Solveig Glomsrød and Iulie Aslaksen (eds.)

The Economy of the North 2008

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Preface

The objective of *The Economy of the North 2008* is to present a comprehensive overview of the economy of the circumpolar Arctic, including the traditional production activities of the indigenous people. The report discusses the importance of the Arctic economy from a global perspective, with particular focus on the natural resources in the Arctic region.

The Economy of the North 2008 has been produced as part of the ECONOR II project, under the sponsorship of the Sustainable Development Working Group (SDWG) in the Arctic Council. The project is funded the Norwegian Ministry of Foreign Affairs, the Nordic Council of Ministers, Statistics Norway and institutions participating in the Arctic network of statistical bureaus and academics. The report is the result of contributions from a network of researchers from national statistical offices and academic institutions located across the Arctic nations. Statistics Norway has hosted the editorial group that compiled and edited the contributions from the project network.

Statistics Norway would like to thank all the individual contributors and institutions who have provided data, analysis, texts, illustrations, and scientific advice for *The Economy of the North 2008*. The present report is a pioneering work in the sense that the path outlined in the first ECONOR report *The Economy of the North* is still new and relatively unexplored, with various challenges of statistical and conceptual nature. It is our hope that the present overview of the Arctic economy will inspire work to further strengthen the information basis from where to assess the sustainability of the Arctic communities in terms of natural wealth management and environmental challenges.

The Economy of the North 2008 was edited by Solveig Glomsrød (chief editor), Iulie Aslaksen, and Lars Lindholt of the Research Department of Statistics Norway. Marit Vågdal did the technical editing, and Siri Boquist was the photo editor. More information is available at www.ssb.no.

Statistics Norway,
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Øystein Olsen

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1. The Economy of the North 2008: An introduction

Solveig Glomsrød and Iulie Aslaksen

The Arctic regions belong to different national regimes, and information on social and economic issues has been dispersed and not easily available at the circumpolar level.

A central task of the ECONOR project from where this report originates is to contribute to fill this gap by presenting a comprehensive overview of the scale and structure of the circumpolar Arctic economy. Among several good reasons for compiling an overview of the circumpolar Arctic economy is a need for an information platform from where to assess the sustainability of the Arctic communities in terms of natural wealth management and vulnerability towards climate change and global policies and trends.

The Economy of the North 2008 report finalizes the ECONOR II project which has been carried out by Statistics Norway in cooperation with a circumpolar network of Arctic statistical officers and academics. The purpose of this second report has been to update the economic statistics of the first version, *The Economy of the North*, and to include a wider set of socioeconomic variables to more clearly depict the livelihood of Arctic people[1]. Other objectives have been to shed light on the value of natural resources in the Arctic and to bring forward knowledge about how indigenous people manoeuvre between subsistence activities and the market economy.

The backdrop of this statistical work has shifted considerably from the time of compiling the first version to the current situation. A global economic crisis has rearranged the framework for economic activity and not the least for resource based industries, which tend to dominate in most Arctic economies. It takes time before regional statistics is updated, and the report presented here cannot bring evidence of how the shifting of gear in the global economy is affecting the Arctic economies and living conditions of the population. A follow-up of this statistical work in a more institutionalized setting seems valuable.

The data in this report are only reflecting the initial phase of rising prices of natural resources and the early part of the upswing in the natural resource extraction, but are nevertheless highlighting how responsive the Arctic economies are to global resource demand. Although the report cannot describe the full impact of volatility in the global economy, it can illustrate the exposure to such fundamental shifts.

Besides updating statistics on the Arctic economies as provided in the first version, this report includes more information on the socio-economic situation and living conditions. Chapter 2 presents in telling figures the situation of core elements in human welfare in Arctic regions. The composition of the population, the life expectancy and rate of infant mortality are all observations that convey crucial information which gross regional product (GRP) and not even disposable income per capita can communicate. To do such extended socio-economic analysis is particularly important in small economies like the regions of the Arctic, where a quick glance at GRP would not bring us close to the reality concerning the basis for livelihood, because a substantial share of GRP is from petroleum and mining activities largely owned and taxed from outside the region itself.

Inuit village, Greenland. Photo: Crestock

Chapter 3 looks at the Arctic with a bird's eye perspective and presents macro level data of land area, population, GRP and disposable income of households by region. Regional data are depicted in relation to their corresponding Arctic nations, and to the circumpolar level.

It is important to have in mind when reading this report that the data on revenues in resource extraction include the wealth component of natural resources. In resource

Highway running through Alaska wilderness/Crestock

rich communities like the Arctic regions the sustainability of wealth management is particularly important. Resources that have been extracted from the ground represent a loss in wealth that in principle should not be counted as income. However, by national account conventions it is still included in income. Because the loss of natural wealth is not explicitly accounted for, resource revenues can easily be consumed contrary to principles of long-term sustainability. To avoid myopic behaviour, revenues from petroleum production have in some cases partly been placed in financial funds. An alternative or supplement could be investments in human capital, which has substantial positive side effects and is not subject to financial erosion. As the Arctic economies generate a substantial share of their income from resource extraction, it would have been useful to have data for genuine income generation in addition to the value of straightforward resource depletion. The Arctic region has higher extraction costs than other regions and consequently the wealth loss component of reported income tends to be lower. As the report illustrates, however, the shares of extractive industries in the Arctic regions are high and it therefore remains a relevant question for the Arctic regions if wealth management is sustainable from their perspective.

Chapter 4 The Arctic Economies within the Arctic Nations leaves the circumpolar perspective and looks closer at the role of each regional economy in the national context. In this chapter the economic data are presented in local currencies. The core tables in this chapter are compiled to present a consistent set of data by region, at the same level of detail by industry in order to show economic structure in comparable categories.

Petroleum in the Arctic is the topic of chapter 5. Natural resource wealth is not really a fixed fortune – in real economic terms natural wealth of a certain resource will increase or decline along with our preferences and needs – including what will be perceived as the cost of future greenhouse gas emissions.

One of the large uncertainties confronting the investors in the Arctic is the future price of petroleum. The World Energy Outlook (2008) of The International Energy Agency expects that the oil price will increase again in the near future and average USD 100 per barrel of oil equivalents during the period 2008-2015 and rise further to about USD 120 in 2030, high enough to make the Arctic attractive for further activity in spite of the high costs[2]. But at what scale? As part of the ECONOR II project, a model based study of the potential for oil and gas production in the Arctic regions was carried out. With a time horizon up to 2030, this study provides a background for the discussions and expectations concerning the further development of petroleum activity in that region.

The statistics presented in this report has a strong focus on the commercial activity in the Arctic. For several of the Arctic regions, employment and revenues from min-

eral extraction may be the pillar of the regional economy. However, the Arctic has a rich wildlife that provides substantial nutritional and cultural values to the Arctic communities. Fishing and hunting for own consumption and sharing is a major source of subsistence livelihood for many people[3]. This source of income and consumption may at a first glance seem to be decoupled from the shifting performance of the global economy – but even this local and mostly unregistered production feels the change, because availability of cash income from wage income and sales is important for being able to purchase equipment and means of transportation for hunting and fishing. In Alaska, dividends from the Alaska Permanent Fund are an important source of funding for the subsistence activities. Hence, subsistence activities and the cash economy are mutually dependent on each other for providing consumption possibilities in the Arctic today, and are at the same time part of a lifestyle that represents continuity, sharing and connection to nature.

Chapter 6 on the interdependency of subsistence and market economies in the Arctic gives a brief overview of the importance of subsistence activities in different Arctic regions. This is a follow-up on chapter 5 of the first ECONOR-report[1], presenting the contribution to food consumption based on the SLiCA project[4]. With some notable exceptions, as in Alaska, subsistence activities are mostly invisible in official statistics. Chapter 6 provides information on subsistence activities in Alaska, Northern Canada, Northern Russia and Sámi reindeer husbandry in Norway. Estimates of subsistence production for Northern Russia indicate that the market value of consumed goods from own production is considerable, as compared to monetary income. Finally, some results from the SLiCA- Survey of Living Conditions in the Arctic – project are reported.

The Arctic Region as referred to in this report is depicted on the map in figure 3.1. It covers Northern Russia with the Republics of Karelia and Komi, the Murmansk and Arkhangelsk Oblasts, the Yamal-Nenets and Khanty-Mansii Autonomous Okrugs, the Taimyr and Evenk former Autonomous Okrugs, the Republic of Sakha, the Magadan Oblast, and the Chukchi and Koryak Autonomous Okrugs. The American Arctic includes Alaska and the Northern territories of Canada (Northwest Territories, Yukon, Nunavut). The European Arctic consists of Greenland, Faroe Islands, Iceland and Arctic Norway (including the Svalbard Archipelago and Jan Mayen), Arctic Sweden and Arctic Finland.

Presenting an economic overview of the Arctic regions in comparable terms offers some particular challenges that go beyond the question of quality and coverage. To add up or compare income accounted for in different countries it is necessary to transform the numbers to a common currency. The USD is frequently used for this purpose as most people have an understanding of how much a dollar can buy in the world market. However, a translation of income based on a straightforward use of market exchange rates will normally lose some of the information about the true capacity to consume in the domestic market of a specific region. To adjust for price differences in domestic markets purchasing power parity (PPP) indicators have been established as an attempt to harmonize income measures across regions. However, the PPP transformation may sometimes lead to biased assessment of income from the production activities in different regions. This problem is further discussed in Box I.

A statistical overview of the Arctic economy cannot be established by just adding up the data provided by the statistical bureaus of the Arctic countries. Some Arctic regions are regions within states and it is a general phenomenon that regional economic statistics has been less developed and is less complete than the one at the national level. Geographic location has been subordinated to other dimensions of the information. It also occurs that regional data are limited for confidentiality reasons as the number of enterprises involved is too low. Further, some Arctic regions are nations or autonomous regions with small populations and minimal capacity to carry out surveys and administrative routines that constitute a necessary basis for economic statistics and national accounts. Finally, the Arctic regions are associated with states still to some extent using different classifications and definitions when producing the statistics – hence Arctic economic statistics has to be rearranged to a common format in order to be presented in a reasonably harmonized manner.

The lack of compatibility and also the special problems of producing regional statistics are at the core of the limitations facing the production of this report. The major problems associated with production of regional statistics are outlined in Box II. Due to the diversity in the statistical material this report should be read and interpreted with necessary caution.

The data have been given a common format facilitating comparison of income, production and economic structures among the individual Arctic regions. This represents a major improvement on earlier available material and may work as a building block in a further process towards a harmonized database on Arctic economic issues.

The path outlined in the first two ECONOR reports is still new and relatively unexplored. It is our hope that these overviewes of the Arctic economies will inspire further work to develop an information basis for the Arctic economies.

The Economy of the North 2008 is a result of contributions from a network of statistical officers and academics across the Arctic region. The individual chapters bear the names of the authors, however.

Acknowledgements

The Economy of the North 2008 report has been produced as part of the ECONOR II project, carried out under the Sustainable Development Working Group (SDWG) in the Arctic Council, with participants from most Arctic States. The Arctic Council is a high level forum to provide a means for promoting cooperation, coordination and interaction among the Arctic States. The Arctic Council involves the Arctic indigenous communities and other Arctic inhabitants on common Arctic issues, in particular, issues of sustainable development and environmental protection in the Arctic. The ECONOR II project has been funded by the Norwegian Ministry of Foreign Affairs, the Nordic Council of Ministers, Statistics Norway and institutions participating in the Arctic network of statistical bureaus and academics. The financial support from these institutions as well as the sponsorship of the SDWG for the ECONOR II project and The Economy of the North 2008 is gratefully acknowledged. The editorial group at Statistics Norway carefully acknowledges the scale and competence of the contributions from the network, without which this report could not have been produced.

Notes

[1] Glomsrød, S. and I. Aslaksen (eds.) (2006): *The Economy of the North*, Statistics Norway.

[2] IEA (2008): *The World Energy Outlook*, International Energy Agency.

[3] AHDR (Arctic Human Development Report) Akureyri: Stefansson Arctic Institute

[4] SLiCA- Survey of Living Conditions in the Arctic. (www.arcticlivingconditions. org)

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2. Economic and social conditions of Arctic regions

Gérard Duhaime and Andrée Caron

In 2007, *Far Eastern Affairs* published an article about prospective oil and gas development in the Russian North, stating that "the new hydrocarbon-producing complexes will speed up growth in living standards and quality of life in East Siberia".[1] On the other hand, it was expected that the huge James Bay hydroelectric project in Northern Quebec would lead to "a certain decline in the standard of living of native people relative to that of the country, despite the financial benefits of industrial development".[2]

Who are right - those who predict prosperity and welfare resulting from industrial development or those who recommend development of small-scale local economies giving benefits for the people directly involved? This chapter approaches that question by looking into the relationships between the economic conditions of the Arctic regions and human development.

Table 2.1. **Basic economic and social conditions, Arctic regions, 2006**

Regions	Total population	Aboriginals Share of aboriginal peoples in the total population	Females Share of women in the total population	Youth Share of children aged 0-14 years in the total population	Life expectancy Years	Infant mortality Per thousand live births	Tertiary education Share of tertiary education graduates in the total population	Personal disposable income USD-PPP	Dependency ratio	Composite index[1]
Alaska	670 053	13.1	48.5	21.5	76.7	6.7	24.7	32 811	0.6	9
Labrador	26 364	37.8	49.3	20.6	76.1	4.4	9.4	19 044	1.3	6
NWT	41 465	49.8	48.8	23.9	79.1	4.2	19.4	30 339	0.7	8
Nunavik	10 815	89.2	49.1	36.3	63.5	17.3	9.6	19 532	1.9	4
Nunavut	29 475	84.5	48.7	33.9	70.4	10.0	11.9	24 495	1.6	5
Yukon	30 375	25.0	49.7	18.8	76.4	11.0	23.4	29 761	1.0	8
Faroe Islands	48 183	0.0	48.1	22.8	78.9	4.4	23.0	15 275	0.7	7
Lapland	184 935	0.8	49.9	16.3	78.6	5.9	20.7	14 000	1.5	7
Oulu	465 018		49.7	19.8	79.0	4.2	22.7	13 847	1.4	7
Greenland	56 901	88.6	47.0	24.8	68.3	15.4	n.d.	15 237	0.9	5
Iceland	299 891	0.0	49.6	21.8	81.2	1.4	23.5	17 957	0.8	8
Finnmark	72 937	9.2	49.2	20.5	77.6	4.3	21.4	18 687	1.1	7
Nordland	236 257		50.0	19.3	79.4	3.3	19.8	18 700	1.2	7
Troms	153 585		49.6	19.7	79.0	3.7	25.1	18 550	1.0	8
Norrbotten	251 886	3.6	49.3	15.6	79.5	5.1	13.6	14 721	1.3	6
Västerbotten	257 581		50.0	16.1	80.4	3.1	19.4	14 139	1.2	7
Arkhangelsk	1 280 200	0.5	53.3	16.3	64.8	10.2	12.1	7 465	1.1	3
Chukchi	50 500	20.9	47.9	21.7	58.9	23.2	14.6	19 267	0.3	5
Evenk	17 000	19.3	50.0	24.2	59.1	21.3	11.5	9 765	0.5	4
Karelia	693 100	0.0	54.2	15.5	63.8	7.6	13.7	6 734	1.0	3
Khanty-Mansii	1 488 300	1.4	50.8	19.9	68.8	7.5	15.9	16 851	0.7	6
Komi	974 600	1.0	52.5	17.5	64.2	7.0	12.2	10 710	1.1	4
Koryak	22 600	34.2	50.0	22.0	56.0	33.0	9.9	12 389	0.6	3
Magadan	168 500	8.7	51.6	17.0	63.4	14.2	15.4	10 682	0.8	4
Murmansk	857 000	0.2	51.6	15.7	65.2	10.3	15.5	9 853	0.9	5
Nenets	42 000	14.3	51.2	22.3	62.2	15.2	9.9	..	0.5	4
Sakha	950 000	2.4	51.5	23.6	65.6	10.6	14.6	10 733	1.0	5
Taimyr	38 400	19.0	51.8	22.9	63.8	7.4	13.3	11 641	0.7	5
Yamal-Nenets	532 600	5.9	50.7	21.3	68.9	13.0	16.8	20 447	0.5	6

[1] This index is based on the 6 indicators: female proportion, life expectancy, infant mortality, tertiary education rate, personal disposable income and dependency rate.

A Nenets man signs a paper to get a ballot as he votes at a mobile polling station in Tundra, near the river Niarovecha, located in the Yamal peninsula above the polar circle, northeast of Moscow. REUTERS/Vasily Fedosenko/Scanpix

Standard economic theory suggests that economic growth trickles down in society, inevitably increasing general well-being and living conditions. Amartya Sen argues that, in practice, this is not necessarily the case. He describes development "as a process of expanding the real freedoms that people enjoy. Development requires the removal of major sources of unfreedom: poverty as well as tyranny, poor economic opportunities as well as systematic social deprivation, neglect of public facilities as well as intolerance or overactivity of repressive states"[3].

Denial of liberties may include lack of access to health services and education, inadequate housing, and economic poverty. In the Arctic regions, the main question is to what extent human development has improved in the wake of large industrial development in resource extraction and energy production. Human development may be incongruous with economic growth and may even be hindered by growth, when growth combines with forces seeking to impose their exclusive interests.[4] However, human development may also be fostered by growth. The economy may support material conditions that are favourable to fulfillment and expression of individual abilities, and to find meaning in one's existence.

The economic situation cannot be understood properly without considering its relationships with the society which surrounds it.[5] In this context it is necessary to account for the relationships of power – taking into account the option that the economy ultimately may contribute to human development controlled by citizens themselves, via democratic public authorities.

While the present report *The Economy of the North 2008* puts large emphasis on the role of the oil industry and other extractive sectors, this chapter expands the scope by depicting the basic social conditions and the social issues raised by large-scale resource development. Does growth in this area of the economy favour human development, the capacity of indigenous and other local Arctic residents to control their fate, to allow the development of their full potential – while huge pipelines span the wilderness where they reside? What are the undesirable social consequences of petroleum and mining activities?

Several socio-economic indicators are now available, making it possible to depict Arctic livelihood with a broader palette. Following the major analyses carried out within the scope of the *Arctic Human Development Report*, the many studies on the social situation and living conditions of residents of the Arctic and native peoples, the launch of the socio-economic database, ArcticStat, and finally, the publication of the first report on *The Economy of the North*, it is now possible to examine the Arctic situation from a socio-economic viewpoint. This chapter focuses on fundamental dimensions of economic and human development, as measured by a set of socio-economic indices. The socio-economic data are interpreted in terms of social structures and power relations between business, governments, and Arctic citizens, in the various national and regional con-

Box 2.1: ArcticStat
Circumpolar Database

As a result of multiple sources with different definitions, methods and access, finding the relevant socioeconomic data for the Arctic regions has long been a highly time-consuming procedure.

ArcticStat was created in order to overcome these difficulties and to increase the research capacity by taking advantage of already existing data. ArcticStat aims to facilitate research by organizing socioeconomic data covering 30 Arctic regions belonging to 8 countries: Alaska, Northern Canada, Greenland and Faroe Islands, Iceland, Northern Norway, Northern Sweden, Northern Finland and the Northern Russian Federation.

The data made available by ArcticStat cover population, language, health, education, migration, economy, employment and other social issues. The computer database is a free-access web-based databank unique as a socio-economic datasource devoted to the Arctic circumpolar regions.

A user-friendly portal links users directly with the relevant tables on web sites where they originate. When such procedure is not possible, users have access to tables compiled and stored in the ArcticStat-database itself.

ArcticStat www.arcticstat.org., was on line on October 1st 2007. It gives access to more than 5 300 tables through 9 indicators and some 75 sub-indicators.

ArcticStat was created by the Canada Research Chair on Comparative Aboriginal Condition of Université Laval, Canada, as a major Canadian contribution to the International Polar Year.

texts of the Arctic, with particular emphasis on social policies and political development in regions with a majority of indigenous people.

Economic and human development: Method of analysis

Our analysis is based on selected indicators of the economic, demographic, social, educational and health situation. The data were selected for their capacity to depict human development under the social conditions of Arctic citizens. Data for household disposable income are used in our analysis. For the purpose of measuring consumption possibilities, household disposable income is generally a more relevant indicator than the gross domestic product (GDP).

