with their investigation of correlations between hunting and wage labour in Qeqertarsuaq. In the latter work the correlation between hunting and wage labour is expressed as a mixture of dietary supplement, which is to say subsistence-oriented hunting, and monetary supplement, i.e. commercial hunting. However, in contrast to the situation of the village-dwelling hunters, the workers in towns such as Qeqertarsuaq, with their steady wage incomes, are not dependent on hunting to the same degree.

To find out whether the commercial aspect is present or, on the contrary, the family in question is merely enjoying a dietary variation, or if indeed subsistence beluga whaling is in question, it would be necessary to observe every household singly. I do not believe that considering all the households together enables one to establish whether or not hunting should be termed commercial. Even if the majority of the households should have a commercial interest in beluga whaling, this interest might still coexist with a subsistence orientation. Forchammer's definition of the concept of subsistence stretches from a pure subsistence orientation, as might still have been found in the early 1970s, to the commercial orientation observable in the selling of whaling products. He tends to subdivide his findings regarding every aspect of the hunting profession from the moment of actually catching a seal to the drying of its skin. This subdivision may appear out of place, on the grounds that the profession in many ways is inextricably linked to traditional culture and to nature itself, thereby tempting the observer to exclaim: But all of it is interconnected! Even those aspects

that are deemed commercial by Forchammer (e.g. whaling) are in the last analysis connected to subsistence hunting: without whaling no subsistence hunting, without subsistence hunting no whaling. However, this conclusion is based on a holistic, if you will, view of the complete yearly cycle of the profession.

The need for studying hunting economies

In the last 10 to 30 years, a great development of the hunting and fishing profession has taken place in Greenland as well as in other sectors of Greenlandic society. The development of Greenlandic society, politically and technologically, proves that rapid changes can be brought about as consequence of either political decisions or natural changes. That means that the need for sociological research grows in step with the ongoing social changes, particularly with respect to the utilisation and management of natural resources.

Over the years a steadily growing need for understanding the individual hunter's formal and informal—i.e. subsistence—economy has made itself felt. This need must be construed in relation to the development of the hunting profession, with respect to which the technical and economic aspects have been stressed, whereas the interrelations between these aspects and the harvest pressure and the operating and household costs have largely been ignored.

The economic conditions of the hunters and fishermen, including their conditions of social and cultural development, can be construed from several points of view. Especially, though not exclusively, in the villages, the in-kind and subsistence economy continues to play an essential role to this day. In urban societies, where the economic situation of the hunting family is more complex, its role is correspondingly more uncertain. Presently, the subsistence economy—the value of one's own hunting and fishing—does not figure in Greenland's gross national product. Consequently, its importance for the individual households cannot be registered or settled.

Among other things, there is a pressing need for mapping the roads of hunting and for determining whether they lead out to the local market or in to the household, and similarly examining the economic interrelatedness of, for example, hunting and fishing tools (i.e. dinghy, rifles, fishing equipment etc.), seasonal variations pertaining hereto, and the hunting, fishing and household economy, again also with respect to seasonal variations.

In connection with this, a *socio-economic analysis of the hunting profession* covering statistical material for all of Greenland has recently been initiated. Furthermore, in connection with a detailed analysis of the hunting profession in a particular West Greenlandic locality—which has so far included preliminary studies of the hunting profession in a socio-economic context—a number of interviews with regard to

equipment and such have been carried out. The aim of the detailed analysis is to reach an improved understanding of the formal and informal—i.e. subsistence—economy of the individual hunters. The need for carrying out this analysis must be construed in relation to the development of the hunting profession, with respect to which the technical and economic aspects have been stressed, whereas, generally speaking, the interrelations between these aspects and the harvest pressure and the operating and household costs have been ignored. The project aims at quantifying and diversifying values of household consumption of hunting and fishing products as well as those of commercial and industrial hunting and fishing in Greenland. The initiative is meant to develop and increase the sociological competence within this field in Greenland.

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Beluga management in Greenland: policies, strategies and interests

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Introduction

If one is to understand the complex relationship between humans, climate and the marine ecosystem a multitude of components and aspects have to be combined. Even with a map of all components, it would be difficult to fully systematise and comprehend the influence of each component and its relationship to other components in the system. When it comes to the component 'humans' the complexity increases because humans cannot be seen as simple predators. Humans tend to change technology, strategies, goals, aspirations, institutions, values and social structures. Change itself seems to be a dedicated human project. In addition to change, human societies are often characterised by diversity, conflicts, paradoxes, negotiations, trial and error and discontinuities.

How are we to grasp this complexity? In order to approach the problem complex, I suggest we look at the development of the management regime. It is the management institutions that have to deal with change and promote change. The management institutions, so to speak, bridge the gap between ecosystem and social system. Consequently, one may ask how the management institutions have related to, understood, diverted and promoted change in society, human values, and human influence on the environment.

A focus on the management regime redirects our enquiry: the question is not what influence hunting and fishing have on the ecosystem, but rather what influence humans want those activities to have on the ecosystem and how we organise to control that influence.

The switch from *single-species* to *system-oriented* knowledge-based management of resource use is also reflected in the increased need to include a more holistic socio-economic approach when it comes to the understanding of human systems. The management institutions have to know in detail about the diversity of human needs, aspirations and perspectives in order to take informed decisions. Seen from the point of view of a management institution the goal is not only to establish long-term sustainable use of the resource but, just as much, to consolidate long-term sustainable livelihoods.

The difficult task of regulating human influence on the ecosystem and human responses to climate change falls on the management regime constituted by politi-

cians, managers, experts, consultants, representatives, organisations, municipalities and citizen/user participants. Therefore, we need to focus on the management regime if we want to understand human influences on the ecosystem. This is not to say that we do not need to have studies of the impact of, for example, demography and technology on the ecosystem. But we need to understand the values and the decision-making processes that, among other things, make this technology and subsequent influence acceptable or unacceptable.

Thus the management regime is the main structural and institutional driver behind environmentally significant human behaviours. The impact of human thought and social organisation is indeed significant on the human-environment relationship. Because of this, authorities may stand in a situation where they have qualified scientific data available on resources and society, are under bilateral or international pressure, have set up sustainable goals and strategies, but nonetheless fail to implement an effective management regime owing to problems within the management regime itself. Therefore we need to understand the management regime in all its complexity if we want to implement sustainability successfully.

I present below an analysis of the creation of a beluga management regime in Greenland in the 1990s and throw light on how institutions, interest groups and biologists have interacted and dealt with what I term a crisis situation. I will focus on a number of problems that emerged during the negotiation of rules and values to be implemented in the regime. I use an analytical key developed and elaborated by Henry Huntington (Huntington 1992). Huntington's key consists of seven criteria to be analysed when evaluating a management regime:

- legality;
- ecological relevance;
- local involvement;
- cultural appropriateness;
- flexibility, predictability;
- adaptability;
- defined roles for institutions and participants.

I limit myself to the first four criteria. However, in order to fully understand the beluga management regime it is important to dwell briefly on the perceptions of the marine mammals and the marine ecosystem existing in Greenland.

Perceptions of the environment

Broadly speaking, the environment is a giving environment for the hunters (Bird-David 1990), and is seen as a life insurance. Whatever happens you can always turn to the resources as a safety net and if you are in need (defined within the limits

of the culturally acceptable) your use of resources to provide for your household's well-being is very often considered legitimate by many hunters regardless of limiting regulations. The use of resources for subsistence purposes is considered a cultural and human right not to be usurped by any institution. This does not however mean that hunters themselves neither promote nor respect the existence of regulations. It means that there are certain situations, defined as natural or crisis situations, where state regulations are considered culturally inappropriate.

Even though the environment is a giving and supportive environment it is also an environment *of risk*. Sea, wind, ice and weather conditions in general constitute a risk to the health and life of hunters as well as a threat to their means of production. Furthermore, there is always the risk of returning empty-handed home or of not being able to sell the catch. The risk is associated with a certain level of unpredictability and the hunters know that only patience, skill and experience may compensate a little for their lack of control. Hunters often express an opinion of low power over the elements and the system itself because they face a system full of surprises, flips, and multiequilibria on a daily basis. This lack of control is expressed in the way hunters frequently stress the importance of having multiple choices and flexible strategies. They often argue in favour of resilience-enhancing mechanisms. For the hunters a giving environment is constituted by the access to and the presence of a certain *system* rather than by the *elements* themselves. Hunters can easily point out economically important species, fishing localities, etc. but in the same breath they underline that the importance of the species is context-bound. The importance of a resource may change according to the context and hunters often add '...it really depends...' if requested to point out important resources. This system approach is often in contrast to the management institution, which works with single-species regulations.

Increasingly, contemporary management institutions have to look at the environment as an environment *at risk*. There is a fear that human use of resources threatens the quality of the ecosystem and that species are at risk. In order to avoid a collapse of the system, the regime introduces an array of control mechanisms and strives to get a complete picture of the system and its components. In this way the regime creates a predictable and controllable environment. The management regime requires monitoring programs and is always demanding more data. Collapse is thought to be avoidable by implementing strict control and predictability and by promoting a discourse of equilibrium.

The management regime's 'environment *at risk*' is very different from the hunter's 'environment *of risk*' (Nuttall 1998). Hunters are often in need of dispensations from streamlined regulations in order to respond to an unpredictably foreseeable situation such as bad weather or unusual ice conditions. The need to protect a fragile and

threatened hunting occupation is a recurring issue at the meetings in the Parliament (Landstinget) and a priority of the government (Landsstyret). A significant proportion of management initiatives are preoccupied with securing the hunters' occupation and eliminating as many risks as possible.

Therefore, managers today have to consider both the environment *of* and *at* risk, and that is a predicament. On the one hand, they have to employ the internationally agreed precautionary principal. This implies that in the case of a crisis situation the resource in question has to have first priority at the expense of human needs. Hunters on the other hand are constantly worried about their occupation and often fear for the survival of the Greenlandic hunting culture if resources are at the centre of attention. One could say that they want the management institution to make the precautionary principle apply to humans and culture. This implies that the management regime should not implement any restrictions on hunting unless the decision is 100% informed—which it never is nor can be—therefore the precautionary principle.

I have sketched out these environmental perceptions because I think they have a large impact on the ways in which the ecosystem–human relationship is approached and how humans organise themselves. Building environmental management regimes is one way to organise human society. If we look specifically at the development of the beluga management regime, the importance of human organisation becomes apparent.

Managing beluga whaling

Legality and community definition

Beluga whaling means a lot economically and culturally to the households of hunters and the local communities during certain periods of the year in some regions (Heide-Jørgensen 1994). Beluga whaling is a small-scale activity that does not require the same level of specialisation and investment as minke whaling, for example. It often takes place as cooperative hunting where two or more hunters join forces. The catch is shared according to local custom. Even though beluga whales migrate up and down the west coast of Greenland, hunters primarily understand beluga whales as a resource which is locally accessible during certain periods of the year, and the whales have to be approached, caught and distributed according to locally controlled rules and values if the opportunity and need are present (Dahl 1989; Sejersen 1998, 2001).

Beluga whales as a resource have been redefined, however. Beluga whales as a *local* resource sustaining the local community are now considered a *national* resource which should be managed nationally and which should be accessible to all legitimate users independently of locality. The community in which beluga whaling takes place

has, so to speak, expanded, and local rules and values have to a large extent been supplemented and replaced by national rules and values. The authority to regulate the hunters' access to beluga whales and their disposition of the catch is not in the hands of communities and municipalities to the same degree any more (Dahl 1998, 2000; see also Sejersen 2003a, b). This change has taken place since 1992 when the first beluga regulation was introduced by the Home Rule government, replacing one made by the Regional Council (Landsrådet) in 1958 that was solely concerned with ice-entanglement of whales (*sassat*).

When the draft proposal for the order in 1992 was sent to the local organisations of hunters and fishermen (KNAPP) for comments, some responded that municipality orders and local customary rules were already in place and no further management initiative was needed in their municipality, although others argued for stricter regulations in other localities. Their insistence on maintaining municipality authority can be seen as a reaction against outside interference in local affairs, and a way to protect community integrity and control. *Localism* is not necessarily conservatism but a means to support and give strength to local networks, authority and livelihoods in locally meaningful ways.

The redefinition of beluga whales from a local to a national resource has been intensified by the Home Rule's engagement in bilateral, multilateral and international cooperation on management issues. NAMMCO (the North Atlantic Marine Mammal Commission), the JCNB (the Joint Commission on the Conservation and Management of Narwhal and Beluga) and the IWC (International Whaling Commission) are examples. In these contexts Greenland sees herself as, and is considered, the protector of national interests and resources. This redefinition is also a result of the creation of a state-like structure in Greenland.

The question is whether the regulations are seen as legally appropriate and legitimate from a local point of view (is there already a regulation in place and who is to have the authority to regulate?).

Part of the legitimacy and legality of a regulation is related to the rather abstract demarcation of actors and communities who give and are given rights under the regulation. These actors and communities have changed from being locally defined to being nationally based in occupational associations, predefined socio-economic groups and state-like institutions. In this process communities are doing what they can to hold on to their integrity and to be respected. Very often the legality of a regulation is perceived to be associated with the observance of the appropriate hearing process. If the parties and communities feel they have not all been adequately heard, the proposed regulation is often met with indifference, frustration or aggress-

sion. This has happened many times: a minor mistake in the hearing process has been interpreted as undermining the legitimacy and legality of a whole regulation.

Sometimes hunters are reluctant to respect regulations if they consider them non-legal, unfair or not in correspondence with local realities and needs. Faced with hard regulations on bird hunting, the hunters in Nuuk in January 2002 for example announced: 'We will continue to hunt as we have always done. In our view, there is no risk of exterminating the species in question' (Anon. 2002; my translation).

Ecological relevance

The warnings from NAMMCO and JCNB throughout the 1990s concerning the unsustainable harvest levels of beluga whales which, according to biological reports, have reduced the population by 60% since 1982 have not been unanimously met with approval in Greenland. Many hunters have argued that beluga whales are abundant and that the biological research has failed to understand the behaviour of beluga whales in all its complexity. They argue among other things that biologists count at the wrong places, at the wrong time, and with the wrong methods. There seem to be different understandings of the basic unit under study. Hunters disagree with some of the biologists' assumptions about the life of beluga whales such as reproductive rate, foraging behaviour in ice, etc. Seen from some hunters' point of view, the biological reports are anxious academic exercises with little ecological relevance or local insight. The suggestion from NAMMCO to reduce the catch from the present 600 to only 100 beluga whales (Rydahl and Heide-Jørgensen 2001) has indeed had difficulties taking root in Greenland.

Biologists have throughout the 1990s conducted a series of aerial, genetic and satellite-tracking surveys on beluga whales. They have to some extent responded to requests from hunters—to expand the survey area, for example. Furthermore, biologists have, locally through public meetings and more widely through popularised reports, television programs and articles, presented their data and tried to explain methods and considerations on accuracy. The beluga controversy triggered an unseen extrovert attitude of biologists—an attitude also stemming from public and political pressure.

To challenge and supplement the knowledge production of biologists, KNAPK (National Association of Hunters and Fishermen in Greenland), ICC (Inuit Circumpolar Conference) and the Home Rule Authorities initiated a local knowledge project on the distribution, biology and hunting of beluga whales and narwhals. The results were published in 1993 in both Greenlandic and English (Thomsen 1993). Interestingly, the report, which is one of the first comprehensive local knowledge projects in Greenland, has not been used to any great extent by any groups, not even the hunters and their organisation.

Local involvement in research (in the form of local knowledge studies), in surveys and at local meetings, etc., has not had the expected outcome. Hunters and their interest groups have changed little in their understanding of the ecological relevance of stricter regulations. Hunters have continued to claim that a reduction in the harvest level should only be implemented if the biological data are more solid seen from their point of view (see for example Seminaret for kvoterede fangsttyr i Qeqertarsuaq 2001). Hunters also emphasise that their participation in research and management discussions has not changed the managers' and biologists' understanding of the beluga whales and the hunt. The situation consequently seems to be quite locked unless one is willing to replace the conflict between biologists and hunters with a political conflict. Management initiatives not only require data and a thorough understanding of the system as such, but also the political will to take decisions even though they might be unpopular. The historical avoidance of implementing a management regime for beluga whales has now put Greenland in a situation where there are no popular and straightforward decisions to be taken. Politically, there has been a tendency to dislocate political problems to the level of data collection, and this diversionary manoeuvre has undermined the co-operation between knowledgeable hunters and biologists.

Several questions arise out of the different opinions of biologists and hunters. For example it seems as if it is important to reflect on what constitutes a crisis in the ecosystem. When is a situation turned into a crisis, how is it overcome and when is the crisis considered to be over? In order to answer these questions one has to look into how the involved stakeholders understand the system and its elements, the role humans play in it and the primary crisis indicators that the stakeholders look for. If the correspondence is minimal, the other groups in the regime may neither understand, accept nor consider the worries and solutions put forward. It may be looked upon as ecologically irrelevant. Can the research process be changed to improve this situation and are there possibilities within the system that the hunters are not using fully?

In order to improve the integration of local people in the planning and interpretation process we have to single out the third criterion: Local involvement.

Local involvement

The Home Rule authorities have primarily used scientific research on beluga whales as their main source of information. The authorities have tried to develop the harvest statistics, and have requested hearing comments from the municipalities and hunters' organisations. The hunters have had little influence or not used their influence fully on the elaboration of research projects (the hunters' organisation KNAPK is on the board of The Greenland Institute of Natural Resources, for example). Projects on beluga whales have been set up as a scientific endeavour, not a local or regional

one, and data collection and interpretation are in the hands of scientists. This authority exists no matter how much biologists are open towards new ideas and local knowledge (Nadasdy 1999). Paradoxically, it is now expected that the biologists should be the ones to solve this lack of local involvement in the system as a whole, and authorities and organisations require that biologists integrate, more and more, local knowledge and local perspectives. This request only cements the project as a biological one organised by the Greenland Institute of Natural Resources. If the responsibility is kept in the hands of a chosen few, the feeling of marginalisation and alienation may continue to exist among local users.

To furnish a correspondence and communication between different views, co-management regimes in different shapes have been created in North America with more or less success. In some cases, like the Alaska Eskimo Whaling Commission, the hunters are equal partners at the table where research planning and interpretation take place. This way they have become able to introduce their worries, their understanding of relationships in nature etc. In Greenland, hunters have little if any influence on these aspects. The hybrid management regime in Greenland, where the same few organisations and institutions are regularly heard in legislative processes, leaves little room for genuine integration of local perspectives and local responsibility. In those cases where the managers have actually tried to decentralise decisions and involve hunters in the development of new regulations, problems often arise because the involved hunters do not always have the needed experience outside the hearing culture created by the Danes and later refined by the Home Rule.

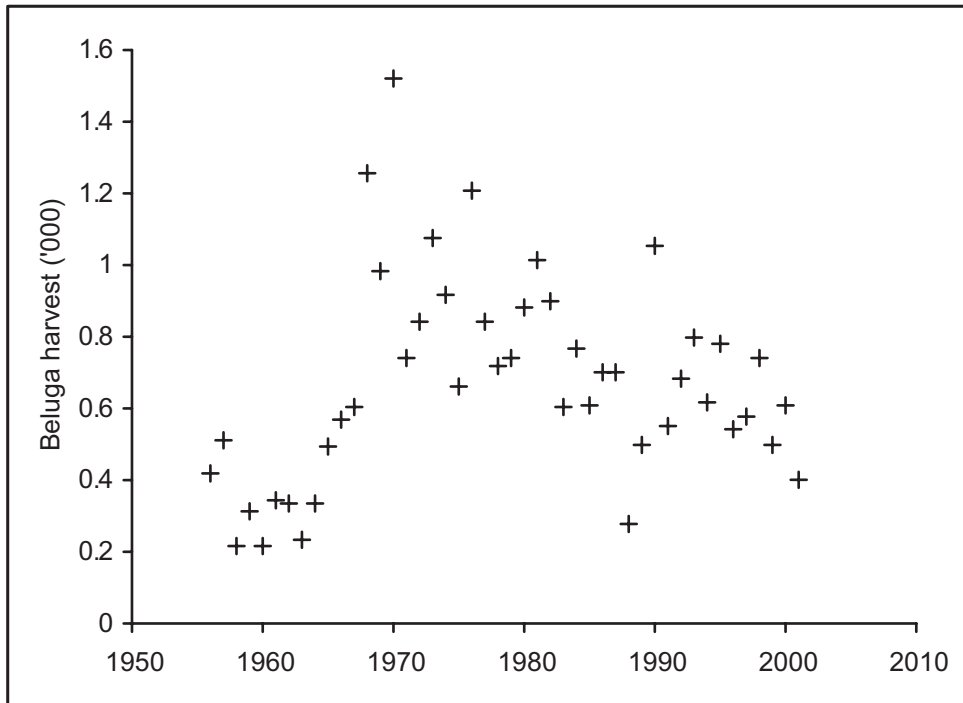
This third criterion 'Local involvement' may be a hallmark of successful management, not only because it may improve compliance and further the integration of ideas and knowledge. But also because local involvement stimulates local responsibility, and this may break the feeling of marginalisation as expressed by some hunters—a marginalisation which is felt even though their organisation, KNAPK, is involved to a large extent in the hearing and political processes.

Adaptability and cultural appropriateness

KNAPK representatives were actually rather active in drafting the first beluga orders. The first orders were, roughly speaking, minimum orders with no or very little influence on beluga whaling. Anyone with an occupational or spare-time hunting license was allowed to whale. However, in 1995 encirclement of whaling was banned and this affected the Upernavik region severely. Upernavik hunters complained as it was seen as an intervention into their local hunting practices. Quite quickly the hunters changed their hunting practices and are now pursuing whaling in new ways where they keep co-operation to a minimum resulting in increased competition and chaos at the hunting site. Where they used to distribute the whales to all participating hunters they now only distribute to those who have harpooned the whale. So even

though you shoot and wound a whale you only get a share if you harpoon it as well. It is 'the harpoon which counts', as they say (naaligaq naalagaavoq) (Bo Albrecht-sen, personal communication). The authorities had hoped that the banning of the encirclement of whales in 1995 would have led to a major reduction in the national harvest level. This did not happen, as the record of beluga catches from 1956 to 2001 indicates (Figure 1).

Figure 1. Beluga whale catches in Greenland, 1856–2001 (Heide-Jørgensen and Rosing-Asvid 2003; Greenland Statistics 2003).



Apart from the banning of whaling by encirclement the other major management measure has been to limit the access and disposition rights of hunters. Locally, small-scale occupational hunters see the participation of spare-time hunters and other better-off hunters and fishermen as unjust competition for limited resources. In Sisimiut, to give an example, they have tried to deal with this problem by developing a complex system for dividing the catch, organised along lines of socio-economic affiliation (Sejersen 2001).

Since 1992 government orders have increasingly tried to reduce the catch by restricting the access and disposition rights of well-off hunters and fishermen, defined by the size of their boats. The regulations have been adaptable to local socio-economic

changes and to the concerns of the small-scale hunters whom the authorities primarily want to support. However, it has not reduced the harvest. And those socio-economic groups of hunters restricted in their access and disposition have actually still quite good whaling possibilities. Coastal shrimp-trawling vessels are for example allowed to hunt two beluga whales on every trip for consumption on board.

The regulations have thus increasingly dealt with the distribution of rights among hunters as a way to reduce the harvest level. It is an exercise in socio-economic engineering and the fundamental understanding of socio-economic complexes seems to reflect concerns among the small-scale hunters. However, there is no adequate data foundation for these decisions. There is a need for socio-economic research to provide the data for such decisions.

Adaptable and culturally appropriate management also has to identify the importance of the resource in the economy of the household. Beluga whales constitute a strategic economic resource which may provide the household with both meat and cash (Sejersen 2001). The potentially rather large cash income may help the household acquire items and hunting gear which are out of reach during the rest of the year. Consequently, there are few resources, if any, that can replace beluga whales if the harvest is reduced. The management regime has first to consider what other resources sustainable livelihoods can be built on, and secondly whether there are regulations in place for these substitutes. Within the last years there has been a tendency to integrate and improve the regulation on substitute resources.

The criterion focusing on the cultural appropriateness of regulations involves the identification of values, perceptions and practices that are present locally. The question of how people organise themselves in relation to the resources needs continuous attention in order to understand how households try to create sustainable livelihoods.

Conclusion

These points may seem far away from the goals of Ecogreen, which are preoccupied with the scientific understanding of natural processes in the ecosystem. I argue that we have to understand how society receives, uses and influences scientific data and research. An expansion of our scientific understanding of the relationship between climate, ecosystem, and humans may have no influence at all outside the academic circles if we forget to investigate the social and political structures and the present cultural values embedded in the management regime.

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Small, medium and large scale strategies: cases of social response and change in Greenland

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Introduction

Greenland has experienced several socio-economic shifts during the 20th century, characterised by interactions between natural systems, climate change and the socio-economic and socio-technical system of resource exploitation (Rasmussen and Hamilton 2001; Buch et al. 2003; Rasmussen and Tommasini 2003) and described as social adjustment to world realities (Rasmussen 2004).

The first shift was from a sea-mammal-based economy to fisheries during the 1910s and 20s, owing to a marked increase in sea temperature, which resulted in a decrease in the sea mammal stock, combined with a dwindling world market for blubber and sealskin. Cod became the dominant species, but the fisheries were characterised by a diverse use of locally available resources.

The second was the post-war shift from local to global resource exchange, with increasing emphasis on offshore fisheries and world market access, as well as industrialisation and urbanisation as main socio-technical characteristics (Smidt 1989; Poppel 1997).

The third was the shift in the 1980s from cod fisheries to a mono economy based on shrimp, owing to a reduction in sea temperature which eliminated spawning possibilities for cod, and allowed a massive expansion of the shrimp fishery, especially facilitated by a shift from inshore to offshore fishing (Rasmussen and Hamilton 2001).

And the fourth is the ongoing shift towards a more diversified resource base, with shrimp as the backbone of the economy, but with Greenland halibut offering substantial contributions in the northern regions, and at the same time a tendency in the whole economy away from resource exploitation and towards a knowledge-based development process (Rasmussen 1998, 2004).

The focus of this paper is on the socio-economic characteristics of the two recent shifts, stressing three dynamics that have shaped both the characteristics and outcome of the processes.

First the dynamics of the sectoral divide within fisheries, where the different foci of three main sectors—the local, the regional, and the national—show marked differences in their involvement and response to both external and internal changes.

Second, the ongoing changes of the socio-economic characteristics of both hunting and fishing, which have modified the sector's influence on both the economy and the social structure of communities that were previously dominated by hunting and fishing.

Third, a discussion of the role of the community level in the process, where the determining dynamic depends on the availability of human and social capital needed for adaptation to changing conditions.

Sectoral response and rationales

A main divide in fisheries in Greenland is between three sectors: small boats or skiffs; the inshore fleet; and the offshore fleet (Rasmussen 1998). The small-boat sector today consists mainly of skiffs with outboard motors. The group is highly variable, but is dominated by boats typically 15–25 feet in length equipped with 20–100 HP outboards. These small vessels—in general, below 5 GRT—used to dominate the entire fishing economy, but today, less than 15% by value of the formally sold fish stems from this group (Rasmussen 1998; Rasmussen and Hamilton 2001), even though they are still numerous. Owing to a steady increase in power and speed, these vessels now have quite a large radius of action, but their activities are limited by their size, in general to one-day trips because they lack room for ice and larger equipment. Consequently, they are most suited to hunting and to fishing with jigging, hand-line or long-line, and they mostly fish close to the settlements and within the fiords. Their exact number is unknown, but estimates indicate that it has probably been about 3.000–5.000 since commercial fisheries started. When products are landed and sold at one of the official landing sites, the owner of the boat and the value of products are recorded, and these statistics show that presently around 2.500 persons are using small boats in commercial activities in connection with fishing and hunting, and that the commercial part of their activities results in a yearly outcome of approximately DKK 100 million. This is around 20% of the value of all landings, and around 5% of the formal economic outcome of fisheries.

The medium-size group consists of vessels from 5 up to 75 GRT. The group includes the smaller motor vessels that were introduced in the early days of the commercial fisheries called 'nummerbåde' (numbered boats) up to 20 GRT. These boats played a key role in connection with industrialisation after the war. With around 100 vessels by 1960, around 250 by 1970 and 350 from 1980 until today, they are crucial for the small-scale fisheries. More recent changes within the sector have emphasised larger vessels closer to the 75-GRT limit, which focus on shrimp fisheries and, more recently, have entered the snow-crab fishery. Their size enables them to carry ice and a variety of equipment, but generally they are also limited to one-day operations, and therefore also to a restricted radius of operation. The inshore fleet today

consists of around 250 active mid-sized boats, and employs around 500 persons. Although limited to day trips, they cover larger areas close to shore and within the fiords, and account for a production worth approximately DKK 400 million—about 20% of the total income from fisheries.