The analysis covers the circumpolar Arctic, that is, Alaska (US), Yukon, the Northwest Territories, Nunavut, Nunavik and Labrador (Canada), the regions of Lapland and Oulu (Finland), Greenland and the Faroe Islands, Iceland, the regions of Finnmark, Troms and Nordland (Norway), the regions of Norrbotten and Västerbotten (Sweden), and the regions of Arkhangelsk, Chukchi, Evenk, Karelia, Khanty-Mansii, Komi, Koryak, Magadan, Murmansk, Nenets, Sakha, Taimyr, Yamal-Nenets (Russian Federation). Data for 2006 from ArcticStat (see Box 2.1) were produced by the national statistical agencies of the countries concerned.

Greenland/Colorbox

These data were complemented by an inventory of health indicators and a preliminary version of Chapter 3 of this report.[6]

The most recent year available was used when 2006 data were not available. Some data series were not covered by all regions, and some data sources had certain major conceptual divergences. When data were not available on a national scale, they were estimated. Missing data for certain regions were estimated by the corresponding value for the closest comparable region. These few estimations require that the results are interpreted with some caution.

The main focus is on six socio-economic indicators: (1) Female proportion, (2) Life expectancy, (3) Infant mortality, (4) Tertiary education, (5) Disposable income, and (6) Dependency ratio. The dependency ratio is defined as the proportion of the population unemployed or outside the labour force. Our set of indicators is larger than those included in the Human Development Index (HDI) used by the United Nations.

These six indicators are presented in six-pointed radar-shaped diagrams for the Arctic regions in figures 2.1 to 2.8. In these graphs, the more of the total area that is covered, the more favourable are the indicators in terms of human development. The six indicators were transformed to indices on a scale from 1 to 10, where 1 represents the least favourable and 10 represents the most favourable condition for human development. For example, the highest disposable income was attributed the relative value of 10, and the lowest was attributed the relative value of 1. In the case of the female proportion, the value closest to the universal value was attributed the relative value of 10.

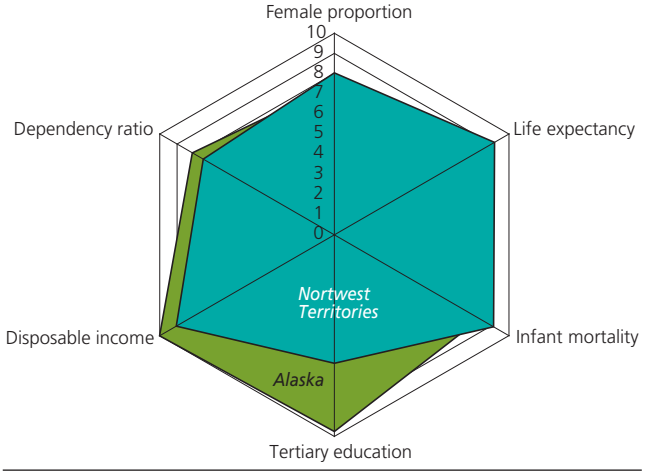
Economic and human development: Main results

Table 2.1 gives an overview of the absolute values of the set of socio-economic indicators for the Arctic regions, presented in geographical-alphabetical order. It also gives a composite index, which is the average of

Table 2.2. **Arctic regions, by socio-economic patterns. 2006**

Model	Typical patterns	Variations
"North American model" Figure 2.1	Alaska Northwest Territories Yukon	Labrador Nunavik Nunavut
"Scandinavian model" Figure 2.2	Iceland Nordland Troms Finnmark Västerbotten Norrbotten Oulu Lapland	Faroe Islands Greenland
"Russian model" Figure 2.3	Arkhangelsk Karelia Komi Magadan Murmansk Sakha Taimyr	Chukchi Evenk Khanty-Mansii Koryak Nenets Yamal-Nenets

Figure 2.1. **Main indices of economic and social conditions, Alaska and Northwest Territories, 2006**



the six main indicators.[7] At first glance, it appears that the optimal conditions are found in North America, and then in the Scandinavian countries, while the minimal conditions are in the Arctic region of the Russian Federation. However, in order to interpret major regional differences, it is useful to consider the six main indices in a graphic analysis, as explained in the following figures.

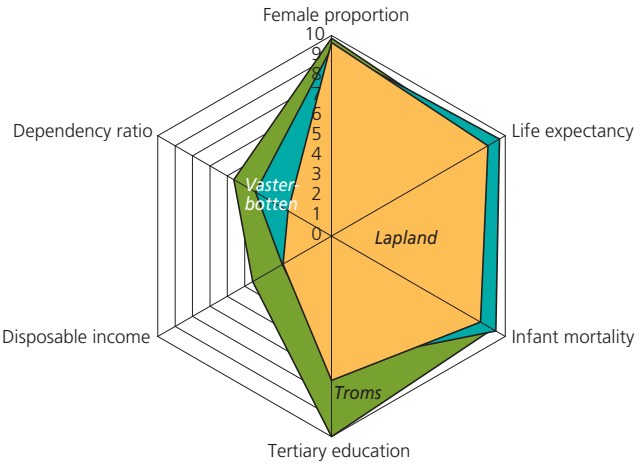
The graphic analysis of the main indices leads to the observation that there are three typical models of socio-economic patterns, suggesting three main groups of Arctic regions. These general patterns correspond more or less to the social and political divisions of the Arctic regions: "The North American model", "The Scandinavian model", and "The Russian model". Table 2.2 shows how the Arctic regions are distributed between the three typical models, and indicates some variations within the main models.

"The North American model" represents a pattern where generally all the socio-economic indices have high values. Figure 2.1 shows the results for two such regions: Alaska and the Northwest Territories. Disposable income is at its highest circumpolar level, while the female proportion is somewhat lower.

"The Scandinavian model" represents a pattern where the female proportion, life expectancy, infant mortality and tertiary education are near their highest values, while disposable income and dependency ratio are near the average values. Figure 2.2 shows the results for three of these regions: Troms, Västerbotten and Lapland.

"The Russian model" represents a pattern where generally all the socio-economic indices have the lowest values for the socio-economic variables. Figure 2.3 shows the results for three of these regions: the Arkhangelsk and Murmansk Oblasts, and the Republic of Komi.

Figure 2.2. **Main indices of economic and social conditions, Troms, Västerbotten, Lapland, 2006**



The regions that represent these three general models cover two thirds of the Arctic territory and have 77 per cent of the population.

There are, in addition to these three typical models, a certain number of variations.

The regions Nunavut and Labrador (Figure 2.4) as well as Nunavik represent a variation of the general North American model: a dependency ratio and education level well below average, and somewhat lower disposable income than in Alaska and the Northwest Territories in Canada.

The Faroe Islands and Greenland (Figure 2.5) represent a variation of the general Scandinavian model: lower values for the female share of the population and for disposable income. In Greenland, there are also lower values for the other socio-economic indices, except for the tertiary education, where the level is closer to the North American and Scandinavian regions.

Figure 2.3. **Main indices of economic and social conditions, Murmansk, Komi, Arkhangelsk, 2006**

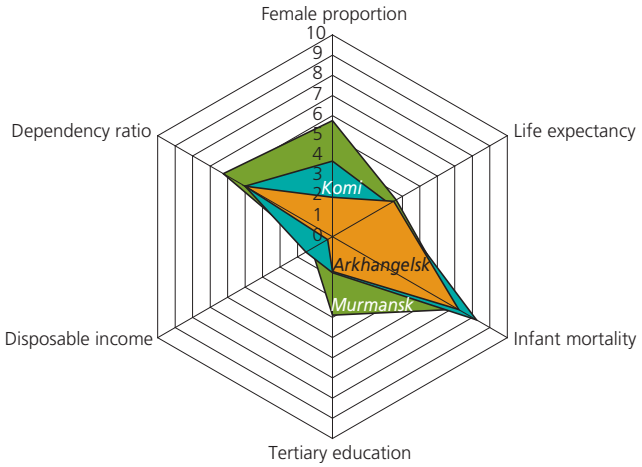


Figure 2.4. **Main indices of economic and social conditions, Labrador, Nunavut, 2006**

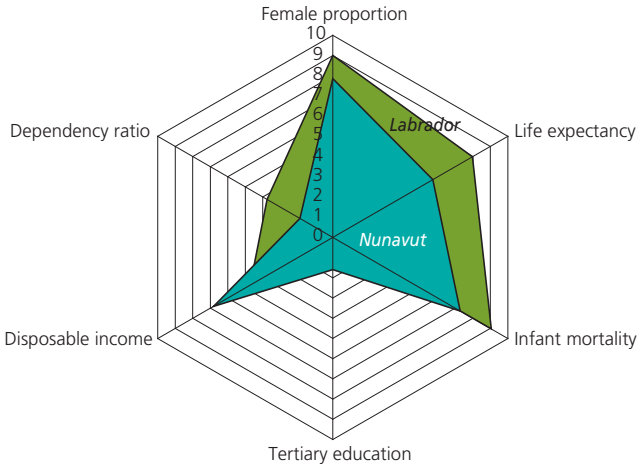


Figure 2.5. **Main indices of economic and social conditions, Faroe Islands, Greenland, 2006**

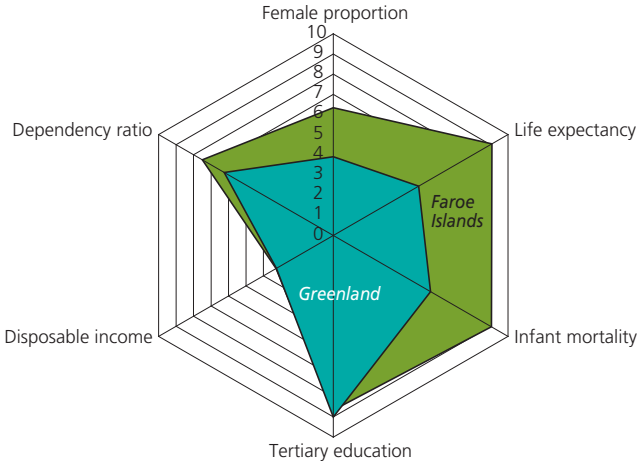


Figure 2.6. **Main indices of economic and social conditions, Yamal-Nenets, Khanty-Mansii, 2006**

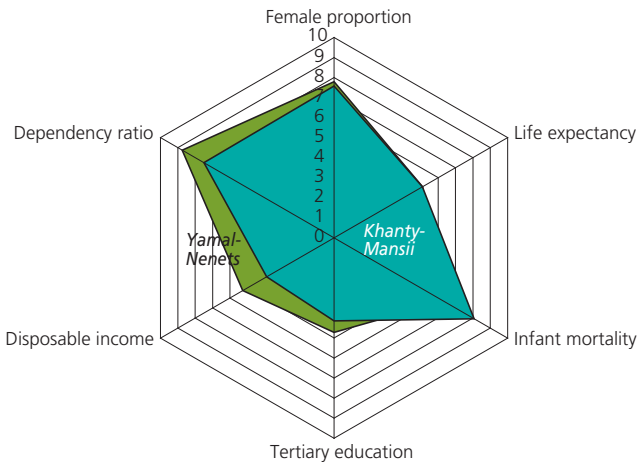


Figure 2.7. **Main indices of economic and social conditions, Chukchi, Nenets, 2006**

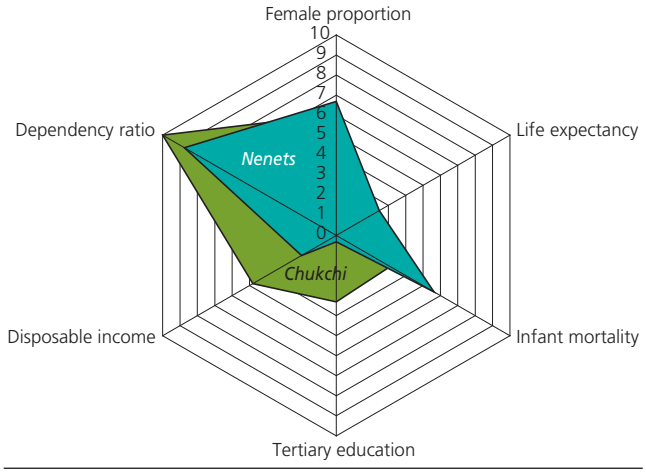
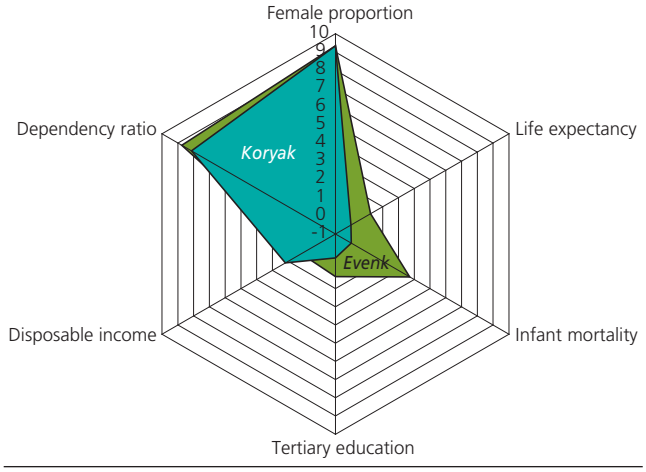


Figure 2.8. **Main indices of economic and social conditions, Evenk, Koryak, 2006**



The different regions of the Russian North represent several variations of the general Russian model. Yamal-Nenets and Khanty-Mansii have higher values for almost every socio-economic variable (Figure 2.6). Chukchi and Nenets (Figure 2.7) have considerably higher disposable income, higher dependency ratio and higher infant mortality. Evenk and Koryak (Figure 2.8) have slightly higher disposable income, higher dependency ratio and higher infant mortality.

The regions that represent these variations from the three general models cover one third of the Arctic territory and have 23 per cent of the population.

These results indicate that there are indeed general models of socio-economic structure, but that there are also major regional variations. For each of the three general models, we will, in the following discussion, try to characterize the economic structure and the redistribution mechanism associated with the three models and their variations, in order to interpret the observed socio-economic patterns. The power relationships between the social actors, in particular when they involve ethnic or indigenous minorities, will be considered before finally discussing our central question: How does economic development influence human development in the circumpolar Arctic regions?

"The North American model": The neo-liberal regime at the last frontiers

High revenues, little redistribution

A closer look at some characteristics of petroleum and mining activities in Alaska and Canada can help us understand the first general model, corresponding to what has been called the neo-liberal regimes at the last frontiers for resources exploitation. [8] In order to remove obstacles to resource exploitation, it was necessary to reconsider the status of areas earmarked for environmental protection and for subsistence activities of indigenous and other rural residents. In some cases conflicts were resolved by profit-sharing, ensuring a part of the resource revenues from the petroleum and mining industry to the native peoples.[9]

The first general model presented, "The North American model" comes close to this description. High disposable income is secured in particular by the high salaries of the extraction industry. Income tax paid by individuals is relatively low. However, services for ensuring the living conditions of residents (education, health, social services, housing) are largely the responsibility of individuals or local communities. Redistribution of wealth through social policies may be perceived as weak, in the sense that national redistribution regimes have been modified by a gradual dominance of the neo-liberal economic view and a diminishing role

Thule, Greenland. Photo: Scanpix



Arctic Canada, Igloolik. Photos: Mary Stapleton

of the State.[10] These regions nevertheless enjoy a level of basic services that has made it possible to greatly reduce infant mortality and maintain high life expectancy. The provision of widespread educational services in these regions is quite recent. There are major variations in the schooling levels actually reached, particularly deficient among young native men.[11]

The share of women in the population is below the optimal value; it varies between 48.5 per cent in Alaska and 49.7 per cent in the Yukon (Table 2.1). At the local level, this proportion is perhaps even lower.[12] It may not be explained by the desire of young rural women to go to high school, as they may attend high school almost everywhere, also in small villages. The deficit in the proportion of women is rather explained by the outmigration of young native women, motivated by the desire to find employment to their liking.[13] As a consequence, the dependency ratio is slightly lower, partly also explained by the inflow of single workers to the extraction industry of these "last frontiers" regions.[14]

The integration of native peoples and their consent

Over recent decades the political weight of native peoples in the American North have increased. The political organisation of native peoples, and their capacity to have their voices heard, including via legal action, have forced public authorities to take their interests into account.[15] This has materialized in the signing of Land Claim Agreements.[16] Indigenous people have been beneficiaries of government compensation transfer payments and as business partners of the oil and mining industry. To some extent indigenous people have been able to share profits from resource exploitation, to limit the environmental damage caused by the extraction industry, and to base their own development on the benefits thus obtained. This has been possible because the democratic roots of these countries remain intact and allow the expression of diverging interests, including those resolved by the courts.

Compared with other regions of the American North, Nunavut, Nunavik and Labrador are peripheries. Penetration of industrial interests has occurred later there, as resources in more easily accessed regions were exploited first. The administrative development of these territories also came later. In recent years, Land Claim Agreements have played an important role in removing obstacles to resource exploitation, which has become more enticing as the global demand for energy and raw materials have increased. In these regions, disposable incomes are still lower (Figure 2.4). The economy of these regions is based less directly on massive extraction of resources and more on activity within public administration and public services.

In these regions, the dependency ratio and tertiary education level are well below average (Figure 2.4). Are these discrepancies solely a result of the late administrative organisation of the territory? The proportion of native population is much higher in these regions than in other regions of the continent, which explains the high dependency ratio, as the demographic and employment structure of the native population is different from that of the populations of the "last frontiers". Households are larger, and the number of children much higher, leaving a considerable burden for the population of the workforce. These characteristics make it easier to understand the low rate of higher education. Moreover, low education levels are associated with the relatively recent emergence of a formal educational system where native people have influence, as well as the more recent acceptance of formal education, after the initial and painful experiences of church-controlled boarding schools.

"The Scandinavian model": The redistribution mode of Northern Europe

Universalism versus economic growth

The Scandinavian model may be characterized by three distinct traits: a work-oriented approach for both men and women, universalism of social security benefits, and the importance of the State in the provision of social security and production of services, based on widespread redistribution of wealth through taxation.[17] This model is not without variations throughout Scandinavian countries.[18] Sweden would be the most representative example, while other countries diverge more or less from the model. In this respect, Iceland is the furthest from the model; the redistribution system is not as extensive and not as costly.[19]

Longyearbyen, Svalbard, the world's northernmost city. Photo: Crestock

This perspective can explain the patterns found in the second general model. The Scandinavian economies are generally more diversified than those of Alaska and the Canadian North.[20] In spite of a lower disposable income, the Northern Scandinavian regions have achieved some of the most favourable social conditions for human development, which can be partially explained by the political redistribution of resources through social policies. Disposable income is lowered through taxation; on the other hand, public revenues generate social development by increasing the level of education and life expectancy, decreasing infant mortality, and by supporting a gender-balanced demography.

In the northern regions of the United States and Canada, government transfers often take the form of transfer payments to families. In the Scandinavian countries, these policies take the form of public services, and transfer payments to families, as well as public pension plans, are usually more generous. Poverty rates in Scandinavia are lower than elsewhere. All indicators point to redistribution policies having had beneficial effects on living conditions in the Arctic regions of the Scandinavian countries.

In the Scandinavian North, life expectancy and education level are the highest within the circumpolar Arctic, and infant mortality is the lowest. The dependency ratio is average as compared with the circumpolar area as a whole. The demographic structure of the regions of the Scandinavian North is very close to the demographic structure of the countries to which they belong. This demographic structure is typical of industrialized countries, with fewer children and more elderly people than in the Arctic regions of North America.[21]

The proportion of women in the Scandinavian North is quite high. However, outmigration of women has been observed here, too, as elsewhere in the Arctic. In northern Norway and Iceland, outmigration of women is also associated with erosion of their economic and social role.[22] In Iceland, the majority of young people – young women in particular – who live in a fishing or agricultural village, think they will one day migrate to an urban centre.[23] In Scandinavia, the push factors for outmigration of women are to some extent counterbalanced by strong pull factors. First, there are employment opportunities for women in the public sector. Secondly, living in fishing communities is often perceived as "a good life".[24] Finally, regional centres and villages attract immigrants, who do not feel like they are in "remote" regions, but more in paradises combining beautiful landscapes, outdoor activities, and safety, together with urban elements "such as a clustered society, cafe latte society, gender equality and high mobility".[25] These perceptions confirm the common impression that Arctic cities and villages in Nordic countries sometimes have more similarities with continental Europe than with North America or Russia. The climate clearly contributes to this difference.

In Nordic countries, the social-democratic tradition modifies the power structure. On the one hand, global demand has pushed the oil industry to constantly look further for exploitable resources. Structural changes in the fishing industry have affected many coastal communities, however, some major factors have made it possible to attenuate the consequences of these transformations, which were more catastrophic in other Atlantic regions that are very heavily mono-industrial, Newfoundland for example.[26] These factors include: the diversity of the economy, social policies for redistribution of wealth, the vitality of citizen associations, including those run by women - based on a relative distribution of power that seems to be more favourable to human development.

The Invisible Sámi

Within the context of the Scandinavian North, what is the situation for the Sámi people whose traditional areas of livelihood cover the Arctic regions of these countries? Is the Scandinavian model, so apparently advantageous, just as advantageous for native people? The socio-economic data analyzed here are not available on the level of the Sámi people of Norway, Sweden and Finland. The lack of relevant data is due to several reasons, including the geographical dispersion of the Sámi population, with a large number living outside the core Sámi areas of the north, as discussed in the recent Sámi statistical publication by Statistics Norway.[27] (See also chapter 4, table 4.11 and chapter 6.)

The Sámi were for a long time an "invisible minority", whose socio-economic status was inferior to that of their compatriots, and whose role in the power relationships was more or less nil.[28] The strengthening of the political power of the Sámi, their affiliation with international organisations dedicated to the defence of indigenous rights and territorial rights, and finally the establishing of Sámi Parliaments seem to have counteracted this invisibility. The Sámi do not seem to suffer from discrimination as much as other indigenous populations and they are not "grossly impoverished".[29] Still, more recent works indicate that, in Finland for example, the Sámi earn less than other inhabitants of the country and are under-represented on the job market and over-represented among the unemployed.[30]

On the other hand, they face problems, in matters of cultural survival in particular. For the minority of the Sámi still involved in reindeer breeding, the problems are numerous. Without even taking into account the climate change and the presence of predators (and policies limiting the capacity of breeders to eliminate them), conflicts regarding land use are numerous: pastures are destroyed or access to them is restricted by the construction of hydro-electric dams and the submergence of land, by the construction of roads and high voltage transmission lines, by the advance of the lumber companies, and recently, by development of infrastructure for wind power.[31] 20 years ago it was pointed out that the Sámi of Fennoscandia were victims of an ideological dilemma resulting from the social-democratic political philosophy. Whereas, in the international arena, Scandinavian countries supported minority rights, on the domestic scene, they prioritized growth, export and employment.[32]

However, the rights of the Sámi have improved considerably the last decades. Sámi Parliaments have been established in Finland (1973), Norway (1987) and Sweden (1992). The explicit granting of constitutional protection of indigenous rights in Finland and Norway, and the mention of the Sámi's interests in the Swedish Constitution, have modified the political landscape of northern Scandinavia, even though the governments have merely delegated authority, with declarations having limited impact. Yet the three countries differ in their approaches to Sámi rights – Norway has ratified the ILO Convention, while neither Sweden nor Finland has done so.[33] The increase of the Sámi's political weight does not, however, go as far as ensuring them ownership nor control of natural resources.[34]

Greenland/Photo: Crestock

The previous economic and social situation of the Sámi warranted political action, which has had results. It seems that the gains achieved are due rather to the sustained investment of the indigenous leadership of Fennoscandia than to the inclination of the national regimes to distribute specific rights: their social-democratic foundation does not permit them to forfeit the principles of universalism, or to question the imperatives of growth.

The peripheral islands

The situation of Greenland and Faroe Islands seems quite different at first glance (Figure 2.5). However, the general model of the Nordic countries applies here as well. Comparing with this model, life expectancy is lower and infant mortality is higher in Greenland. The socio-economic indices are generally more unfavourable in Greenland than in Faroe Islands, a situation that can be related to the general condition of native peoples throughout the circumpolar Arctic.

Like other coastal regions, the economies of Greenland and Faroe Islands are largely based on the fishing industry. In Faroe Islands, massive subsidies increased the capacity of the fishing fleet and processing plants, leading to over-fishing and crisis in the fishing industry.[35] Greenland followed the same path as Faroe Islands, both experienced negative economic growth around 2003 (see Chapter 4).

Disposable incomes are generally lower in Greenland and Faroe Islands than in other Scandinavian regions. This can be explained by an economic structure that is small scale and less diversified, and by the fluctuating income of the dominant fishing sector. The lower proportion of women reflects the desire to outmigrate, associated with the change of women's economic and social role, and with the incidence of domestic violence in these male-oriented communities.[36] The outmigration of young women might also partly explain the relatively low dependency ratio, by reducing the birth rate.[37]

Economic and human development are closely related in these peripheral regions of the social-democratic model. The political orientations favour redistribution of wealth to create the conditions necessary for the development of human capacities.

"The Russian model": The new Russia

Tyonek Fish Camp – A fish camp in Tyonek on the shore of West Cook Inlet, Southcentral Alaska in June 2004. Photo: Davin Holen

Old power networks

The third general model of relationships between the economic and social conditions, echoes the situation of the Russian Federation, two decades after the end of the Soviet era. The transition was characterized by extensive privatisation of businesses and creation of a powerful economic and political oligarchy. This adversely affected the economies and social conditions of rural and remote regions; by shrinking the social safety net; by a territorial reorganization leading to marginalisation of ethnic and indigenous minorities; with lower incomes and higher unemployment leading to higher infant mortality, and reduced life expectancy.[38] The socio-economic indices of this group of regions have the values furthest from the optimal conditions of human development, with a few exceptions.

The regions of the Russian North were opened up to industrialisation in the 1920s and 1930s, to supply the resources necessary for the construction of the USSR: iron, nickel, coal, wood, gold, etc. It was supported by immigration - not always voluntary, as in the case of the political prisoners forced to work in mines and on construction of railroads.[39] The present major economic infrastructures (railroads, port installations, industrial complexes) date back to this period, and have long suffered from under-investment.[40]

The dismantling of the USSR and the economic and political reorganization struck a hard blow to these regions, whose years of prosperity are behind them. Unemployment more than doubled in the decade that immediately followed the collapse of the Soviet system. The withdrawal of the government as producer and organizer "have redrawn class boundaries, undermined traditional job guarantees and eroded the old social safety net. The result is a wider gap between rich and poor".[41] The poverty rate is reported to be between 20 per cent and 25 per cent generally, and 30 per cent or more in 12 of the 21 republics of the federation.[42] Poverty has been particularly severe among single-parent families and large families, among individuals with little education and those living in rural areas. A large portion of the population attempts to make ends meet by cultivating a plot of land or by creating small businesses.

The industrial complexes, which in the past ensured basic social services (health, school, day care), shed these responsibilities when they were privatised. Regional and local authorities were unable to replace the services. Access to higher education is limited. Mandatory private health insurance has not improved health services and has created more disappointment than anything else.[43] "Today, old power networks remain strong and traditional bosses have adapted their style to remain in power, but they are often in no position to provide for essential needs to their clients."[44]

The economic transition was accompanied by massive migration from the Arctic regions to the southern regions. [45] Between 1989 and 2002, the Sakha Republic alone is reported to have lost half of its population.[46] Compared to other Arctic regions, the proportion of women is high in the Russian North. It is associated with a shortage of men, largely explained by early death due to pathogenic lifestyles.[47] The low dependency ratio is associated with the current crisis as well as "the demographic echo of World War II", as "a numerically small generation of children born to those who were born during World War II, a 'second demographic echo of the war'. The abruptly narrowed foundation of the pyramid reflects a dramatic fertility decline in the past decade, when the economic crisis of the 1990s and 'the second echo of the war' coincided".[48] The socio-economic conditions of the "New Russia", built on the Soviet ruins, thus reflect a greatly weakened social situation and a redistribution system which cannot even be qualified as a rudimentary welfare state.

Powerless minorities

The classification of the Russian regions based on socio-economic indicators suggested three types of variations, representative for Yamal-Nenets and Khanty-Mansii (Figure 2.6), Chuchki and Nenets (Figure 2.7), and Evenk and Koryak (Figure 2.8). The interpretation of these differences immediately introduces the discussion on the condition of ethnic and indigenous minorities in Russia today.

The first variation has similarities with the pattern of the neo-liberal model typical for the petroleum producing regions of the American North. The discovery of massive oil and natural gas reserves in Yamal-Nenets and the Khanty-Mansii dates back to the 1960s. When the reserves where put into production, the population of these regions increased for a short period, in order to take advantage of the high salaries. Life expectancy

and infant mortality were not much influenced, suggesting that economic growth alone may not succeed in improving basic social conditions, at least not in a few years.[49] Other indicators have been improved by higher income and migratory inflow, as the migrants have higher than average schooling and contribute to restoring the demographic equilibrium.

The oil revenues contribute to considerably higher incomes in these regions. Although the Moscow government remains the owner of the resources, it can grant their usage to regional authorities.[50] A consequence of oil revenue sharing was that the budget of the regional authorities became closely linked with exploitation, as is also the case in Alaska. This situation is not trivial: it means that regional authorities will tend to consider the growth of the sector as a main priority, ahead of any other issue. In 2005, the petroleum industry generated more than 50 per cent of total gross regional product in Arctic Russia (see Chapter 4).

The new political structure of the Russian Federation has symbolically acknowledged the presence of ethnic and indigenous groups by attributing their name to the political administrative entities. This is the case of the Autonomous Okrugs of Yamal-Nenets and Khanty-Mansii. Elected and administrative positions were reserved for members of these cultural groups. On the other hand, this structure has sanctioned the political marginalisation of these groups. The demographic weight of ethnic and indigenous groups is less (and sometimes considerably less) than the majority of the residents of these entities (Table 2.1), making them powerless minorities.[51] This is not a new situation, as the marginalization is part of Soviet heritage.[52] As northern Russia seeks to revitalize the economy of its once prosperous regions, its oil-producing regions are little by little turning toward the north-American neoliberal model, without policies leading to substantial and effective recognition of minority rights.

Several of the ethnic and minority groups have maintained their bond to the land and continue to practice customary activities, from which they derive a portion (if not all) of their income, and their identity, like in

Leftovers, Nuvahut/Photo: Mary Stapleton

Alaska, Canadian North, and Fennoscandia. In these cases, the customary exploitation of the land, like the seasonal move to summer pastures and fishing, is often in conflict with large-scale industry.[53] The power to allocate land and resolve divergent interests is held by regional authorities, whose income depends precisely on oil revenues. When it comes to choosing between revenues from growth of large-scale exploitation of resources and maintaining the customary activities of minority groups, the choice is clear. The result of this type of situation is that ethnic and indigenous minorities are stripped of their land and power.

Although the socio-economic pattern observed in Yamal-Nenets and Khanty-Mansii suggests a quantitative improvement of the indicators considered, and increased incomes for the workers employed in the petroleum industry, it does not reflect an improvement of living conditions and of the capacity to control one's fate for the ethnic and indigenous minorities of these regions. Their lot is statistically obscured by their minority status.

Conclusion

In all the three main models, economic growth is highly valued. In the North-American Arctic, petroleum and mining industry has to some extent consented to share oil and mining revenues with local populations. In Nordic countries, growth is encouraged because it provides a major source of universal social benefits, even though high-growth industries may be detrimental for customary activities in the land of the Sámi. In the north of the Russian Federation, privatisation has allowed industrial complexes to shed the social responsibilities without introducing alternative social services.

In all the models, there is redistribution of revenues created by large-scale exploitation of natural resources to communities and citizens. There is no doubt that the terms and generosity of this redistribution differ. However, what appears as common to the three models is that the scope for redistribution is closely linked to the capacity of citizens to express their position and make their voices heard, and to the propensity of public authorities to listen to them. This is all the more true in the era of generalized liberalisation of the markets, with strong pressures to avoid barriers to growth. The effectiveness of the claims of the citizens depends at least as much on the activism demonstrated by associations and pressure groups as on the fundamental political orientation.

Our observations have led us to conclude that for all the models, the relationship between the proportion of women and disposable income can be used as a key indicator to diagnose the state of health of the economy and society; that it should be monitored closely; and finally, that industrial developers should integrate the prospects of women into their projects, which they have often neglected to do.[54]

Economic growth affects ethnic or indigenous minorities in all regions where they are present. Their capacity to benefit from the growth differs widely. In Alaska, indigenous people have in some cases become business partners for profit-sharing. In Greenland they have obtained certain regulatory powers and the right to a share of revenues from natural resource extraction. In several regions in the Canadian North they have become sub-contractors and received financial compensation for the use of their territory. In the Russian North they have acquired seats within the public domain and symbolic recognition. We suggest that there is an association between the capacity of indigenous groups to be stakeholders in projects that affect their territories, and the success they achieve in forcing public authorities to grant them tangible power. Land Claim Agreements can probably increase the capacity of the indigenous groups to act upon their fate.[55] However, they are not panacea, as pointed out by many observers, and are often instrumental to obtaining a common belief in the value of growth.[56]

Many of the regions where ethnic and indigenous populations are strongest are located in the "variation" of the models, outside the three main models. In these cases the economic and social condition of minorities shows inequities in the form of lower incomes, lower education levels, lower female proportions, and lower life expectancies, higher infant mortality, and higher dependency ratios. Although they live in developed countries, nothing guarantees that the minorities enjoy the benefits.

In Russia around 1990, several ideas contended in the debates regarding the future of the North and of its "Small Peoples", as the old regime referred to ethnic minorities: Some argued for conversion to industrial work; others suggested to modernise traditional branches of the economy, technically and financially. Both views basically supported economic growth. There was another option: "The most radical view aimed at the development of genuine native autonomy, with the greatest possible growth of local forms of self-government and of the economic and legal independence of each community".[57] These solutions have more or less materialized - except the last one. The dominant economic ideology has successfully continued to promote the view that growth is the guarantee of overall progress of society.

In our analysis of the Arctic, we have found that there is not a direct link between economic growth and human development, at least not in the perspective of Armatya Sen. If economic growth had been a guarantee for human development, we would not have found the considerable variability in the socio-economic patterns, with high infant mortality rates and low disposable incomes, even in resource-based regions. We found many indications that economic development in a region does not always lead to improvement in the living conditions, nor increased democratic rights, nor inclusion of local populations in development projects from the beginning, as prescribed in the Rio Declaration[58]. In particular, the situation of the indigenous people reminds us that their interests in many situations remain invisible.

In the relationship of power between business, governments and citizens, one side has a crucial role for orienting economic growth toward human development and the capacity to control one's fate, and that is the power of citizens. Regardless of the form it takes - environmental pressure groups, local associations, labour unions, indigenous associations - the involvement of local populations in the debate on economic interests is the guardrail to redirect economic development toward human development. This does not mean that citizen involvement in the public debate is a guarantee for beneficial human development. However, the manifestation of citizen involvement that we found in all regions of the circumpolar Arctic has led us to conclude that favourable conditions for human development are closely linked to the capacity of all citizens to express their position and make their voices heard.

Notes

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Box I. The use of Purchasing Power Parities in this report

Street business – Siberian women trying to supplement the household budget through street selling. Photo by Gérard Duhaime

The main purpose of this report is to provide an overview over economic activity in the Arctic regions. A major challenge has therefore been to add up and compare production data for different regions in different countries. There are some particular challenges associated with such comparisons. A translation of production data based on a straightforward use of market exchange rates (MER) will normally not reflect the true production volumes of the different regions. To adjust for price differences in domestic markets Purchasing Power Parity (PPP) indicators have been applied. However, also PPP conversion may sometimes lead to a biased assessment of production and income levels.

Chapter 3 provides an overview of the economic activity in the circumpolar region. Based on PPP-conversions it is estimated that gross product of the Arctic in 2005 accounted for 0.5 percent of the world economy, or 301 billion USD-PPP, of which the Arctic regions of Russia accounted for 209 USD-PPP, or 69 percent. PPP-converted gross products (value added) might be considered as proxies for income. In that respect income levels in the Arctic vary from a low of 21 000 USD-PPP/capita in Greenland to a high of 54 000 USD-PPP/capita in Alaska, cf. table 3.6. It is interesting to note the differences between national and regional income within the different nations bordering the Arctic. For example, per capita income of Russia is around 9 000 USD-PPP at the national level while it is almost 29 000 USD-PPP in the Russian Arctic regions. In Norway the pattern is reversed: While per capita income at the national level is 44 000 USD-PPP, the income level of the Norwegian Artic regions is 25 000 USD-PPP. Hence, while Norway has a considerably higher national PPP-corrected income level compared to Russia, income levels appear to be relatively similar if we look at these countries' Arctic regions.

As noted the data for the different countries have originally been reported in national currencies, but have in this report been converted into a common currency using purchasing power parities. Alternatively the national currency data could have been converted into a common currency by use of the market exchange rates. The Russian share of the Arctic gross product would, for example, then have been estimated to 46 percent, instead of 62 percent, cf. also Figure 2.

In most studies comparing different countries PPP-conversion is preferred to market exchange rates. We have followed this tradition and have applied PPP-converters developed by the International Comparison Program and the OECD-Eurostat PPP-program.

The advantage of PPP-conversion is that it takes into account that price levels vary considerably between countries. A frequently applied illustration of the variation in price levels is the price of a Big Mac in different countries. Using market exchange rates the average price of a Big Mac in Stockholm was 4.53 USD in April 2006, where as the price in Moscow at the same time was 1.77 USD. This illustrates that almost identical products are priced quite differently even in the Arctic countries if we use market exchange rates as the basis for price comparisons. Consequently MER-conversion of production levels might give seriously misleading numbers as far as production and consumption levels are concerned.

When practising PPP-conversion we would have preferred to use PPP-factors specific for the Arctic regions in each country, but Arctic-regional PPP-factors have not been developed. Instead we have applied PPP-factors for the national economies.

It is difficult to judge to what extent the use of national PPP-measures is misleading. If the economies of the Arctic regions simply were downscaled versions of the economies of the respective nations and products were priced uniformly across regions, the national PPP-converters would not have been a source of error. However, the Arctic regions are quite different from their respective national economies, as discussed in chapter 4. Moreover, the general price levels are different between different regions within the individual countries. A Big Mac is, for instance, more expensive in Anchorage than in New York. Hence, just as the use of MER-based numbers would represent a source of error, using national PPP-based numbers are also a source of error.

The Russian Arctic region is more dominated by oil and gas production than the rest of the Russian economy. Oil and gas are internationally tradable goods and the relatively high average income level of the Russian Arctic is largely due to the oil and gas industry. The dominance of the fuel industry in the Russian Arctic indicates that the use of a PPP-converter calculated for the whole Russian economy will probably represent an over-correction when it is applied to the Russian Arctic regions.

Figure 1 illustrates how sensitive the estimates of regional GDP per capita are to the choice between PPP and MER. When PPP-factors are applied, regional GDP per capita in Russian Arctic are close to the income levels of the Arctic regions of the Scandinavian countries. However, as MER-factors are applied, the income levels in Arctic Russia appears to be much lower.

It should be noted that we have reported data on regional GDP, not gross regional incomes, which have not been available for all Arctic regions. Because regional GDP, contrary to gross regional income, does not include transfers between regions, regional GDP per capita does not constitute a precise representation of income levels in the different regions.