The dividing line between the medium-size and large-size vessels is to a certain degree an artificial one. Boats close to the 75 and 80 GRT level can be equipped to conduct fisheries at considerable distances with, at the same time, a trawling efficiency similar to that of larger boats. When the 80-tonne limit was introduced—to prevent the big efficient boats from competing in near-shore fisheries—several 79-tonne boats were built and used for offshore fisheries as well as near-shore.

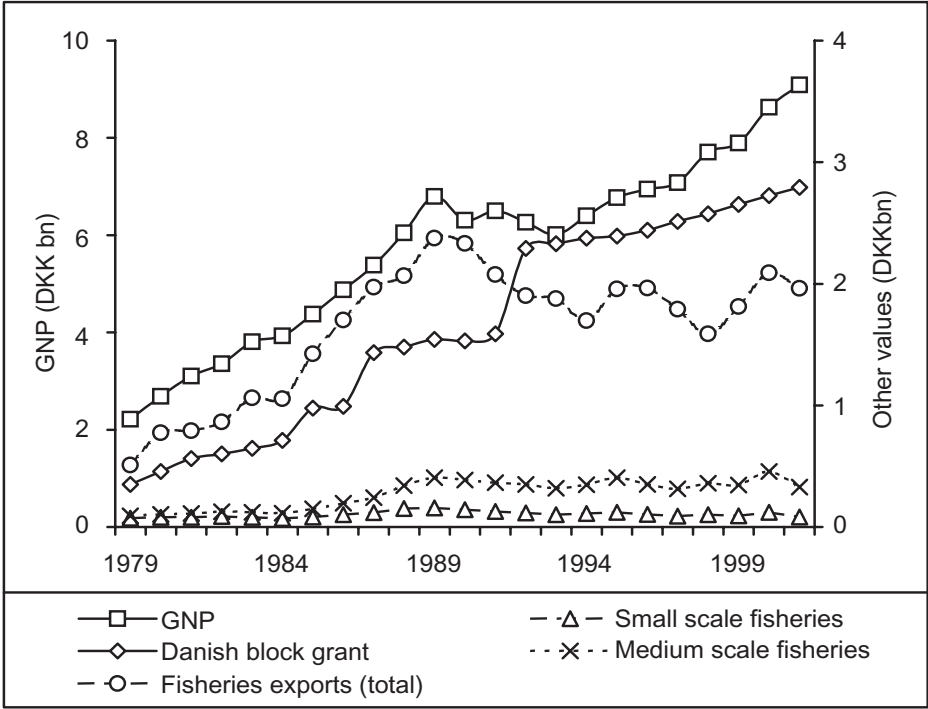
The offshore fleet includes boats above 75 GRT, usually equipped for long-distance trips up to a month in duration, and most also equipped for on-board processing. This fleet consists of less than 30 boats and constantly employs between 250 and 500 persons. It nevertheless contributes with production worth more than DKK 1,6 billion/yr, and is therefore responsible for more than 75% of the total value of fisheries. Most of the catch is sold directly to the international markets, and never occupies anyone in Greenland. The amount that, owing to legal restrictions, is landed for processing in Greenland is only 1/4 of the catch.

The offshore sector is dominated by capitalism with concentration and centralisation through large-scale projects and economy of scale as the fundamental mechanisms. This fleet comprises a small—and declining—number of boats and employs relatively few people, but is nevertheless responsible for by far the largest volume and value of fisheries. Owing to unfavourable world prices for most seafood products the total contribution from fisheries has been relatively stable in spite of a marked increase in total production (Figure 1).

The intermediate sector, aiming at in-shore fisheries, is partly based on capital rationality, and partly based on a life-style that has become the backbone of many of the larger settlements. The inshore fleet consists of mid-sized boats able to cover larger areas close to shore and within the fiords. They contribute to the national economy, even though the figures do not seem to be of the same importance as the large-scale fisheries. Their strength, however, is the crucial role they play in regional and local economies by being the main suppliers to local processing plants.

Despite the—formally—limited contribution to the national economy, the small-boat sector is vital for the smaller settlements. It acts as a backbone of the cultural heritage, and is important for maintaining reasonable living conditions for the smaller places. It contributes to the maintenance of the informal and subsistence economies in all settlements, and establishes the link between the formal and the informal sectors.

Figure 1. Fisheries production in relation to Greenland GNP and other components of the Greenland economy, 1979–2001.

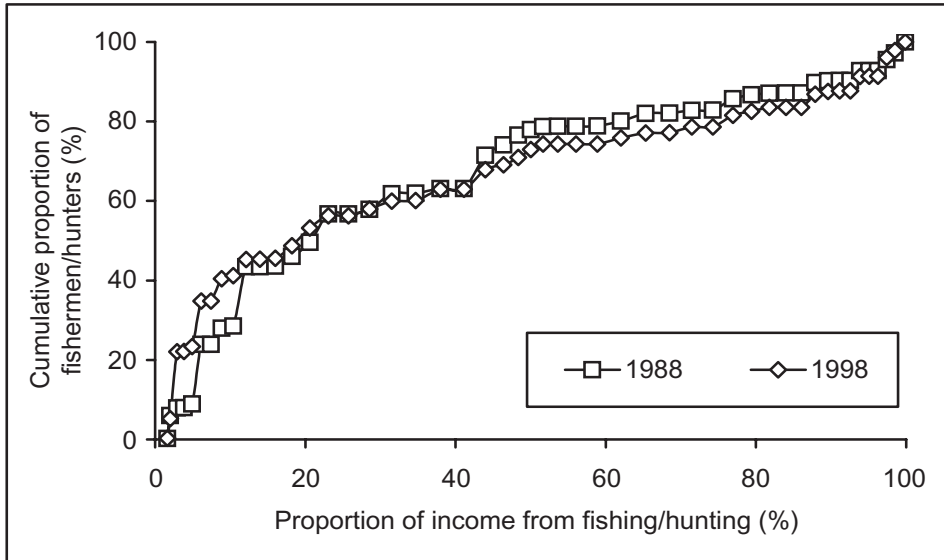


Ongoing changes

The sectoral pattern described above has emerged since World War 2 and most Greenlanders consider it to be a more or less stable structure which validates fisheries and hunting as a backbone of both economy and life in Greenland. For the last decade, however, changes have been occurring which will eventually result in marked structural alterations. Only a few of the fishermen and hunters actually have their main income from fishing and hunting; the income from fishing among small-scale producers has decreased; and it has been replaced by income from other activities. In 1988 only 30% of these people had less than 12% of their income from fisheries, but by 1998 this proportion was almost 45% (Figure 2). In both years around 65% had a total of less than 45% of their income from this sector. At the other end of the scale, the number of persons in 1998 with more than 50% of their income from fisheries has increased relative to 1988. The pattern is clear: an increasing professionalisation of fisheries means that a small—and declining—group of very professional fishermen and hunters, able to invest significant resources in their trade, are thereby

able to survive, while most of the people involved only have a fraction of their income from fishing or hunting and a main income source elsewhere.

Figure 2. Distribution of commercial fishermen and hunters by proportion of income derived from fishing and hunting in 1988 and 1998.



This interpretation is supported by the fact that there has been a remarkable decline in the number of persons involved in commercial fishing and hunting over the last two decades (Figure 3). A first wave of decline happened in the late 1980s, when the number was reduced by 50%—from more than 8.000 to about 4.000. And a second wave is presently ongoing, showing a reduction to around 2.500 persons.

Who the disappearing people are is obvious. In 1987 the peak of persons involved in fisheries and hunting were young people in the age group between 19 and 29. The age distribution in the industry then showed a healthy structure with a steady input of younger people, and a slow decline in numbers with age. In 2000, however, this pattern has totally changed. There are few young people present today—for instance less than 1/5 of the number of 20-year-olds compared with 1987. Instead the modal age is between 30 and 40 years (Figure 4). And this shows that the same cohort that was dominating the fishery in 1987 is still dominant, although its numbers have been reduced from around 250 in each year class to around 150. The important—and alarming—perspective of this development is that if it continues along the same path, commercial fisheries and hunting will simply disappear within a few decades!

Figure 3. Numbers of fishermen and hunters engaging in formal sale of products, 1987–2003.

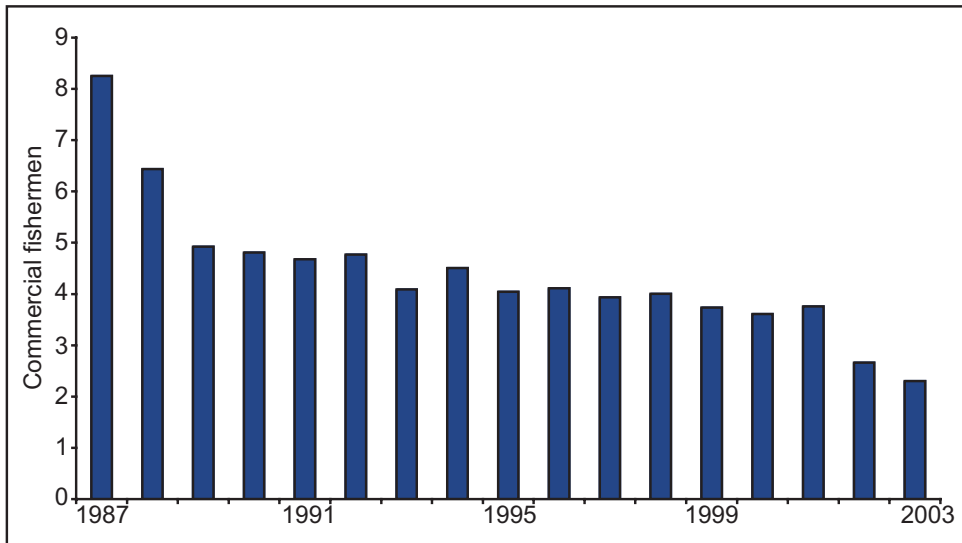
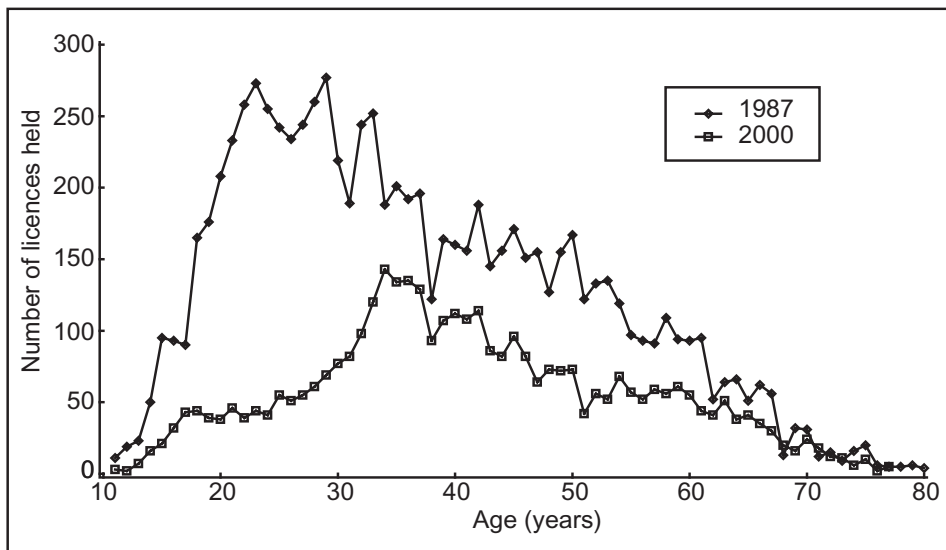


Figure 4. Age distribution of holders of commercial hunting and fishing licences, 1987 and 2000.



Even though the patterns described above are indicative of some general tendencies in relation to both fisheries and hunting in Greenland, there are marked regional differences both in speed and general characteristics. The 'hunting districts', i.e. the regions where commercial fishing is more or less absent, and hunting and subsistence fishing are therefore still crucial to survival, are characterised by a more balanced development, still maintaining hunting and fishing as backbone activities. These regional differences show up in the relative numbers of the two types of licence. In order to obtain a commercial licence at least 50% of income should be generated by hunting and fishing. With a leisure-time licence it is possible to maintain some hunting and fishing activities, both for subsistence and also for small-scale commercial activities. And there are remarkable differences in the distribution of the two types of license. The large settlements in the 'open water' district on the West coast are all characterised by a limited proportion of commercial licences—from 50% and below—while at the other end of the scale the smaller municipalities in North, South and East have a substantially larger part of their activities connected to a commercial licence.

The on-going processes of change described above show not only some general patterns, but also some of the processes that are shaping the future. First of all a generation shift that indicates that it is difficult to encourage young persons to engage in commercial fishing and hunting. Secondly, a professionalisation of the trade that includes a small group of efficient full-time professionals—often, however, relying on wage incomes from other members of the family—with a much larger group of persons with a part-time involvement, the major part of their income stemming from wage employment outside the sector. Finally the process indicates a general inclusion of both fishing and hunting on a leisure-time basis in the activities, and economies, of most households. There are marked regional differences in both speed and direction of these changes, and as will be discussed below, there are remarkable differences in patterns of change between different communities.

Local dynamics

Even though the pattern of changes in resource base have been more or less similar all over Greenland, the socio-economic changes have been remarkably varied. To understand these changes, basically three different types of dynamics can be determined (Rasmussen and Tommasini 2003):

- **a self-sustaining dynamic**, which is defined as a development process able to react to changes, whether they are due to natural fluctuations or human induced. It includes the necessary human resources and social capital. While a diverse resource base can be seen as an important prerequisite, experience shows that this is not always enough.

- **a dependent development dynamic**, which is defined as a development process where the dynamics are defined outside the community it self, and therefore depend on outside decisions, initiatives, and actions.
- and finally, **a detached dynamic**, defined as a development process where there is no clear connection between the development that takes place in the community and the surrounding society. In Greenland such communities are found in marginalised regions where the resource base is sparse.

These three patterns can be illustrated through the development of three communities; Sisimiut is characterised as showing a self-sustaining dynamic, Paamiut the dependent dynamic, and Tasiilaq showing a detached development dynamic.

Sisimiut

The first Danish colony was established in 1756 and was moved to its present position in 1764 (Nielsen et al. 1970: 500). The region is productive, in the sea with sea mammals, as well as on land with reindeer and other animals. So during the centuries it continued to be a productive colony. And when fisheries started at the beginning of the 20th century, it soon became an important place for this activity as well. Situated close to some of the most important spawning and shrimp-producing banks along the coast, it had all the potential for positive economic development.

The second most populous settlement in Greenland, Sisimiut has developed, in many ways, somewhere between the average development in Greenland and the development in Nuuk. It has had a steady increase in population to the present level well above 5.000. As a growth town, it early received a considerable number of persons from outside Greenland, and this proportion increased until the middle of the 1980s.

Facilities for salting fish were established in 1914, and in 1924 expanded with a canning line. After the war the old and outdated plants were torn down, and in 1957–58 a larger production unit was established; by 1964 a capacity for 20t/day of frozen cod fillets was established (Nielsen et al. 1970).

When the halibut fisheries stopped in 1934, the production facilities were reconstructed for shrimp, based on a local stock, but when important further resources of shrimp were found in Disko Bay, a processing plant was installed in Qasigiannuit, and the processing plant in Sisimiut was closed (Smidt 1989). 'Holsteinsborg Shrimp Ltd' was established in 1962, when new shrimp resources were found, and in addition this company also produced salmon, Greenland halibut, and meat from whales and reindeer. In 1965 KGH restarted production of peeled shrimp, and by 1968/69 capacity was 3 tons per day, with 60 people employed (Nielsen et al. 1970). Investment in large trawlers at the beginning of the 1970s enabled large-scale production

based on fishing grounds on Store Hellefiskebanke, close to Sisimiut (Smidt 1989), and more recently on other offshore grounds.

Sisimiut is known as a place where many initiatives have been taken over time. Land-based production activities play a certain part, for instance with the shipyard for maintenance and repair as well as building of new ships. Tourism has been active, as Sisimiut is relatively close to the international airport in Kangerlussuaq and is also the most southerly settlement where Greenlandic sled-dogs may be kept. Sisimiut is known as a very active place, with good political connections. At the same time the production facilities are constantly busy, owing to a favourable location in relation to both local and more distant resources (Rasmussen and Hamilton 2001). And with the population increasing, and the prospect of a road to Kangerlussuaq, there are possibilities of additional emerging initiatives in the future.

Paamiut

The trader Jacob Severin in 1742 established the colony 'Friderichshaab' (Nielsen et al. 1970)—the present day Paamiut. A general problem for the settlement then, as well as later, was the summer sea-ice. Drift-ice from the east coast is transported round Cape Farewell and north as far as Paamiut in cold periods. The site was chosen, however, because of the large number of Greenlanders settled in the area, and its potentials were generally recognised as being great, although ice conditions severely hindered its expansion.

In the beginning of the 20th century commercial trade in fish started, and the first buildings for salt cod were erected in 1920 (Fisker 1980). The settlement continued to live a rather dull life, which, however, was changed drastically in connection with industrialisation, especially the industrialisation plan of 1958 and the programme from 1959. The G60 development plan pinpointed Paamiut as a very good place for a modern development: owing to relatively positive climatic and geographic conditions, it was expected to be a place worth investing in, and great plans were made for its future (Fisker 1980). Large investments were diverted there, and building started. To generate the resource base for the planned processing plant, the fishing fleet had to be improved, and investments were made in large trawlers which have ever since been responsible for up to 80% of the landings. Production on the first section of the production plant was started in 1967, and the second section in 1971. Three trawlers were connected to Paamiut in 1971, 1973 and 1975 (Fisker 1980).

According to development plans, Paamiut was to become the second largest settlement in Greenland, with 5.000 inhabitants by about the middle of the 1970s and 10.000 at the beginning of the 1980s. The GTO¹ considered it to have the best

1. Greenland Technical Organisation—responsible for technical development in Greenland, including all building work.

location in the open-water district. To house the new inhabitants, modern dwellings were erected, using the technology of that time, i.e. concrete multi-story buildings. Also a new sewage system, new schools, a large fish processing plant—at that time the largest in the North Atlantic region—buildings for administrative purposes, etc. (Fisker 1980).

Several problems were observed, however. First of all the fluctuating resources caused uncertainty and fluctuations in the processing activity, so that instead of full-time jobs, a large number of temporary jobs were created. Another problem was that the anticipated immigration did not happen. It was expected that the modernised settlement would attract many people from the surrounding settlements, and from the rest of Greenland. But the fluctuating jobs, the large concrete blocks, the limited recreational opportunities, the limited feeling of 'belonging'—all contributed to growing social tensions.

According to the plans, production at the factory was supposed to generate sufficient revenue to cover all costs including investments. But ever since the establishing of the plant it has generated a deficit. First of all owing to the fluctuating resources which have caused uncertainty and under-utilisation of the processing capacity. Until recently, when processing of snow crab was established and plans for shrimp processing introduced, there have been very few attempts to create alternative economic activities in Paamiut, just as it has never been a destination for tourists. It is one of few larger settlements in Greenland to experience a reduction in population (Rasmussen and Hamilton 2001).

Tasiilaq

The town of Tasiilaq is the largest town in east Greenland and the central town of the municipality of Ammassalik. When the town was founded in 1894 it was named Ammassalik ('the place with the *ammassa*' (capelin)). Permanent connection to Europe was established with the 'konebådsekspedition' (the *umiaq* expedition) by Gustav Holm in 1884–85. At that time the settlement had a total population of around 400, suffering severely from vanishing resources, malnutrition and disease. In 1894 a trade station was established. Until the beginning of the 1950s the primary activity in the region was hunting, and the colonial government, worried that the Ammassalimiut would abandon their traditional way of life if they had too much contact with the outside world, intentionally kept the population away from any changes. At the end of the 1950s, however, the district was definitely opened to the outer world. During the 1960s the cod fisheries looked promising and investments were made to promote a change in the economic base. Cod appeared in great numbers in the Ammassalik region, and so the east coast of Greenland also became part of the Danish plan to convert Greenland to a modern economy by means of the development of cod fisheries. In just three years commercial fishing developed spectacularly: in

1956 the production was 22 tons, in 1957 it was 66 and in 1958 it was 474 tons. In 1960 the record production of 984 tons (Robert-Lamblin 1986) nurtured optimistic plans for the development of the industry, and the Danish authorities decided to enlarge the factory to provide more new jobs.

The introduction of commercial fishing did much to change a subsistence economy into a money economy: it produced a modernisation of the technical fish equipment and the transport system, and it accelerated the purchase of boats and the concentration of the population around the fish factories. It also provided the hunters with an important new source of income to add to the cash obtained by the sale of seal-skins, just as the processing of the fish also provided paid work, and thus a new source of income (Nooter 1972–73). Nonetheless the population never really abandoned hunting. They became hunter-fishermen and were declared 'hunters' (Robert-Lamblin 1986). A clear decline in cod production was recorded between 1972 and 1976, around 1979 the temperature of the sea began to drop slightly, and the cod disappeared from the waters off east Greenland in the early 1980s (Nooter 1988).

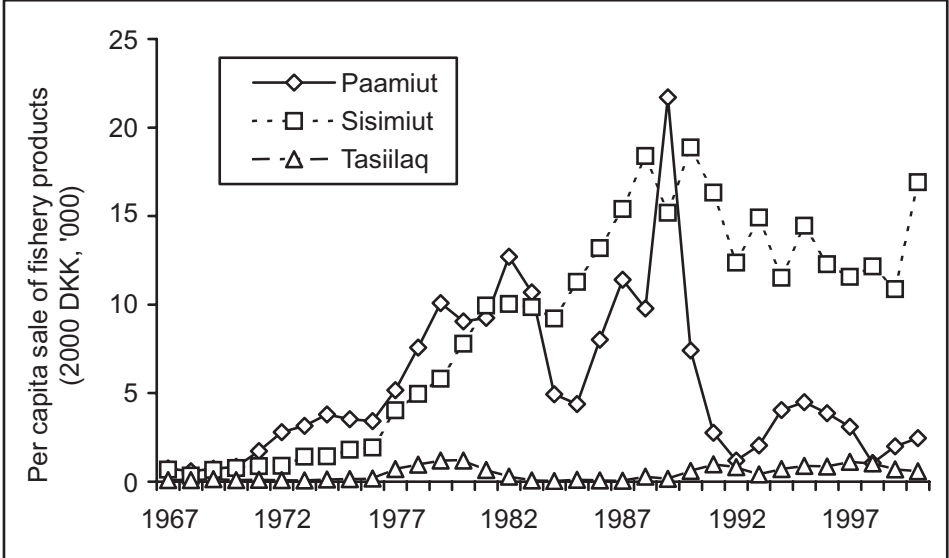
The Ammassalik district may well be defined a social-welfare community, as the greater part of its income stems from welfare, old-age pensions, and governmental allowances for children. Although few east Greenlanders still live exclusively from hunting, the hunting of seals is by far the most important basic subsistence activity in the Ammassalik district. Fish is rarely caught except in some areas where Arctic charr and ammassat have always been caught.

Community resource usage

The local economic importance of fisheries and hunting is clearly shown when the sale value is calculated per capita. The per capita income from sale of fish and shellfish show a pattern of increase and stabilisation in Sisimiut, increase, fluctuations, and a drastic reduction in the economic base of Paamiut, and for Tasilaq a pattern reflecting the fact that fishing has never played a serious role for livelihood in east Greenland (Figure 5).

Sisimiut shows a remarkable growth during the 1970s, partly an expression of the available renewable resources that can be sustainably extracted, and partly due to a general decrease of world market prices of fish and fish products. A further slow increase during the 1990s in volume of not only shrimp, but also other kinds of fish and shellfish, is counterbalanced by the world market price reduction. Owing to flexibility in resource usage, however, Sisimiut has been able to maintain and increase a high level of resource extraction, and thereby maintain a good basis for economic development. Paamiut, in contrary, shows a pattern of one-resource dependency.

Figure 5. Per capita value of sales of fishery production in Paamiut, Sisimiut and Tasiilaq, 1967–2000.



The focus has been on the cod fisheries, and with the increase of the cod stock the community managed to develop remarkably during the 1970s and in the latter part of the 1980s. This development, however, was largely due to external influence and involvement, so with the disappearance of cod due to cooling of the sea, the community practically died out. Allocation of snow-crab quotas during the late 1990s enabled the maintenance of a low-level fishing activity, in recent years, however, almost overtaken by an increase in hunting activities. The attempts to increase fisheries in Tasiilaq only had a short-term influence on the economy. In spite of available resources only limited local activity has evolved in connection with fisheries. In contrast, hunting has been a stable and more or less continuous contributor to the economy. The value of hunting products has fluctuated, but has not reflected all the change in world market prices, as hunting products—primarily fur—have received public support from both the Colonial, and later on, the Home Rule governments, which have considered it appropriate to maintain a livelihood for the part of the population which has been dependent on hunting. The crisis in the cod fisheries of course also influenced activities in Sisimiut, but owing to their ability to adjust to changes, they were able to compensate for the lacking resource by developing other activities. In Paamiut the crisis created by the dearth of cod has been aggravated by the lack of alternative production, so that fisheries have practically disappeared as a basis for livelihood, leading to a situation much more similar to Tasiilaq than to Sisimiut.

In the case of commercial hunting, the pattern is more or less the reverse of that for fisheries, but the scale is completely different. Where annual revenues per capita from fisheries are counted in tens of thousands of kroner, the income from commercial hunting is only hundreds or up to a few thousands of kroner. Both Sisimiut and Paamiut show a very limited economic importance of hunting, though Paamiut during the last couple of years has shown a remarkable increase in hunting activity, more or less parallel to the decrease in fisheries (Figure 6). In order to earn a living the former fishermen can add to their income by expanding hunting. The economic importance of hunting in Tasiilaq is fluctuating, but generally at a much higher level than in Sisimiut and Paamiut, indicating the marked importance of this activity. It is important to note, also, that these figures only include commercial activities, and not subsistence hunting. From 10% to 30% of the local economy is due to contributions from the informal and subsistence sector (Rasmussen 1998), which of course should be added to the figures shown on the graph. And last but not least—a full view of the economic situation in all three communities requires an overview of the importance of transfers, which, however, is outside the scope of this presentation.

Population trends

Many things affect population structure in a community, and the changes recorded below are not necessarily due to any direct relationship between resource development and population changes. But developments show many parallel characteristics and it is possible to summarise development in Greenland in a number of phases (post-Home-Rule description partly based on Poppel, 1997):

1945–1950: Re-connection to Denmark after the disconnection during WWII, and recognition of a need to substantially improve the living conditions in Greenland.

1950–1960: *First attempt to modernise.* With the 1953 formal abolition of the colonial relations, recognition of Greenland as a county in Denmark, and the G50 plan, the way was paved for new development of the economy based on fisheries, primarily based on private initiatives. Owing to marked improvement in health services the period saw the highest increase in population experienced in Greenland, and population growth took place in all three communities.

1960–1975: *Second attempt to modernise.* The limited private interest in investing in Greenland resulted in a new development plan primarily based on public investments and activities. During this period the promotion of large-scale industrial activities led to a situation where most population increase took place in the larger settlements, especially in settlements with a high potential for development of fisheries. This was the situation in Paamiut as well as Sisimiut where population growth was matched by massive investments in new concrete housing on a large-scale

Figure 6. Per capita value of sales of hunting production in Paamiut, Sisimiut and Tasiilaq, 1967–2000.