Figure 1. **GDP per capita by Arctic Region 2005. 1 000 USD**

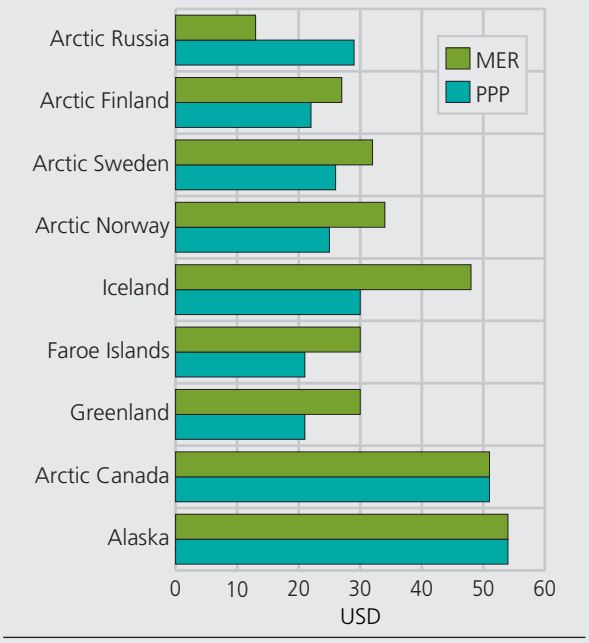
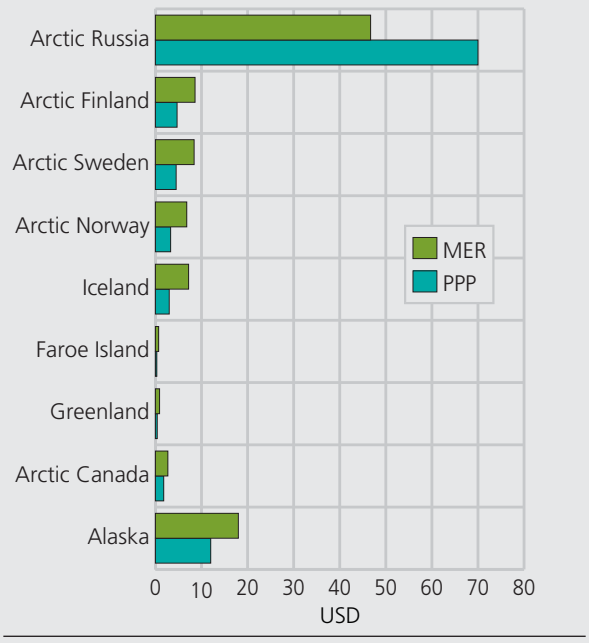


Figure 2. **Arctic Region share of total circumpolar GDP. 2005. Per cent**



Nuuk, Greenland. Photo: Tom Nicolaysen

3. Comparative analysis of Arctic economies at macro level

Ilmo Mäenpää

The Arctic hosts few people upon vast areas of land and oceans. This vast territory contains rich valuable natural resources, and the Arctic economies are largely based on natural resource extraction. Variations in the regional endowments lead to considerable variations in regional GDP across the Arctic. However, transfers tend to modify the gaps in disposable income per capita between regions. This chapter takes a broader look at the Arctic economies from a macro level perspective, taking a circumpolar outlook as well as comparing the Arctic regions with their non-Arctic counterparts within the countries.

The Arctic economies are generally confined to regions which are encompassed or traversed by the Arctic Circle. In many contexts, however, regions in Europe that are situated somewhat to the south of the Arctic Circle, but participate in the cooperation of the Barents Euro-Arctic Council[1] are included among the Arctic economies. The Arctic regions of the ECONOR project largely comply with this definition, however the Canadian region of Nunavik is left out because Nunavik is part of Quebec and lacks official regional accounts[2] (Figure 3.1). Eight countries have regions belonging to the Arctic economies: United States, Canada, Denmark, Iceland, Norway, Sweden, Finland and Russia.

The overview presented below illustrates regional economic activity in terms of Gross Regional Product (GRP). Further, Disposable Income of Households (DIH) is included to indicate economic welfare of the populations. The data used in this analysis are based mainly on the regional accounts of the statistical offices of the Arctic countries. The regional data are converted from local currencies to USD in purchaser price parities (PPP), see box I pages 24-25. Box 3.1 below illustrates some of the steps that have to be taken when harmonising the valuation of economic data across regions.

An overview of Arctic economies

At circumpolar level the Arctic regions with 0.2 percent of the world population generated 0.5 percent of global gross domestic product (GDP) in 2005. The Arctic covers as much as 11 percent of the global surface area.

Arctic states hold different shares of the Arctic in terms of land area, population and GDP. Figure 3.2 illustrates the role of the Arctic states in the entire Arctic region. Arctic Russia covers more than half of the total Arctic surface area. The Russian share of economic activity amounts to 70 percent of total Arctic activity and the population share is similarly high. Canada and Denmark (Greenland and Faroe Islands) take the second and third largest shares of the surface area of the Arctic, but have disproportionally low population densities and economic activity levels. In other Nordic countries – Iceland, Norway, Sweden and Finland – the population densities and economic activity levels are relatively high.

Figure 3.3 shows the role of the Arctic regions in their national context. In the United States and Canada the population and GDP of the Arctic regions represent less than one percent of country level. In Russia the

Box 3.1. The harmonisation of economic values across regions

United States, Canada and Sweden provide gross regional product (GRP) at market prices (including the product taxes minus subsidies) whereas other countries present GRP at basic prices (at factor cost or as gross value added). From detailed regional accounts of United States, Canada and Sweden the share of product taxes less subsidies were available, however, and all the GRP figures could be converted into basic prices.

In the national statistics the figures of GRP and disposable income of household (DIH) are expressed in national currencies. They are converted to unified purchasing power parity (PPP) values and expressed in USD 2005. The PPP conversion factors have been taken from the Economic Outlook database of IMF. The role of the PPP conversion factors is to adjust for differences in regional purchasing power, thus providing a better indicator of the capacity to consume based on regional price levels while at the same time achieving a unified valuation. However, national PPP conversion factors reflecting national price levels have been used, causing some bias in the GRP and DIH values, because the price levels in Arctic regions may differ from the country average price levels.

Regional accounts for Norway, Sweden, Russia, Greenland and Faroe Islands are available only at current prices. To get the volume growth of the regional economy the GRP of the year 2000 are converted into 2005 price level by using the implicit price index of the national GDP series at the IMF database.

Figure 3.1. **The circumpolar Arctic**

Source: www.arcticstat.org

Arctic share of the population was 5 percent, but the Arctic region generated as much as 15 per cent of total Russian GDP in 2005. Iceland is totally encompassed by the Artic as defined in this report and so its percentage shares are all equal to 100. For the other countries the Arctic population share is highest in Finland (12 per cent) and Norway (10 per cent).

Arctic population

Population growth for Arctic and non-Arctic regions within countries over the whole period 2000–2005 is shown in Figure 3.4. The Arctic regions of both United States and Canada have experienced a more rapid population growth than the non-Arctic regions within these countries. The population growth in Alaska was 6.7 percent over the 5-year period, in Northern Canada it was 5.9 percent. The population of Arctic Russia declined 1.9 percent – more than in any other Arctic region, but less than in other parts of Russia, where the population decreased by 2.2 percent. Both Sweden and Norway experienced declining population in their Arctic regions, at 0.8 and 0.4 percent respectively. Sweden and Norway were the only Arctic countries with population growth in non-Arctic regions and popula-

Figure 3.2. **Arctic surface area, population and GRP of Arctic states as share of the Arctic total. 2005. Per cent**

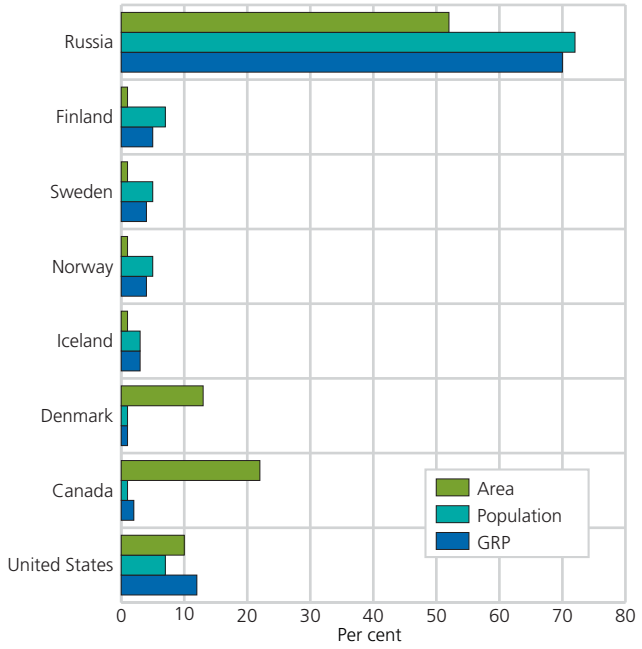


Figure 3.3. **Arctic region share of surface area, population and GRP of corresponding country. 2005. Per cent**

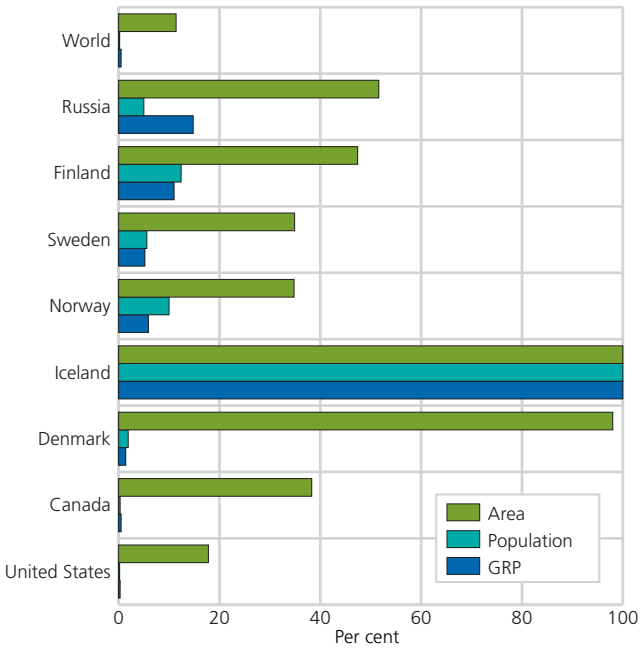


Figure 3.4. **Population growth. Arctic and non-Arctic regions by country. 2000-2005. Per cent**

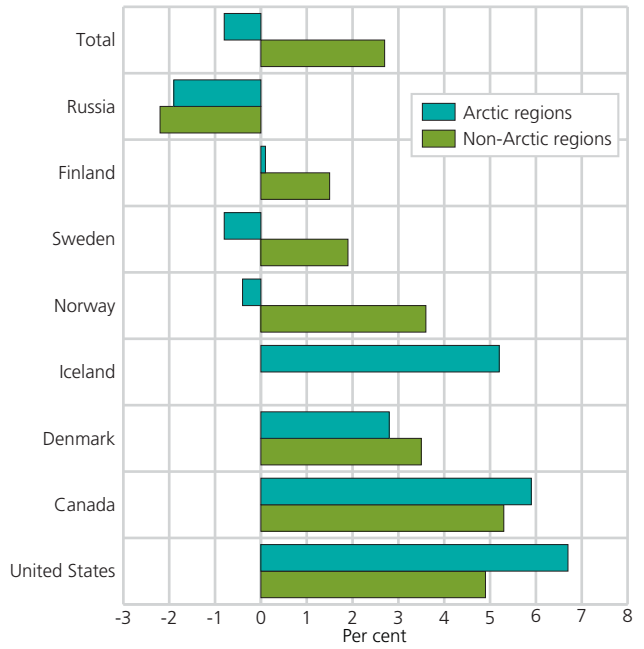
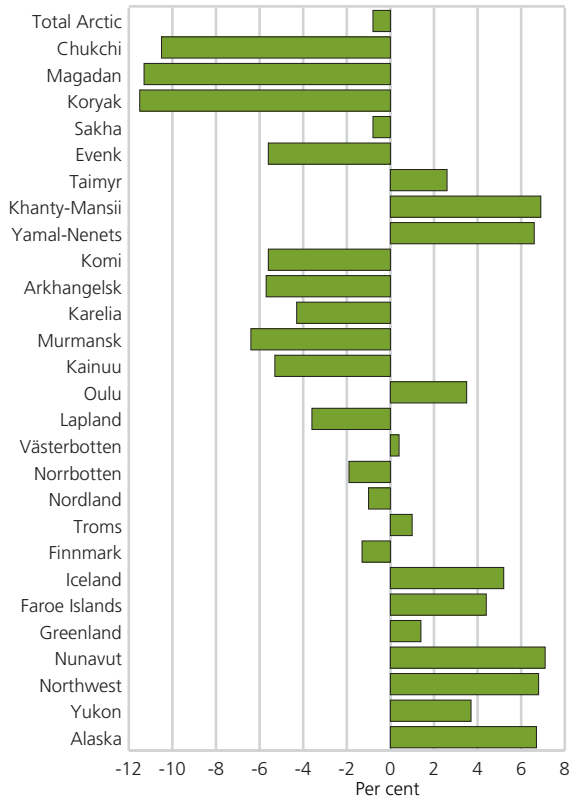


Figure 3.5. **Population growth by Arctic region. 2000-2005. Per cent**



tion decline in Arctic regions. This development was particularly pronounced in Norway, where the non-Arctic region had a population growth of around 3.5 percent. Arctic Finland experienced a marginal population growth. In the Arctic as a whole, there was a decline in population of 0.8 percent during 2000-2005.

Figure 3.5 shows the population growth at a detailed regional level. In Russia the two regions with large oil and natural gas industries, Yamal-Nenets and Khanty-Mansii, have had rather high population growth at 6.6 and 6.9 percent, respectively. Except for Taimyr, other Russian Arctic regions have declining populations, around 5-6 percent decline in western regions, and above 10 percent decline in the eastern regions of Koryak, Magadan and Chukchi. These numbers reflect the "demographic echo of the World War II", see chapeter 2, page 20, in addition to the economic and social crisis following the break-up of Former Soviet Union, which was modified in some regions by the revitalization

Figure 3.6. **Gross regional product (GRP) per capita. 2005. 1 000 USD-PPP**

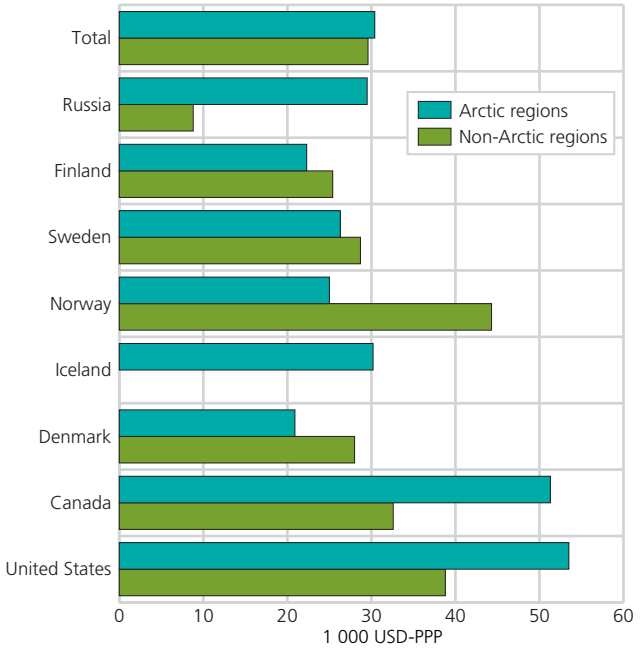
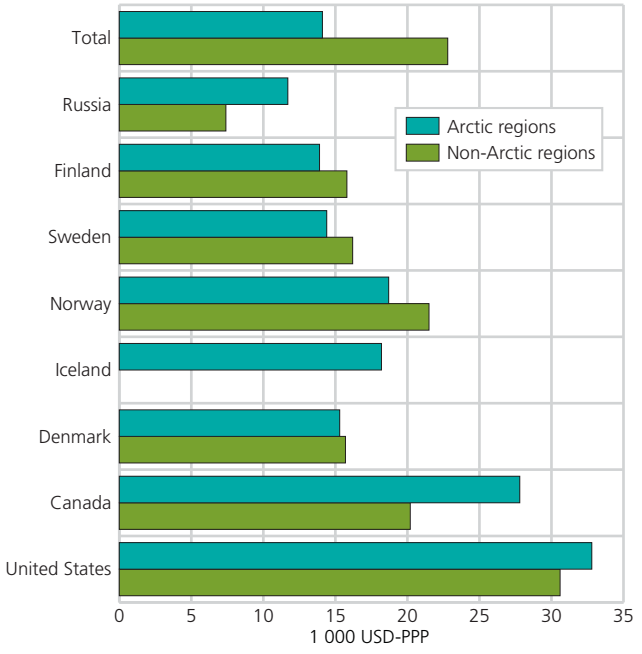


Figure 3.7. **Disposable income of households per capita. 2005. 1 000 USD-PPP**

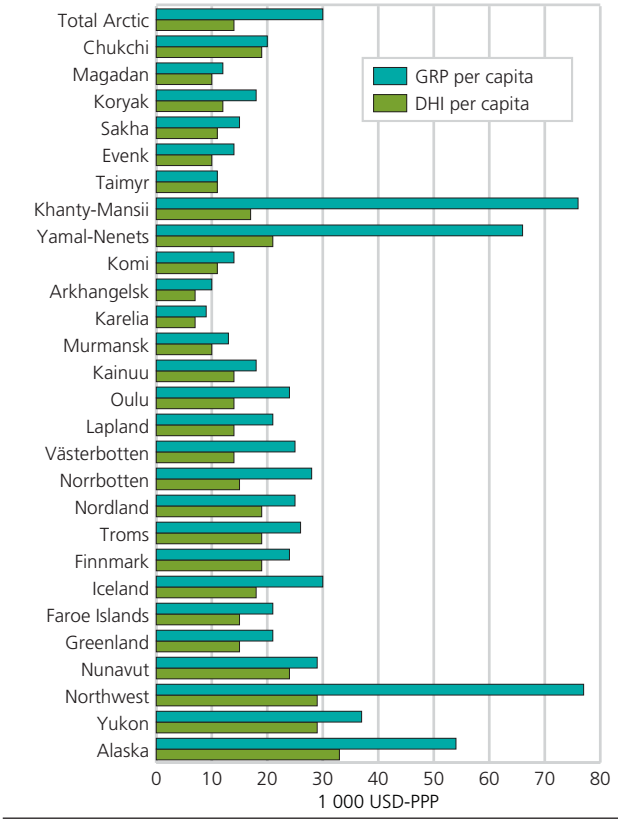


of the petroleum industry. Arctic regions of Finland, Norway and Sweden have one subregion each with population growth, in other subregions the population declines. This structural change is most clearly visible in Arctic Finland, where Oulu has absorbed migrants attracted by the electronic industry and academic institutions.

The economy of the Arctic

In resource rich Arctic regions of United States, Canada and Russia the Gross regional product (GRP) per capita is considerably higher than in non-Arctic regions (Figure 3.6). In Russia the GRP per capita in Arctic regions is as much as 3 times higher than in the rest of the

Figure 3.8 **Gross regional product (GRP) per capita and disposable income of households (DIH) per capita, by Arctic regions. 2005. 1 000 USD-PPP**



country, reflecting the presence of huge petroleum and mineral industries in Arctic Russia. In Norway, where revenue from oil and natural gas extraction is generated in non-Arctic regions, the difference in favour of non-Arctic regions is large. Sweden, Finland and Denmark also have higher GRP per capita in the non-Arctic regions, although the difference is much smaller than in Norway. GRP per capita in Iceland matches the circumpolar average, and among Arctic regions, only Arctic Canada and Alaska had higher GRP per capita.

Differences in disposable income per capita across Arctic countries are smaller than differences in GRP per capita, and the gap between Arctic and non-Arctic regions are considerably smaller than the difference in GRP per capita (Figure 3.7). This follows from income redistribution mechanisms as revenues and taxes from natural resource extraction in Arctic regions enter the country level economies whereas the regions of resource origin receive transfers.

Among Arctic regions, disposable income per capita is highest in United States. Note, however, that a comparison of disposable income per capita between countries can only roughly indicate differences in welfare. In United States, the government covers a lower share of educational and health expenditures than in other countries. For better comparability, public expenditures to household services should be added to the disposable incomes. The share of GRP devoted to public services can be found in chapter 4 in this report.

Figure 3.9. **Average annual economic growth of Arctic and non-Arctic regions, by country. 2000-2005. Per cent**

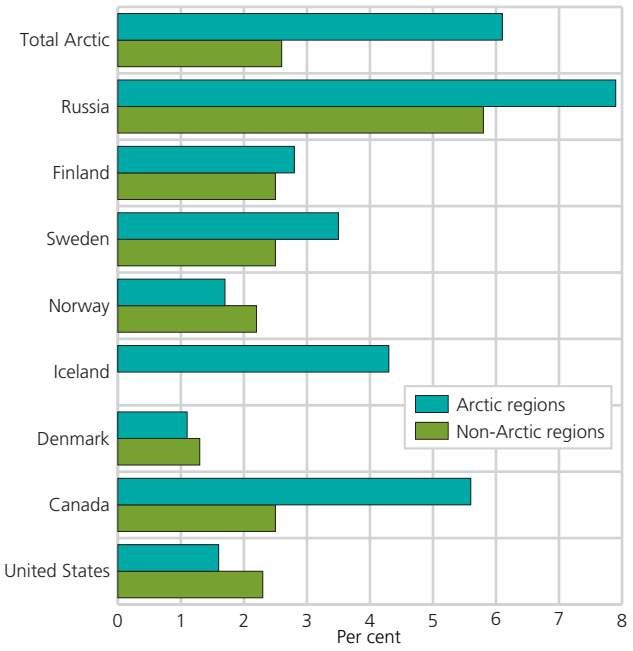
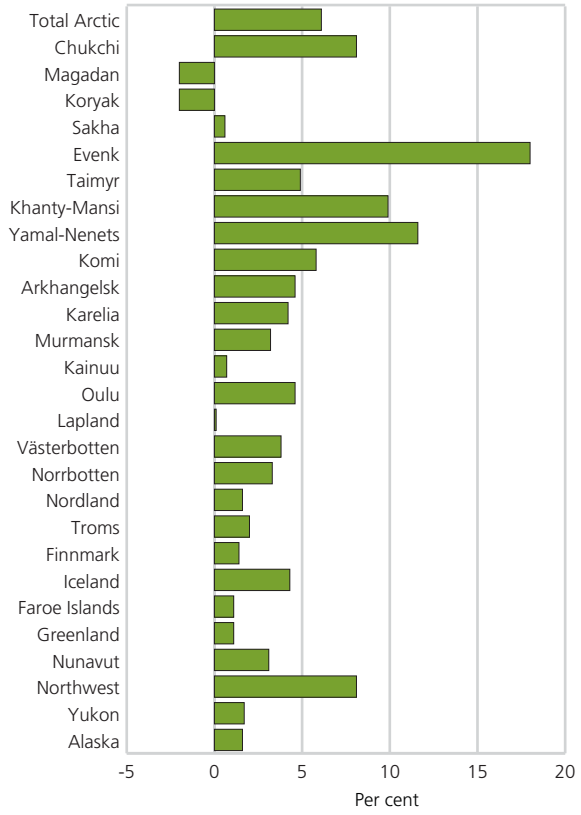


Figure 3.10. **Average annual economic growth, by Arctic region. 2000-2005. Per cent**



Further, it is important to keep in mind that Arctic and non-Arctic regions within the same country might have different price levels, tending to be higher in Arctic regions with low population density and high transportation costs. Hence, Figure 3.7 may overestimate the actual welfare level of Arctic regions when compared with non-Arctic regions. On the other hand, own hunting and harvesting of food is more widespread in the Arctic regions.

Figure 3.8 shows GRP and disposable income per capita at a detailed regional breakdown. The four regions with exceptionally high GRP per capita figures are Khanti-Mansii and Yamal-Nenets in Russia, Northwest Territories in Canada and Alaska in the United States. These regions are all characterised by substantial revenues from extraction of natural resources, particularly from oil and natural gas production in Russian regions and Alaska, and from diamonds in the Northwest Territories.

The redistribution is particularly visible in the Nordic countries Norway, Sweden and Finland. Despite differences in per capita GRP among sub-regions, the disposable income differences are negligible within each country.

Among the Russian sub-regions, Chukchi, Yamal-Nenets and Khanty-Mansii had disposable income per capita above the circumpolar average. GRP per capita in Khanty-Mansii is more than 4 times higher than disposable income per capita. The Northwest territories in Canada with high revenues from diamond extraction in 2005, had only slightly higher level of GRP per capita than Khanty-Mansii, but a disposable income about 70 percent above the level in Khanty-Mansii

For the Arctic as a whole, GRP per capita is twice as high as disposable income per capita.

Economic growth 2000-2005

The economic growth rates presented here are calculated as average yearly percentage change of GRP 2000-2005 in constant (chained) prices. At circumpolar level the economic growth rate of Arctic regions has been over two times higher than the growth rate of the non-Arctic regions (Figure 3.9). Only in the United States, Denmark and Norway the Arctic regions have had slower growth than the non-Arctic regions.

The economic growth rates of Arctic sub-regions are shown in Figure 3.10. Especially high growth has taken place in Evenk Autonomous Okrug, where petroleum exploration and production has started up. Among the smallest and poorest Arctic regional economies, Evenk has been experiencing around 18 per cent annual growth on average during 2000-2005. This economic growth has so far not lead to population growth, as there was a decline in population of almost 6 per cent over the period 2000-2005, which is considerably lower than in other Russian Arctic subregions such as Koryak, Magadan and Chukchi without substantial mineral extraction (figure 3.5)

Koryak and Magadan both had economies declining 2 percent per year on average, combined with population reduction of 11 percent over the 5 year period (Figure

Figure 3.11. **Dependency ratio in Arctic and non-Arctic regions, by country. 2005**

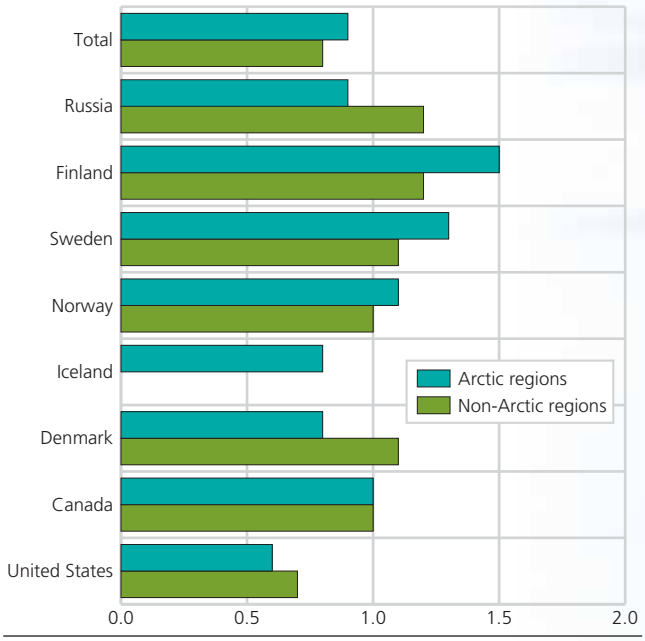
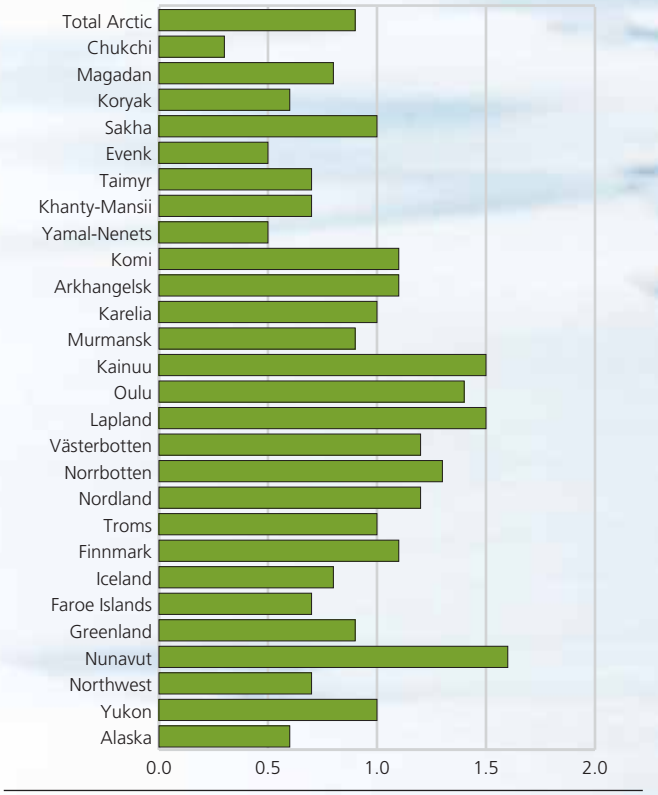


Figure 3.12. **Dependency ratio, by Arctic sub-region. 2005**



3.5). All other sub-regions had positive, but highly variable, economic growth.

The rapid economic growth of the Northwest Territories up to 2005 in Canada is mainly related to the development of diamond mining.

Dependency rate

A useful socio-economic indicator is the economic dependency ratio, which is the number of persons unemployed or outside the labour force per employed person. The persons outside the labour force include children, elderly, disabled, students, unemployed, and, especially relevant in the Arctic, people involved in informal subsistence economy.

Figure 3.11 shows that in North America, Denmark and Russia the Arctic regions have lower dependency ratios than the non-Arctic regions. The use of seasonal and migrant labour in petroleum and mining industries may explain the low dependy ratios of the US (Alaska) and Arctic Russia. In Nordic countries, especially in Finland, the dependency ratios in Arctic regions are higher than in non-Arctic regions.

The dependency ratios of Arctic sub-regions are presented in Figure 3.12. For understanding the factors behind the differences of dependency ratios, more detailed statistics on the population age structure etc. would be needed.

The main petroleum producing regions Alaska, Khanty-Mansii and Yamal-Nenets, have fairly low dependency ratios, indicating use of seasonal/temporary labour. So is the case with the Northwest territories of Canada with diamond production. Denmark with Greenland and Faroe Islands have lower dependence ratio than the non-Arctic region, pointing to subsistence as one reason, another is that young people leave for higher education in other countries. The Fennoscandinavian regions have higher dependency ratios, reflecting a greater variety in the economic basis and public services supporting more stable settlements. Nunavut has the highest dependency ratio.

Notes

[1] See: http://www.beac.st

[2] Regional accounts for Nunavik have, however been compiled for 1938, 1991, 1998 and 2003, and are available at Nunivaat.org or http://www.nunivaat.org/TableViewer.aspx?U=http://www.chaireconditionautochtone.fss. ulaval.ca/extranet/doc/152.pdf. See also Duhaime, G, and V. Robichaud, 2007. Economic Portrait of Nunavik 2004. Québec, Canada Research Chair on Comparative Aboriginal Coundition, 66p.

Box II. Notes on Gross Domestic Product and Value Added Comparisons Across Arctic Regions

Gross Domestic Product (GDP) is the total value of final goods and services[1] produced within a territory in a specified time period. It is one of the important measures of the level of economic activity in a region, along with employment and personal income.

GDP is a measure of how much output a region can produce as well as how much income it can generate from that production. In this regard GDP is equivalent to Value Added (VA), defined as the economic contribution to goods and services production at each step in the production process by the factors of production—mostly labor and capital. Since the sum of value added equals both the value of output and the income to factors of production, total income equals total output.

The international standard for measuring GDP is established in the System of National Accounts (SNA93) prepared by representatives of the International Monetary Fund, European Union, Organization for Economic Cooperation and Development, United Nations, and World Bank. The rules and measures for the measurement of national accounts are designed to be flexible, to allow for differences in local statistical needs and conditions.[2] GDP statistics are available for most countries and are commonly used to track and compare economic performance.

GDP is generally measured in the local currency, and so to compare the economic activity or performance between different countries requires that they be converted to a common base, typically using either the currency exchange rate or the purchasing power parity exchange rate. The choice depends on the objective of the comparison. The former compares the international purchasing power of different economies. The latter is a better measure of the domestic purchasing power of the average producer or consumer within the countries. Some implications of this choice with relevance for The Economy of the North are illustrated in Box I.

Analysts using GDP as a measure of economic performance for a country need to keep in mind that it has a number of well-known shortcomings including:

1. Non-market transactions (child rearing, homemaker production, etc.) are generally excluded.
2. Economic «bads» are included. More production simply means a higher GDP, regardless of what is produced.
3. The value of leisure and other aspects of the quality of life are excluded.
4. The distribution of income across the population is not measured.
5. The sustainability of production is ignored.

In many countries GDP is also calculated at a regional level, allowing comparisons between regions within a country as well as between regions in different countries. These comparisons need to recognize certain features of regional GDP calculations, particularly when the regions are small and remote.

1. Residency—GDP is a measure of the value of production within a region, regardless of the residence of the labor used in production or the ownership of the capital. A companion measure at the national level, Gross National Product (GNP), measures the value of production by the residence of the owners of the labour and capital used in production, wherever that production takes place, but there is no comparable figure at the regional level, at least in the United States.

This can be a problem when using GDP as a measure of the income of a small and remote regional economy. A significant share of the work force could consist of commuters or seasonal workers who live outside the region. A large share of the capital could be owned by non-residents and the profits from production could leave the region. If these conditions are true then the income accruing to the residents of the regional economy will be less than the value of production.

It is also possible that the opposite would be the case. The state of Alaska controls a large investment fund, the Alaska Permanent Fund, with a portfolio of investments that is entirely outside the state. Each year the Fund generates several billion dollars of income that is not included in Alaska GDP because the production associated with those investments occurs outside the state.

2. Federal Assistance—A remote rural region of a national economy may be dependent upon assistance from the central government to pay for and provide public services, over and above the level that taxes from the region to the central government can provide. In such a case the GDP, which generally includes all public sector spending in the region, will be an overestimate of the productive capacity of the region itself by the amount of the «subsidy». For example, an increase in the subsidy will increase GDP, even though it does not represent a strengthening of the regional economy.

3. Location of Production—When production involves inputs located in different regions it can be difficult to allocate the share of value added attributable to each region. For example oil production on Alaska's North Slope depends on the inputs physically located in Alaska, but also on capital and labor inputs located in the headquarters offices of the oil companies outside the state. Allocating economic rents (the value of output in excess of that required to compensate capital and labor) between regions in this case is arbitrary.

Production may occur in one region and be reported in another. A share of the seafood harvested in the ocean adjacent to Alaska is done by boats headquartered outside the state. The value of their harvest is reported as occurring in other locations rather than in Alaska.

4. Valuing Subsistence Activities—A share of the population in many remote rural regional economies engages in productive activities outside normal economic markets, such as the subsistence activities of indigenous people. The valuation of these subsistence activities can be handled in several different ways in the GDP accounts. They may be excluded altogether as is the case in the United States. If they are included, there may be differences in the types of activities included. For those included activities valuation may be done by comparison of the outputs to similar outputs that have market prices (replacement value), by valuing the outputs at the cost of the inputs, or by some other method of imputing a value to the activity.

5. Price Variation—Small remote regional economies may be dominated by a limited number of primary commodity producing industries. The value added in the production of those commodities can be quite volatile from year to year because of volatility in their market prices. The Alaska GDP is heavily influenced by the importance of oil production, and much of the change in GDP from year to year is a result of the change in the price of oil rather than any change in the physical output of the economy.

This volatility means that comparisons with other regions are sensitive to the year in which the comparison is made. A comparison when the price of oil is high will indicate a larger Alaska economy relative to other locations than would be the case of a comparison when the price of oil is low.

6. Data Collection Difficulties—The small size of regional economies results in less precision in estimates of GDP based on sampling (due to sampling error). Remoteness can also contribute to imprecision due to the challenges of data collection associated with travel, weather, and other variables.

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[1] Including exports.
[2] Countries may differ in the types of non-market activities they chose to include in GDP. They also may differ in which prices they use to present output figures. Among the alternatives are market prices (including any sales, property, and excise taxes) or factor costs (market prices net of taxes which are not a return to a factor of production).

Iceberg, Icefjord north of Nuuk, Greenland. Photo: Tom Nicolaysen

4. Arctic economies within the Arctic nations

Solveig Glomsrød, Ilmo Mäenpää, Lars Lindholt, Helen McDonald and Scott Goldsmith

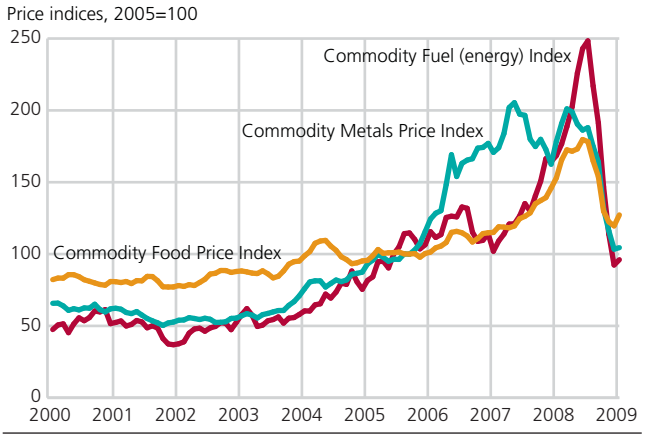
This chapter updates information on the economic characteristics of the Arctic regions of the 8 Arctic countries. The economies of the Arctic are heavily dependent on natural resource extraction. The recent years have added experience of boom and bust to the economic development of these nature based economies. After 2002 there has been a strong increase in world market prices of most raw materials – in particular prices of metals and energy, both main sources of export revenues for most Arctic regions (figure 4.1). Prices peaked at a level 4-5 times above the 2002 level before collapsing with the financial crisis by medio 2008. Food prices also peaked in 2008, before they fell considerably although less than the prices of the more cyclically exposed minerals and fuels. High prices on fish rewards the fish exporting arctic economies, but on the other hand, the arctic regions import most of their food, and higher food prices add to already high costs of living.

In the following presentation of National Account data and other statistics on economic development in the Arctic regions, it is useful to keep in mind the recent raw material price development when interpreting the results. The main bulk of economic data in this chapter goes up to 2005, only covering the initial years of the price rise on energy and metals, but are far from reflecting the impact on the economy of the peaking raw material prices up to 2008.

For the most part, the information in this chapter is viewed from an intra-national rather than a comparative international perspective, although some comparisons among the regions are made in the concluding remarks to this chapter.

For each of the Arctic regions this chapter contains a core table showing gross regional product (GRP) (or GDP for nations) in current prices and the contribution to GRP by industry at a disaggregated level (for 18 industries). At this level of detail we hope to make all the main activities of the circumpolar Arctic regions visible. In addition, standardized figures present contribution to GRP by main industry and the role of nature based industries in the regional economy. These core tables generally refer to the years 2002 and 2005. The tables present value added or contribution to GRP in local currency in order to focus on the Arctic element of their respective national or federal economies. The data for the Arctic regions are based on national statistics. Data sources by region are listed in box 4.3, page 67. Where available some more recent economic indicators are presented.

Figure 4.1. **Price indices of food, metals and energy. 2000-2009**



Source: IMF (2009), see endnote 1.

Box 4.1. Thule institute

The regional account data in this report have been harmonized by researchers at the Thule Institute at the University of Oulu, Finland. The Institute promotes cooperation across disciplines and carries out high quality research in the field of Northern and Environmental Issues, one of the University's focus areas. The Institute has four operational units, the Centre for Arctic Medicine, NorNet (Northern Environmental Research Network), NorTech Oulu and Oulanka Research Station.

The Thule Institute covers research programmes, graduate schools and Master's programmes. The Institute also participates in national and international networks in the field of northern and environmental issues.

The research programmes are titled Global Change in the North, Northern Land Use and Land Cover, and Circumpolar Health and Wellbeing. The Institute is also involved in research on Environmental and Resource Economics, Environmental Technology and in the programme Human-Environment Relations in the North – resource development, climate change and resilience. The research programmes include academic education and research training.

In 2008, the number of staff working at the Institute was 38 and the number of researchers, PhD students and graduate students working on research projects supported by the Institute was about 210.

Alaska/Photos.com

Alaska

The economy of Alaska has a large contribution from resource-based industries such as petroleum, minerals, seafood and tourism. However, national defense and other government services also play an important role in the economy. In 2005 Alaska accounted for 0.3 per cent of the GDP of USA.

Alaska has a small and dispersed population of about 670 000 people. Natural resources, primarily oil, are extracted and generally shipped out of the state for processing. However, there is some manufacture of seafood, and to a modest extent, petroleum.