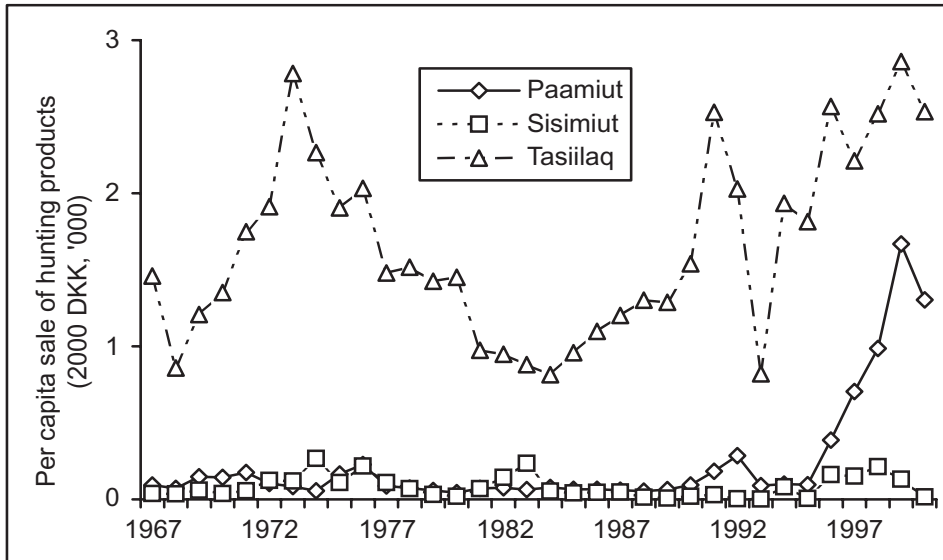
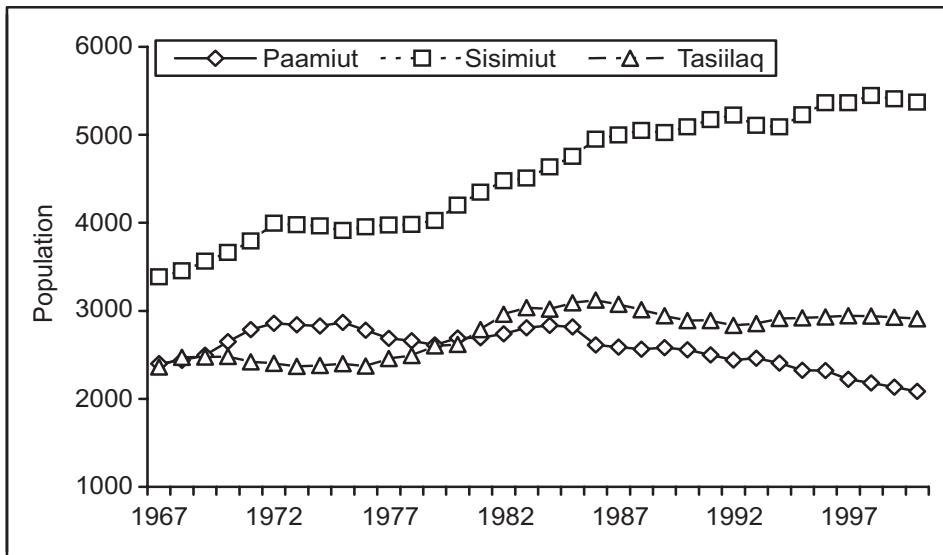


Figure 7. Population of Paamiut, Sisimiut and Tasiilaq, 1967–2000.



industrial base (Figure 7).

1975–1979: A transition period where the Danish activities were slowly downsized, awaiting the take-over by the advent of Home Rule. The population growth in Sisimiut halted for a while, and the population in Paamiut decreased slightly, while the population in Tasiilaq stagnated.

1979–84: Initialisation, a period of building up the Home Rule by taking over responsibility in different fields step by step, but faster than anticipated. The taking over not only concerned the responsibility, but also the finances involved. And with the abolition of a large number of traditional institutions, substantial sums were available for new initiatives. The main focus was on a development based on renewable resources on a broad basis, with emphasis on the industrialisation of fisheries and renewable resources as the backbone of the economy. The decline of the cod fisheries became still more obvious, at the same time as the shrimp fisheries were booming. Consequently, a massive population increase took place in the larger settlements, first of all Nuuk, but also Sisimiut. The population in Paamiut experienced a small increase due to the expectations connected to new Home Rule policies, and the same was the case in Tasiilaq.

1985–87: Economic boom with an overheated construction sector and over-investment in the fishing fleet. Owing to the breaking up of a large number of the previous institutions it appeared to be a period of organisational fragmentation. At the same time it appeared obvious that there were limitations to how many new initiatives could be undertaken. Consequently the focus was much more on industrialisation, and much less on diversity in the use of renewable resources. Consequently, the population concentration increased, while places with limited economic development potentials like Paamiut and Tasiilaq experienced stagnation and population decline.

1988–89: Stagnation, consolidation and recovery: getting control over public expenditures, and at the same time growing exports and opportunities for the Home Rule treasury to raise loans on favourable conditions. The need of economic alternatives to the traditional renewable resources became more and more obvious, and one attempt to resolve this problem was to convert Royal Greenland into a multinational corporation. Similar population trends as the previous years.

1990–93: Restructuring of Home Rule activities towards market orientation, and converting the former Home-Rule-owned companies into quasi-private companies, with the Home Rule as the main shareholder. The consequence was stagnation or decline in population growth in all three settlements.

1994–date: Consolidation and new business strategy: it has become obvious that there are limitations to economic expansion based on renewable resources, and the

concept of 'the three pillars' (Fishing, Minerals and Tourism) has been developed into a means for further development. The transfer of the Bureau of Minerals and Petroleum to Nuuk may be one of the events that enabled this pillar to become as important as the fisheries are today. This does not, however, influence population development. The previous trend continued, with increase in the larger settlements with expansive economies, leading to continued growth in Sisimiut. For Paamiut it led to the most marked decline in population of any larger settlement in recent time, while the continuing stagnation of Tasiilaq has become even more obvious. (Figure 7).

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Fisheries management and small localities: notes on recent Norwegian experiences

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Is it possible to develop a fisheries management strategy that strengthens the many small localities along the coastline? Can fishery policies be worked out in a way that balances economic viability, ecological sustainability, and local needs? Granted that it is a politically determined aim to have a composite pattern of localities from which fishing and fish-farming activities are operated, what measures—preferably generic ones—may be adequate to attain this objective?

In this article, these questions will be addressed, with special reference to the locality dimension, and mainly based on observations and studies of fisheries and regional development in Norway.

In Norway, a pressing question in this respect has long been that considerations of economic efficiency seem to lead in the industrial or large-scale direction. Large-scale facilities, concentrated in a few fishing ports, have been expected to boost incomes from the marine sector. Since the Second World War, the recipe for successful fisheries development in Norway has been the industrial idea—with its basic components of large vessels, operating on a year-round basis, supplying large production plants regularly, and with an adjacent service and export-facilitating structure.

Although publicly and politically contested, the understanding of the industrial model as a necessity for modern fisheries has also underlain more recent attempts to develop administrative regulations and planning in Norway. One central idea seems to be the need to make the fisheries work as a vertically integrated productive system. The problems have been located in the fields of manpower recruitment to the fleet and to the production lines ashore, but also in the persistence of small-scale units, conceived of as preventing the development towards an optimal fleet and settlement structure along the coastline. A more recent problem has been the conflict over quota and fishing rights, as the capacity of the Norwegian fishing fleet has grossly exceeded the available fishable stocks. And the persistence of several 'too-small' places, now equipped with good overall welfare arrangements and offering a cheap housing alternative to expensive forms of dwelling in the larger regional centres—this has also indirectly undermined the development in a more clear-cut industrial direction.

Small is beautiful—and profitable?

The mismatch between the industrial model and local 'small-scaleism' itself represents a source of tension and conflict. For many years, the duality in the fisheries made sense, as the large-scale vessels were able to secure stable deliveries and could thus underpin onshore employment as well as maintain stable deliveries to an international market. But as the large-scale vessels have become fewer and bigger, they have also managed to unloose the bonds to the local filleting plant. This has left the small places in a severe predicament as to diversification and female employment, but not unexpectedly, it has also led to a persisting interest in small-vessel fisheries, while the employment-munificent filleting plants have been replaced by transit arrangements, facilitating decentralised delivery of the catch, but now without the positive effects on onshore local employment. The fact that small-scale fishing activities are still attractive and—in a somewhat mysterious way—considered economically viable by their practitioners is seen as an obstacle to large-scale viability. Even though the smaller vessels only harvest a modest proportion of the total allowable catch, their share is perceived as representing the decisive additional volume needed for the larger vessels to be profitable!

Typically, small-scale fishery activities are operated from outlying and smaller localities, places which have undergone a thorough modernisation as to public services, communication and habitation facilities. Although fewer people live in these places now, compared with some decades ago, they are persistently fighting for welfare institutions (schools, kindergartens, pensioners' homes) and for their status as municipalities. The very existence of a modernised periphery seems to make it difficult to obtain a 100% restructuring of the fisheries sector according to the principles of a large-scale and vertically integrated production system.

Another problem for the industrial way of organising fisheries has been that large-scale activities are much more harmful to the conservation and regeneration of the marine resources, compared with the more ecologically adapted small-scale fisheries.

With fishery resources being increasingly scarce—and valued—the contrast between the two types of fishery system has formed the basis for political conflict. A zero-sum game, which is what the finiteness of the fishery resource invites to, is hard for the authorities to transform or convert into a win-win situation between larger and smaller participants. And in addition to the tensions created within the fishery sector, there is a geographical dimension involved. The competition between places, based on strong local identities as well as on differences in ways of life along the rural-urban dimension has aggravated the conflicts within the fishery sector. It seems

very difficult to work out managerial or administrative solutions and strategies for the sector at large that are perceived as fair to the stakeholders.

Explaining the persistence

Nevertheless, to try to work out compromises has become a task for the political and administrative systems of many nations. One may ask, why has it not been possible to get rid of the small-scale segments of the fishery sector long ago? There are, however, several reasons why this has not been an option to decision-makers. First, the small-scale actors have been able to mobilise a majority within the fishery sector in numerical-democratic situations. Second, the small-scale actors have adopted modern technologies so as to achieve a sufficient competitive efficiency. And increasingly, the price of advanced technology has been lowered, while simultaneously, modern harvesting, navigation and communication technologies have become available in a format to suit the small-scale actors. Third, the resource situation has put the small-scale fishermen in a more favourable 'sustainability' position. Fourth, the small-scale fishermen have proved to be more flexible in coping with ecological and economic fluctuations.

And fifth, their stories and perspectives have been efficiently communicated to the public, to administrators and to political leaders, often by social scientists engaged in the new and decentralised academic centres of the north. This article draws heavily on the research carried out on the relation between fisheries policies and fishery-based localities in Norway, in particular on the work of University of Tromsø social scientists Svein Jentoft, Ragnar Nilsen, and Siri Gerrard.¹ Their research has been directed to the analysis of vital aspects of the dynamics of fishery localities, and they have shown the advantages of combining insights from policy analysis and social theory related to household, gender, and locality development, as well as to resource management and regime theories.

A normative commitment underlies the research on the dynamics of locality/ fisheries relations—these researchers explicitly state a concern with the small-vessel fishery sector, and in particular with people living and working in outlying fishery localities in the Northern periphery. This normative commitment is underlined by a development of the classical argument that coastal localities depend on incomes generated from fisheries. But one may turn the argument around, and maintain that the fishery sector at large depends on sustainable localities, and thereby underline the importance of a social space for the varieties of fishery *culture* and *knowledge* at the level of the

1. Svein Jentoft is at the Norwegian Fishery College; Ragnar Nilsen and Siri Gerrard are both at the Institute of Planning and Community Studies, University of Tromsø. Most of the observations in the present article are based on studies performed by the abovementioned scientists, but they are not responsible for the way I have made up the arguments and conclusions here.

locality (Jentoft 2000). Following this way of reasoning, if fishery-culture localities cease to exist, fishing practices will be completely dominated by industrial enterprises and vessels operating at a distance, with a size and capacity that leave them in a constant dilemma with bankruptcy threatening on the one hand and resource depletion on the other.

People living in the smaller fishery localities are likely to maintain local knowledge about where and when to make good catches. Thereby, smaller vessels will be able to exploit an inshore fishery resource potential that is hardly known to, or technically possible to reach by, the larger vessels. In their way of fishing, the small-vessel fishermen will be able to catch well-grown individuals, and to switch easily between harvesting different species. Thus they are more likely to contribute to a better composition of the total catch, from a sustainability point of view. According to Svein Jentoft, it is hard to see how local knowledge about seasonal variations and fishing grounds can be maintained without localised fishery cultures.

And even the recruitment of personnel to the industrial fleet seems to be served by the existence of viable fishery villages. Young people often want to make money by seeking available employment in urban centres rather than setting up their own, or participating in their parents' enterprise in their native locality. For young people growing up in regional centres, however, marine occupations are far less attractive than jobs in the land-based service sectors. In this way even the industrial large-scale segment of the fisheries will profit from the maintenance of the smaller fishery-based localities. Following this line of reasoning, it is easy to see that the conflict between large and small units, and between urban centres and outlying localities, can be antagonistic as well as moving in the direction of a compromise.

The quest for a compromise

It is an essential part of the argument that the different segments of the fishery sector are intertwined, even though the conflicts and specificities between various size groups lend themselves to a conception of the fisheries sector as one characterised by zero-sum-games, as the total quotas are fixed and the catch capacity far exceeds the limits set by political authorities. The children of the smallholders, who do not immediately have access to the position of the autonomous fishermen, need the industrial segment as a place to work in order to accumulate capital sufficient to invest in their own small scale vessels in due time—perhaps as late as when occupational retirement would normally be an option. In the same way as elements in the fishery sector are interdependent, so are places and localities of a region, even though they also may differ substantially as to size, occupational structure and life styles.

These somewhat harmonious possibilities need to be balanced by a perspective that pays respect to global trends, such as an increasing drift of younger people toward educational centres, and of capital and quotas to larger vessels—the argument of centralisation. Long-term trends seem to favour big over small, central over remote locations, and urban life-styles over semi-urban or semi-rural. Partly, this is a trend that is nourished by the dynamics of economic and technological change. But there is also a cultural element, created and mediated by a consumerist ideology, in the urban-is-beautiful trend. Young people, especially, seem to favour high personal mobility, preferably within and between the metropolitan regions of the world, and do so seemingly independently of birth-place. Thus a policy for strengthening the small/remote end of the fisheries scale will have to take into account not only the resistance from several investors and managers in the industrial sector, it will also have to face the strong and seemingly growing cultural preferences for urbanity. And we have to take into account that this is not a question of urbanism outweighing a rural life-style of the original kind (which is more or less out of the question in today's society), but over *life forms in which people strive to combine elements of urban and rural life, and thus transcend the classical urban/rural divide*. We will return to the discussion of cultural versus material/economic reasoning in the discussion of recent developments in Norwegian fishery policy formation.

Vessels: small, large, but also medium

The classical divide between industrialised (ocean-going trawlers) and household-based (small-vessel) fisheries is supposed to be well known. This dichotomy fits well with the split between the two classical rationalities of the fisheries discussed above: the one-dimensional, utility-oriented rationalism of the industrial enterprise as contrasted with the rationality underlying the diffuse and complex needs and practices of a family or household unit involved in fisheries.

However, this useful and pedagogical dichotomy may not function so well when it comes to a third category in the fishing fleet, namely the mid-sized vessels. These boats are often operated and owned by fishermen living in fishery localities, and thus they are not so deeply integrated into the investor rationality typical of land-based industries. On the other hand, buying and operating such vessels demands access to financial capital. This means that they cannot normally be run as part of a family or household economy; they will be organised as shareholding companies and they will demand an amount of capital in the form of loans that integrate them into the financial sector. The skippers have to 'fish for the bank', as the saying goes.

While the larger fishing vessels rely on their vertical linkages to a land-based company, and the small ones rely on family resources, the mid-sized vessels increasingly, at least in Norwegian waters, rely on their mobility and often operate in a de-linked

mode, relieved from local delivery responsibilities. Auctions and centralised freezing storehouses have become important components in the mid-sized vessel fisheries.

Nowadays, fishery resources are scarce, and even increasingly so, in most regions. Total quotas are set by international negotiations (and will, it is hoped, be respected), so that there will be a zero-sum-game of fishing both within and between the three segments of the fleet. The fish itself is mostly mobile, and that means that for all practical purposes, the same individual may be caught by an industrial trawler, by the mid-sized long-line vessel, or by the net of a small-vessel fisherman. This presents a seemingly everlasting problem to fishery management: one can settle the overall resource question by agreeing on the Total Allowable Catches (TAC), but then decisions on distribution between groups—and between boats within groups—will enter the agenda. Any reasonable division of labour and compromise between size groups, vessels within groups and even between regions will be made more difficult by the increasing mobility and flexibility of the fishermen—and of the fish stocks themselves. In other words, fishery regulations boil down to politics—the natural and social sciences can only provide a framework for political decisions that will never be regarded as neutral by the stakeholders.

One could of course wish for a shared understanding of the merits of the various participating groups, but whatever the decision on distribution of the TAC, it will invariably affect company dividends or family incomes in a way that leaves the field open for political unrest, mobilisation, and organisational and private lobbying. Within the sustainability framework, the small-scale advocates have solid arguments—they are the only group that can effectively go after the grown individuals in any stock, and thus their mode of harvesting, at its best, may contribute to a proper regeneration and even growth of the resource base. At the other end of the size scale, however, the industrial operators can refine their technologies and adhere to monitoring practices so as to avoid resource breakdown. And they can argue that big units create spin-offs and jobs to land-based industries in a variety of ways, to a degree that hugely exceeds those of a small-vessel fleet. And as the larger vessels can go for stability in deliveries throughout the year and thus reduce the impact of seasonal variations on fishery activities, their operating concept is nicely tuned to the needs of the financial segment. So it seems that it may be possible to reach an agreement on the relative merits of different parts of the fishing fleet, but that is it—the distribution of the TAC of any species will be subject to decisions that can hardly be anything but politically determined.

Rural settlements, fishery villages and nodal ports

Corresponding to the division between vessel types, we will often find a division between locality types. To speak of fishery-based localities as basically of one type will inevitably be misleading. Here, we propose a threefold approach:

- some fishery-based localities are made up of dispersed settlements along fjord landscapes and on islands, with farm properties as the basic units. Small vessels are found all along the coast, but only in **rural settlements** (with inhabitants counted by hundreds rather than by thousands) do they tend to dominate the fishery sector. Some of these fjord settlements may form small municipalities; others may be the outlying areas of larger ones. The way of life will typically be unspecialised, with fishing being one of several productive sectors at the level of the household, and often seasonal or part-time. As a consequence, investments in fishing vessels will be kept down to what is economically viable. Throughout the year, and throughout a lifetime, there will be a mix of fishing activities, sometimes for recreational purposes, sometimes for the family economy—keeping expenses down—and sometimes in a purely commercial mode, with delivery to a local processing plant (but sometimes also producing dried fish at home). The participation of family members in the fishing activities will also vary, involving at times spouses and children (Gerard 1995). In an age of urbanisation, combined with post-industrial activities, fjord settlements will perhaps be especially attractive to middle-aged and retired persons, and younger families will be recruited on a basis of a preference for an alternative life style as well as on the basis of tradition and belonging.
- other fishery localities are more or less the 'pure' fishery town or village, with a dense settlement structure and people mostly living in flats or in suburban-style houses. The mid-sized coastal vessels (and the occasional trawler) will typically operate from this kind of **fishing village**, with a size from a few hundred to a few thousand inhabitants. The vessels will recruit their crews locally, but their owners will increasingly feel free to fish and deliver their catches wherever they get the highest price. The link between the village and the mid-sized vessel has been severed. We are used to thinking of the fishing village as an integrated production system, with a fishing fleet, harbour facilities, and processing plants, but there is a tendency for the vessels to behave in a more egoistic mode, something that has been facilitated by new technologies often combined with the demand for fresh, unprocessed fish products in markets dominated by the upper middle class. There may also be a trend of differentiation in the village's economic structure, e.g. with tourism and public services as typical occupations outside fisheries.
- the large scale industrial trawlers will operate from, and be linked (by ownership) to what we can call the **nodal ports**—which are often regional centres.

These often boast of being the biggest fishing ports in the country, but at the same time they are places where fisheries have long since ceased to be a dominant activity (like Tromsø, with a population of 62.000 in Northern Norway). The nodal ports are nevertheless vital to the fisheries, partly by the fact that they are the location of important land-based industries, but increasingly by their administrative, research and servicing capacities in relation to the fleet. Perhaps the most prominent advantage of the nodal ports is their attractiveness to young people from the whole region in which they are located. *But this recruitment pattern has very little to do with an attraction to the fisheries based in that nodal port.* On the contrary, what the young people seek and find is better educational opportunities leading to work in the public (health, education, research) and private (finance, commerce) service sectors.

What is important is that all three types of locality will be found along the coastal landscapes of the North, and even though they may intersect and form parts of the same municipal or regional jurisdiction, they represent different challenges to fishery policies and management systems. The problem—in principle a problem of cosmic proportions—is that fishery policies address not places but fishery units and/or associations of such units. Territorial units, like fishing villages, fjord settlements and urban centres, in which a myriad of economic and cultural activities take place, can of course not be handled by the fishery authority's approaches, not even an approach that is sensitive to the intertwining of fisheries practices and other socio-economic practices (Jentoft 2000).

It is obvious that fishery policies taking only one of the types as their point of departure are likely to fail at the other end of the locality scale. Provisions that are meaningful to places with many full-time fishermen will hardly work in localities with part-timers, and vice versa. Now, this has for long been acknowledged in governmental statistics, for instance in Norway, where the fishery censuses always distinguish between fishing as a person's sole occupation, main occupation, or a part-time or seasonal activity.

We should not expect policies to be developed by a generative mode of thinking, starting with the locality and moving upwards. Management policies in the fisheries are doomed to remain in the top-down mode, ruled by a centrally and internationally agreed TAC for all important species. Policies are expressions of country-wide political ambitions (modified by lobbying and the representation of interest groups in committees) as well as of research-based forecasting and analysis.

And neither the fishery sector nor the settlement structures have always been as they are today. Politicians have mandates from the people, based on programmes that vary between radical restructuring schemes—in different directions—and schemes

for conservation. Today, in the wake of a global wave of economic liberalisation, we will have to restrict our creative powers for fishery regulations, because what we would think of as effective policy instruments, like financial incentives to certain vessel or gear types, or barriers on mobility, can be ruled illegal and detrimental to trade by international courts.

However, to press for a radical restructuring of the fisheries sector, because it is needed to survive in the global competition for market shares, is not a good strategy. Worldwide, there seems to be a strong and growing demand for high-quality fish products. Resource depletion in many waters, combined with the popularity of marine food with the upper and middle classes all over the world, do indeed create very good prospects for the industry. Control over an Exclusive Economic Zone, and conservation of the resource base, seem to be the most important elements for securing commercial success.

Locality-sensitive fishery management: three options

The challenge for central authorities is to develop fishery policies attuned both to a diversified fleet and to a diversified settlement structure. If there is a shared conception that a variety of vessel types and a variety of community types are indispensable to a sustainable fishery sector, then the range of fishery policies should be widened to take at least a partial responsibility for fleet-locality relations. On the other hand, if fisheries are conceived of as business only (within given ecological limits), the policy options will be different from the ones offered here.

A management system that takes responsibility for fleet-locality relations must relate to the relevant stakeholders. Then there may be three options:

Regionalisation:

One will be the devolution of distributional competences from the central level, not to the local fishermen, but to local authorities like elected regional and municipal institutions. Regionalisation of fishing licenses will be one example of such a policy. Another would be local or regional regulation of access to waters for different types and numbers of fishermen. The first option means an opening-up of the fishery sector to the local and regional political community. As a result, people with no or slight expert knowledge in fisheries could come to exercise substantial regulatory competence, but in practice, most likely only those with interests in the fisheries will serve on the advisory boards for the regional or municipal authorities.

Co-management²:

A second option will be to keep strong within-sector regulations, but to allow for collaborative measures between the central authorities and fishermen, associations and companies at the level of the locality or the region, so that the implementation of the regulatory practices could be adequately informed by local knowledge. This option would expect that the practitioners at the regional and local levels would be invited to inform and to influence regulatory practices under the auspices of the local branches of central government. There are two catches to this. First, there is the risk that the most successful fishermen will tend to dominate the associations that the state officers will have to relate to. It is almost impossible to think of these as generously granting additional licences to newcomers, if it means a reduction in their own quotas. The other problem is, who is to decide in cases where the representatives from the central government and the local representatives do not reach a consensual agreement? If it is the state that decides in the end, what will then be the legitimacy of this kind of arrangement?

Locality empowerment:

A third possibility is to start out from below with the funding and organising of special programs aimed at balancing local or regional fishery systems or empowering stakeholders, including would-be actors, within a locality or region. Another objective would be to obtain new knowledge on how people themselves will adapt to new possibilities, (certainly within a framework of sustainable practices). This third option could allow experiments for a time period. In this case, the central authorities may invite both local people from within and outside the fishery sector to come up with proposals for more local competences over, say a 5-year period. The tricky thing here is that it may be problematic to invite private people to exploit possibilities that may be closed in a few years, especially if investment of any substantial sum is involved. Private actors demand predictability, not experiments. (That is, some private actors do—others are fully aware that in the present 'global' times, things are prone to change, and businesses are about taking risks.) Here, the TAC is actually not at risk, but the distribution of incomes between people or places may be changed under an experimental regime. Nevertheless, this third option may be the only one enjoying some viability, because in the two former cases, it is to begin with difficult to envisage an agreement politically, and—not the least—to see how the fishery bureaucracy can be stopped from stopping it.

2. Svein Jentoft has written a series of articles on issues pertaining to co-management in fisheries, e.g. in the journal *Marine Policy*.

Experiences from Norway—attempts at decentralisation

In Norway, fishery management policies have to a great extent been national policies, with very little discretion left to regional and local authorities. The determination of minimum prices and measures to overcome onshore deliveries and market problems were earlier the main objects of the management system. However, the handling of a limited resource base and intra-sector distributional systems now dominate the management agenda.

Small-vessel fishermen (boats less than 30 feet length) could, until the resource crisis in 1989–1990, operate without formal (cod) quotas. All size categories however were included in the quota system by 1990, and this reform led to the exclusion of several part-time fishermen from the cod fishery.

An increasingly liberalised economy, together with detailed regulations under the EU single market regime, has led to a centralisation of onshore processing industries, as hygienic formalities as well as a general ban on state subsidies have favoured the more modernised processing plants.

Several attempts have been made to modify or to evade the centralising pressure emanating from both the liberalised economy and from the central authorities. The following strategies are all bottom-up initiatives that are targeted at maintaining a small-vessel fleet, thereby also strengthening localities of the rural type:

- *ethnic dimension and Sámi small-vessel fisheries*: in northern Norway, quotas for small fishing vessels are more easily obtained in municipalities that are included in the area covered by the Sámi development fund (Nilsen 2003a; Davis and Jentoft 2003). The success of this strategy in some Finnmark municipalities has led to the suggestion that the whole of northern Norway waters should be declared a Sámi fisheries zone, but this is for obvious reasons not possible to implement.
- *regional regulation strategies*: regional-level fishery management has been practised for centuries in the rich seasonal Lofoten fisheries. Here, formal rules for participation (only small-scale vessels are welcomed), for allotment of sea areas, dates and hours for fishing etc. are fixed and obeyed. The seasonal Lofoten fisheries, however, represent a very special case and the arrangements here are hardly replicable elsewhere. An attempt to practise fjord-basin fishery regulation in the Lyngen fjord north of Tromsø was stopped by central authorities (Jentoft 1998), but the question of regionalisation of quotas is at present a hot issue, reaching the threshold of the more influential political parties. The strategy here will possibly be that local or regional authorities manage parts of the total national quota volume, and lease them to vessels that are willing to serve local processing plants.

- *micro-level occupational pluralism strategy*: More successful has been a 3-year project of stimulating occupational pluralism in the Malangen–Balsfjord area from 2000 to 2002. Here, individuals and households with activities within either agriculture or fisheries could apply for funding to expand their activities in another economic field. Several small fishing vessels were partially financed by this scheme, and an onshore delivery facility was established, serving a large number of small vessels (Nilsen 2003b). Significantly, the Ministry of Fisheries declined to participate in this fisheries-oriented project (which was funded by the Agricultural Ministry and the Ministry for Municipalities).

And the central level's response: a buying-out strategy

In the light of the many local and regional attempts at stimulating small-scale fisheries and onshore decentralised delivery stations, it was a great disappointment to see that the Norwegian Ministry of Fisheries had quite another agenda directly affecting the small-vessel sector: a scheme for buying out small vessels with cod quotas was passed by Parliament June 2003, with the aim of improving the economic viability of the remaining ones in the same size category, who were offered the 'liberated' quotas for a fixed price. Paradoxically, a new fishing vessel in the Malangen–Balsfjord area, financed in part by the Ministry of Agriculture, could only months later be bought out of fisheries, according to the scheme worked out by the Ministry of Fisheries!

The tension between the small-scale rationality of people living close to the resource base, and the one-sided efficiency rationale from the political and administrative centre, is unquestionably present today in Norwegian fisheries management. The new regulations, aimed at throwing active fishermen out of the sector, are not part of some plot staged only by wilful bureaucrats: the central bureaucracy feels that it is firmly supported by owners of the mid-sized vessels that really must have access to more fish in order to survive in economic terms. To the general public and to politicians with slight knowledge of the diversities of fishery sector, the mid-sized-vessel owners are still seen as more successful than the small-vessel owner.

The interesting thing however is that for decades, the central authorities have tried, by various means, to get rid of the many small-vessel operators along the Norwegian coast. By 2003 it is still necessary to implement harsh schemes of exclusion to prevent local people from participating in fisheries in a way that they themselves prefer. The secret of the small-vessel fleet is disclosed if one employs a *life-cycle* or *career* perspective: the small-vessel operators are often middle-aged or semi-retired people who have been fishing on bigger vessels or have been wage labourers for

many years, but with the aim of fishing with their own boat in the maturity of their working life. They have often financed their boats by savings, and can thus be fishermen in a more season-variable way without facing bankruptcy.

‘De-linking’ fishermen?