The Alaskan processing and manufacturing industries serve a limited number of international resource-based commodity markets that are cyclical in nature and price sensitive. Many goods and services are imported by the region and contribute to a high cost of living and relatively high labor costs. The limited infrastructure in the state as well as its distance from major American and foreign markets have restricted the development of diverse processing and manufacturing industries. As a high cost producer Alaska is highly exposed to price fluctuations, as those observed in recent years. Furthermore, the importance of US federal spending to Alaska makes the economy vulnerable to political decisions made at the national level concerning security and to federal budget constraints. The boom and bust nature of the Alaskan economy often results in an influx of workers during boom periods and an exodus when the boom ends.

Table 4.1 shows GDP of Alaska in current prices in 2002 and 2005, increasing by 6. 4 per cent per year on average. Adjusted for inflation the average annual growth rate was 3.6 per cent.

Oil and gas extraction took over as the largest single industry in 2005 – a position earlier held by public administration and defense. When transportation via pipeline is included, petroleum accounted for as much as 29 percent of GDP, even before the oil price really took off during 2007. Value added in transportation via pipeline decreased during the period, reflecting that the volume of oil production in Alaska continues falling after the huge field of Prudhoe Bay peaked in the late 1980s.

Table 4.1. **Value added[1] by industry. Alaska. 2002 and 2005**

	2002		2005	
	Mill. USD	Per cent	Mill. USD	Per cent
Agriculture	26	0.1	20	0.1
Forestry	14	0.1	11	0.0
Fishing	258	0.9	219	0.6
Coal, lignite and peat extraction		0.0		0.0
Oil and gas extraction	5 343	18.0	8 550	23.9
Other mining and quarrying	503	1.7	1 416	4.0
Processing of fish	285	1.0	403	1.1
Other manufacture of food	32	0.1	45	0.1
Manufacture of wood and paper	20	0.1	34	0.1
Coal and oil manufacturing; chemicals	114	0.4	254	0.7
Manufacture of basic metals		0.0	2	0.0
Other manufacturing	145	0.5	211	0.6
Electricity, gas and water supply	346	1.2	366	1.0
Construction	1 442	4.9	1 932	5.4
Transport via pipelines	2 040	6.9	1 915	5.3
Public administration and defence	5 861	19.7	7 044	19.7
Education, health and social work	1 728	5.8	2 216	6.2
Other services	11 584	39.0	11 202	31.3
GDP	29 741	100.0	35 840	100.0

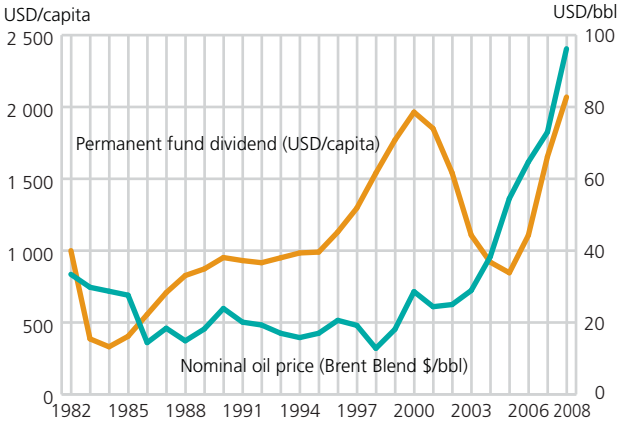
[1] At basic prices.

Mining is the single industry that achieved the highest average growth rate at 41 per cent per year in current prices, mainly because of significant increase in mineral prices. However, the share of mining in GDP was still only 4 per cent in 2005. Public administration and defence represented 20 percent of GDP in 2005, private services 31 per cent.

It can roughly be said that the economy of Alaska stands on two pillars – petroleum and the public and private services necessary to sustain the society. Note, however, that private services includes tourism, an important sector that provides employment in the same scale as in the petroleum industry.[2] Agriculture and forestry played a minor role in 2002, and even declined over the period 2002-2005. Fishing and fish processing together contributed somewhat less than 2 per cent to GDP in 2005. This may seem modest in comparison with the dominating petroleum and mining industries. However, it is important to keep in mind that a considerable share of income from petroleum and other mineral extraction flows to investors outside the State of Alaska. Fisheries on the other hand are more important by other measurs, in terms of employment and residential income.

With 29 per cent of total GDP from petroleum extraction and pipeline transportation, the economy is naturally heavily exposed to fluctuations in the market price for oil and gas. Alaska has recently reformed the petroleum tax system, from gross taxation in terms of royalties to a net income-based system that stabilizes

Figure 4.2. **Alaska permanent fund dividend. Current USD/capita. Nominal oil price. 1982-2008**



Source: Alaska Permanent Fund Division, https://www.pfd.state.ak.us

Figure 4.3. **Gross domestic product (GDP) per capita and Disposable Income for Households (DIH) per capita. Alaska and United States. 2005. 1 000 USD-PPP**

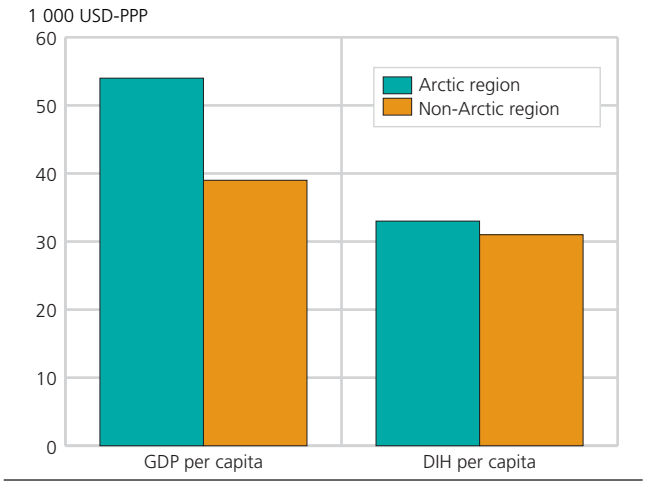
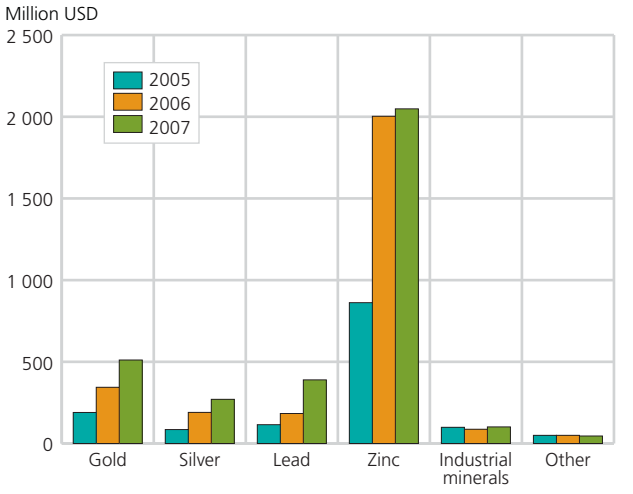


Figure 4.4. **Mineral production of Alaska. 2005-2007**



Source: See note 6.

the tax revenue during volatile price development. The revenue in petroleum production is usually higher than in other economic activities, as the oil and gas prices contain a resource rent. However, the cost of petroleum production is higher in the Arctic than in other petroleum producing areas[3], hence the resource rent portion of revenue is lower than in more accessible petroleum regions. As a consequence, oil price variability tends to be more challenging in Alaska than in most petroleum producing areas world-wide. This is also the case for mining.

Resource rent is a wealth component rather than income generated by labour and capital. To turn petroleum rent into a sustained source of income the Alaska Permanent Fund has been established. The fund has received 25 per cent of royalties on oil production and had a value of about USD 32.6 billions by September 2009, down from 35.5 billions in June 2008. The fund has achieved a nominal rate of return of about 10 per cent per year over the last 20 years. A dividend program allocates a share of annual fund revenues to inhabitants of Alaska according to a scheme that smoothes the return over the last 5 years. Each person received a dividend of USD 2 069 in the fiscal year 2008 (figure 4.2). (In addition there was a one time extraordinary payment in 2008 of USD 1 200, so each person received a total dividend of USD 3 268.)

Royalties and taxes from oil production have historically generated large revenues for the state of Alaska to finance the public sector and build infrastructure. Although the growth in the economy has been significant during recent years it has not resulted in much economic diversification.

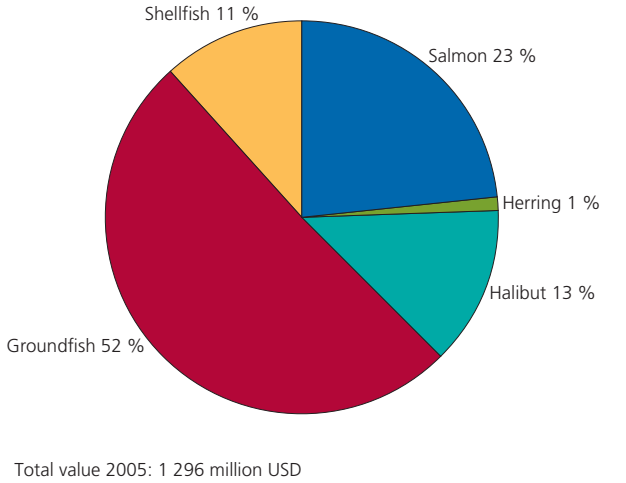
Historically, the U.S. federal government has contributed to the Alaska economy, through direct expenditures and transfers to the state government. Direct expenditures to federal activities are related to management of public lands, services to Alaska natives and military operations. The level of federal government spending in Alaska is quite high both on a per capita basis and as a percentage of federal spending. The military is an important part of the economy; in 2004, about 23 000 military personnel were on active duty in Alaska. Growth in federal spending in Alaska has been strong in recent years due to the political strenght of Alaska's congressional delegation and because of military build-up associated with the war in Iraq.

Petroleum

The value of petroleum production at wellhead was USD 18 billion in 2005. Crude oil including natural gas liquids accounted for the lion's share of petroleum revenues with 96 per cent of total output in value terms. The value of oil and gas production increased 70 per cent from 2003 to 2005. This increase in value was only a result of increased prices as annual crude oil production declined from 2003 to 2005. With the exception of refining of crude oil for local consumption, the bulk of crude oil is exported outside the state.

Alaska ranks as the third largest U.S. producer of crude oil after Texas and Federal offshore production. In spite

Figure 4.5. **Value of fish and seafood landings. Alaska. 2005**



Source: Alaska Department of Fish and Game, http://www.cf.adfg.state.ak.us

Figure 4.6. **Value added by main industry. Alaska. 2002 and 2005. Per cent of GDP**

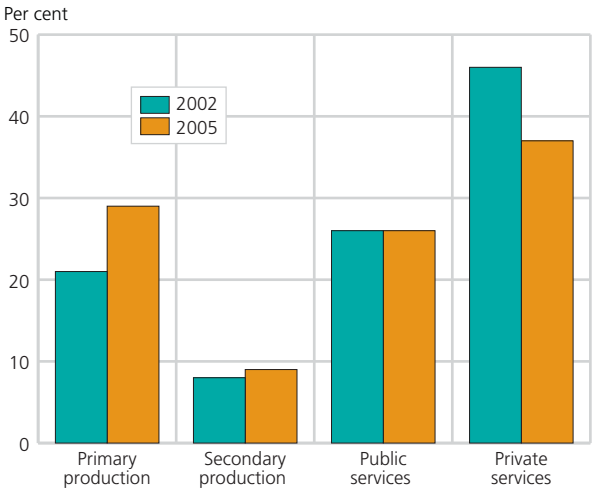
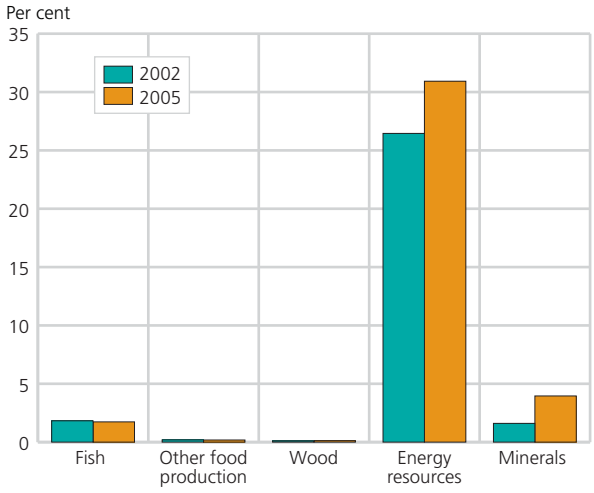


Figure 4.7. **Value added in natural resource based industries. Alaska. 2002 and 2005. Per cent of GDP**



of the decline in oil production, Alaska still accounted for close to 17 per cent of the total crude oil production in the US over the period 2000-2005, but production is clearly lower than in the 1990s. The Prudhoe Bay field on Alaska's North Slope has dominated the oil production and is the largest oil field ever discovered in North America. Production from Prudhoe Bay peaked in the late 1980s and went into decline. However, the Prudhoe Bay oil field alone still provides about 6 per cent of total US production[4].

The value of natural gas production accounted for 4 per cent of total petroleum production in 2005. Some natural gas is processed into LNG (liquefied natural gas) and ammonia-urea for export, and some is consumed within the state. At 15 per cent of the U.S. total, Alaska natural gas production (gross withdrawals) is ranked third after Texas and the Gulf of Mexico. However, 87 per cent of total gas production was re-injected to increase oil field pressure and enhance oil recovery.

With petroleum production dominating the economy, the future reserve situation becomes of huge importance. Alaska has not been explored extensively compared to the rest of the U.S. In terms of proved reserves, Alaska's oil reserves accounted for 20.2 per cent of US reserves and Alaska's gas reserves for 4.4 per cent of US reserves in 2004[5]. A recent assessment carried out by the US Geological Surveys concluded that there are undiscovered resources of oil amounting to 46 billion barrels of oil equivalents (bboe) of oil and 47 bboe of gas in Alaska (see chapter 5).

Other minerals

The value of mineral production, at market prices, rose from USD 1 401 million in 2005 to USD 3 367 million in 2007, an increase of 140 per cent (figure 4.4).[6] The major mineral product in terms of value was zinc, which accounted for over 60 per cent of the value of mineral production in 2007. After zinc came gold (at 15.2 per cent) and lead (at 11.6 per cent). In volume terms, zinc production amounted to 696 115 tons, gold production was 762 933 ounces, and lead production was 167 181 tons. Virtually all the output of the mining sector is exported.

The mining industry has been hit by falling world demand following the financial crisis, but is likely to benefit from a rebound in the world economy in the years to come. However, further development is economically viable only for the largest deposits. This is because of a lack of access to, and power at, remote sites, as well as the high construction and operating costs at these sites.

Other industries

The value of landed fish and other seafood amounted to USD 1 296 million in 2005, up from USD 942 million in 2000 (figure 4.5). However, the value of landings fluctuated during that period, as a result of significant variations in both prices and volume. Groundfish accounted for 52 per cent of the total value of landings in 2005 followed by salmon (23 per cent), halibut (13 per cent) and shellfish (11 per cent). The Alaska fishing industry is close to full exploitation of its resource base.

Most of the fish is processed within the state. The value of exports of fish products declined from USD 1 335 million in 2002 to USD 1 296 million in 2005. In recent years Alaskan salmon fisheries have faced significant international competition from farmed salmon in Norway, Chile, U.K., Canada and elsewhere.

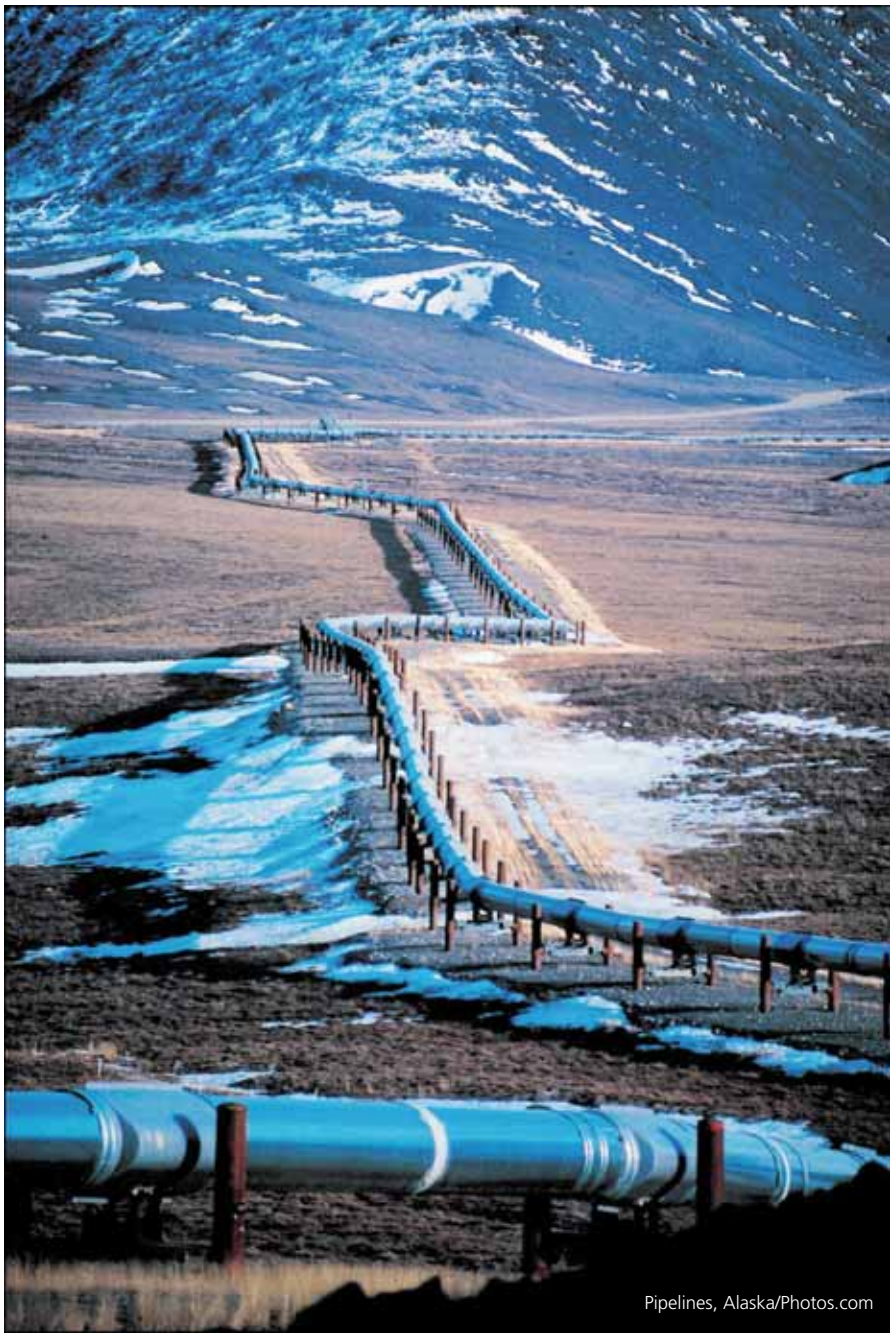
Alaska attracts tourists both from elsewhere in the U.S. and abroad and the number of tourists visiting Alaska increased steadily, from 1.15 million people in 2000 to 1.37 million people in 2004, an increase of 19.2 per cent. The 2004 level was already substantially above the level of 1990 when 716 000 tourists visited Alaska. This suggests that tourism in the Arctic is experiencing a long-term trend in growth, expected to recover from a decline during the recent economic recession. Reflecting the harshness of the climate, almost 90 per cent of tourists in 2004 visited Alaska during the summer.

International air cargo operations at the Anchorage International Airport and at Fairbanks have been expanding. Alaska is well positioned to serve not only the trade associated primarily with economic growth in China, but also trade due to the shift in manufacturing industry growth to countries such as Malaysia and Vietnam. Air transportation is included in the other services industry in table 4.1.

Economic structure

Secondary industries, dominated by construction, contributed 9 per cent to GDP of Alaska in 2005, almost the same as in 2002 (Figure 4.6). The private service industry is larger than the public service industry and contributed as much as 37 per cent to GDP in 2005. Private services include pipeline transportation, air cargo and tourism among others. Pipeline transportation contributed 5.3 per cent to Alaska's GDP in 2005 (table 4.1); hence there is a large private service industry besides petroleum transportation. Pipeline transportation slightly reduced its role in the economy as the reduced volume transported was not made up for by higher transportation fees. Mining and petroleum combined made the share of primary industries increase from 21 per cent in 2002 to 28 per cent in 2005.