This dynamic however is by no means appreciated by central-level bureaucrats, top-level politicians or representatives from the Norwegian Fishermen’s Association. The role of the association demands some comment: a mode of collaboration—or corporatism—has for many years been facilitated by the position of the Norwegian Association of Fishermen, an occupational association that has included fishermen from all parts of the country, and all vessel size groups. The common ideology of this association has been the idea of the free fisherman, with no obligations whatsoever to the landside, but on the other hand, with a strong expectation of being provided with landside facilities. The de-linking of the fleet from landside industry has become most prominent in the auction system and in the preference, especially from the industrial part of the fleet, to land its catch at international rather than national ports. The association has also accepted the almost total abolition of the annual treaty negotiations with the state, an instrument that had earlier been used to at least partly territorialise fishery policies (by subsidising transport to, and between, processing units). In a situation with harvesting over-capacity, the splitting of the association into three distinct size groups was inevitable, and was completed with the break-out of the larger vessels group in 2003 (the smaller ones formed their own association in the early 1990’s, The Coastal Fishermen’s Association). And with three competing partners, the idea of collaboration based on agreement between fishermen and the central authorities has waned.

What can be done? Is the municipality the answer?

From a researcher’s point of view it should be possible to assess the relative importance of different factors that may contribute to the sustainability of localities, and this kind of knowledge, though certainly not immediately transferable to other regional and national contexts, should at least contribute to the understanding of the complexities as well as to the ‘ways out’ for small scale habitation and economic activities in the future.

From a central or provincial point of view, fishery policies are developed to serve the interests of fishermen and vessel-owners, to protect fishing stocks from over-utilisation, and to facilitate an ever-ongoing restructuring of the sector to meet environmental and efficiency-related demands. Vessels of a certain size are definitely mobile, and even though most of them are attached to certain localities, where they recruit the fishermen, buy gear and services, and deliver their catch, the ultimate

end-point of fishery policies is at the level of an owner of a mobile fishing vessel with no territorial attachment or obligations.

The implication is that to the small-scale segment, perhaps local politics and municipal institutions are more promising political platforms than fishery policy discourses that are kept within the fisheries sector. One should, however, not have too great expectations as to the impact of such alliances on fishery policies at large. Perhaps only a minor part of what will be the overall fisheries policies may be reformulated and implemented with municipalities and composite household structures as stakeholders. But performed in an inclusive manner, a debate and discourse on 'where', rather than only on 'who' shall get what, as to rights and obligations in coastal fisheries, may be of great societal importance, as it may foster hope and activity in the parts of a region that is doomed to lose if market rules only are applied.

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Challenges to socio-economic research in a changing society— with a special focus on Greenland

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Introduction

The North has undergone marked changes during the last century. From a pre-industrial situation—minimal communication with the rest of the world and a livelihood obtained by harvesting natural resources—communities in the Arctic now experience the influence of large-scale renewable resource exploitation, a growing influence of large industries, an increasing degree of income transfers, and growing national and international interdependencies. Especially since World War II, modernisation and rapid changes have affected both the living conditions and the cultural characteristics of Northern societies. And the present pace of globalisation calls for a focus on the short- and long-term perspectives for Northerners.

Instead of an understanding of the Arctic environment as unspoiled and inexhaustible, we find a growing concern over trans-boundary contaminants and large-scale resource exploitation. Industrialisation in the North has created new settlement patterns, with populations concentrated instead of dispersed over vast areas. This has led to new patterns of resource use, causing substantial impacts on the natural environment, as well as on social life (Nellemann and Vistnes 2003; Storey and Hamilton 2003). It could be said that Greenland differs from this pattern, as the settlement pattern still includes a substantial number of villages, and only few towns relying on a single resource. The industrialisation of fisheries, however, with its emphasis on large offshore trawlers as the backbone of the economy, contributes to a situation where Greenland is similar to other parts of the Arctic.

Present-day Arctic societies are affected by the exploitation of resources at many levels, and the economic behaviour of individuals, families and communities has been transformed by the extension of monetary incomes, while human health is affected by pollution and by changes in diet resulting from the contamination of the food chain as well as from the increased access to imported industrial food. Customary hunting, fishing and herding activities have been transformed by intensified commercial harvesting. As a result of these rapid changes, social and cultural settings are changing quickly, generating meaningful new ways of making a living, but

also producing major social disruptions. So in spite of attempts to maintain images of Arctic peoples as exclusively traditional hunters and trappers, the reality shows traditional and modern ways of living existing side by side in modernised circumpolar societies, with different levels of self-determination, using new technologies—satellite dishes and snowmobiles—and building up welfare societies where concerns regarding future socio-economic structures and living conditions have become the focus of politics—and should be a focus of research as well (Rasmussen et al. 1995).

The heritage

The Arctic communities, and first of all their resources, have been in the sphere of interest of Euro-American capitalism. Growing needs connected to industrialisation have impacted traditional life and created a basis of regional inequalities within nation states. The historic heritage of the colonial system and the dynamics of the maintenance and abandonment of former colonial relationships has become a crucial off-set for the contemporary socio-economic (re)construction process.

Many of the present day characteristics of settlement patterns in the Arctic are a conglomerate of a conscious and rather similar settlement policy, very varied commercial and industrial policies, but also of course reflecting traditional use of renewable resources. From settlement patterns formerly dependent on seasonal as well as longer-term fluctuations in subsistence resources, modernisation has resulted in fixed settlement structures with concentrations of population in larger urban centres. Consequently, urbanisation has become a persistent development characteristic of Arctic communities (Rasmussen 1997, 1998), and thereby an important framework for socio-economic processes.

A common point of departure for the circumpolar North has been trade monopolies which have characterised and shaped development processes: in Greenland the Royal Greenland Trading Company and Home-Rule-owned companies, in Canada the Hudson's Bay Company, and in Alaska the Russian-American Company. The inherited administrative and organisational configurations have been based on bureaucratic and hierarchical organisations, and such structures are difficult to break up. Even though serious attempts have been made to introduce free-market economies based on competition there are still a lot of structures that are monopolistic in character. Attempts to change to more liberal policies seem to conflict with distribution and allocation objectives, and do not necessarily create the expected economic yield, nor the hoped-for local economic benefits. So it remains an open question, whether there are other ways of organising Arctic economies than by introducing private ownership and liberalisation? (Winther 1999, 2001; Winther and Duhaime 2002)

In Greenland as in other Arctic regions the State plays a crucial role in terms of regulations, demand, allocation, and ownership. In essence Greenland is a modified étatist society referring to state (in French *état*) dominance, and an elitist society. A new ruling class has emerged, composed of high-ranking Danish civil servants, Danish corporate executive officers, well educated Greenlanders on their way up the social ladder, politicians and managers representing the interest-articulating associations (trade unions, employers' associations, the fishermen's and hunters' associations and so on). Besides, a traditional economic elite—e.g. the owners of the shrimp-fishing trawler fleet and privatised enterprises—has gained increased importance. Management in large Home-Rule-owned corporations, especially, has what Galbraith (1967, 1983) labelled 'facilitated power'.

This is a type of acceptance that has nothing to do with force or pecuniary remuneration, but depends on an ability to persuade the agent to change his opinion or to follow the ends of the power holder. Persuasiveness, high education or—in a negative view of this concept—the ability to manipulate are central skills in the hands of the power holder. The agent releases and identifies himself with what he experiences as right, natural or proper in a social context and does not at all discover that he is moved to act in others' interest.

Facilitated power is essential for the understanding of the modern economy as it exists in reality. Its source is the organisation or the techno-structure in the large corporation, with highly educated experts in influential positions. The large corporation does not merely ensure the subordination of its employees through subtle management philosophies, but also reaches out and seeks control of its surroundings, in order to consolidate its position, secure continuous growth and development, and ultimately contribute to consolidating power, privilege, above-average incomes and accumulated wealth. Advertising, lobbying, the establishment of formal and informal networks ('old-boy network'), legitimating social sciences and influencing the mass media are cardinal instruments in ensuring corporate power. Such power can be the opposite of the popular dogma on the political elite and political decision-making. Large corporations whether state- or privately owned may possess a subtle power not visible to the public. Professional top management, especially, holds this power, influencing electorate, politicians and stockholders. The large corporation has of course also an option of practising two other dimensions of power: condign and compensatory. Economic incentives, the fear of relegation or expulsion, and the strong personality of the principal may in combination with facilitated power ensure the agent's loyalty to the ends of the large corporation.

If we include the Greenland dimension to this approach, we get a picture of a facilitated exercising of power dictated by Danish customs and practices. Moreover, there is a schism between on the one hand proponents of hybrid ownership struc-

tures based on an interaction between Home Rule ownership and private ownership, and on the other those who want to move society in the direction of neo-liberalism, impose privatisations and free markets, and release the Home-Rule-owned assets from Government control in order to consolidate new powers in the hand of the private capitalist elite and its allies in other circles of the new class. This type of power is not just internal in the organisation; it is also external. The surrounding society and the political elite are shaped by and in some cases led to accept the behaviour and requests of large corporations. Recent developments in Greenland support this hypothesis (Winther 2002).

Distorted and dual economies

Increased accessibility of formerly remote regions has been drawing the Arctic regions into the development sphere and dynamics of the industrialised world, introducing marked changes in social requirements and expectations. One characteristic of this process has been large-scale projects that in many cases have conflicted with local production and the attempts to create coherent and viable local economies (Rasmussen 2003c; Rasmussen and Koroleva 2003). As large-scale projects are consumers of both resources and space, their activities have affected traditional usage patterns, and have led to the replacement of locally produced products by imported goods. This process has caused a marked divergence between on the one hand a traditional sector heavily dependent on subsistence, with small money incomes and personal transfers, and on the other hand a modern sector with high dependence on money income as well as high transfer rates. This process has resulted in a very diverse and unequal income structure with social stratification and unemployment as important elements.

In the discussion of such economic activities, there is a still-growing awareness of the possible problems, leading to an increased research focus on the socio-economic consequences of resource development (Winther 2000, 2003; Rasmussen 2003b, c; Rasmussen and Koroleva 2003), and bringing awareness that a better understanding of the consequences of large-scale renewable-resource and mineral development in Greenland might facilitate mitigation.

By their very nature, large-scale activities in the Arctic tend to create boom-and-bust cycles. Especially in connection with non-renewable-resource exploitation, the process from discovery to the closing of the exploitation activity is often short, and the communities involved are therefore temporary in nature and can experience extreme instances of boom-and-bust. This can also be the case with renewable resources owing to their sensitivity to over-exploitation and environmental change. Communities that depend on a single industrial base can experience chain reactions and catastrophic situations if it is depressed or collapses (Zelarney and Ciarlo 2000).

A resource-extraction activity can be associated with local society after one of three typical patterns, each with a dynamic of its own: enclave economies, adjacent activities, and integrated communities (Rasmussen 2003b).

Enclave economies are characterised by situations where all activities at the production site are isolated from the surrounding communities, so that the only interaction is through the royalties or taxes paid by the companies and, perhaps, employment of persons from the communities. The enclave concept has traditionally been used in connection with mineral exploitation, but with the present structure in renewable-resource exploitation where a few very large off-shore boats with on-board processing is responsible for most fishing in Greenland, a substantial part of these activities can also be characterised as enclaves. The fact that an activity is conducted as an enclave does not always eliminate positive interaction with settlements in a specific area and there can be a contribution to their economy (Rasmussen 2003c; Rasmussen and Koroleva 2003; Storey and Hamilton 2003), but this requires a policy of promoting such interaction patterns.

Adjacent activity is the result when there is a certain degree of interaction with nearby communities, for instance through the involvement of local workers or local services. Integrated communities develop in situations where the activity becomes an integral part of the life of the community, and develops peripheral activities, such as shops, schools, public services, other types of industry, renewable-resource production etc., that are common to the general characteristics of any community, and that at the same time interact with the mine through labour force exchange, rendering services to the company, etc.

Besides mining exploration, oil and gas finds may have a considerable impact on Northern communities, but research on the economic consequences of oil and gas production in Greenland is still in its infancy. Exploration has been going on for some 25 years now, underlining the ambitions of the Home Rule government to enter the club of oil-producing countries. Since 1999 the Home Rule administration has started to show interest in socio-economic research on the impacts from oil, gas and mineral exploitation, and discussions on methods of economic research have gained in interest: decision makers in Greenland do not want to be caught off guard if the Greenland society and economy should be exposed to the tremendous shock of a find of massive oil and gas reserves.

Hydrocarbon reserves ought to contribute to a booming and successful economy, but open-economy macroeconomic analysis and structural arguments suggest that the opposite could occur. Mineral-export growth may in some cases be more of a curse than a blessing. This anomaly is identified as *the Dutch-disease phenomenon*, (Winther 2000, 2003) where the conclusion drawing most attention is the short-

run model pointing to a *de-industrialisation* effect in export-oriented industries. In short, the windfall gain in a booming sector exploiting mineral resources or oil and gas may cause a spending effect leading to a growth in the sector for non-tradable goods (non-currency-earning activities) and a resource effect referring to the mobility of labour out of the sector for tradable goods (export earnings). Because wages are higher in the boom sector and the sector for non-tradables, there is a mobility of labour out of the tradables sector. Competing for labour, this sector has to raise wages, which in turn squeezes profits. At the same time there is an inflationary trend—the country in question will suffer from lower earnings in export trades owing to lower competitiveness, higher costs and wage bidding.

The Greenland economy is interesting in a Dutch-disease perspective, both because mineral exploitation already has taken place—and will again; and because the Greenland economy each year receives income transfers from the Danish State. Empirical research has suggested that if there ever was a structural distortion due to transfer incomes from Denmark, the patient seems to be recovering. Data suggests that between 1955 and 1990 the average annual growth of the tradable goods sector's GDP share was positive, while the opposite was the case for the non-tradable goods sector. Running OLS regressions on the association between growth in state expenditures and growth in these two sectors, sign analysis suggested that the data on Greenland do not fit to a Dutch-disease model. Nonetheless, it will of course be important to monitor similar data, if oil and gas finds should result in a booming Greenland economy.

A traditional conflict has been the development of continuous and renewable resources versus non-renewable resources. The heritage from colonialism has been a split between the interest from southern areas primarily directed towards either non-renewable resources, or renewable resources which could be used industrially, while the local population has to a higher degree maintained an interest in renewable resources that could serve as a basis for subsistence production as well as commerce. This discussion has included the question of small-scale versus large-scale policies, since the means—as well as a requirement—for an efficient allocation of capital has been the expansion of activities in still-growing organisation and production units, while the community focus has been much more on local activities. In this process an understanding of the role of technology is essential. While much large-scale expansion has been due to expansion of associated technologies, the introduction of information technology has changed the situation. Not necessarily to the disadvantage of small organisations—with the possibility of getting stuck with old-fashioned monopolies (Hansen 2003)—or necessarily to their advantage either, but leaving communities with a possibility of choice.

The dual character of the economy is most obvious in relation to the market for food and food products (Rasmussen 2003a). Modernisation has caused a major transformation of consumption patterns. The introduction of supermarkets in the 1970s, especially, had significant consequences for the consumption patterns—to such a degree that a lot of traditional products started disappearing (Dahl 1989). Parallel to commercialised consumption, however, consumption of local products distributed through subsistence and informal channels has continued. Subsistence activities are locally important in Greenland, and, together with informal marketing are discussed as important development factors (Marquardt and Caulfield 1996). Local markets served as a ‘leveller’ of differences between Greenlandic hunters and their countrymen working for the colonial authorities, as well as a redistribution channel whereby hunters received European goods, while Greenlandic and Danish salaried employees received valued country foods and locally produced items of clothing and other goods. Without the local market, a starker separation might have emerged between subsistence and commercial activities. And local markets have persisted, even in most of the larger towns, with nearly all types of country food exchanged.

The formal economy—i.e. wage incomes and incomes in connection with sale of hunting and fishing products to registered producers—obviously dominates in the Greenland towns (18 municipal centres with 531–14.350 inhabitants on 1.1.2005), but plays an important role also in the settlements (22–416 inhabitants). Of equal importance in the settlements are transfers. In absolute value these are of about the same size per person in the towns, but there, owing to higher incomes, they play a more limited role. Informal economic activities are important in all settlement types, but most markedly so in the larger settlements. This is partly because many hunters and fishermen from the larger settlements bringing their products to market in the towns, where there are more customers. The subsistence sector is present at all levels, but most dominating in the settlements. It must, however, be borne in mind that there are marked differences in income level between towns and settlements according to size.

Social relations

Parallel to economic development and industrial policies in the Arctic with their focus on identifying and developing economic strengths and overcoming barriers and weaknesses, a general issue has been the impact of these processes on social structures and relations. Human responses to impacts of industrialisation are tightly connected to those social and cultural institutions that relate to knowledge about resources, as well as to the ownership, control and management of those resources. A fundamental problem, therefore, is how access and ownership have been influenced by different emphases on centralised or decentralised decision-making, which can also shape decisions about investments and economic development. The social

consequences of these decisions have varied dramatically according to whether or not projects had the consent of local people. Therefore it is important to know about the cultural, political and economic basis for coping locally with environmental and social changes such as the limits of mutual tolerance or incompatibility between alternative uses of resources, how the cumulative pressure of multiple forms of resource extraction have affected the resources required for land-based ways of life, and how cumulative impacts of development have altered local systems of social control, land and sea tenure, conventional configurations of rights, and resources in general (Rasmussen et al. 1995).

Human resources and local development are closely connected through the availability and potential of human resources. Three elements in particular seem to be of growing importance. First of all the acquisition of the formal knowledge needed in a world where formally recognised qualifications are increasingly essential. Secondly, an increasing use of local knowledge in connection with resource management, resulting in the possibility of co-management regimes as well as a more dispersed and diverse resource use. The third is the question of alternative development patterns, taking into account the experience and knowledge that are a necessary part of the innovation process, and resulting in a shift towards user-producer interaction as a principal development element. While national accounts and economic analysis often treat labour as a more or less homogeneous input to economic activity, a more in-depth understanding of the differentiated skills, knowledge and expertise of workers is needed in order to recognise the shifts in economic output from production of goods towards production of services and other knowledge- and information-intensive forms of output.

In this process of change from a resource-extracting to a knowledge-based economy a better understanding of demographic changes, as well as behaviour difference between sexes and generations, is essential. While middle-aged men often seem to be stuck in fixed production patterns, younger people and women seem to be more flexible, not only adapting to externally imposed changes, but also exerting strong influences on development processes. Out-migration patterns indicate very different mobility in the sexes (Hamilton and Otterstad 1998; Hamilton and Butler 2001), and research on young people's preferences (Hamilton and Seyfrit 1993, 1994) clearly illustrates how studying a single fraction of the population—no matter how influential it may be at the political and administrative level—may limit the value of research.

Political and economic changes since the Second World War have caused crucial changes in the traditional Greenland fishing/hunting culture, and hence in traditional social structures. Changes in occupational structure, a transition to a monetary economy, and educational mobility as well as increased urbanisation have meant that the norm, value and prestige systems in Greenland society today are linked

less to subsistence production in extended families in small closed communities and much more to wage-earning in a more globalised and open society. In 1945 it was estimated that 66% of the labour force in a population of 21.412 individuals was involved in hunting and fishing. By 1996 this proportion had decreased to approximately 25%, and this figure includes those working in the modern fishing industry (Andersen and Poppel 2002). Over roughly the same period the average number of persons per household decreased—from 5,9 in 1945 to 2,8 in 1999—indicating a major change in family and household structure.

'The basic processes of changing living conditions are ... well understood: settlement in permanent communities; monetization of work, trade and mutual aid; technological emancipation from toil and uncertainty (housing, clothing, feeding, transportation, hygiene and health maintenance); bureaucratization of social organization; personal mobility through schooling, vocational training, or professional experience; growing class stratification and status differentiation; increasing separation between public and private life; institutionalization of politics and the rule of law; concomitant development of civil society (voluntary associations, independent press, and private enterprises); and conversion of public discourse to conflicting ideologies of progress, master ship of destiny, formal rights and a self-conscious quest for identity'. (Kruse 1999).

This process of change, and the population's attempt to adjust to it, have not been without problems—not least because changes took place at an unprecedented speed. Changes in economic, political and social structures led to a break with traditional norm and value systems. Owing to the rapidity of the process these systems, however, were not immediately replaced by new norms and values. A lack of norms appeared in large segments of the population, accompanied by a general feeling of powerlessness or alienation among those who felt they could not influence the process of modernisation. The result has been a number of serious social and life-style problems. Suicide, for example, has become a prevalent social problem in Greenland (approx. 12 per cent of all deaths in 1997 were suicides), along with crime, domestic violence (including child abuse and neglect of children), and the abuse of alcohol and marijuana.

Anomalies like the above-mentioned have not been characteristic only of Greenland, but have also occurred in other indigenous populations in the Arctic where similar modernisation processes have taken place. *'Almost in the space of one generation, most of the practical or mental references of what it had always meant to be an Inuit, Iñupiat, or a Sámi became indeterminate, fluid, less reliable. At the same time, widening opportunities opened the door to rising expectations, both personal and collective. Inasmuch as the past no longer provided a handbook for the future, people sought--if only partially--to write their own futures.'* (Kruse 1999)

Even given similarities in political, economic and social development processes, the period after the Second World War has also been characterised by rapid and regionally different structural changes, which have had different effects on the living conditions of different peoples. To understand this variety requires comparative analysis such as the ongoing Survey of Living Conditions in the Arctic (Andersen and Poppel 2002; Andersen et al. 2002).

Conclusions

In spite of differences, however, the process, as Scardigli (1983) emphasises, has been a general shift from a cultural order to an economic order—from a closed society based on barter and subsistence to a society based on economic exchange through monetary means, whether a market society or an étatist society, and from a society governed by customs to a society governed by laws and regulations. Consequently, understanding the currents of change requires a definite focus on the ongoing socio-economic dynamics.

When doing that, a number of important characteristics should be emphasised:

- Using research experiences from one part of the Arctic does not always make sense in other parts. Even if the points of departure may have been similar, both speed and direction in the development process in for instance Greenland and Canada have been remarkably different, and comparisons therefore require the utmost precaution in order to prevent misinterpretations.
- Owing to attempts to implement the Nordic welfare model in Greenland, the social structures and processes in Greenland in many respects resemble those in the Nordic countries more closely than they resemble those in North America. This does not mean, however, that a Nordic approach to the analysis of development characteristics in Greenland necessarily makes sense. Both settlement patterns and relationships to subsistence activities differ markedly.
- Analysis of living conditions among the indigenous peoples of the Arctic must reflect the people's views on which dimensions of their living conditions are important to them, and must also permit international comparisons. It is also necessary to carry out comparative dynamic social analyses of the causal relations between different individual resources, and between individual well-being and different political, economic and technological settings. Only then is it possible more fully to understand the complexity of individual well-being in small Arctic communities in an ever more globalised world, and to analyse the conflicts between cultural continuity and social change.
- The study of privatisation and liberalisation involves the analysis of comparative economic systems. Alternative forms of ownership, such as cooperative

societies, local ownership by employees and suppliers, and 'people's shareholding companies' as in Alaska, Nunavik and Nunavut, are important fields for further study.

- It is important to focus on settlement activities. Yet it should not be forgotten that analysis of hunting, fishing and other traditional activities cannot stand alone. In western Greenland, a part of the population is involved in the large-scale fishing industry and in other production and service sectors and in Government administration. In some other parts of the Arctic mining and hydrocarbon production are also important activities. Analyses of the macroeconomic effects and the socio-economic consequences of non-renewable resource extraction are important, because incentives accompanying the 'Dutch disease' phenomenon may cause labour to move out of the fishing industry.
- Likewise it is important not to rely solely on middle-aged males as a main subject in the study of social changes. Such an approach may easily lead to an absurd image of contemporary changes in Greenland.
- Study and analysis of local communities may well give a very good picture of local opinions and understandings, but does not necessarily explain the overarching dynamics that at the end of the day determine the relationships between social structures and Scardigli's three determinants: the economic order, the global market, and the governing system of laws and regulations.

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The value and management of living marine resources

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The value of living marine resources

From an economic perspective, things and, indeed, phenomena in general, are valuable, i.e. have a value, if they satisfy two conditions; (i) they contribute to human welfare either directly via one or more individual's utility functions or indirectly via production of useful things (ii) they are in limited supply, i.e. are scarce. Thus coal is valuable because it can contribute to the production of useful things and is relatively scarce while oxygen is generally not valuable because, although extremely useful, it is generally in ample supply. It is important to note that if things that are valuable can be traded they will command a positive market price.

Many, but by no means all, living marine resources are valuable in this sense. Such resources provide value in several different ways. Among these, the following are particularly prominent (see e.g. Hanley et al. 1997; Tietenberg 1994):

- extraction value;
- passive use value;
- ecosystem value;
- bequest value.

The extraction value of a living marine resource is the value obtained from harvesting these resources. This value is measured by the net social surplus, profits or rents that can be generated by the extraction activity. Note that the extraction may be for either commercial or private purposes with recreational hunting and fishing being included in the private activity.

Living marine resources typically have various passive (non-extractive) use values. This includes observing specimens of the resource in their natural habitat and the associated tourist activities. It also includes the value of the option to undertake these activities, which basically requires the continuing existence of a sufficient availability of these resources. Moreover, it includes the so-called existence values of the resources, which is the utility people get from believing the species in question survives and, preferably, is thriving.

Living marine resources often have ecosystem values. This means that they serve a valuable (from a human perspective) function in the wider ecosystem which itself is valuable. Depending on the exact nature of the function, the ecosystem effects of the species and its demise may possibly range far and wide.

Finally, living marine resources may have what has been termed bequest value. This means that the present generation desires the maintenance of the resource, not for its current value but because future generations may find it beneficial in some way. This is obviously related to concepts such as sustainability and intergenerational equity.

In all cases, irrespective of its source, the resource's value is the present value of the future stream of benefits flowing from the resource. All living marine resources are renewable. It follows that the maximisation of the present value of the stream of benefits flowing from these resources would normally¹ imply sustainability of use and, consequently, maintaining the stock of the resource at some positive level. In most cases this optimal stock size would exceed that corresponding to the maximum sustainable yield.

This raises the question of whether these various uses of living marine resources are in some way contradictory. The answer is clearly yes. The extraction demand and even the ecosystem demand would generally want a sustainable extraction level above what would be optimal from the perspective of passive use demand and the bequest demand. As a result these various utilisation demands and the associated values have to be weighed against each other and the jointly optimal utilisation level found.

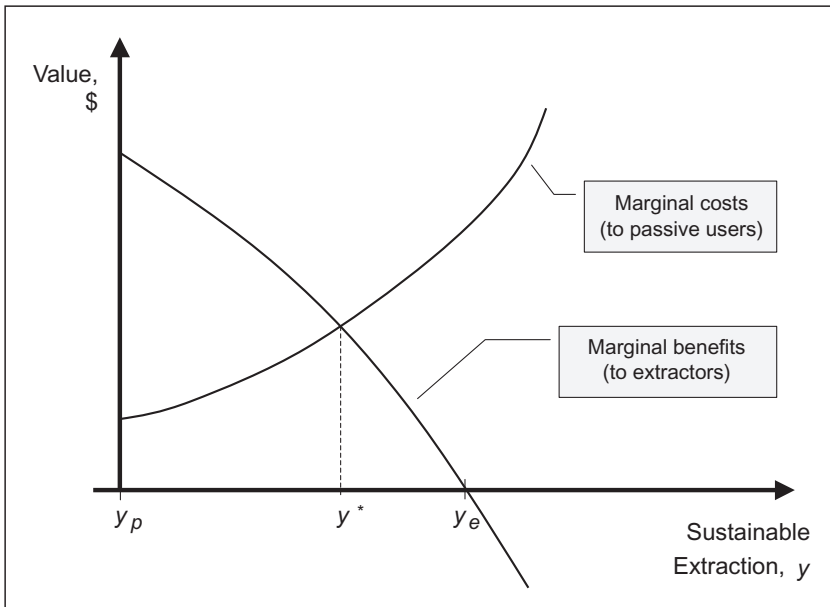
An example of this kind of balancing act is illustrated in Figure 1. The Figure illustrates a possible case for one species. The sustainable extraction level is drawn along the horizontal axis. Values are measured along the vertical axis.

Two marginal benefit (or value) curves as functions of the sustainable harvest (and consequently also equilibrium stock size) are drawn in the diagram. The declining curve represents the marginal (or additional) value of extraction to the extraction industry at various levels of harvest. This curve is declining because, generally speaking, each additional unit of extraction contributes less than the previous one to the extraction industry. The increasing curve represents the marginal cost to the passive and bequest use of the resource at increasingly higher levels of sustainable harvest (and consequently lower resource level).

As the diagram in Figure 1 is drawn, extractors maximise their benefits at y_e . So this is the extraction level they would want and would carry out if they had unhindered access to the resource. The passive users, on the other hand, maximise their benefits at y_p , i.e. the zero extraction level. The jointly optimal point, which we may identify with the social optimum in this simple diagram, is at y^* , which lies between

1. The exceptions would be resources that have negative impacts on human welfare and the case of very high rates of time discount (interest) relative to the intrinsic growth of the resource.

Figure 1. Marginal costs and benefits of extraction from a renewable resource.



the respective wishes of the passive users and the extractors. Extraction above this jointly optimal level implies more loss to the passive users than additional benefits to the extractors. Extraction below the joint optimum implies more loss to the extractors than reduction in costs to the passive users.

To find this optimal level of extraction, y^* , or even obtain a reasonable estimate of it, is an extremely difficult task. To do so requires full knowledge of the ecosystem, the utility and profit functions of the various users, and the ability to aggregate these components into a common whole. The task is made even more difficult by the realisation that y^* is not constant over time but varies with changes in the natural and economic systems. It is obvious that no real central authority can hope to accomplish this task.

However, it is useful to realise that if rights to use of the resource belonged to either group and they could negotiate without undue cost about the extraction rate, the jointly optimal extraction level, y^* , would indeed be realised (Coase 1960). The same result would apply if there were a perfect market for resource extraction. In both cases, good-quality property rights are the prerequisite for the solution.

It follows from the above that the value of living marine resources is not a fixed number. It is a function that depends among other things on the state of the resource

in question, of other resources, and of the economy, as well as on people's preferences. Although this value presumably exists at each point of time and for all states of nature, it will vary from one time to another partly as a function of human actions and partly as a function of variables outside human control.

The total value of living marine resources is simply the present value of the flow of net benefits from the resource from the current time onwards. The value of a unit of the resource is the change in this present value when the current resource quantity is increased by one unit. Formally we may express this as follows. Let V represent the total value of the resource, $\pi(t)$ the net flow of social benefits from the resource at time t and the rate of time discount by r . Then the value of the resource is simply

$$V = \int_0^{\infty} \pi(t) \cdot e^{-rt} dt$$

And the value of one additional unit of the resource obtained at time t , say, is given by the expression:

$$\frac{\partial V}{\partial x(t)}, \text{ where } x(t) \text{ represents the volume of the resource.}$$

As already mentioned, the first expression gives the value of the resource as a whole while the second measures the value of a marginal unit of the resource added at time t . This latter value corresponds exactly to a price. It is indeed the price at which a unit of the resource would be traded if a fully competitive market existed. In cases where such markets do not exist,

$$\frac{\partial V}{\partial x(t)} \text{ is generally referred to as the 'shadow price' of the resource.}$$

The utilisation problem

Societies worldwide, including Arctic nations, have traditionally defined living marine resources as common property. A resource is said to be common property if anyone belonging to a certain group (often the complete nation) is entitled to extract from or otherwise utilise the resource. Thirty years ago the common-property arrangement for living marine resources was virtually universal. Since then, there has been a trend to remove the more commercially valuable of these resources, especially fish stocks, from the common-property category. Nevertheless, today, at the outset of the 21st Century, the common-property arrangement is still the most common framework for harvesting living marine resources.

Common-property resources, as is well known (see e.g. Hardin 1968), are subject to fundamental economic problems. The relevant economic theory has been primarily developed for extraction activity (see e.g. Clark 1976), but as we will see, it applies with only minor modifications to other types of utilisation, as well as to many different types of utilisation simultaneously. However, for the sake of exposition it is probably most beneficial to start with the case of extraction utilisation.

In the utilisation of living marine resources, the common-property problem manifests itself in:

- excessive extraction capital and extraction effort;
- too-small resource stocks;
- little or no profit and unnecessarily low personal incomes;
- unnecessarily low contribution of the extraction industry to the GDP;
- a threat to the biological sustainability of the resource.

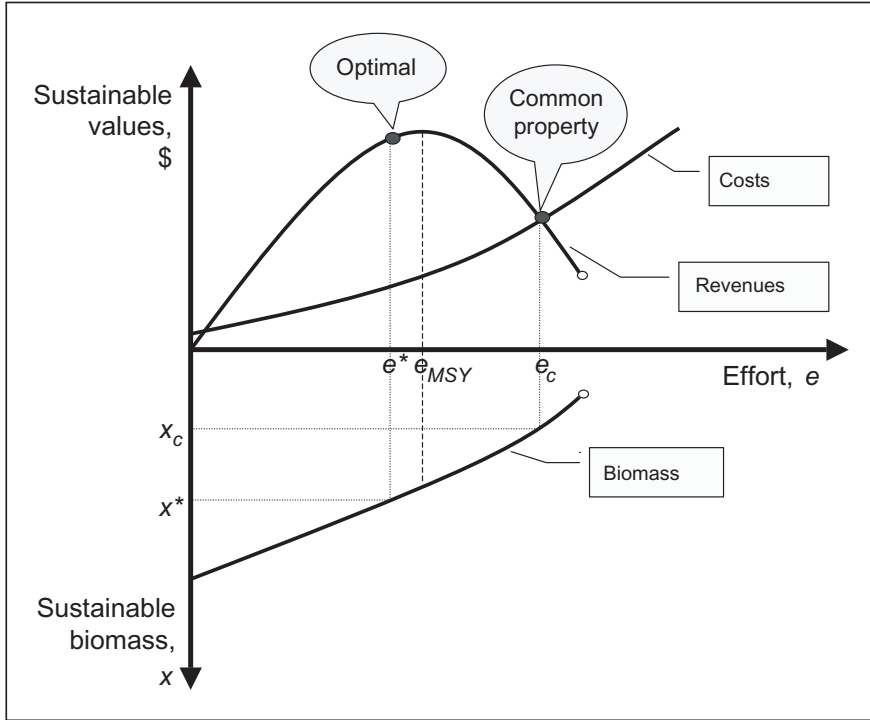
The essence of the fundamental problem is captured in the diagram in Figure 2.

Figure 2 illustrates the sustainable revenue, biomass and cost curves of a typical living-resource extraction industry as a function of extraction effort. Let us for convenience refer to the resource extraction industry as simply hunting (where the term 'hunting' may be interpreted to comprise both fishing and traditional hunting for commercial as well as recreational purposes) and the extraction activity as harvesting. The stock of the resource, since it consists of biological entities, is referred to as biomass. Effort may be regarded as the application of harvesting capital to harvesting. The revenue and biomass curves drawn in Figure 2 are sustainable in the sense that they would apply on average in the long run, if harvesting effort were kept constant at the corresponding level.

The upper part of Figure 2 is the well known sustainable-fisheries model initially proposed by Gordon (1954). Although designed for fisheries, this model applies equally well to hunting and, indeed, to the harvesting of any living resource². As illustrated, sustainable revenues initially increase with harvesting effort, but at a declining rate as the biomass is reduced. At a certain level of effort, sustainable revenues are maximised. If harvesting effort is increased further, sustainable revenues decline as the biomass level is reduced. Finally, at a certain level of harvesting effort, the industry is no longer sustainable. The stock collapses and there will be no sustainable revenues. As drawn in Figure 2, harvesting costs, on the other hand, increase monotonically with harvesting effort.

2. So for instance the economics of grazing and logging may be analysed with the help of the same diagram.

Figure 2. The sustainable utilisation model.



The lower part of Figure 2 describes what happens to sustainable biomass as harvesting effort is increased. Note that the level of biomass is measured downward so that the further down in the diagram the higher the biomass. The relationship between biomass and fishing effort, drawn in the diagram, shows that sustainable biomass is monotonically decreasing as harvesting effort is increased. If, as illustrated in the diagram, harvesting effort exceeds a certain level, the stock size becomes insufficient for regeneration—the hunting is no longer sustainable and a stock collapse occurs.

Looking at Figure 2 quickly reveals that the socially optimal level of the harvesting activity occurs at effort level e^* . At this level of harvesting effort, profit and the contribution of the hunting activity to GDP are maximised.³ Note that as the curves are drawn in Figure 2, these profits constitute a very high fraction (over 50%) of total revenues. This would not be unrealistic for many ocean fisheries. Note also that the optimal harvesting effort e^* is less than the one corresponding to the maximum sustainable harvest or yield, e_{MSY} . Consequently, the optimal sustainable biomass

3. This assumes that all the relevant prices correctly reflect economic valuables.

level, x^* , is comparatively high, as can be read from the lower part of Figure 2. The optimal harvesting policy, consequently, is biologically conservative. Indeed, the risk of a stock collapse or even a serious stock decline is generally very low under the optimal sustainable harvesting policy.

While the optimal harvesting policy generally leads to good profits and high sustainable levels of the resource, harvesting under the common-property arrangement leads to the opposite results. Under the common-property arrangement, harvesting will reach equilibrium at effort level, e_c . At this level of harvesting effort, costs equal revenues and there are no profits or economic rents in the industry. Thus, the net contribution of the extraction industry to the GDP is approximately zero⁴, and harvesting this natural resource contributes virtually no net benefits to the economy. This outcome is independent of the size and productivity of the underlying natural resource: no matter how large and valuable it is, harvesting under the common-property arrangement always leads to overexploitation and approximately zero profitability.

The reason for this unfortunate outcome is not difficult to understand. Assume for instance that harvesting effort is below the equilibrium level e_c . At this level of effort there will be profits. This does two things. First, it encourages the existing hunters⁵ to expand their operations in order to increase their individual profits. Second, it attracts into the harvesting activity new participants wanting to take part. Investment takes place and effort rises. As a glance at Figure 2 will demonstrate, this generates little or no additional harvest, but raises harvesting costs. Thus, profits decline. And this process will continue as long as there are any profits to be had. Equilibrium in common-property hunting will only be reached when there are no profits, i.e. at effort level e_c .

Compared with the benefits obtainable by optimal hunting, the common-property arrangement is wasteful. It generates little or no net economic benefit, and it also implies a much smaller biomass level. Indeed, as can easily be verified from inspection of Figure 2, common-property harvesting puts the resource under unnecessary risk and may easily exhaust the biomass altogether. Thus, hunting on the basis of the common-property arrangement may easily be unsustainable.

It is important to realise that individual hunters subject to the common-property arrangement can do nothing to avoid this wasteful outcome. When hunters share ownership in a common resource stock, each has every reason to grasp as large a share of the potential yield, and as fast, as possible. Prudent harvesting by one

4. Assuming, as is commonly done in economic analysis, that labour engaged in the harvesting activity is paid its reservation wage.

5. Be they individuals or companies.

hunter in order to maintain the biological resource will, for the most part, only benefit the other more aggressive hunters without preventing the ultimate demise of the resource. Thus, each hunter, acting in isolation, is powerless to alter the course of the hunting activity. His best strategy is to try to grasp as large a share in the industry as possible while the biomass is still large enough to yield some profits (Bjørndal and Scott 1988). This, in a nutshell, is what has been called the tragedy of the commons (Hardin 1968). The common-property arrangement in hunting basically forces hunters to overexploit the resource, even if they know better. As a result, the potential benefits, no matter how great, are wasted by the competition between users.

How can we accommodate other uses of the resource such as passive use, ecosystem use and bequest value within this basic and well known framework? The following describes a simple way to do this. Let the net benefits, i.e. benefits less whatever costs are associated with enjoying them, from all these non-extractive uses of the resource be described by the function $U(x)$, where as before, x represents the size of the biomass. For comparison with the presumed monetary benefits of the hunting activity, this benefit function is of course also expressed in monetary terms. Note, however, there is nothing special about money in this connection. The point is merely to measure all benefits on the same scale. Without loss of generality, this non-extractive benefit function may be taken to be positive and increasing in the level of the biomass.

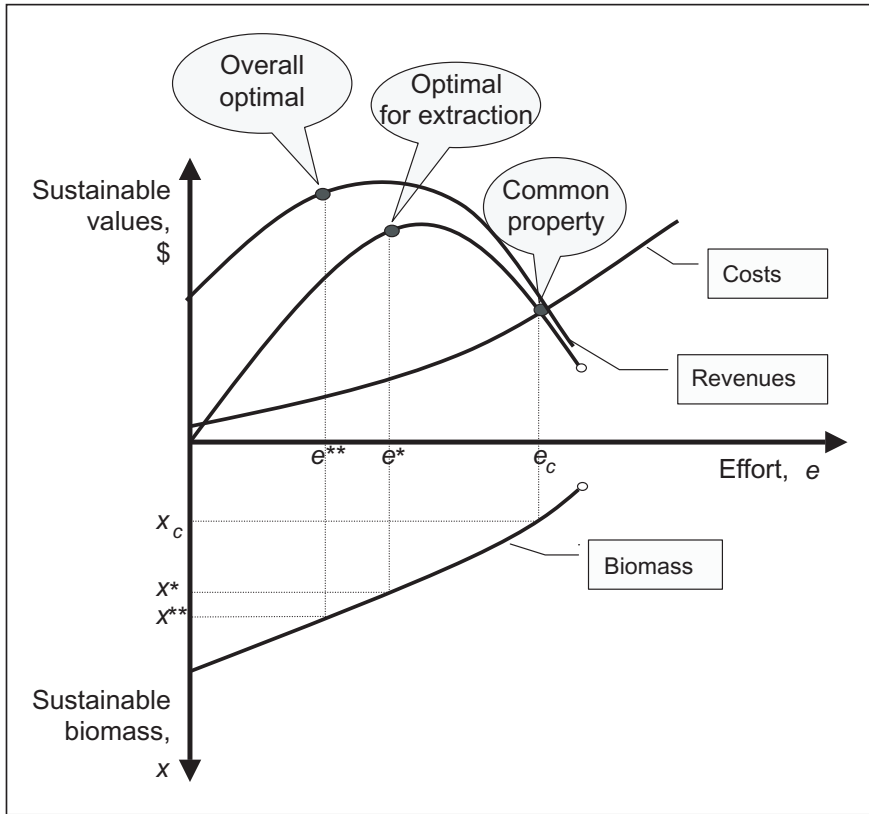
Now, with this new benefit function added to the extraction benefits, the sustainable utilisation model becomes as described in Figure 3.

The benefits from all uses of the resource are given by the top dome-shaped curve. This curve adds passive, ecosystem and bequest values, i.e. the non-extractive benefit function, to the extraction value given by the usual sustainable revenue curve. Given this overall benefit curve the socially optimal extraction effort is reduced and the corresponding sustainable biomass increased. Obviously, if the non-extractive benefits are high enough, the optimal extraction level will be zero. Similarly, if the extraction benefits are high enough, the overall optimal extraction will be very close to the extraction optimal one.

It is important to realise that under the common-property arrangement, the extraction demand, not the other three types of demand, will determine the extraction level and therefore also the biomass. Hence, with no extraction management the effort level will be e_c and the corresponding biomass x_c . Taking the alternative uses of the resource into account, this common-property extraction level is even more inferior to the optimum than is suggested by the standard fisheries model.

The extreme economic waste associated with the common-property arrangement is the reason why special management of extraction activities is needed. The funda-

Figure 3. Sustainable utilisation: all uses.



mental purpose of this management is to create conditions under which individual enterprise in the hunting sector will lead to maximisation of economic rents overall, not just from hunting, and, consequently, to the highest possible common good.

Management systems

Common-property hunting as described above has led to great economic waste and the demise of many valuable species around the world. Arctic regions, in spite of sparse habitation, have by no means been immune to the problem. Many Arctic whale stocks were decimated in the 19th and early 20th century. More recently, several Arctic fish stocks, such as Atlantic cod, Greenland halibut, capelin, and herring, have been severely overexploited under the common-property arrangement. Similar outcomes have been observed for certain other living marine resources in

the Arctic subject to the common-property arrangement, such as birds and seals and even polar bears.⁶

In recent decades, the attention of the global community has been increasingly turned to what has become known as the fisheries problem. Fisheries, it is well known, represents the last frontier of large-scale hunting in the world. This hunting activity has traditionally been based on the common-property arrangement. Consequently, the industry worldwide has been characterised by declining fish stocks, excessive fishing fleets and poor, or often negative, profitability. Globally the fisheries problem is very sizeable, representing the loss of tens of billions USD annually.

Given all this, it should come as no surprise that there has been considerable interest in finding remedies. A great number of social and biological scientists have been summoned to analyse the problem and come up with solutions. Research institutes and university departments have received grants to study the problem and, perhaps more usefully, educate young people in the art and science of fisheries management. Countless conferences and workshops have been organised to discuss the problem and disseminate the accumulated knowledge.

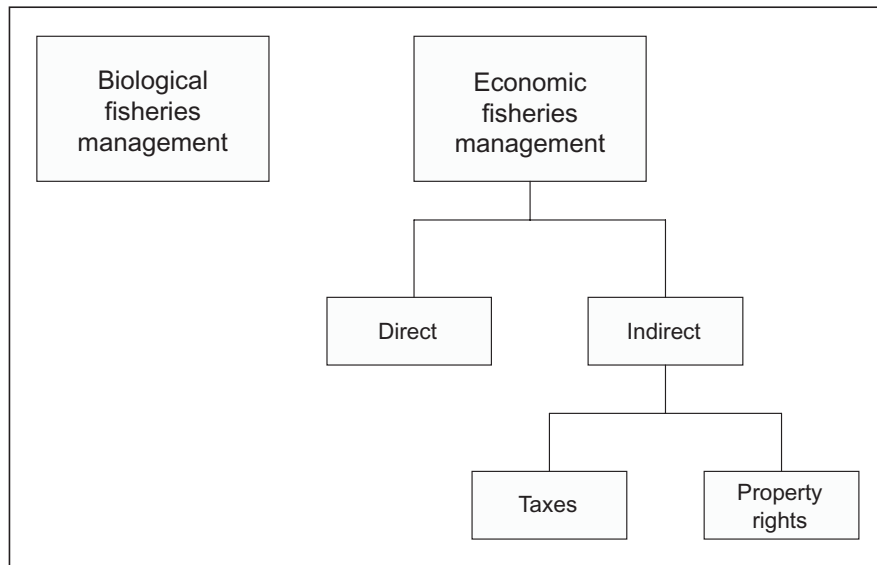
During this process a great number of different management schemes have been suggested and examined. Moreover, a large number of them have been tried in the various fisheries of the world. As a result, we can now state with a degree of confidence that we know what works and what does not work in fisheries management. It goes without saying that, although developed for fisheries, these management systems apply equally well to any hunting and indeed any other renewable natural resource extraction activity. Perhaps less obviously, the same management systems also work for the various types of resource utilisation, stemming from e.g. extraction demand, passive-use demand, ecosystem demand and the bequest demand as discussed in Chapter 1. The fundamental reason is that the socially optimal utilisation taking all different uses into account corresponds to a certain biomass size. Good management systems will be able to generate this biomass level at minimum cost, and those that are optimal for extraction activities such as fishing and hunting will also, in all likelihood, be optimal for the broader mix of demands.

Most of the fisheries management systems that have been suggested may be conveniently grouped into two broad classes: (1) biological management and (2) economic management, as illustrated in Figure 4. Economic fisheries management may be further divided into (i) direct restrictions and (ii) indirect economic management.

6. Several bird species have been hunted to extinction relatively recently. Among them one may mention the New Zealand Moas, the Mauritius Dodo and the North Atlantic Great Auk. The disappearance of some of the North American megafauna during the Pleistocene (about 8000 BC) has also been attributed to hunting pressure (Smith 1975).

The difference between these two categories is that direct economic management consists of explicit restrictions on the activity of the fishermen, while indirect management merely changes the incentives facing the fishermen. To make a long story short, the only fisheries management methods that on theoretical grounds have any chance of success⁷ are indirect economic ones.

Figure 4. Management systems: classification.



Biological fisheries management

Biological fisheries management, such as mesh size regulations, total allowable catch, area closures, nursery-ground protection etc, may conserve and even enhance the fish stocks. However, they fail to generate net economic benefits because they do not remove the common-property nature of the fishery that is at the root of the fisheries problem.

To see this, it is useful to take a moment to think about the effect of one of the more common biological management methods, namely Total Allowable Catches (TACs). To fix ideas, let us imagine the fishery is initially at a competitive equilibrium where there are no profits and the fishing effort is at e_c . Now, imagine that TAC restrictions are imposed, and implemented by effort limitations⁸. Moreover, let us assume, which is by no means certain, that these measures manage to increase the fish stocks. Then, at the prevailing level of fishing effort, the fishery will become profitable. As a

7. In terms of generating net economic benefits or rents.

8. E.g., limited fishing days for the fleet.

result, each company will have an economic incentive to increase fishing effectiveness in order to get more profits. Consequently, there will be a stampede to improve fishing vessels, build new ones etc. in order to partake in these profits. Thus, in order to maintain the TAC restriction, the operating time of the fleet will have to be curtailed further. This will go on until all profits will have been wasted in excessive investments. In the end, when this process has worked itself out and a new equilibrium been established, sustainable catches may have increased and the fish stocks improved. However, what really counts, the net economic benefits from the fishery, will be the same as before, namely zero.

Direct economic restrictions

Very much the same applies to direct economic restrictions. Such restrictions take various forms. There are limitations on days at sea, fishing time, number of vessels, holding capacity of the vessels, engine size, etc. Just like biological fisheries management, these methods fail to generate economic rents because they do not remove the common-property nature of the fishery. As a result, the fishermen are still forced to compete with each other for a share in the catch until all net economic benefits have been wasted through expansion of the fisheries inputs that are not controlled.

In addition to this rather negative outcome, it is important to realise that setting and enforcing biological and economic fisheries restrictions is invariably costly. Usually, these costs are quite substantial.⁹ Since, as we have seen, these measures do not generate any economic benefits, at least not in the long run, these costs represent a net economic loss. Consequently, we are driven to the somewhat distressing conclusion that these fisheries management methods—biological fisheries management and direct economic restrictions—may be worse than nothing!¹⁰

Indirect economic fisheries management

Indirect economic fisheries management may be divided into taxation and various types of private property rights.

Taxation

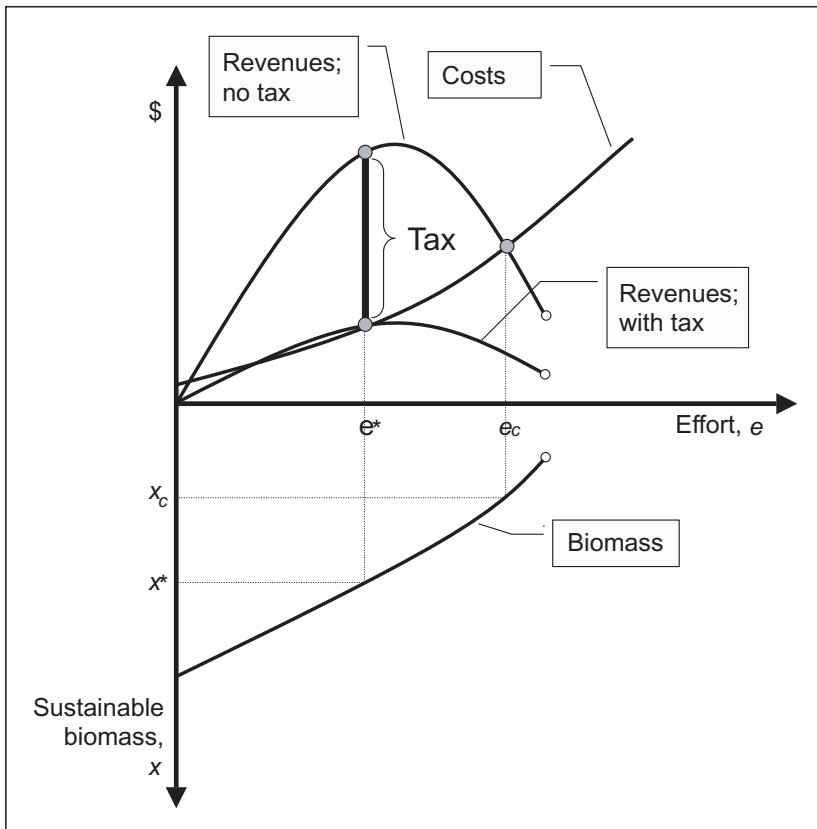
The appropriate taxation of the fishing industry can in principle induce the industry to operate in the social optimal way. Taxes can do this by reducing revenues, as illustrated in Figure 5 (e.g. tax on landings), or increasing the costs of fishing (e.g. tax on fishery inputs). In practice, however, there are severe technical and social problems with using taxes as a fisheries management tool (Arnason 1990). For this reason,

9. Fisheries management costs typically range from 3-20% of the gross value of the harvest (Arnason et al. 2000).

10. The reader should recall that these results apply not only to fisheries but to renewable resource use in general.

fisheries management by means of taxes has not been used in any significant ocean fishery so far.

Figure 5. The effect of tax on landings.



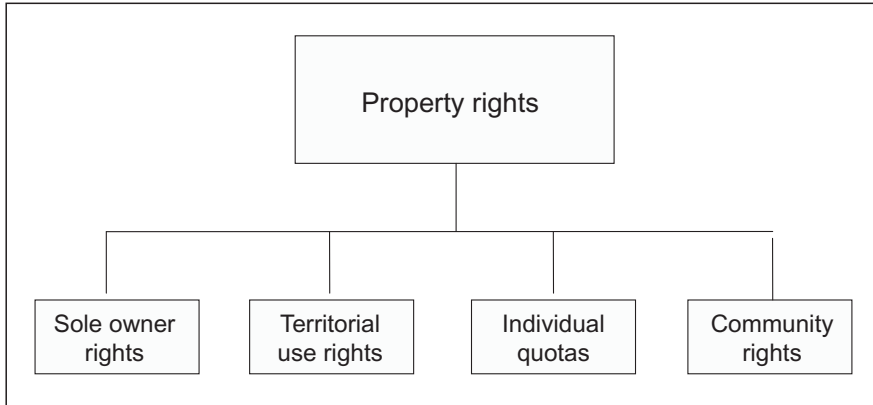
Property rights

Property-rights-based regimes, on the other hand, especially ITQ systems, have been widely applied and have met with a fair degree of success.

Property-rights-based approaches to fisheries management attempt to eliminate the common-property problem by establishing private-property rights over the fish stocks (Arnason 1996). Since the source of the economic problems in fisheries is the absence of property rights, this approach should in principle be successful in securing full economic benefits from the fishery.

Several types of property-rights regime have been employed to alleviate the fisheries problem. The most common of these are Territorial User Rights in Fisheries (TURFs), individual catch quotas and community fishing rights (Figure 6).

Figure 6. Types of property rights regime.



Territorial User Rights in Fisheries

Territorial User Rights in Fisheries (TURFs) consist of the allocation of a certain area of the ocean and the associated seabed to a single owner (user). Being perfectly parallel to a farm property on land, such a concept gives the owner every incentive to husband his TURF efficiently. Consequently, this arrangement works fine for relatively sedentary fish stocks, i.e. those that remain within the confines of the TURF. In fact, for those species, TURFs are close to being the ideal fisheries management system. Not only do they provide close to perfect property rights over the fish stocks in question, they also give the TURF holder a good deal of control over many of the environmental variables, e.g. seabed etc., on which the fish stock depends. For relatively migratory stocks, i.e. stocks that periodically migrate in and out of the TURF area, the effectiveness of TURFs as a fisheries management system is much reduced. Indeed, the indications are that the stock in question does not have to spend much time outside the TURF for its beneficial effects to be virtually nullified (Arnason et al. 1999). This, obviously, greatly reduces the applicability of this method.¹¹

TURFs have been employed in several shellfish fisheries around the world¹² with seemingly very good results. Some fisheries in Japan and some Pacific reef fisheries have also been managed on the basis of communal or group TURFs.

11. Unless, of course, the TURFs can be made sufficiently large.

12. E.g. oyster (USA), mussels and scallops (New Zealand), ocean quahog (Iceland).

Individual quotas

Individual quotas have been widely applied around the world with a fair degree of success. Transferable and perfectly divisible catch quotas are usually referred to as Individual Transferable Quotas or ITQs. If the ITQs are also permanent they constitute a complete property right just like a building or a piece of land. In that case, standard economic theory should apply and, barring market imperfections, the fishery should automatically reach a point of maximum profits (i.e., net economic benefits).