To show the natural resource based characteristic of the Alaskan economy, figure 4.7 presents value added in clusters of industries that relate to a specific resource extraction. Processing of fish and other food is thus included in their respective resource-based industries, as is value added generated by petroleum pipelines. Data for tourism are not available; otherwise this industry might well be included among the nature based industries. In total the resource-based industries in Alaska accounted for 37 per cent of GDP in 2005, and oil and gas production and pipeline transportation clearly dominates the resource economy. Hence, Alaska has a narrow economic base, which makes the economy vulnerable to shifts in global demand and business cycles.



Pipelines, Alaska/Photos.com

The Canadian North

For purposes of this report, the Canadian North is defined as the three Northern Territories, namely, Northwest Territories, Yukon and Nunavut. The Northern Territories combined accounted for 0.5 per cent of Canadian GDP in 2007. The population of Arctic Canada was 104 739 as of July 1, 2007, and was fairly evenly distributed among the three territories with about 43 thousand inhabitants in the Northwest Territories and 31 thousand each in Yukon and Nunavut.

Table 4.2 shows gross regional product for the northern territories in 2002 and 2005 by industry. The mining and quarrying (excluding mineral fuels) rose to the position as largest industry accounting for close to 20 per cent of GRP in 2005. The growth of the diamond industry contributed substantially to this change. Second, at 16 per cent, came public administration and defense, followed closely by education, health and social work at 12 per cent.

Next were construction (8 per cent) and oil and gas extraction with slightly less than 8 per cent of GRP in 2005, about the same share as in 2002. It should be noted that the price of oil and diamonds in 2005/2006 was considerably higher than in 2002. More recent data suggest that the dominance of the government in the Territorial economy has declined primarily because of the boost given to the mining sector by the diamond industry. All of the diamonds currently mined in Canada are produced in the Northwest Territories.

As illustrated by figure 4.8 the extractive industries increased their relative position in the economy at the expense of both secondary industries and public and private services.

Other natural resource based industries than energy and minerals contributed less than one per cent to GRP in 2005. Energy based industries declined somewhat in relative terms due to the rapid growth in mining, in particular the diamond industry (figure 4.9).

When it comes to disposable income of households, Arctic Canada has 40 per cent higher disposable income per capita than in the non-Arctic regions (figure 4.10). The relatively high income in the Arctic mineral and energy sections together with a relatively low number of people might explain that disposable income per person is higher in the Arctic regions. In addition, there are relatively high transfers to the northern territories.

Petroleum and mining

For the three Territories combined, the major pillar of economic activity has been mining and oil and gas extraction. In 2005, these industries accounted for 27 per cent of total value added in the Territories. Figures 4.11 and 4.12 illustrates how production values and volumes in petroleum developed during the period 2000-2008.

Table 4.2. **Value added[1] by industry. Arctic Canada. 2002 and 2005**

	2002		2005	
	Mill. CAD	Per cent	Mill. CAD	Per cent
Agriculture	6	0.1	7	0.1
Forestry	15	0.3	18	0.3
Fishing	2	0.0	2	0.0
Coal, lignite and peat extraction		0.0	0	0.0
Oil and gas extraction	398	7.9	512	7.7
Other mining and quarrying	676	13.4	1 302	19.5
Processing of fish		0.0		0.0
Other manufacture of food		0.0		0.0
Manufacture of wood and paper		0.0		0.0
Coal and oil manufacturing; chemicals		0.0		0.0
Manufacture of basic metals		0.0		0.0
Other manufacturing	33	0.6	32	0.5
Electricity, gas and water supply	94	1.9	99	1.5
Construction	508	10.1	533	8.0
Transport via pipelines	28	0.6	31	0.5
Public administration and defence	913	18.1	1 047	15.7
Education, health and social work	606	12.0	766	11.5
Other services	1 763	35.0	2 321	34.8
GRP	5 042	100.0	6 669	100.0

[1] At basic prices.

Oil and gas extraction has continued to decline as producing wells and fields come to the end of their lifespan. From 2001 to 2008, the volume of oil extraction declined 39 per cent. However, due to an increasing oil price, the value increased by 43 per cent in the same period. Most of the crude oil produced in the Territories is shipped to Ontario while most of the natural gas is shipped to British Columbia. The destination of these products depends on the proximity of pipelines.

Gas extraction has been in rapid decline from 2000 to 2008, falling by 77 per cent in volume. The price development has not compensated for this change and the value of natural gas sales declined as much as 59 per cent. The gas production in Northern Canada is connected to the North American gas market, where the price is currently determined in response to supply and demand, and not mainly based on long term contracts as in European gas market, where the gas price is llinked to the oil price.

After more than tripling between 2000 and 2004, the value of diamond production declined 24 per cent between 2004 and 2006 (figure 4.13). Sales are made in U.S. dollars and the appreciation of the Canadian dollar versus the U.S. dollar and lower diamond prices contributed to this decline in the value of diamond production.

Table 4.3 **Basic indicators. Arctic Canada. 2007**

	Northwest Territories	Yukon	Nunavut
Population	42 637	30 989	31 113
Share of GRP in all three Northern Territories (per cent)	61.4	21.2	17.4
Transfers[1] as share of public revenues (per cent)	72.2	82.9	91.7

[1] From other than territorial government.

From 2006 to 2008 the value of diamond production rebounded, although the volume declined from 2007 to 2008.

In spite of recent turbulence in output and prices, diamonds continue to make a major contribution to the economy of the Northern Territories. In fact, the diamonds in Northern Territories have made Canada the world's third largest producer of diamonds, in value terms. Not only is Canada rich in diamonds as a result of the diamonds being mined in Northwest Territories, these diamonds are of high quality. There are a few companies which are processing diamonds in Northwest Territories. However, most of the diamonds from the Northwest Territories are exported outside Canada as rough or un-worked diamonds.

The diamond industry is having a positive impact on other sectors in the economy of Arctic Canada, including exploration, which have been carried out to some extent in Nunavut as well as in Northwest Territories. Economic activity related to the diamond industry has also stimulated non-residential construction, wholesale trade and transportation. It is expensive to construct and maintain a diamond mine in the Northwest Territories. A number of factors contribute to high construction and maintenance costs, including a harsh climate, transportation on ice-roads and environmental commitments.

The Territories

In all three Territories, the territorial government is larger than both the federal government sector and the local, regional and municipal sector. Transfers from the Canadian federal government are a substantial source of funding for the territorial governments (table 4.3). In fiscal year 2007/2008, transfers from other than the territorial government accounted for 81.5 per cent of total public revenues in the three Territories. For the individual Territories the share of revenues accounted for by other government transfers ranged from a low of 72.2 per cent in Northwest Territories to a high of 91.7 per cent in Nunavut with Yukon Territory in the middle at 82.9 per cent. While the Territorial governments are largely funded by federal government transfers, it should be noted that the federal government is benefiting from the economic activity related to diamonds through royalties and increased business and personal income taxes generated by the sector.

Figure 4.8. **Value added by main industry. Arctic Canada. 2002 and 2005. Per cent of GRP**

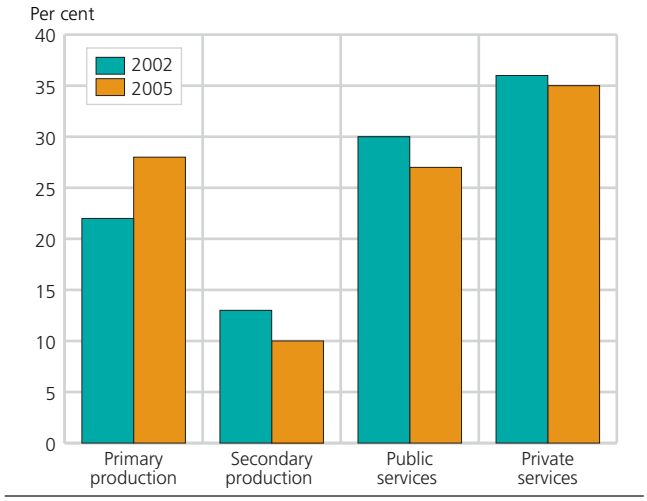


Figure 4.9. **Value added in natural resource based industries. Arctic Canada. 2002 and 2005. Per cent of GRP**

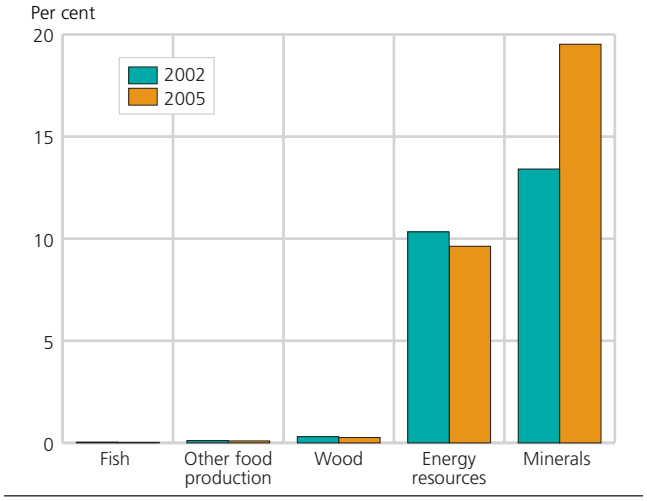


Figure 4.10. **Gross regional product (GRP) per capita and Disposable Income for Households (DIH) per capita. Arctic Canada. 2005. 1 000 USD-PPP**

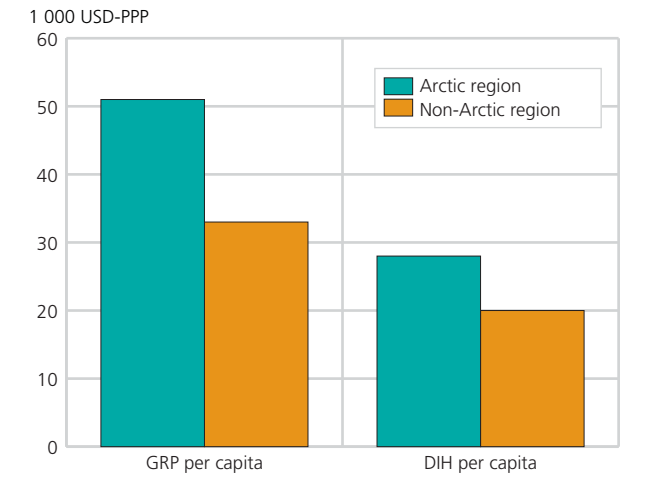


Figure 4.11. **Oil production. Arctic Canada. 2000-2008**

Figure 4.12. **Natural gas production. Arctic Canada. 2000-2008**

Figure 4.13. **Diamond production. Arctic Canada. 2000-2008**

The impact of climate change leads to enhanced activity throughout the region. Retreating ice cover has opened the way for increased shipping, tourism and resource exploration, and new Arctic shipping routes are being considered, including through the Northwest Passage.

Figures 4.14 illustrates the economic development in selected industries in Northern Canada and in each of the territories during 1997-2005.

For the Territories as a whole, the third largest industry is construction, which grew from CAD 532 million in 2004 to CAD 954 million in 2007 (both figures are in constant dollars). The growth in construction is primarily due to the stimulus provided by diamond mining and exploration.

The fourth largest sector in the Northern Territories is the financial industry, which includes finance and insurance, real estate and renting and leasing and management of companies and enterprises. The financial industry grew from CAD 736 million in 2004 to CAD 804 million in 2007.

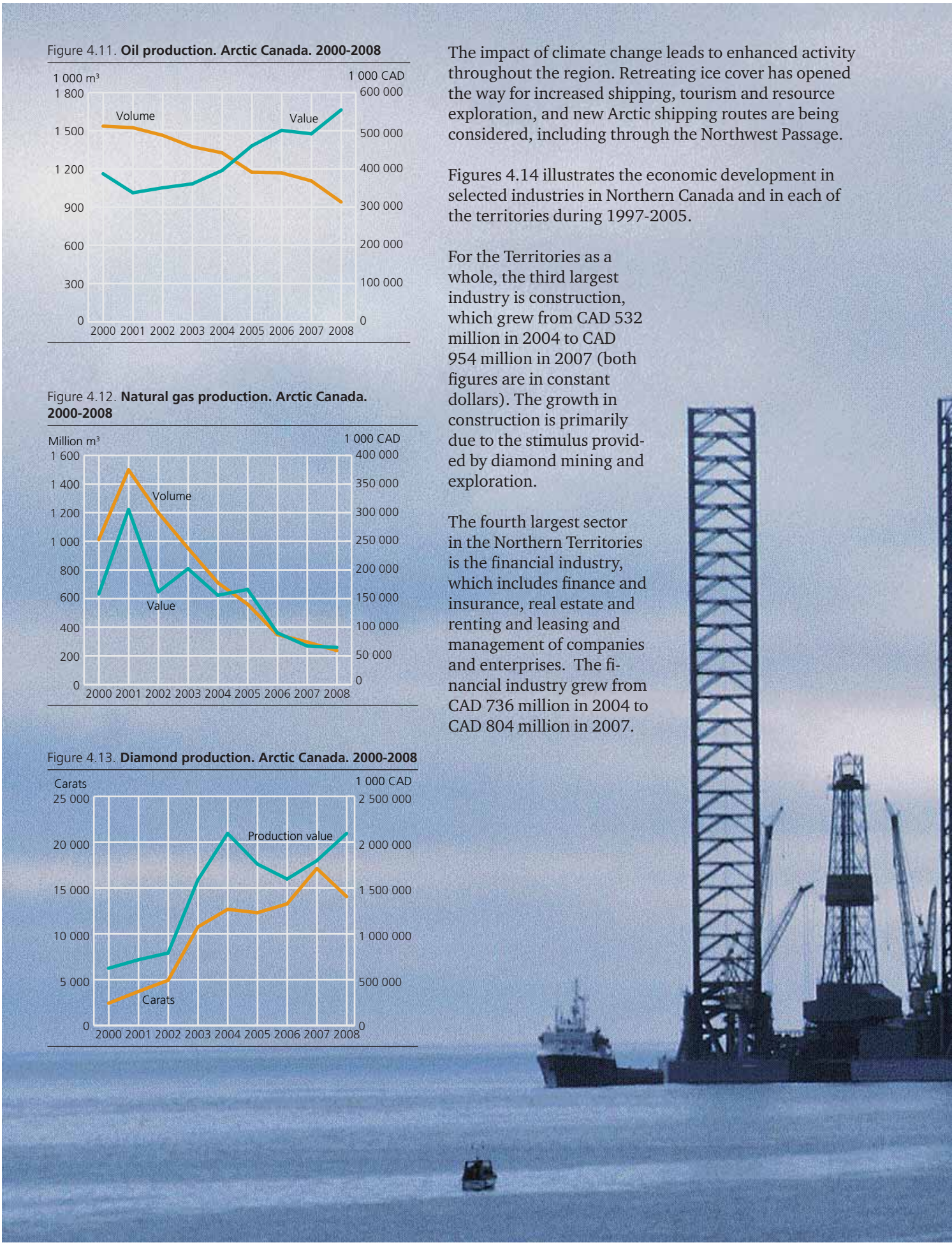
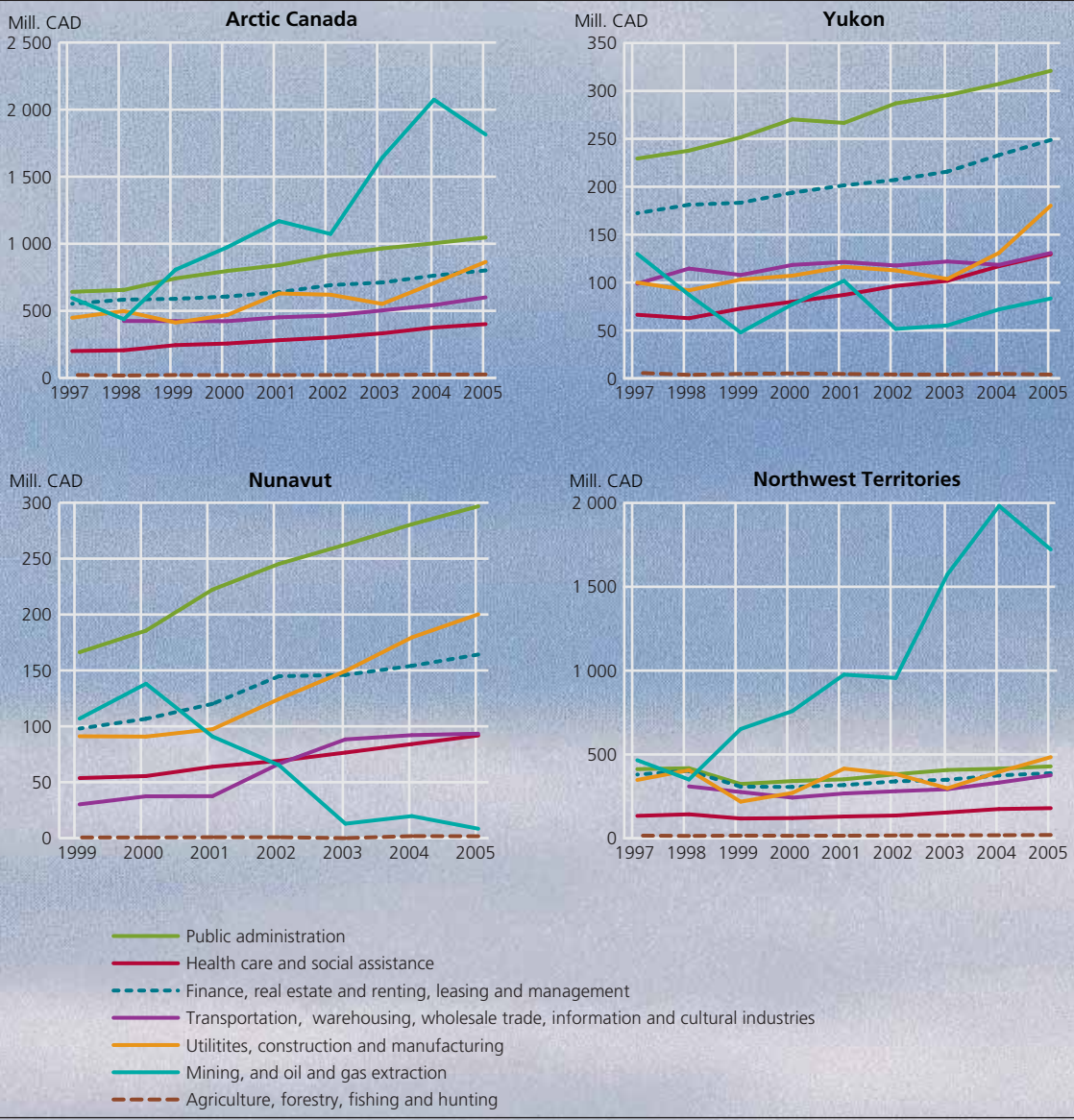


Figure 4.14. **Value added in selected industries. Arctic Canada. 1997-2005. Mill. CAD**



Faroe Islands

Faroe Islands has experienced variable, but on average solid economic growth during the last decade, as illustrated in figure 4.15. The average growth rate from 1998 to 2006 was 3.5 per cent per year in real terms. However, in 2003, GDP decreased by 4 per cent, largely a result of a decline in value of landed fish (figure 4.16), primarily of cod and to a lesser extent of saithe and haddock. Landings of cod and saithe decreased in tons, whereas landings of haddock declined in value due to a fall in prices.

Over the period 2002-2005, GDP in fixed prices was hardly increasing. Table 4.4 shows that value added in current prices increased about 4 per cent from 2002 to 2005 and fisheries' share in GDP fell from 18.1 per cent to 14.4 per cent. Processing of fish (including fish farming) decreased its share of GDP from 8.3 to 7.0 per cent.

More than 80 per cent of incomes from export are due to fish exports and the economy is critically dependent on fishing. Fisheries, fish farming and fish processing together account for more than 20 per cent of GDP. Moreover, other sectors also rely heavily on deliveries to the fishing industry. Initiatives have been taken to develop a supply industry for the petroleum sector, so far only involved in exploration in the waters of Faroe Islands, encouraged by oil discoveries west of the Shetland Islands, close to the sector of Faroe Islands. However, recent exploration has been discouraging.