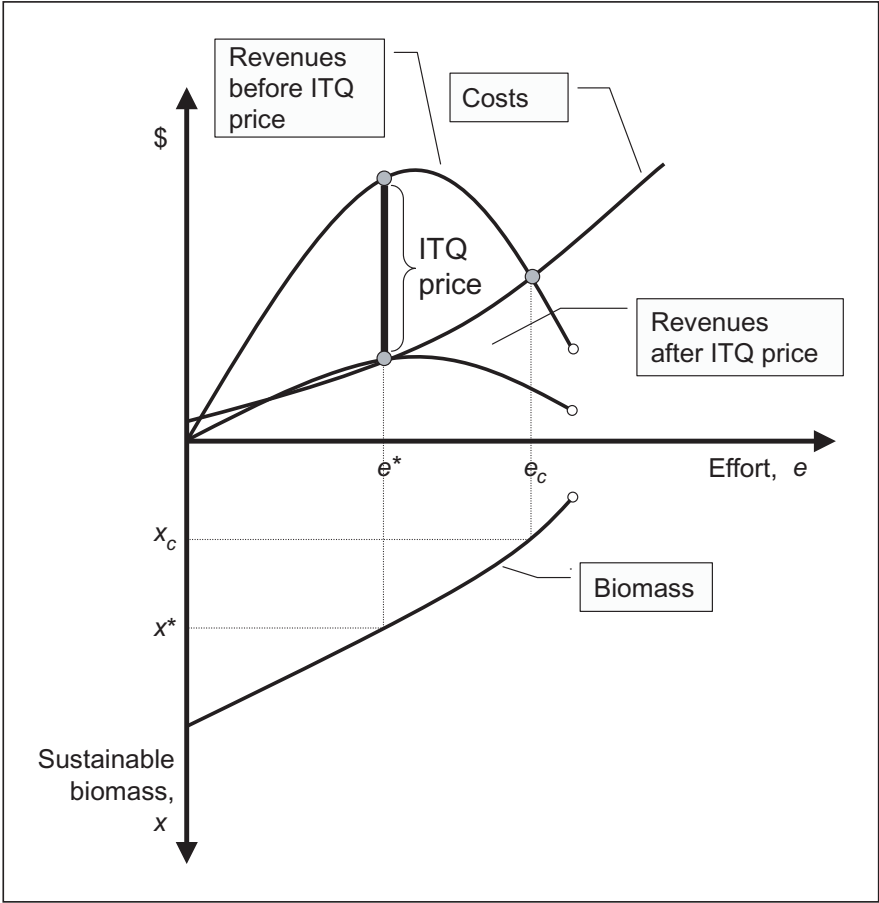
Individual transferable quotas do this essentially in two ways. First, secure rights to a certain quantity of harvest¹³ allow the holder to take this harvest in the economically most efficient way. This means that the harvesting takes place when the conditions in terms of market prices, fish availability, input costs and other operating variables are most favorable. Under ITQs there is little or no need to compete with other fishermen for larger catches by excessive investment and fishing effort. The second way in which ITQs further economic efficiency is by quota trades. Any two fishing firms of different efficiency will benefit by engaging in a quota trade by which the more efficient fisherman buys quota from the less efficient one. Thus, given quota tradability, there will be a tendency for only the most efficient fishing firms to operate in the fishery. Thus, under an ITQ system, there will be a convergence to the optimal use of overall fishing capital and fishing effort and to the most efficient fishing firms operating in the fishery.

But the efficiency effects of the ITQ system go even further than this. Provided the ITQs are permanent and defined as shares in the TAC, the system, unlike a taxation system, encourages the ITQ holders to work toward the conservation of the fish stocks. With permanent and transferable quotas the ITQ holders will find it to their advantage to preserve and, if necessary, rebuild the marine resources. After all, larger fish stocks mean more profitable fishing operations. Moreover, the market value of the permanent quota, as a share in the future TACs, depends on the state of the fish stocks and the sustainability of the fishery. The larger the fish stocks the higher the value of the permanent quota. Thus, the ITQ system provides the fishing firms with a powerful incentive to preserve the fish stocks and, in fact, the marine ecosystem as a whole. This incentive can be utilised to put part or all of the responsibility for conducting the fisheries management, i.e. enforcement, research and even setting the TAC, onto the shoulders of the fishing industry itself. This arrangement, often referred to as co-management or self-management, relieves the government of certain obligations and contributes to more efficient provision of fisheries management services.

13. Actually defined as a share in whatever TAC is set.

One of the most visible outcomes of a quota system is the quota price, i.e. the price by which quotas are traded in the market. This price, just like any other market price, represents the value of the marginal fish to society as a whole. At the same time it represents a cost to the user of the quota. After all, the quota used for harvesting fish cannot be sold in the market. Thus, the quota price acts as a deterrent to harvesting very much like tax on landings discussed above. A significant difference, however, is that the tax reverts to the government while the quota price stays with the members of the fishing industry (Figure 7).

Figure 7. The effect of the ITQ system.



Since the ITQ system goes a long way toward eliminating the basic common-property problem of fisheries and is widely applicable, there has now emerged something of a consensus among fisheries economists (see e.g. Shotton 2000 and the refer-

ences therein) that this management system offers the most promising general approach to managing ocean fisheries. This does not mean, however, that ITQs are necessarily the best management in all fisheries. For instance, a prerequisite for this method to work is that the individual quota constraints should be enforceable. If that is not the case, some other management method may be preferable.

Community Fishing Rights

Under a system of community fishing rights, exclusive harvesting rights are given to a community, e.g. group of fishermen, village, municipality etc. These exclusive rights may be to the whole fishery or to a certain share of the fishery, e.g. in the form of a community fishing quota. With this exclusive asset in hand, the hope is that the group will find a way to manage it efficiently. The belief rests on the well known argument that if property rights are clearly defined and bargaining and enforcement costs sufficiently low, then there is good reason to expect the parties involved to come to a mutually beneficial conclusion (Coase 1960). In the case of the fishery the mutually beneficial conclusion would be the introduction of an efficient fisheries management system.

The great advantage of communal fishing rights is that they are often (i) socially acceptable and (ii) facilitate effective enforcement of fisheries management rules owing to the social and physical proximity between the enforcers and the harvesters. Obviously for this advantage to be effective, the group or community in question has to be reasonably small and socially coherent.

The main disadvantage of communal fishing rights as a way toward good fisheries management is that this simply may not happen. It is important to realise that community fishing rights do not constitute a fisheries management system. They merely represent devolution of the fisheries management authority from a higher level to a lower level. The community will still have to deal with the problem of designing and implementing a good fisheries management system. In this the community may or may not be successful.

The fisheries management coming out of the community fishing rights arrangement depends on various factors including the decision-making process, group dynamics and coherence. The management system adopted can easily be just as inefficient as the one preceding the assignment of community rights. Therefore, to increase the probability of success, it is imperative to

- give fishing rights to as small and coherent a community of fishermen as possible;
- exclude alternative interests such as those of labour, suppliers of inputs and purchasers of outputs;

- set up a communal decision-making process to facilitate the movement to efficiency.

Thus, it is important to realise that community fishing rights are no fisheries management panacea. The fisheries management coming out of the community process can be anything and is always uncertain. At best it can approach and even exceed the efficiency of a well designed ITQ system. At worst it will simply replicate the common-property fishery.

Nevertheless, community management of fisheries may be the best alternative in situations where there are (i) political and social problems associated with introducing individual property rights and (ii) technical problems in enforcement of individual rights. These problems often pop up in artisanal types of fishery.

Conclusions

The management systems discussed above were developed for fisheries. Nevertheless, it should be clear that they apply equally to the harvesting from other renewable natural resources. This is particularly obvious for other living marine resources such as seals and whales. Clearly, it makes no difference for the management theory whether the marine resources in question are warm- or cold-blooded. The theory extends similarly to the hunting of terrestrial animals such as caribou, bears, foxes and birds. With regard to all the aspects relevant to management these resources are no different from fish stocks. The management theory outlined above even applies to utilisation of land-based resources such as forests and grazing areas.

More importantly, these results concerning management systems for extraction purposes also apply to the overall optimal use of the resource taking all different uses into account. Thus, to generate the overall socially optimal use of for instance seal stocks, it might be a good idea to allocate property rights to the harvesters. The conservation demand, stemming from passive use, ecosystem and bequest values, would then simply purchase these rights from the harvesters until the socially optimal point is reached. Under perfect market conditions this would happen automatically. In the real world, there could be problems associated with the public-goods nature of the conservation demand (Arnason 1999).

So, for all the living marine resources found in the Arctic and whatever uses they can be put to, the same management theory applies. The most efficient management regimes are in all cases property-rights-based ones. The practical problem is merely to choose between the three broad classes discussed above, namely TURFs, individual quotas and community rights. For stationary resources such as forests and grazing areas, the most efficient property-rights arrangement would be TURFs. Note that TURFs are basically the traditional farm arrangement where each farmer

holds a given tract of land. With more migratory resources, such as many types of animal, individual harvesting quotas and community property rights would be more appropriate. Which of the many possible variants within these two categories is the most suitable depends on the particulars of the situation.

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Comparative economic systems and management of fishing and hunting resources in Greenland

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The participants in our workshop have been asked to assess possibilities for socio-economic research related to management of the exploitation of living marine resources in West Greenland. In terms of regulatory regimes, this paper aims at introducing comparative systems analysis as an approach to different ways of resource management. Comparative analysis suggests the possibility of three classes of economic system: competitive interactions between resource users, regulated interactions, or co-operative interactions. Going further, an expectation of long-term dependence on natural resources necessitates the choice of the best practice in terms of both strategy and tactics. Nowadays, the institutional relations of Government organisations' policies and behavior are, in general, reflected in the question of which type of interaction, expressed within the framework of a socio-economic system, represents 'best practice'. More briefly—which system may best serve the ends of efficiency, sustainability and economic viability? After all, these are the goals most often articulated in debates on management systems. A point of caution is appropriate, though—it seems that the expression 'management system' may confound the organisation of management regimes (science, markets, bureaucracy or co-determination) with global elements of socio-economic analysis. Organisation is one component, the regulatory instruments are a second, and the economic decision-makers a third—but behind all that, some basic comparisons of economic systems may be useful in understanding how this issue could be incorporated in social-scientific analysis. In essence socio-economic systems become the subject of discussion, and this is not a simple question even today, some ten years after Fukuyama declared 'the End of History'.

We may conduct descriptive and empirical analysis of these issues in two ways. Either we could dig into phenomena as they are, or we could discourse on phenomena as they might be. At the present time, as often in its post-war history, the Greenland economy is in a period of transformation. However, historical evidence on previous experiences with different allocative regimes is in place. Moreover, in the comparative context, experiences from other Arctic regions exist and can be included in the analyses. It is the last-mentioned approach that I have chosen for this presentation on a comparative-systems approach to the questions raised at this workshop.

Obviously, this puts the following questions on the agenda:

- what is comparative analysis of systems?
- how can they be analysed in the context of the Greenland economy? What has been the experience with the dichotomies between planned vs. free-market economics and collective vs. private ownership in the post-war development of Greenland?
- are there any alternatives beyond either a free-market system, or having regulation impose more State planning and control on decentralised decision-makers? In relation to this, it is emphasized that a 'third co-operative or participatory way' has frequently been aired as something more in accordance with original Inuk cultural values.
- what do experiences with cooperatives in Greenland and other Arctic regions tell us in this context?
- what modified research questions could be suggested as a consequence of a 'brain-storming' based on these questions?

Of course a presentation of this kind does not pretend to be a full-fledged and finalised project description. The organisers of this workshop have asked us to line up proposals on research questions. My presentation will conclude by doing just that.

Comparative systems in the Greenland discourse

Central elements of comparative empirical analysis are descriptive analyses of similarities and differences of different social and economic systems. Advanced statistical and econometric studies may contribute further, by evaluating a hypothesis or a theoretical model. Regarding economic sustainability, the effects of the exploitation of renewable and depletable resources are crucial. In terms of economic viability, an affinity analysis evaluating the viability of combinations of social coordination mechanisms (planned, free-market or associative) on the one hand and ownership regimes on the other would be the focal point.

Social coordination mechanisms considered here are often:

- central command and planning economy;
- market socialist economy;
- cooperative and participatory economy;
- social-market capitalist economy;
- regulated-market capitalist economy;
- laissez-faire-market capitalist economy.

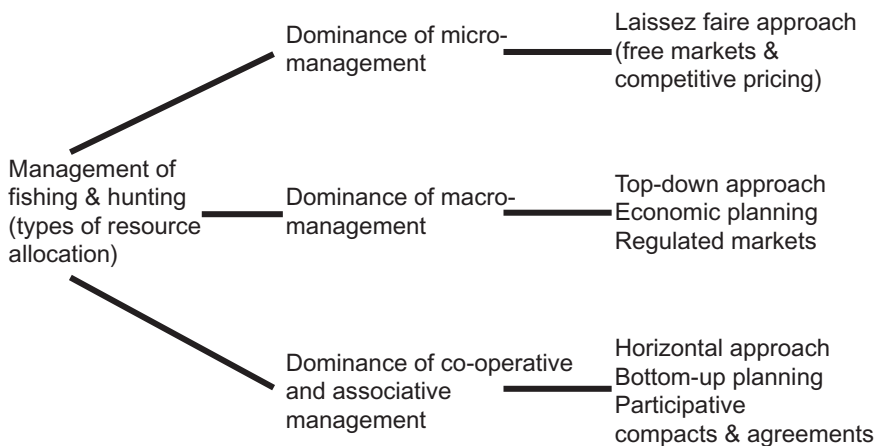
And of course:

- hybrid forms.

Ownership structures can be: state ownership, mixed ownership (joint ventures), traditional private ownership, employees’ or suppliers’ ownership, and co-operative ownership in accordance with the Rochdale principles—still valid globally in different types of co-operative.

Here we will only apply a rough sketch of the comparative analysis of economic systems. Modes of regulating the interaction between users and living resources illustrate different social and economic systems. The main question is, whether the economic system impacts resource harvesting or not? Three main economic systems have, to a greater or lesser degree, been present in Greenland’s economic development since World War II (Figure 1).

Figure 1. The Greenland economy—laissez-faire, planning and regulations, or associative management?



Regulatory regimes are either based on markets and competitive pricing, on top-down planning and regulations, or on bottom-up mechanisms of associative planning (compacts and agreements). To each of the regimes, different regulatory instruments could be presented in order to analyse how well these instruments underpin efficiency, sustainability and system viability. In the Greenland context, the sector for tradable goods (fishing, fish manufacturing, and hunting) is especially important for the country’s aspirations to more self-reliance and a higher degree of economic independence. The question is, which regime is most worthwhile to develop for this sector.

Often it is taken as self-evident that the only efficient regime is the laissez-faire approach, despite the fact that Greenland has never quite managed to implement such a system. What has functioned hitherto has been either the top-down approach (mainly in the 60s and 70s) or a hybrid of this with private ownership in the sector for non-tradable goods and services. And this has actually fared quite well in terms of ability to promote growth and development, based on value added in fisheries and on the Danish block grant to and state expenditures on and in Greenland.

My presentation today will not address the issues of descriptive analysis and analysis of sustainability mentioned above. I will instead address the questions of comparative efficiency and economic viability.

Comparative systems in Greenland's post war economic history

The Greenland economic system today is not characterised by overall central planning so much as by the above-mentioned hybrid system, however without the elements of central economic planning and regulated markets. Government and corporate bureaucracies are dominant; monopolies are prevalent—in some cases natural; and on a limited scale, we see small-scale private ownership of companies, mainly in the sector for non-tradable goods and services. This constitutes an economic system of the type often seen in economies blessed by windfall gains, which may distort the economic structure by squeezing the sector of tradable goods and services and impacting the sector of non-tradable goods in a growth-oriented direction, although empirical research suggests that this tendency has weakened in Greenland over the years (Winther 2000b). The phenomenon is described above in the article by Poppel, Rasmussen and Winther as the 'Dutch disease'. But that phenomenon being the case, it cannot be ascribed to an evil 'socialist will' among Danish politicians in the 50s—it is due to the specific geographical circumstances that Greenland shares with other Arctic regional economies. Economies characterized by this syndrome may have some features in common with Greenland—the Government sector is often dominant, for example. In Greenland this tendency was followed in order to maintain a supply of goods and services on a par with living standards in the rest of Scandinavia. A pragmatic view on development, first from state planners and political decision-makers in Denmark and later from decision-makers within the Home Rule government, has led to this situation. The different phases of Greenland's development describe the above-mentioned social coordination mechanisms very well (Winther 1999, 2000a, 2003):

Phases of development:

1950–1959 (The Greenland Commission of 1950): Liberalisation, markets and private ownership.

This was a strategy based on private initiatives in the sector for tradable goods (fishing and sealing). Furthermore, it was believed at that time that competitive markets and traditional private ownership combined with a welfare state, as in the rest of Scandinavia, could work in Greenland. This proved false. By the end of the 50s it became obvious that private investors showed little interest in investing in fishing and fish-related industries.

1960–1978: (The Greenland Commission of 1960; The Home Rule Commission): Central planning and state ownership.

After a debate in the Danish Parliament in 1959 on the implementation of a large-scale industrial program established and implemented by the Danish State, a decision was made to establish state-owned fishing vessels, factories and infrastructure in Western Greenland. Central physical and economic planning from Copenhagen, organised as 5-year investment plans, was adopted. A central planning agency—the Greenland Council (Grønlandsrådet)—and investment planning proved to be a tremendous success in terms of material development. State ownership and State initiative by the Royal Greenland Trade (KGH) and Greenland's Technical Organisation (GTO) was the backbone of the state-owned and -operated regional economy. Private initiatives in the sector of non-tradable goods could rely on Government demand for goods and services, and private initiatives to set up small firms could often rely on help from government companies and authorities.

1979–1988: (Industrial policy plan, 1980; The Home Rule Dept. of Trade's 5-year development plan of 1985): Participatory and cooperative firms and central industrial planning.

After the inception of Home Rule in Greenland, ownership and central planning from Nuuk became dominant in the sector of tradable goods and services in fisheries and hunting. Nevertheless, efforts to promote decentralisation and 'Greenlandisation' were carried on by the appointment of 'production committees' in the Home-Rule-owned plants and by the appointment of 'shop committees' in the KNI¹ chain of retail stores. These days were the heyday of experimental university Marxism in Greenland and of attempts to encourage the establishment and operation of 'co-operative societies as a bulwark against capitalism'.

1989 on: (Unit price committee's report of 1998; OECD report of 1999; structural policy action plan from the Home Rule Dept. of Economy of 2000; The Self-government Commission, The Danish State and the Home Rule Common Committee's report of 2003): Neo-liberalism, back to the ideas of the fifties.

1. KNI A/S, Home-Rule-Owned successor to 'Kalaallit Niuerfiat', the Royal Greenland Trading Company.

Instead of operating the Home-Rule-owned companies as an appendix to the fiscal budget with a soft budget constraint, it was decided to launch a privatisation program through state-owned stock-holding companies. In order to liberalise and support the functioning of free markets, a supervision of monopolies was established through a Competition Committee (Konkurrencenævnet). Traditional privatisation strategies for the large state-owned corporations (KNI; Tele Greenland, Royal Greenland etc.) were presented to the public, and neo-liberal economists and Home-Rule civil servants presented reports and policy papers with clear political inclinations towards value-impregnated statements. The first results of a failed privatisation and a failed liberalisation were seen in 2000/1 with the privatisation of KNI and the liberalisation of air traffic in Greenland.

A detailed assessment of the efficiency and the viability of these social and economic systems cannot be presented here. I have elsewhere at length discussed both the theoretical implications of different economic schools and the empirical research that can be performed on the limited statistical database we have. The general picture is that large-scale attempts to encourage reforms on liberalisation and privatisation have failed in post-war Greenland. The hybrid system of Government and private initiative described above has proved itself viable and efficient in terms of ability to generate economic growth and development (Winther 1999, 2000a). This alludes, of course, not so much to pleasing ideological consequences as to the harsh realities that are so difficult for neo-classical and neo-liberal economists to face. Of course there were and still are many problems related to centralisation of the Greenland economy—decentralisation may be attainable in some areas of political and economic decision-making, and this raises the question of the viability of a third way: a participatory and co-operative system in Greenland.

Future prospects and forgone experiences

In terms of management and allocation of resources, the associative or participatory model addressed in Figure 1 need not be solely co-operative. What constitutes its defining element is the concept of participation in decision-making, and in ownership and management of resources. The last-mentioned has, among colleagues within the framework of North American Arctic social scientific research, also been labelled 'co-management'. It refers to a common decision-making process—formal or informal—between authorities and other agents in the management of fishing, hunting and other resources. This term is considered an acknowledgement of the aboriginal peoples' right to use the resources, to participate in the management of them and to equal rights in the exploitation of new resources. Organisationally and administratively this entails corporate bodies where fishermen and hunters participate in co-operation with scientists (biologists), civil servants and planners (Caulfield 2000).

While this may bear some resemblance to political and administrative participation and self-government structures, this is only a part of what I have presented as the participatory, cooperative and associative system—the alternative to traditional Government and market structures comprises more than that.

As an alternative to these two social coordination mechanisms, we can array the participative types of ownership and decision-making as consumers', suppliers' and workers' cooperatives, employee 'take-overs' of firms from perpetuating owners, suppliers forming partnerships or stock-holding companies, deferred profit-sharing to employees and franchising or leasing Home-Rule-owned assets. Experiences abroad with employee ownership paint a picture of firms that, comparatively speaking, fare well and operate with higher growth rates and better financial results than those of traditional firms. That is indeed not always the case, when it comes to co-operatives, which in some cases dragged out a miserable existence in post-war Greenland. The closest comparisons to co-operatives are of course similar firms in other Arctic regions. In one case, where we have a comprehensive database we can rely on, the picture is quite different. The case of Nunavik co-operatives constitutes an anomaly—here we see a viable sector based on multipurpose co-operatives. In terms of profitability and a proxy for productivity the Nunavik co-operatives managed to create a steady annual growth—for some since as long ago as 1968. The Federation of Co-operatives in New Quebec has developed into a totally independent federation, completely self-financed and independent of financial support from either the Quebec Provincial government or the Canadian Federal government (Winther 2001; Winther and Duhaime 2002).

One may ask then, why it went wrong in Greenland:

- the suppliers' co-operatives (fishermen and hunters) had a non-essential existence between on the one side a dominant Danish or Home Rule State sector and on the other side a weaker traditional private sector. This meant that the suppliers' co-operatives were reduced to operating only in settlements where no private investors were interested in placing their capital. Moreover, in towns, the presence of both a Royal Greenland Trade factory and a co-operative often meant that the co-operative was restricted to production that neither private investors nor the State sector found profitable;
- lack of education in and knowledge of co-operative ideas and business operations critically hindered the spread of this type of company. There was a lack of knowledge of the principle of dividends issued in proportion to how much is bought from or sold to the company by its members. In general, opinions were hostile—possibly because the co-operative idea was a 'top-down' initiative from the Danish State, from the Danish consumers' movement or from political parties in Greenland. A cooperative movement founded by experts

- without an accompanying grass-roots mobilisation is probably less viable than the model started from the bottom up;
- the development model for Greenland is a small-scale example of the Marshall Aid to Europe after the Second World War. The consequences of this exist even today in post-colonial Greenland. In a way, we could say that the indigenous population was put to sleep by benevolent initiatives from the Danish colonial masters, and is still waking up. This created a different story from that seen when former British and French colonies obtained independence from their colonial masters. That was occasionally more violent and bloody. Yet, colonialism imposed a Scandinavian way of life on the Inuit, and the ramifications of that phenomenon are still present in Greenland. There is a widespread lack of entrepreneurship and a lack of social innovations of the kind attached to a cooperative movement. Even traditions related to subsistence harvesting suffer as a consequence of this. Talking about grass-roots initiatives we have implicitly emphasised the crux of the matter. A cooperative initiative is a defensive precaution against a hostile laissez-faire market society. It is a self-reliance movement set up to fulfill workers', consumers' and suppliers' needs—needs for stable and secure incomes, needs for inexpensive quality goods and services, and needs for a place where self-employed producers can sell their produce and services. If a government guarantees all that anyway, the very base for a cooperative disintegrates;
 - the geographical conditions in Northern Greenland could not secure a stable and continuing production. Many suppliers' cooperatives were located in the North where waters are closed during winter-time owing to ice, making it impossible to transport processed fish to consumers in the south or to receive inputs to maintain the settlement plants;
 - opposition among Danes belonging to the post-colonial elite and opportunism among Greenland politicians was an important constraint to the development potentials of the co-operatives. Rent-seeking, and attempts to hold on to power both in the economic and the political sphere, could, along with deficient comprehension of the co-operative idea, explain opposition and disapproval regarding co-operative takeovers of Danish State operations in Greenland after 1979.

Modified research questions

The comprehensive research question that follows from my presentation above of the elements of comparative system analysis relates to whether and how social coordination mechanisms are compatible with management regimes, or rather regulatory instruments, when it comes to users' interactions with living resources in Western Greenland. The gist of this question bears on basic questions of economics—how are the resources harvested, how are they allocated and to whom are they

allocated? In turn, this can be carried further to the question of social coordination mechanisms, resource allocation, and types of ownership, all crucial to the solving of these basic problems.

This involves both the more common allocative mechanisms, with Government planning and regulation at one pole and laissez-faire private ownership markets at the other, as well as the different ownership structures described above. Additionally, this calls forth the question of allocative mechanisms and ownership and the compatibility of these concepts with Inuk values. If these values are still community, co-operation and sharing, the economics of participation and self-management may further clarify a management regime operating as a best-practice approach and in accordance with these values.

Analysing whether this is in fact an alternative cannot ignore historical facts pointing to a bad record for hunters' and fishermen's co-operatives in settlements and some Greenland towns in the eighties. An apparent inconsistency when one looks at co-operatives in other regions. Nunavik, especially, has had success with multipurpose co-operatives in settlements and towns, suggesting that co-operatives could be an option provided that there is in existence an institution-building ethos that could promote these participatory firms.

Some exploratory research questions could be raised within the framework of the system approach:

- will competitive markets work in fishing and hunting in Western Greenland? What are the costs of running markets (transaction costs, potential loss of natural monopoly, the costs of distribution of goods and services to unprofitable parts of Royal Greenland and the costs of unprofitable activities, e.g. in Nuka Inc. and Neqi Inc.)?
- in terms of comparative efficiency, economic viability and increased economic self-reliance: What type of ownership would be the best-practice privatisation of hitherto Home-Rule-owned activities in fishing and fishing industries? What type of ownership: traditional stock-holding, partnerships, cooperative societies, employee or suppliers' stock ownership, people's stock-holding companies as in Nunavut, Nunavik or Alaska? Or joint ventures between Home-Rule government and private Greenland investors, trans-national 'take-overs' and 'buy-outs', joint ventures between trans-nationals and the home rule?
- in terms of how far development and resource management should be left to laissez-faire markets, this question comes to mind: How much should this be regulated by Home-Rule authorities? What instruments of regulations should be applied (administrative decree or economic measures like tradable permits or taxation)? Could horizontal co-operation and networks of users and stake-

- holders replace or complement regulations? Which type of regulation saves the resource for future generations?
- how much can be accounted as net debit balances in a balance-of-payments account for Greenland owing to capital exports and incomes in fishing in relation to unregulated economic activities? How much value added is lost owing to exporting raw resources (shrimp and fish) for manufacturing in Denmark and abroad?
 - can the Home Rule administration mobilise sufficient resources and competences to run a regulatory regime in fishing (e.g. TAC's, permits, taxations, fishing inspection, monopoly control)?

Regarding data compilations, historical data since the fifties are crucial to the descriptive analysis mentioned above in relation to comparative analysis of systems. Moreover, it seems important to analyse historical data regarding the ability of growth patterns and management regimes (including the laissez-faire regime) to affect the sector of tradable goods (fishing and fishing industries and hunting). These data are diagnostic for analysis of economic viability and efficiency. Yet, these terms may collide with sustainability suggesting the inclusion of resource constraints on maximisation of catch, revenues and profits.

In relation to theoretical considerations, a conceptualisation is needed to bridge the gap between socio-economic analysis—as a part of social sciences—and the natural-science approach. Their understanding of socio-economics or, in particular, the analysis of management regimes as they are often understood may differ substantially. We referred to a term from political science—'corporatism'—and to the inclusion of local stakeholders—'co-determination' or 'co-management'. These regimes and potential alternatives to them could be the point of departure for a concise development of theories of management or regulatory regimes. Constructing a common framework between the faculties is still a hard nut to crack.

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III. Social and economic research related to the management of marine resources in West Greenland: synopses of workshop presentations

Synopses of presentations given at the workshop organised by and held at the Greenland Institute of Natural Resources, Nuuk, 18–20 November 2003.

Ecogreen: setting the scene

Ecogreen: setting the scene

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Ecogreen is conceived as an integrated program of research into the West Greenland marine ecosystem. The Arctic marine environment is vulnerable to the impacts of human activities, and climate change in the Arctic is expected to be larger than in lower latitudes. The West Greenland marine ecosystem is productive, supporting large fisheries, and Greenland is highly dependent on marine resources through a complex mosaic of large- and small-scale exploitation of different ecosystem components at several different trophic levels.

The initiative for Ecogreen came from the senior levels within the Greenland Institute of Natural Resources. A workshop was held at the end of November 2001 to discuss research priorities and attracted nearly 40 marine scientists. A smaller group then drafted a research programme which was completed by July 2002, and some minimal infrastructure funding began to be sought near the end of 2002. An Expression of Interest was submitted to the EU 6th framework in late 2002, and in 2003 GN was seeking funding avenues, setting up a steering committee &c.

The overall objective of the program was to establish a scientific basis for a long-term ecosystem-based management of natural resources in West Greenland waters, including improved knowledge of physical and biogeochemical interactions and ecosystem structure and functioning.

Physical and biogeochemical studies would include modelling of the coupling between atmosphere, sea-ice, and ocean currents, based on high-resolution physical observations and coupling physical and biogeochemical models with ecological models.

Ecosystem structure and function would be investigated at all trophic levels, including:

- plankton: pelagic systems and pelagic-benthic coupling;
- fish and shellfish: stock structure, trophic relations, and impact of environmental change;
- marine birds: distribution, especially with respect to biological oceanography, prey relations, production;
- marine mammals: numbers, distribution, preferred areas, movements.

It was envisaged that fine-scale field work would be planned for the Fylla Bank (off Nuuk), Julianehåb Bay (south Greenland), and Disko Bay in northern West Greenland. For some species—for example cetaceans or birds—wide areas would be surveyed for distribution, numbers, and movements,

A proposed management structure included a science coordinating committee, composed of the leaders of research teams in disciplinary areas, with a program manager to coordinate the use of common facilities. The science coordinating committee would report to a steering committee composed of senior managers in marine science institutions. Funding could come from allocation of block funding to program areas by the steering committee, or individual projects could seek their own funding.

Social, institutional and economic scientists were not present at the first workshop, but it was observed towards its close that if the research program was directed toward enabling sustainable management of resource exploitation, the social and economic aspects of resource use, and the management of exploitation, should be an integral part of it. Therefore, social and economic studies were incorporated into the research program when it was written. Research topics should include the structural and institutional drivers of human behaviour as well as economic studies of interactions of human activities and the ecosystem. However, in order to review proposals for a socio-economic research program, a workshop was planned to prioritise research areas and topics. The present document reports on that event.

Social sciences within Ecogreen

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Introduction

Ecogreen is a long-term research project on ecosystem-based management in West Greenland initiated by the Greenland Institute of Natural Resources. Historically, social science research within Ecogreen was included as an afterthought in the project development process. General objectives and natural sciences content had already been discussed and arranged at a workshop held in Nuuk in 2001 (Jarre 2002).

The outcome of the 2001 workshop mainly focused on strengthening natural and physical knowledge of the West Greenland ecosystem, but it also included some consideration of needed social and economic research from a natural science point of view. The workshop pointed out the necessity of a better knowledge of the impact of human activities on the ecosystem and, marginally, the necessity of exploring other management regimes, such as co-management.

This synopsis presents a framework for the integration of social sciences into the Ecogreen project from a social science point of view. It emphasises key points and connections between natural and social sciences that need to be addressed in the structure and content of the project.

Objectives of the Ecogreen project: what does ecosystem-based management (EBM) imply?

The overall objective of the project was set according to the European Union (EU) research grant application: 'to establish a scientific basis (natural and social sciences) for long-term ecosystem-based management of natural resources exemplified by the off-shore marine ecosystem off West Greenland'.

Secondary objectives were identified, but placed at the same level, such as (a) quantifying and improving the understanding of physical and biogeochemical interactions and (b) implementing a plan to transfer the West Greenland experiences to a generic approach for EBM. In fact, the Ecogreen project carries several tightly connected secondary objectives that do not refer to the research tasks (Figure 1).

These are:

- establishing a knowledge base for the West Greenland ecosystem and human interaction in order to support management;
- operationalising ecosystem-based management in West Greenland;
- contributing to the building of a generic model of EBM applicable elsewhere.

To undertake these research tasks, the first issue to address is the definition of ecosystem-based management. This concept is still in a development phase and refers to two different conceptual approaches: 'ecosystem' and 'management'. In international treaties the concept has evolved from 'ecosystem-based management' (EBM) to 'an ecosystem approach to management' (EAM) (cf. Section I, 2.2.1 above). Thus the first step is to establish the meaning and underlying goals of EBM or EAM within both the Ecogreen scientific community and Greenlandic society. In fact, this project was initiated by the Greenland Institute of Natural Resources in response to growing international interest in the ecosystem approach. It is then essential to ensure that this management-oriented research project be also well connected to social demands within Greenlandic society, thus ensuring a common base for objectives.

From establishing a knowledge base to implementation of EBM

Natural sciences research within Ecogreen will seek to establish and reinforce the knowledge base concerning the ecosystem itself, its components, functions, dynamics, etc. The contribution of the social sciences is dual: understand how human beings relate to the West Greenland ecosystem, and how to implement the EBM concept in the Greenlandic context.

The first question goes beyond research on the impact of human activities on the ecosystem to address research themes like the perception of ecosystem, its components and its functions in Greenland's social organisation. The second question solicits research fields such as the analysis of institutional change, management regimes and decision-making processes. One needs to keep in mind that both research questions are tightly related to the conceptual approach of EBM and respond to the quest to implement EBM in West Greenland. These questions are included in the Ecogreen proposal (Figure 2).

In such a project, relationships between produced knowledge and its final application require profound thinking in terms of content as well as in terms of format. One question to address with the other partners (institutions or other stakeholders) is how to use the generated knowledge in order to institutionalise EBM. This question relates to several issues:

- what constitutes valid knowledge in the management system?

- what is the institutional capacity to integrate the produced knowledge?
- how is knowledge used in the system?
- what knowledge format is to be used in the management system?

'What is valid knowledge' looks into the role of both scientific knowledge and local knowledge in the management system. It relates to the question of knowledge format in the management system. Involving stakeholders (managers, users, interest groups) in decision-making requires that the knowledge base for management be made understandable to everybody. An understandable and available knowledge base is also a step towards more transparency in the management system.

From EBM implementation in West Greenland to a generic model applicable to the EU context

It is unlikely that Ecogreen would be sufficient by itself to develop a complete EBM model applicable elsewhere. Nevertheless, it gives a unique opportunity to enrich knowledge on ecosystems, largely usable elsewhere, and to analyse theoretically and practically a few chosen key points in the implementation of EBM.

The issue of valid knowledge and knowledge format may be one key point. One can also wonder in which cases or contexts EBM or EAM really brings added value to the management compared with other management approaches.

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Figure 1. Social sciences within Ecogreen—A framework for integration.

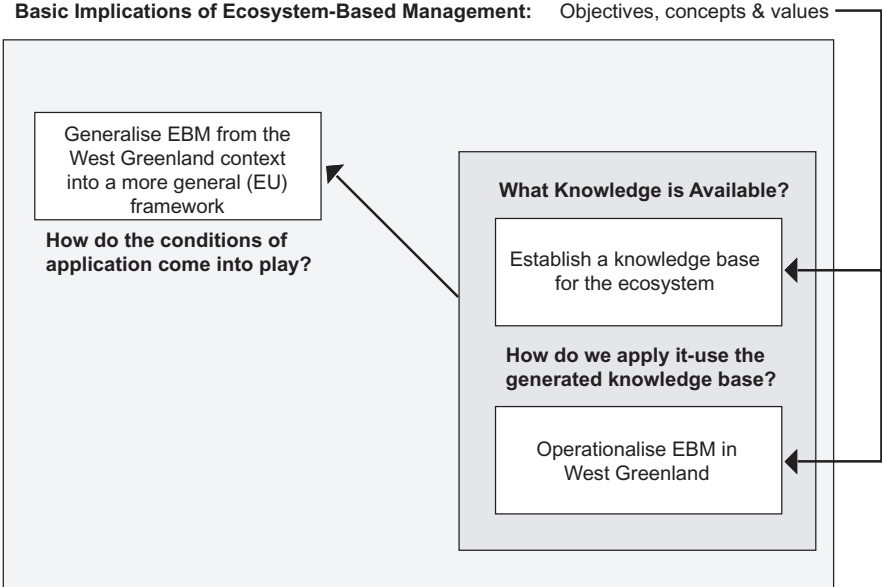


Figure 2. Social sciences within the Ecogreen framework.

2.1 The Social System	
Objectives:	
a)	to identify the societal role of the ecosystem concept and the perception of the ecosystem in society;
b)	to identify the main social and economic drivers of human behaviours affecting natural systems.
Tasks:	
2.1.1	Use of the ecosystem
	Analysis of the past, present and potential uses of the ecosystem, employing retrospective analysis and identification of development projects
2.1.2	Perception of the ecosystem
	Analysis of the perceptions of the ecosystem and its functioning among users, decision-makers and other groups

2.1.3	Dynamics of uses
	Analysis of the main uses, their dynamics and especially underlying driving forces.
2.2	Governance Institutions
	Objectives:
a)	to understand the creation and maintenance of the institutions that govern social behaviour and society's use of and impact on the ecosystem;
	Tasks:
2.2.1	Analysis of management systems: from the generation of scientific advice through to the enforcement of regulations; identify the changes that are needed to move toward ecosystem-based management;
2.2.2	Retrospective analysis of historical effectiveness: how well have different management systems worked in the past?
2.2.3	Involvement of affected groups: how, and how much, do they influence decision-making?
2.2.4	Analysis of costs and benefits of various approaches to decision making;
2.2.5	Institutional reactions to user demands: how do users' attitudes and preferences feed back into governance and decision-making?
2.3	Interaction between the Social and the Natural Systems
	Objectives:
a)	to conceptualise how ecosystem-based management can be used in data-sparse situations;
b)	model the interconnections of natural and social systems;
c)	recommend how EBM can be applied in West Greenland, and also in wider contexts;
	Tasks:
2.3.1	Analyse and collate existing concepts of EBM in data-sparse situations;
2.3.2	Investigate and model human impacts on the ecosystem through harvest, by-catch, discards, habitat changes;

2.3.3	Model the effect of climate change on the ecosystem and on patterns and dynamics of its exploitation;
2.3.4	Plan how to use ecosystem knowledge in constructing and implementing an ecosystem-based management system;
2.3.5	Generalise a West Greenland model of, and experience with, ecosystem-based management into a generic approach with application elsewhere.

Integration: the concept and its interpretation

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See full article by this author on pp. 22–34.

The hunting and fishing society in Greenland: a general overview

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The synopsis below intends to highlight some important aspects of the demographic and economic development in Greenland seen from the perspective of Greenland as a hunting and fishing society. The description of the growth in population size as well as the composition of the work force is supported by time series data from 1781 and 1834 respectively.

Demographics (Figure 1)

- from 1781 and for the next three quarters of a century, there was a steady growth from roughly 5.000 to 10.000 inhabitants. That number remained constant almost to the end of the 19th century when the number of inhabitants reached 11.000. In the first half of the 20th century the population doubled, and within the next 25 years it doubled again. During the rest of the century Greenland experienced a further increase in the total number of inhabitants but at a slower rate reaching 56.000 in 1998;
- the rapid population growth during the 20th century was due especially to: the increase in life expectancy (e.g., between 1946/51 and 1954/58 life expectancy increased by about 50%); the successful fight against tuberculosis and other infectious diseases; a decline in infant mortality; and a growing number

- of Danes, who made up about 20% of the total population at the end of the 1970s;
- while the total number of people living in the small settlements is almost the same at the end of the 20th century as it was at the beginning (roughly 10.000), the proportion of people living in settlements compared with people living in the 18 towns has changed dramatically. This is due to a concentration policy implemented by the Danish colonial powers over a 20-year period from the beginning of the 1950s, reinforced by the general trend seen in most developing countries that people tend to migrate to towns where, among other attractions, educational possibilities are better and jobs more plentiful.

The work force—including the change in numbers of hunters

Developments in the total work force and the distribution by main occupations reflect the very rapid change that has been experienced in Greenland society. Whereas traditional hunting and fishing activities employed more than 80% of the total work force in 1834, and still did a hundred years later, this proportion—including the workers on the fish production plants and fishermen working in the industrialised fishing fleet—declined rapidly to less than 20% in 2000. Parallel to this development, a still larger part of the work force is employed in different land-based trades, public infrastructure, public administration and services leading to an employment pattern that, at a first glance, is similar to that of a western industrialised society.

The hunters still provide not only their families but also the rest of the society with the desired country food (both marine and terrestrial mammals, birds and fish), most often sold at the local markets, and the hunters are living symbols of the traditional Inuk way of coping with the harsh conditions of existence in the Arctic. At the same time, the combination of subsistence hunting and fishing and earned income (often seasonal employment and short-time work) is a fundamental condition for living in the more remote areas and in the many small settlements. Not least for these reasons, there is an interest in ensuring the continued existence of the hunters and hunting as a profession.

Although a large number of people hunt and fish either full-time or part-time it is difficult to define the term 'hunter'. Whether a person is designated as a commercial or leisure-time hunter is important for the rights he will have to hunt certain species. Hence a system of hunting licenses has been in force since 1993. As everyone wanting to hunt must possess a valid hunting license, the Department of Fisheries and Hunting ensures that the criteria are fulfilled (see article by Søren Stach Nielsen in Section II). The Department registers all hunters. During the period that this system has existed the number of hunters has varied between just over 8.000 (1994) to just under 14.000 (2002). The number of professional hunters was at its highest

level in 1996 (more than 4.000) declining to roughly 3.000 in 2002. Not surprisingly, the relative proportion of hunters is larger in the settlements than in the towns. About 30% of all licences are held by people living in the settlements, and the major part of the licences in the settlements are for commercial hunters.

Although the number of people employed in hunting and fishing (including the workers employed in the food processing industry) has been declining in both absolute and relative terms, the sector is still the most important trade and a major contributor to the national economy. The export of fish products (including prawns) amounts to about 90 per cent of the total export. This figure alone shows both the importance to the total Greenland economy and, at the same time, its dependency and vulnerability.

It is not possible to give an exact picture of the contribution by the fishing and hunting sector to the gross domestic product (GDP) by comparing export value of fish products (and the value of local landings). The same reservation goes for comparing the Danish block grant to the GDP. It gives, though, an idea of the importance to the national economy of the different contributors. Hence these components are measured in the same figure.

Economic stages in Greenland's economic development since 1979

The following is a rough classification of the stages of economic development.

1979–1984: The period of building the Home Rule Government by transferring responsibility in different fields from the Danish state at a faster speed than expected and creating the Home Rule Government's organisation and administrative system to handle the different responsibilities.

1985–1987: The economic boom: an overheated construction sector and over-investments in the fishing fleet. At the same time this was a period of organisational fragmentation.

1988–1989: The period of consolidation and recovery: achieving control over public expenditures and starting to repay the public debt. The consolidation process was backed up by an increasing export and the possibility for the Home Rule Government Treasury to raise loans with favourable conditions. In the late 1980s successful attempts were initiated to control inflation.

1990–1993: Restructuring the Home Rule organisation: a process of market orientation was started. The Home-Rule-owned enterprises were established as companies—still publicly owned but with a relative autonomy. At the same time, a process of decentralising some public institutions and some of the newly established com-

panies occurred. Condemnation arrangements were introduced to eliminate the excess capacity in the fishing fleet. The restructuring process was accompanied by an economic recession characterised by decreasing exports (a decline by one third from 1989 to 1992) as well as a negative development in the gross domestic product and an increase in unemployment.

1994–1997: Consolidating and setting up a business strategy: after the restructuring and adjusting the policies of trade and industry a three-stringed policy was set up including goals for fisheries, exploitation of mineral resources and tourism. The period since 1994 has been characterised by a beginning economic recovery, still with a low inflationary background, with stagnating—though still high—unemployment rates, positive annual GDP growth rates and a fulfilment of the goals for repaying the public foreign debt.

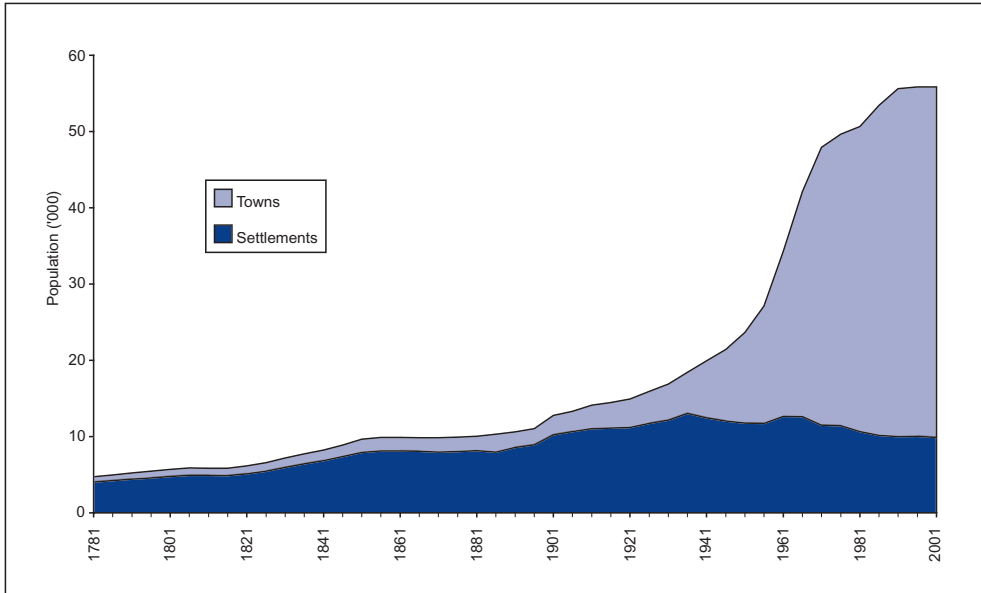
1998–present: Economic growth, decreasing unemployment rates and increasing taxable incomes has led to an eased financial policy. Inflation was at a historically low level during most of the 1990s but started increasing at the end of that decade. As an echo of the international liberal trends in economic policy, and not least inspired by the recommendations of an OECD country report, a structural policy for the economic development was sketched out. Apart from privatisation of a part of the Kalaallit Niuerfiat / KNI (Greenland Trade), the implementations so far have been modest.

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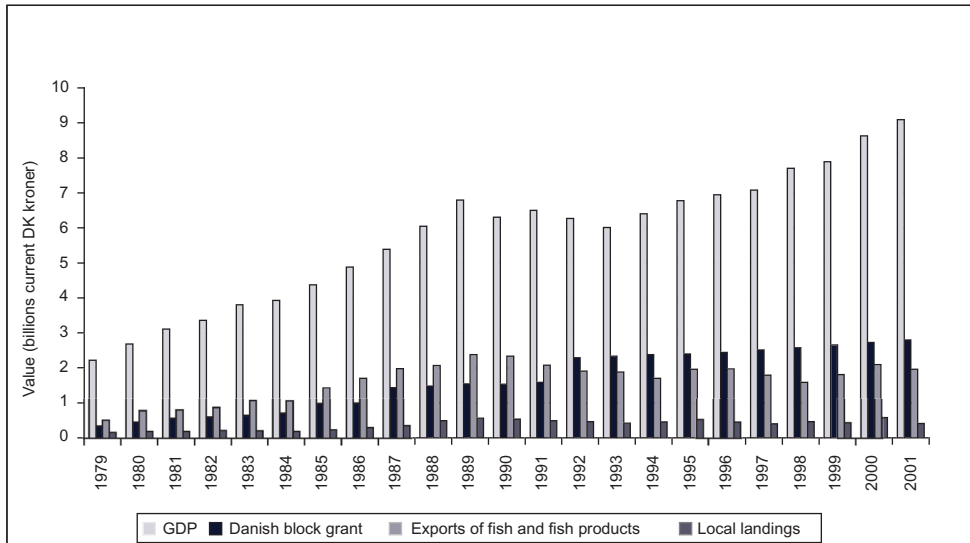
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Figure 1. Greenland population 1781–2001 in towns and settlements.



Source: Rasmussen and Hamilton 2001, Statistics Greenland 2003.

Figure 2. Greenland GDP, Danish block grant and some key figures on Greenland fisheries (in million DKK).



Source: Rasmussen and Hamilton 2001, Statistics Greenland 2003.

Social systems and behavior

The social and cultural dynamics of living marine resource use in West Greenland

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Many people in coastal communities in West Greenland are dependent primarily on harvesting and using living marine resources. Local economic and cultural practices range from marine mammal hunting and small-scale fishing to large-scale capital-intensive commercial fisheries. Marine mammal hunting is carried out primarily for local, regional and domestic consumption, whereas with regard to commercial fishing along the West Greenland coast, most of the fish caught is exported out of the region. Many small communities have mixed economies that are vulnerable to changes caused by regional and global processes affecting markets, technologies and public policies, as well as the environmental impacts of pollution and climate change. Furthermore, local ways of life based on the harvesting of living marine resources are being challenged from within, by changing community dynamics and the transition from traditional local practices of hunting and fishing, based primarily on kinship and other forms of close social association, to large-scale capital-intensive fisheries based on more formalised contractual relations.

Community viability in West Greenland depends on the long-term sustainability of local livelihoods and economies based on the resources of the sea, but ecosystem-based advice for resource management needs to be informed by in-depth understanding of the social and cultural dynamics of living marine resource use and of the social organisation of communities that depend on the sea for a living. While the West Greenland ecosystem is poorly understood in biological terms, so too are the social, economic and cultural aspects of West Greenlandic coastal communities, especially in terms of their interactions with living marine resources and the social and cultural importance of hunting and fishing.

The uses of living marine resources have different, albeit interrelated, meanings in West Greenland: as a way of life and basis for social and economic identity; as a basis for the economic sustainability of communities, especially in smaller settlements; and as one basis for national economic development. At the same time, there is tremendous diversity in resource use, ranging from small-scale hunting and fishing to the activities of larger inshore and offshore fishing fleets.

A crucial element of an integrated marine research programme in West Greenland is to investigate how a community's prospects for sustainability are influenced, limited or constrained by markets, state controls, international regulations, trade barriers, global processes (such as the global restructuring of fisheries) and environmental changes. Furthermore, studies of the historical and contemporary dependence of selected communities on living marine resources will shed light on the role of family, kinship and households and the central place of the marine environment in the social and economic strategies of families. At the same time, it is necessary to investigate and analyse the institutional settings in which communities are placed.

Thinking about appropriate ways to achieve sound ecosystem management and the sustainability of living marine resource use requires an in-depth examination of the processes of negotiation, choice and decision-making within households and communities and within the fishing industry at large, as well as an understanding of how contested ideas of culture have a bearing on legitimacy, compliance and practice. We must also engage in a necessary discussion of what exactly is to be managed and sustained. From a wider regional or even global perspective, scientists, environmentalists and policy-makers may view the goal of sustainability to be the protection and viability of fish stocks and an entire ecosystem; from the perspective of fish producers, it is the fishing industry and markets which need to be sustained; and from the perspective of the local fisher or seal hunter, it is the viability of the family, household and community which is at stake.

One way forward towards the goal of sustainable uses of living marine resources in West Greenland is to adopt a governance approach to fisheries and the resource systems and processes that not only harvest fish, but which provide fish and fish products to consumers. This requires a fundamental shift in thinking away from a purely instrumental management approach to a more inclusive governance approach which places emphasis on aspects of living marine resource use that are seldom considered, such as the broader social institutions, rules and practices which provide the framework for decision-making and cooperation rather than the formal organisations which exist in order to address and deal with environmental issues. A governance approach to ecosystem management rejects the current instrumental emphasis of fisheries management, in particular the overt emphasis on the productive activity of fishing and its impact on fish stocks, and also recognises that while existing marine management policies and fisheries policies may have their weaknesses, one reason for their failure also lies in the administrative and political institutional contexts within which those policies and schemes arise and are legitimated. A governance approach takes a much more encompassing approach to fisheries management by looking at the institutional contexts, but also by considering the wider social, economic, political and market conditions.

By using a governance approach to conceptualising new ways of thinking about the sustainable uses of living marine resources, the focus of the research and policy-making agenda is widened to include consideration of the complex interrelationships between different species and different levels of the marine ecosystem, the assessment of pollution and climate change trends, the production and supply of fish for human food, food safety, and the interrelationships between harvesting, processing, marketing and consuming marine products. There is need to recognise that there are broader aspects to fisheries management beyond the pragmatic, rational, scientific, economic and instrumental dimensions which usually preoccupy resource managers and policy-makers. A greater understanding of the dynamics and make up of the fishing industry itself, and of the social fabric of local communities and the networks of association in which resource users move and operate is necessary if constructive dialogue is to take place between hunters, fishers, industry managers, policy developers, biologists and others.

Comparative economic systems and management of fishing and hunting resources

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Canadian Inuk subsistence and economy

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Introduction

Among the indigenous cultures of the Arctic and the world, no society is perceived as being so absolutely reliant on hunting for the whole of its well-being as are the Inuit. The image of a solitary hunter stooped over a seal's winter breathing hole is all but the defining symbol of everything Inuktitut or authentically Inuk. Indeed, this is so much so that the action of hunting—with all its tools, techniques and strategies, traditional knowledge and the wealth of the hunters' harvests—is all too often interpreted as being the whole of Inuk subsistence culture and economy.

Hunting (and fishing) was, and still is, the primary means of provisioning the traditional economy and *niqituinnaq* (real food) is its substance. However, obvious as the

centrality of hunting is, not least because almost all Inuit inhabit local environments that preclude reliance on plant foods, its drama has often masked the other important aspect of the traditional Inuk economy—sharing, which coupled with hunting forms the core of Inuk subsistence. Thus, hunting and the food it produces are, in fact, part of a larger social process through which those who are less well off—be they temporarily unsuccessful hunters and their families, widows and children, or the aged and the infirm—are not forced to do without.

Canadian Inuk *ningiqtuq*: its structural and operational attributes

Across the North American Arctic (see Bodenhorn 2000; Damas 1972a, b; Fienup-Riordan 1982), the core of Inuk life is framed by two central precepts, *naalaqtuq* (respect and obedience) and *ungayuq* (solidarity, generosity). Together, these frame and direct interpersonal behaviour, with *naalaqtuq* ordering intergenerational relations and *ungayuq* emphasizing solidarity and community (Damas 1963).

Naalaqtuq, meaning respect and obedience, defines authority relations as these are constructed through, most often, genealogical sub-superordination but sometimes also age difference, while *ungayuq* mandates generational and group communality (and, thus, moderates the sometimes sharp edge of *naalaqtuq*). Moreover, because kinship is the centripetal institution in Inuk culture, both of these precepts are most clearly expressed in the *ilagiit*, or multi-generational, male-focused consanguinal extended family. It is the focal social unit in Inuk society (Damas 1972b) and the principal unit for the production, primary distribution and, often, consumption of food. It is within the *ilagiit* that the behaviors of *piliriqatigiingniq* (cooperation) and *pijitsirniq* (responsibility) are most clearly and obviously lived.

The order that *naalaqtuq* and *ungayuq* provides to social relations within the family and the community extends to virtually all other areas of Inuk sociality, including economy. Through *pijitsirniq* and *piliriqatigiingniq*, these two critical social-structural elements organize and facilitate the flow of *niqituinnaq* to all levels of the Inuk social universe, from the individual to the *ilagiit* and from the *ilagiit* to the community.

Table 1. Ningiqtuq: structural, social and action contexts.

Social Context	Behavioral Directive	Form	Description
1a) Individual	Ungayuq	Akpallugiit	Inviting in guests (typically same generation non-kin)
1b)	Ungayuq	Paiyuktuq (A. Quaktuaktuq / B. Niqisutaiyuq)	Specific food gifts to close affines and non-kin elders (A=raw, B=cooked)
1c)	Ungayuq	Niqitatianaq	Uummajusiitiit ('partnered' hunters)
2a) Intra- <i>ilagiit</i>	Naalaqtuq (responsibility)	Niqiliriiq	Tugagauyuk-tigutuinaq complementary
2b)	Naalaqtuq	Nirriyaktuqtuq	Restricted commensalism
3a) Community	Ungayuq	Nirriyaktuqtuq	Open commensalism
3b)	Ungayuq	Minaqtuq	Distribution of stored food
3c)	Naalaqtuq	Katujiyuk/Taliqtuq	Division within task group

For all its apparent underlying structural simplicity, *ningiqtuq* is operationally complex. In functional terms, sharing integrates hunter, family and community and operates via a web of complementary communal and individual mechanisms (Table 1). The result is a system considerably subtler than suggested by the Inupiaq or Copper Eskimo examples outlined earlier.

Overall, the most intensive and *naalaqtuq*-influenced sharing takes place within the social context of the extended family. It is almost invariable that *ilagiit* males hunt together and all members of the extended family are in a *niqiliriiq* (literally, 'those who share food') relationship.

The most basic element of intra-*ilagiit* sharing is *tugagauyuk*. *Naalaqtuq*, as an effector of sharing within the extended family, is found most obviously in the hunter-*isumataq tugagaujuq* transaction. This aspect of *ningiqtuq* is best described as the upward movement of resources from genealogically subordinate members of the extended family to the *ilagiit* head of the social unit. In outline, upon returning from a hunt, the successful hunter deposits the greater part, if not all, of his harvest at the home of the extended-family head or *isumataq*, usually the oldest male in the family

but possibly a senior woman when there is no older experienced male. In practical terms the output from the hunting activity of younger family members, once deposited with the *ilagiit* leader, becomes common to all members of the extended family.

This *naalaqtuq*-directed upward flow from subordinate hunter to *isumataq* is complemented by *tigutuinnaq* (essentially 'taking away') by which any member can freely draw at will from the leader's 'store' according to household or individual need. *Tigutuinnaq*, in effect, reverses the flow of resources by virtue of the responsibility imposed upon a family leader by *naalaqtuq* to ensure the welfare of his/her *ilagiit*.

Two other *naalaqtuq* types of sharing, each involving the distribution of resources within non-kin-based task groups, bear mentioning. The first is *katujiyuk* or *taliktuq* and refers to the distribution of meat by the senior hunter-leader among unrelated hunters. While relatively rare, *katujiyuk-taliktuq* appears to be a variation of the *ilagiit*-based sharing process adapted to the conditions of modern Inuk communities where hunters sometimes find kindred unavailable. The other form is *uummajusiutiit* in which the owner of a boat distributes the harvest among the crew. In this respect, *uummajusiutiit* bears a close resemblance to the primary-level distribution that takes place within Inupiaq whaling crews (see Dahl 2000 regarding Greenland).

Whereas *tugagaujuk-tigutuinnaq* activities function almost wholly within the social context of the extended family, mechanisms for the more generalised distribution of food resources are also present. Chief among these is *nirriyaktuqtuq* commensalism, in which the head of an *ilagiit* hosts a communal meal. Such commensal activity may, when resources are scarce, be limited to the extended family, but more often includes a significant segment of the overall community.

There are two essential differences between restricted and open communal meals. When a *nirriyaktuqtuq* is intended only for family, word is circulated directly to the expected participants. On the other hand open meals, which may involve upward of 100 participants and last for several hours, are preceded by a general announcement throughout the community. The other difference between the two sub-types is in the disposition of surplus food. After a restricted *nirriyaktuqtuq*, any uneaten food is left for later consumption by the host and his household, while food remaining from an open meal, which may be substantial if participation is low, is generally taken away by attendees (see also *minaqtuq*, Table 1) or given to designated non-kin.

Niqiliriq and *nirriyaktuqtuq* describe, respectively, the two basal mechanisms for distributing and re-distributing food within extended families and across communities, although *nirriyaktuqtuq* also plays a role in inter-*ilagiit* transfers (at this level commensalism is always in the form of a shared meal). There are, however, also a number of voluntary sharing practices in which individuals, as initiators and receptors,

are focal. These are *akpallugiit* ('inviting-in'), *paiyuktuq* (giving) and *niqitatianaq* (the division of game between hunting partners).

Akpallugiit, as its gloss might suggest, entails a prospective host inviting a specific person or persons to partake of a meal, often of an especially desirable food, at the host's dwelling. Typically, invitees are unrelated to the host. Rather, the bond may be long friendship, knowledge that the guest shares a fondness for the specialty to be eaten, or the mutual experience of long life. In any case, *ungayuq* underpins this practice.

Paiyuktuq is in some senses complementary to *akpallugiit*, but, unlike it, may be influenced by *naalaqtuq* or *ungayuq*. The giving usually entails the sending of parcels of food to designated persons. These may, as in the case of *paiyuktuq*, be favorite non-kin, but such giving is as often directed to elders and widows who are without the support of hunting kinsmen. While a *paiyuktuq* gift may be something especially favored by the receiver, when the giving is to persons less well supplied it is almost always of cooked meat.

The final voluntary practice is *niqitatianaq* or the division of game between two co-operating hunting partners. This form, in contrast to other types of *ningiqtuq*, only occurs away from the hunters' community near the conclusion of the hunt. It is exclusive to partners who are unrelated and without formal obligation to be *niqiliriq*.

***Ningiqtuq* as an economy**

Ningiqtuq is not simply a system of open food distribution and generalized reciprocity. Nor is it one in which rules rigidly define and circumscribe economic relationships. Open and directed sharing are both present, as evidenced by the generalized nature of community-wide *nirriyaktuqtuq* and by *ilagiit*-focused *tugagauyuq*. However, these two poles, one restrictive and the other open, are complemented by a variety of intermediate mechanisms that ensure that the principal social elements of Inuk society are economically integrated. In this regard, the system mirrors the structural complementarity of *naalaqtuq* and *ungayuq* and the organizational flexibility that characterizes Inuk society overall—the rules are clear but they are neither exclusive nor rigid.

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Institutional interactions and management options

Greenlandic experience in fisheries and hunting management

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Introduction

The underlying foundations of Greenland's management of living marine resources are the Fisheries and Hunting Acts, which encompass act specifications, rights and obligations, and other administrative declarations. The Fisheries and Hunting Acts specify that utilisation of fish stocks and hunting resources must be carried out in a biologically acceptable manner, which the Home Rule Government has clearly delineated and fortified in administration of the Acts. Furthermore, the administration of the Acts solidifies the preëminence of conservation and reproduction with regard to maintaining and sustaining the longevity of these sovereign resources in our society.

Quota system

The Greenland Home Rule Government carries out its administrative responsibilities through quotas, licenses, and other rights and restrictions. First and foremost, Greenland uses a quota system in the utilisation of fish stocks, which has reaped manifold benefits for the government, industry and Greenland's ecosystem. The Directorate's Departments of Fisheries and Fisheries License Control maintain detailed and accurate information pertinent to quota utilisation and license management.

With regard to Greenland's quota system, the Directorate of Fisheries and Hunting introduced an Individual Transfer Quota (ITQ) system in 1990 for offshore shrimp fisheries and subsequently on 1 January 1997 for coastal shrimp fisheries. From our perspective, this system sufficiently regulates fishing capacity according to the available resources. Quota owners do not have any economic incentives to invest more than their quota shares can support. For all commercially viable species, the Home Rule Government determines the Total Allowable Catch (TAC) each year and apportions quotas in accordance with quota ownership governances to the individual operations. The annual TAC is usually established in accordance with advice from international institutions, such as the International Council for the Exploration of the

Sea (ICES) and the Northwest Atlantic Fisheries Organisation (NAFO), in both of which Greenlandic biologists are active.

Additional TAC variables

In this connection, it is worth mentioning that the Home Rule Government has taken preliminary steps towards a more ecosystem-based approach in order to be more aligned with external advisory from international research institutions. For instance, based on guidance and advice for the period 2003–2008, the Home Rule has considered TACs that have been calculated with an additional variable taken into account—the amount of shrimp consumed by cod. Accounting for such ecological variables is by no means peripheral to the establishment of TAC figures. Shrimp biologists consider cod as one of the most prominent predators, and have developed a model that allows NAFO to extrapolate five years into the future when advising on TAC computations. These ecosystem-based approaches are unequivocally useful in the management of marine resources in Greenland and elsewhere. It is also indisputably useful for the industry since, for example, quota owners can more easily regulate their catch capacity in accordance with quotas projected over a five-year period.

In setting a TAC, the Directorate seeks not only scientific advice, but also significant input from the Greenlandic fishing industry. The Directorate makes every conceivable effort to establish TAC according to biological advice; however, biological guidelines on certain species are often scarce or insufficient in terms of data validity. For instance, managing crab stocks is undeniably one area in the Greenlandic fishing industry that requires more support from biologists to more clearly elucidate stock status, and avoid potential overfishing.

In this regard, another issue is management of stocks we share with adjacent coastal states. Despite considerable activity and efforts to develop collaboration with these states further, we have not succeeded in agreeing upon how we should divide the TAC between us. What transpires is virtually inevitable given constraints on information and insufficient international cooperation—each state sets its own TAC. We are fully cognisant of and ever increasingly aware as time passes that this development has unfortunate implications and is resulting in inappropriate use of fishery resources. Needless to say, the long-term solution is an ineluctable and well-constructed agreement with the relevant coastal states to cooperate more closely.

Other management options and considerations

The Home Rule Government has also asserted itself in protecting ecosystem interests. On that note, we have been very diligent in protecting spawning and juvenile

fish areas. One estimable example is on Greenland's east coast where we solidified a 'redfish protection area,' allegedly the world's largest fish stock protection area, in which fisheries with bottom trawl were banned. Since the year 2001, the Directorate has imposed the use of sorting-grids as a mandatory requirement for shrimp fishing operations. This technical conservation step has been evaluated as being remarkably efficient for protection particularly of juvenile redfish and Greenland halibut. As a result of the introduction of sorting-grids, we have among other things been able to effectively eliminate the need for the 'redfish protection area.'

The Directorate would also like to mention the efforts of the Greenland Institute of Natural Resources—the institute that advises the Greenland Home Rule Government—which has undertaken a program envisioned as running for five years in order to establish a concentrated scientific background for long-term ecosystem-based management of natural resources in Western Greenland. The Directorate presumes that this program will allow us to ascertain very useful knowledge applicable to our daily management.

Impact of regulations

When it comes to management of marine mammals it is of inherent importance to emphasise that regulation and quota systems are relatively new, and, consequently, management differences can appear for different species. Traditionally, Greenlanders have managed hunting according to their sustenance needs, and only more recently for commercial reasons, and, therefore, when management measures are introduced there can be quite a lot of turmoil. Before introduction of national regulations in the 1980s, utilisation was monitored through municipal regulations or it was based alternatively on private management. Greenland is via our ties to Denmark a member of the International Whaling Commission (IWC), which oversees large-whale issues, and thereby is granted limited quotas of fin whales in West Greenland and minke whales in West and East Greenland. We obtain these quotas annually under the aboriginal subsistence whaling provisions of the IWC.

Greenland is also a member of several other international marine mammal organisations pertinent to providing guidance and advice on utilisation of whales, seals and polar bears, including the North Atlantic Marine Mammal Commission (NAMMCO) regarding small whales and seals; the Joint Commission on Narwhal and Beluga (JCNB) established between Greenland and Canada; and the International Union for Conservation of Nature and Natural Resources (IUCN) regarding polar bears. On that note, management of marine mammals also requires understanding of how to take the role of the hunter into account in the decision-making processes. Therefore, Greenland whole-heartedly supports such efforts as NAMMCO's workshop regarding user and scientific knowledge, which was held in January 2003.

In conclusion, the need to know more about the relationships between marine mammals, fisheries, and the macro- and micro-ecosystems is irrefutable. That is why the Home Rule Government fully sponsors initiatives concerning ecosystem-based management systems and further evolution of this program, and will continue to participate in developing them.

The on-board processing shrimp fleet of Greenland

Peder Munk Pedersen

APK Fishermen's Association, Nuuk, Greenland

Six major species are fished commercially in Greenland: shrimp, Greenland halibut, snow crab, scallops, redfish and capelin. Factory vessels are associated with all fisheries, but for shrimp, Greenland halibut and snow crab there are also fresh-catch vessels. Of a total export value of 2.183.000.000 Danish kroner (DKK) (2002), shrimp accounted for 62%, Greenland halibut 17%, and snow crab 10%.

The last 14 years have seen drastic and continued decreases in the export price of shrimp; some prices have fallen by more than half between 1989 and 2002. Even though volumes of some products have increased, catch value has not been maintained.

In 1990 a system of licenses issued by a licensing committee was replaced by a system of individual transferable quotas, accompanied by encouragement toward consolidation. Since 1990 there has in fact occurred a substantial consolidation of the on-board processing shrimp fleet, accompanied by substantial investment in quotas. The fleet has shrunk from 47 vessels based at 14 communities, about one-third of them in Nuuk (equivalent to 5,9 communities evenly distributed), to a fleet of 11 vessels at just 2 communities, of which four-fifths are based in Nuuk (equivalent to 1,4 communities evenly distributed).

Small, medium and large scale strategies: cases of social response and changes in Greenland

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See full article by this author on pp. 56–72.

Management of living marine resources: the interface between knowledge and policy

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The institutional set-up for the management of natural resources, the knowledge base on which it depends and the scope of management decision-making are all interdependent; and this is just as true in ecosystem approaches to fisheries management. Management systems can be viewed as comprising three components: the normative basis for management—defining the objectives; the cognitive basis—defining valid knowledge; and the regulatory—prescribing the basis for setting and implementing rules.

Objectives for ecosystem-based management have been variously defined: conserving biodiversity, protecting endangered species, maintaining ecosystem health, considering biological constraints, &c. However, there may still be uncertainty in resolving the normative basis. Different values, such as intrinsic value and utility value, must be reconciled, including perhaps optimising the balance between harvest and recreation, maintaining natural structure and function—referred to ‘pre-fishing’ states, or minimising anthropogenic removals of certain valued species, such as small cetaceans. There can be two understandings of ‘ecosystem-based’, or ‘an ecosystem approach to’, management. ‘Ecosystem-based management’ is taken to imply ecosystem engineering—designing and constructing an ecosystem to achieve a new set of objectives, perhaps reconstructing some ‘virgin state’. An ‘ecosystem approach to management’ pursues existing objectives, but widens the knowledge base to broaden the range of ecological interactions that can be taken into account, and probably—although not certainly—leads to extending the concepts of ‘sustainability’ and ‘resources’ considered in the management objectives.

Thus, the ‘ecosystem approach to management’ will imply changes to the normative basis, balancing a different set of objectives, cognitive changes, with a knowledge base widened to include ecological interactions, and regulatory changes. The implications for institutional change include reconciling multiple objectives, participation of, and perhaps conflict between, a greater number of different parties, and dealing with complex and uncertain knowledge. ‘Sustainability’ will include longer-term and ecosystem-wide concerns, ‘resources’ will become more generally defined, including genetic resources and other components of biodiversity, and there will be new stakeholder groups to be considered and new conflicts of interest to resolve.

Ecosystem knowledge is uncertain and complex. Ecosystem boundaries are open, ecosystems change with time, and multiple scales of space and time interact. Diversity is important to ecosystem functioning, and the ability to predict ecosystem behaviour is limited, but ecosystems have real thresholds and limits that if transgressed can induce major, and possibly irreversible, restructuring.

We can differentiate two ways to use knowledge. One is based on 'hard' predictability, with either a deterministic or stochastic model-based prediction of the consequences of management action. The alternative is based on 'soft' predictability, relying on indicators of ecosystem function to measure the effect of management actions and an adaptive tuning of management responses. The hard-predictability approach assumes that processes are understood and modelled, so that outcomes can be predicted, and new regulations are added to address specific problems as they are encountered. But the research and modelling required are unfamiliar to resource users, so this approach loses legitimacy in their eyes, and the studies needed to make detailed predictions in complex systems are very costly, if indeed they are possible at all, and their results of uncertain reliability.

The 'soft' predictability approach, by contrast, identifies indicator variables reflecting specific issues, such as fecundity or condition of seabirds or mammals, or the condition or extent of sensitive habitat, and regulates the specific issues through separate measures in a management patchwork. 'Soft' predictability may use meta-indicators, such as overall size or age composition in fisheries, or abundance of indicator species, to tune an adaptive management of overall exploitation pressure through generalised measures. Outcomes may not be predictable in the short term, so adaptive management learning is appropriate. Where hard-predictive management—while there may be user consultation in framing of regulations—does not invite users' participation to frame objectives or to assemble the necessary knowledge, user participation in soft-predictive management is likely to integrate user knowledge with research-based knowledge, and objectives are reconciled and integrated through negotiation.

However, much depends on the utility and social acceptability of the indicators chosen. They must accord with stakeholders' perceptions as valid indicators of ecosystem function, and be suitable for communication, but must also be soundly based in a transparent observation or measurement process and unambiguous analysis. They must be realistic from the point of view of cost and other resource demands. They have to be relevant to guiding appropriate decisions and must respond consistently to fisheries conditions in spite of environmental fluctuations. An indicator needs to respond reasonably quickly to a management action, and enough needs to be known about the significance of levels of the indicator to allow reference points to be developed for warning or action.

Thus, changing to an ecosystem approach to fisheries implies changing from single-species hard predictability to multi-species, indicator-based, soft predictability, a change from model-based predictive management to adaptive management, and changes in the decision processes. The knowledge base for the ecosystem approach to fisheries must be developed in step with the development of this institutional framework. Co-management may be part of the solution—not only may users be regarded as having a right to be involved in decisions that affect them but may also be more apt to comply with management measures that they have had a hand in framing. However, in the possible spectrum of co-management arrangements, those which involve users in the implementation of management measures, i.e. the imposition and enforcement of regulations are frequent, but fewer involve users in identifying the knowledge base to be used in making management decisions. Few indeed involve users in setting management objectives.

Beluga management in Greenland: policies, strategies and interests

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See full article by this author on pp. 44–55.

Experiences from fisheries management in the Faroes

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The Faroes are a North Atlantic archipelago of which 18 islands are inhabited by 48,000 people. The islands are a part of the Kingdom of Denmark with Home Rule government—the Landsstýr—giving autonomy over domestic affairs. The economy depends on fisheries: 90–95% of exports are of fish products. Since 1975 the management of fish stocks in Faroese waters has passed through three phases: a period of corporatist regulation from 1975–1991, followed by collapse and restructuring; a short experiment with ITQs and TACs in the mid-1990s; and since 1995 a system of effort regulation, with limits on fishing days.

The corporatist system hinged on the 'Rawfish Fund', a system of price manipulation and support to reconcile the fishermen's costs with sale prices. The fund was operated by a committee representing the inshore fishermen, the fishermen's union, the fish buyers' association, and the Landsstýr; biologists had only an advisory role, and economists no part to play. The industry was vertically integrated, with

close relationships between ship-owning companies, fish processing plants, and the national fish sales company. In intention, fish species should be independent, and the fund should be in balance over time. In practice, the system went increasingly out of balance, with persistent cross-subsidies between species, over-capitalisation both in the fleet and the processing plants and over-fishing, with initially high but subsequently declining catches. A large part of the Faroese budget went to subsidising fisheries—much through the Rawfish Fund, the public debt started to increase rapidly, and the economy to contract. As a result, an economic recovery commission recommended restructuring the fishing and fish-processing industry through a 'Structure Fund'. The vertical integration of the industry was reduced, the fishing companies being severed from the processing plants and the number of the latter halved.

As a part of the restructuring of the industry, the Danish government insisted on an ITQ system for fisheries management as a condition for further loans, but although biologists and economists supported this plan, the fishing industry was less in favour. After little more than a year the system was abandoned, in fact while the working of an ITQ system was still being evolved by those concerned with the industry.

Since 1995, the fishing industry has been managed by regulating fishing days. The total number of fishing days is decided annually by parliament after recommendation from the fisheries minister, who himself is advised by fisheries biologists and by the industry. Each vessel receives a certain percentage of the total. Politicians, fishermen and owners agree that this management system is 'the best in the world', and indeed under it catches have increased. However, biologists are concerned that increases in vessels' fishing power weaken the link between the nominal measure—fishing days—and real fishing effort and reduce the level of control, and fisheries economists agree, perceiving a return to over-capitalisation and declining profitability. Reduced vertical integration means that the land-based part of the industry is now less secure, as fish can go directly to overseas markets.

Fisheries management and locality development

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See full article by this author on pp. 73–86.

Social and economic valuation of natural resources

The value and management of living marine resources

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See full article by this author on pp. 101–120.

Taxation of the resource rent

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Introduction

The Organization for Economic Cooperation and Development (OECD) provides figures on per capita value for fish catches in OECD countries for 1999. The variation is considerable: USD \$16 for the European Union, \$85 for Japan, \$282 for Norway, and \$2.970 for Iceland (OECD 2001). To have an idea of what the figure might be for Greenland we take the export value of fisheries products. On the one hand, this excludes some sales but, on the other hand, includes some value added from processing the raw materials ashore or aboard factory trawlers. An export value of around DKK 2 billion and an exchange rate of DKK 7 per dollar gives \$5.200 per capita. No doubt an even greater figure would be obtained for the Faroe Islands.

Another way to see the relative importance of the fisheries industry is as the percentage of non-government GDP. This item, in recent years, has been approximately DKK 4 billion, so once more, using the export value, we get a relative size in the vicinity of 50%. Derived imports should be deducted from the export value, but, as mentioned, some value from products not exported should be included. In any case, the estimate is rough but the importance of fisheries in Greenland is incontestable.

The resource rent

The resource rent is defined as the amount that could be transferred from the sector to the government without the factors of production—labour and capital—being put to other uses. In principle, efficient use of the production factors is assumed. Using the political economic calendar of Statistics Greenland's yearbooks (Grønlands Statistik 2003) and the Internet pages of Royal Greenland, we see a turnover level

of DKK 3.000 million and DKK 1.000 million for Royal Greenland and Polar Seafood, the two biggest operators, respectively. We can suppose the rest of the sector totals the size of Polar Seafood. This last-mentioned firm declared profits in 1999 and 2000 of DKK 115 million each year. There is a drop to DKK 5 million in 2001, but at the same time extraordinary write-offs take place. Let us say Polar Seafood collects an average rent for these years of DKK 90 million; then an actual rent to the Greenland firms should be at a level of five times this amount or DKK 450 million. The total resource rent includes other items: above-normal incomes of fishermen, and the single most important figure, namely, DKK 300 million in payment from the EU for fishing licenses.

All in all, a guess at the resource rent realised from fisheries with actual policies of not less than DKK 800 million seems reasonable. However, Royal Greenland accounts for about DKK 300 million of this figure, which contrasts with declared profits of practically nil and even a deficit of nearly DKK 300 million in 2001. Whether these results stem from poor management or the fulfilment of other functions remains an open question, but it is not evident that a deduction in the rent of about DKK 300 to 400 million is justified.

Finally, what does the public sector receive as a part of the rent? DKK 300 million from the EU, 22% of DKK 200 million in taxes on the earnings of Polar Seafood and the residual fleet, and direct and indirect taxes on fishermen's above-normal incomes. This gives us DKK 350 million or somewhat more. (A 22% tax rate on corporate profits is suggested by the Skattedirektorat (2003)). Remember, this is not net income; there are fixed costs to society for implementing fishing policies and for surveillance at sea.

Actual and potential rent

In all probability the resource rent could be larger with an optimal fisheries policy. Assume the policy instrument to be fees or charges on catch weights. Somewhat higher charges could reduce fishing effort, and thereby costs, in the industry, and, at the same time, the difference between the value of sustainable harvest and total costs would increase. In principle, levels of charges exist, which would imply maximisation of the resource rent, or, to be more precise, the present value of future profits properly defined, and therefore a sum that is dependent on the rate of discounting.

Choice of policy instruments

Tax policy considerations normally assume total tax revenue to be held constant. Such is the case here, and thus other taxes can be lowered if a greater part of the resource rent becomes public-sector revenue. Simplifying, we look at two instruments:

fees and quotas. In theory, the same results can be obtained using one or the other of these instruments, and, at the same time, objections can be raised against both. Fees can be thought to give unsatisfactory control with respect to the size of the biomass, and quotas have inflexibilities both in relation to period delimitation and to random variations of fish stocks. Furthermore, as is well documented, quotas often waste both labour and catch because of the discarding of less valuable fish.

Naturally, a policy must be practicable in the sense that it must pass parliament, *Landstinget*, and everywhere fees are hard to introduce. Clark (1990) writes, '*fishermen are always unanimously opposed to it*'. Even if not loved, quotas seem to be more acceptable; why is this so? One explanation could be a rather universal human preference for privileges. If you pay for a quota you incur the risk of not finding enough fish, but at least you have obtained the right to exert a certain amount of effort. This attraction is one side of the coin; the other is some unavoidable lack of fairness, unless a scheme is put in place under which all quotas (shares of the Total Allowable Catch or TAC) are regularly put up for auction for periods that are not excessively long.

Clark (1990) seems to favour quotas given away gratis, but combined with a certain level of fees, the philosophy being to let the industry collect the rent in the first place, but then transfer some of it to the general public. In my opinion, setting fees and then giving subsidies to vessels—fishing capacity according to some schemes—appears to be a preferable approach. Here the first step is to tax away the rent (at the margin of efficiency); then the second step is to channel some of it back to the industry. At the same time, the appearance of privilege associated with assigning quotas is avoided.

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IV. Appendices

A. Workshop program 'Social and economic research related to the management of marine resources in West Greenland', Greenland Institute of Natural Resources, Nuuk (Greenland), 18–20 November 2003

Moderator: Ludger Müller-Wille, McGill University (Montréal (Québec) Canada)

Day 1: Tuesday, November 18

0900	0915	Klaus Nygaard, Director	Introduction and welcome
0915	0930	Michael Kingsley	Housekeeping
0930		Ludger Müller-Wille	Workshop overview and introductions
Session 1		Helle Siegstad	Ecogreen and Scene-setting
1000	1030	Michael Kingsley	Ecogreen overview
1030	1045	Break	
1045	1115	Clotilde Bodiguel	Socio-economic research within Ecogreen
1115	1130	Mark Nuttall	Integration of socio-economic and ecological research: the concept and its interpretation
1130	1215	Ludger Müller-Wille	Discussion of parallel programs of ecological and socio-economic research, and their integration
1215	1315	Break	Lunch
1315	1345	Birger Poppel	The hunting and fishing society in Greenland
1345	1415	Questions and discussions	

Session 2		Søren Stach Nielsen	Social Systems and Behavior
1415	1455	Mark Nuttall	Social dynamics
1455	1510	Break	
1510	1550	Gorm Winther	Cooperative societies and comparative economics
1550	1635	George Wenzel	Societal norms and the economic functioning of hunting societies
1625	1705		Questions and discussions
1830	2130		Reception in the Institute's cafeteria

Day 2: Wednesday, November 19

Session 2 (cont.)		Søren Stach Nielsen	
0900	0915	Ludger Müller-Wille	Recapitulation of presentations
0915	1000		Group discussions
1000	1045	Ludger Müller-Wille	Plenary discussions
1045	1100	Break	

Session 3		Marianne Jensen	Institutional Interactions and Management Options
1100	1140	Andrew Aparico	Management options and institutions in Greenland
1140	1220	Peder M. Pedersen	Fisheries management in Greenland: a user's view?
1220	1320	Break	Lunch
1320	1400	Rasmus O. Rasmussen	Consequences of different strategies of small and large scale resource use
1400	1440	Poul Degnbol	Experiences from management of living resources: the interface between knowledge and policy

1440	1455	Break	
1455	1535	Frank Sejersen	Management of beluga hunting in Greenland
1535	1615	Jógvan Mørkøre	Fisheries management experience in the Faroe Islands
1615	1700	Nils Aarsæther	Fisheries management in small communities

Day 3: Thursday, November 20

Session 4		Michael Kingsley	Social and Economic Valuation of Natural Resources
0900	0940	Ragnar Arnason	Valuation of fisheries resources: relevant social and economic factors
0940	1020	Lars Lund	Taxation of the resource rent from fisheries: benefit to society
1020	1040	Break	
1040	1230		Group discussions
1230	1330	Break	Lunch
1330	1530	Ludger Müller-Wille Michael Kingsley	Review and summary Closing remarks
1800	2130		Dinner in the Institute's cafeteria

B. List of participants and affiliations

Invited guests from outside Greenland:

Arnason, Ragnar (Department of Economics, University of Iceland, Reykjavik, Iceland)

Bodiguel, Clotilde (IDDRA—Institut du développement durable et des ressources aquatiques, Montpellier, France)

Degnol, Poul (IFM—Institute for Fisheries Management and Coastal Community Development, Hirtshals, Denmark)

Mørkøre, Jógvan (Department of History and Social Sciences, University of the Faroe Islands, Torshavn, Faroe Islands)

Müller-Wille, Ludger (Department of Geography, McGill University, Montréal, Québec, Canada)

Nuttall, Mark (Department of Anthropology, University of Alberta, Edmonton, Alberta, Canada)

Rasmussen, Rasmus Ole (NORS—North Atlantic Regional Studies, Roskilde University, Roskilde, Denmark)

Sejersen, Frank (Institute of Eskimology, University of Copenhagen, Copenhagen, Denmark)

Wenzel, George (Department of Geography, McGill University, Montréal, Québec, Canada)

Winther, Gorm ('*agio greenland*' and the Research Centre on Development and International Relations, Aalborg University, Aalborg, Denmark)

Aarsæther, Nils (Institute of Planning and Community Studies, University of Tromsø, Tromsø, Norway)

Greenland Home Rule Government

Andersen, Kieth Lau (Directorate for Fishing and Hunting)

Aparico, Andrew (Directorate for Fishing and Hunting)

Jensen, Marianne (Directorate for Environment and Nature)

Lillelund, Mads Brinck (Directorate for Fishing and Hunting)

Poppel, Birger (Statistics Greenland)

Thomsen, Marianne Lykke (Foreign Affairs Office)

Other participants from Nuuk, Greenland

Lund, Lars (Ilisimatusarfik, University of Greenland)

Mathiassen, Mette (researcher)

Pedersen, Peder Munk (APK Fishermen's Association)

Schultz, Sofie (Ilisimatusarfik, University of Greenland)

Theil, Tina Hanne (researcher)

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Born, Erik W.

Frandsen, Rikke Petri

Hvingel, Carsten

Kingsley, Michael C.S.

Kristensen, Emma

Motzfeldt, Kristjana Gudmundsdóttir

Nielsen, Søren Stach

Nygaard, Klaus

Rosing-Asvid, Aqqalu

Siegstad, Helle