The unemployment rate is among the lowest in Europe, down to 1.2 per cent in 2008. However, limited options for education at home lead many young students to go to Denmark or other countries after high-school. Hence labour supply is somewhat reduced and middle-aged/ elderly in composition.

Transfers from Denmark are reduced from 24 per cent of government expenditure in 1998 to 10 per cent in 2007.

Table 4.4. **Value added[1] by industry. Faroe Islands. 2002 and 2005**

	2002[2]		2005	
	Mill. DKK	Per cent	Mill. DKK	Per cent
Agriculture	51	0.6	42	0.5
Forestry		0.0	0	0.0
Fishing	1 566	18.1	1 287	14.4
Coal, lignite and peat extraction	6	0.1	0	0.0
Oil and gas extraction		0.0	0	0.0
Other mining and quarrying	0	0.0	0	0.0
Processing of fish	721	8.3	623	7.0
Other manufacture of food		0.0	0	0.0
Manufacture of wood and paper		0.0	0	0.0
Coal and oil manufacturing; chemicals		0.0	0	0.0
Manufacture of basic metals		0.0	0	0.0
Other manufacturing	401	4.6	368	4.1
Electricity, gas and water supply	152	1.8	150	1.7
Construction	576	6.7	610	6.8
Transport via pipelines		0.0	0	0.0
Public administration and defence	458	5.3	543	6.1
Education, health and social work	1 377	15.9	1 651	18.4
Other services	3 345	38.7	3 690	41.2
GDP	8 653	100.0	8 964	100.0

[1] At basic prices.

[2] 2002 figures have been corrected since last report.

Figure 4.15. **GDP index and growth rate. Faroe Islands. 1998-2006**

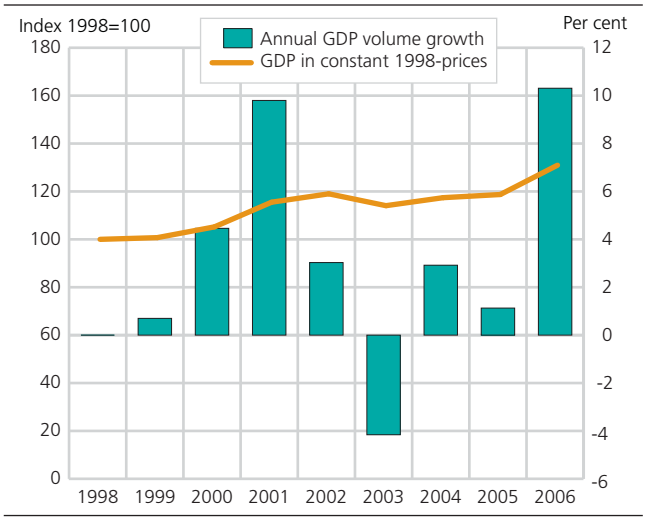


Figure 4.16. **Fish landings. Faroe Islands. 1 000 DKK**

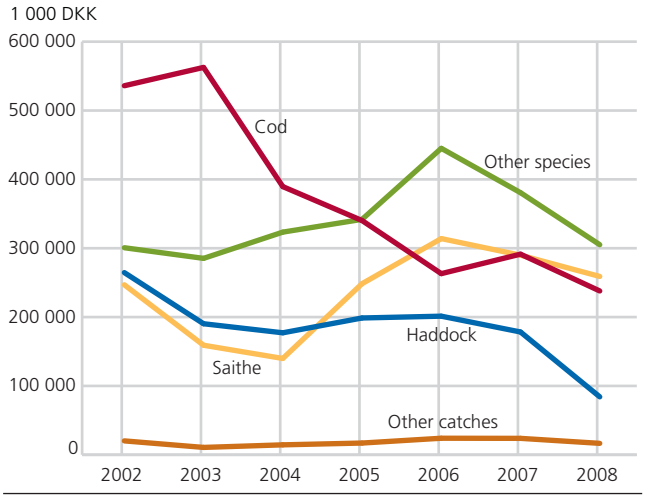


Figure 4.17. **Value added by main industry. Faroe Islands. 2002 and 2005. Per cent of GDP**

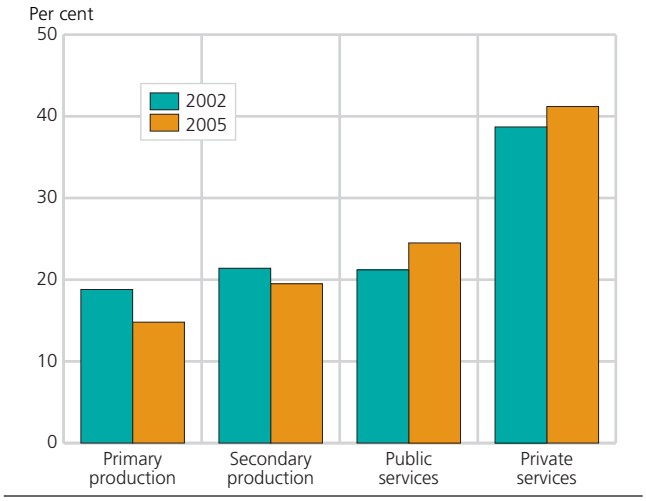


Figure 4.18. **Value added in natural resource based industries. Faroe Islands. 2002 and 2005. Per cent of GDP**

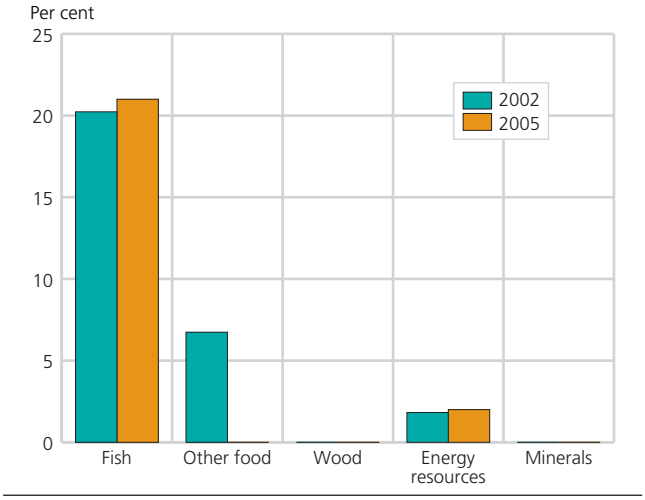
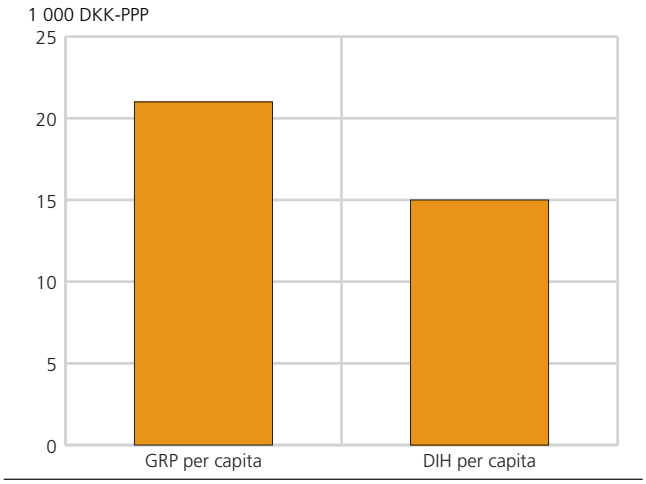


Figure 4.19. **Gross regional product (GRP) per capita and Disposable Income for Households (DIH) per capita. Faroe Islands. 2005. 1 000 DKK-PPP**



Arctic Finland

Arctic Finland differs from other Arctic regions in that the manufacturing industry is highly developed and integrated in the global economy. Table 4.5 shows the industry structure of Northern Finland. In 2005, manufacturing generated 25 per cent of GRP, somewhat less in relative terms than in 2002 (28 per cent). Behind the label "Other manufacturing" we find the dominating electronics industry. In current prices, the other manufacture industry declined in relative important due to falling prices on electronic devices.

Figure 4.20 shows distribution of value added in fixed prices and employment by industry at a somewhat different disaggregation level with the electronics industry as a separate sector[7].

The largest share of GRP is generated in the electronics industry with the city of Oulu as one of the main centres. The electronics industry creates about 17 per cent of the value added in fixed prices in Arctic Finland, but provides less than 5 per cent of the employment. The education, health and social services comprise 13 per cent of value added, but as much as one quarter of the regional employment.

Helsinki view. Photo: Crestock

Table 4.5. **Value added[1] by industry. Arctic Finland. 2002 and 2005**

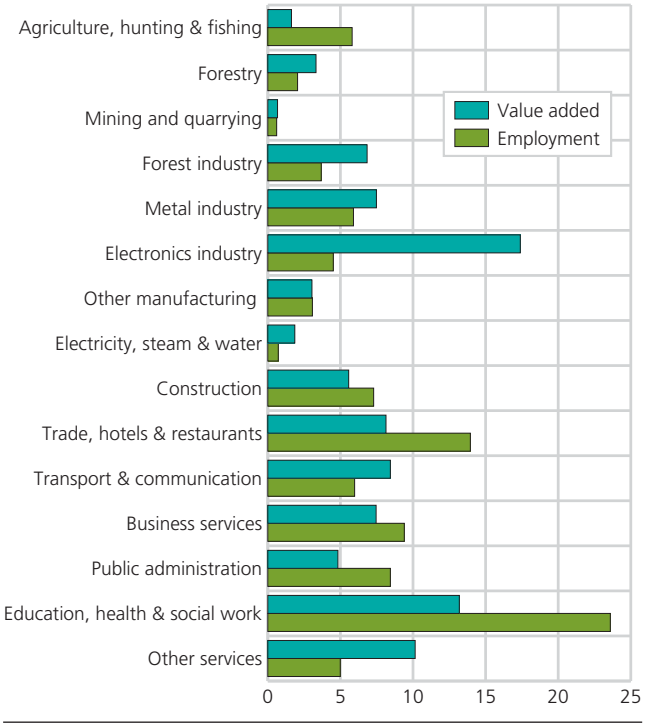
	2002		2005	
	Mill. euro	Per cent	Mill. euro	Per cent
Agriculture	242	1.9	212	1.5
Forestry	482	3.7	456	3.2
Fishing	13	0.1	10	0.1
Coal, lignite and peat extraction	42	0.3	32	0.2
Oil and gas extraction		0.0		0.0
Other mining and quarrying	35	0.3	92	0.6
Processing of fish		0.0		0.0
Other manufacture of food	110	0.8	136	1.0
Manufacture of wood and paper	840	6.5	963	6.8
Coal and oil manufacturing; chemicals		0.0	129	0.9
Manufacture of basic metals	698	5.4	660	4.6
Other manufacturing	1 925	14.8	1 686	11.8
Electricity, gas and water supply	317	2.4	325	2.3
Construction	766	5.9	966	6.8
Transport via pipelines		0.0		0.0
Public administration and defence	707	5.4	812	5.7
Education, health and social work	2 061	15.9	2 396	16.8
Other services	4 737	36.5	5 365	37.7
GRP	12 974	100.0	14 239	100.0

[1] At basic prices.

Figure 4.21 shows the average annual growth rates of value added in volume terms and employment by industry. The value added of the electronics has grown rapidly at almost 15 per cent per year. However, the employment of the electronics industry has declined about 4 per cent per year. Behind this extraordinarily high productivity growth is a structural change within the electronics industry: the low productivity assembly work has been moved to China, and highly productive technical development work has been expanded in Oulu. The success of the electronics industry in the Oulu region is based on the cooperation between the industry, the University of Oulu and the city of Oulu in providing industrial infrastructure. The central area of the electronics industry has been mobile phone technology. However, after 2000 the electronic industry has been diversified. The reason why value added in current prices in other manufacturing in table 4.5 declined from 2002 to 2005 is lower prices in the electronic sector.

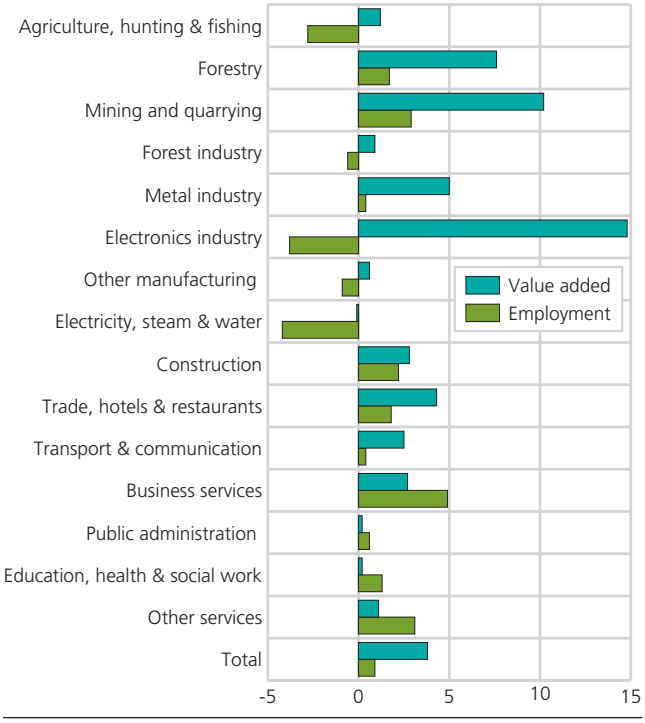
The value added of mining and forestry has increased rapidly, too. Their shares in the total value added are relatively small, however. The growth of the forest process-

Figure 4.20. **Value added[1] and employment by industry. Arctic Finland. 2005. Per cent of total value added and employment**



[1] In 2000-prices.

Figure 4.21. **Annual growth rates of value added[1] and employment by industry. Arctic Finland. 2000-2005**



[1] In 2000-prices.

Figure 4.22. **Value added by main industry. Arctic Finland. 2002 and 2005. Per cent of GDP**

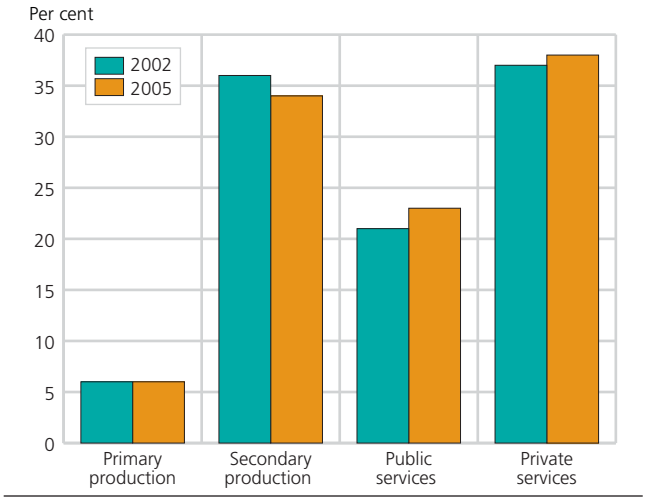


Figure 4.23. **Value added in natural resource based industries. Arctic Finland. 2002 and 2005. Per cent of GDP**

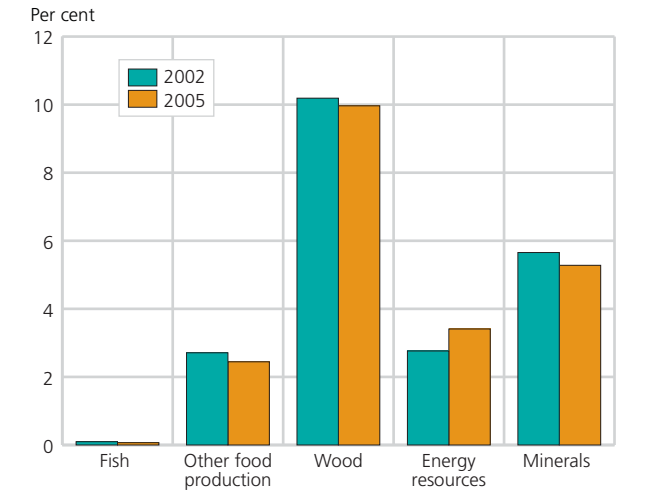
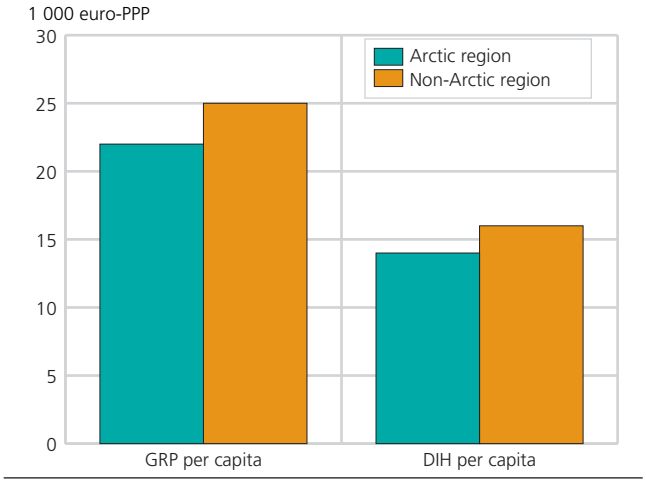


Figure 4.24. **Gross regional product (GRP) per capita and Disposable Income of Households (DIH) per capita. Arctic Finland. 2005. 1 000 EUR-PPP**



ing industry, the most important manufacturing industry in the past, has been slow and metal industry has overtaken it both in terms of value added and employment.

Resource based industries

The food production in Arctic Finland is minor. The share of agriculture, fishing and food manufacturing contributed less than 3 per cent to GRP and provided about 7 per cent of employment in 2005.

About 54 per cent of forested land of Finland is found in the Arctic regions. However, due to northern climatic conditions the share of Arctic Finland in national annual forest growth is less than 30 per cent and the share of round wood removals about 20 per cent. Still the yearly round wood removals in Arctic Finland amounts to about 20 000 m^3 per capita. The use of round wood by the forest industry in Arctic Finland is about the same magnitude as removals on annual basis[8]. The forestry and forest industry together had 10 per cent of GRP and less than 6 per cent of employment in 2005.

Finland has the largest extraction of peat for fuel in the world. About 25 per cent of the land area of Arctic Finland is peat-land. Although the land area used in peat energy production represents less than one percent of total land, the energy content of peat energy production is over 8 TWh per year – from about 13 m^3 peat per capita. The fuel is used mainly in eight large combined heat and power (CHP) plants producing district heat and electricity[9].

Consumption of electricity in Arctic Finland was almost 14 TWh in 2007. The electricity consumption is relatively high because of the high share of processing industry in the economy. However, electricity generation from own natural resources is almost sufficient to balance the consumption. The share of hydro power in electricity supply is about 60 per cent, the share of forest industry CHP power generation about 15 per cent and the last 25 per cent is from the district heating CHP plants. The forest industry CHP plants mainly use wood waste as fuel.

Two relative large basic steel processing plants are located in Arctic Finland, one uses ferro-chrome from its own mine and the other uses ferrous concentrates imported from mines in Northern Sweden and North-West Russia. Besides there are gold and copper-nickel mines whose products are transported for processing outside the region. The share of the metal mining in GRP represents roughly half of the value added of the whole mining and quarrying industry in Arctic Finland.

The volume of mining in Arctic Finland has been relatively small, less than one tenth of the mining in Arctic Sweden in terms of the yearly mass of mined ore. However, two large mines have been opened in 2008 and three more have been decided to be started in near future. Together this growth in capacity would mean

that the ore extraction might grow tenfold in the next few years. The new mines include two copper nickel mines, two gold mines and an iron ore mine[10]. However, future development is dependent on metal prices (see figure 4.1)

Lapland and Kainuu are important winter tourism sites. According to the Regional Tourism Satellite Accounts of Finland the share of tourism in GRP of Arctic Finland was 9 per cent in the year 2002. Since then the number of visiting tourists has grown more rapidly than GRP and we may assume that the share of tourism on GRP has risen to about 10 per cent in 2006[11].

Gross regional product per capita, as well as disposable income of households per capita, is somewhat lower in Arctic Finland compared with all of Finland (figure 4.24).

Nuuk, Greenland. Photo: Tom Nicolaysen

Greenland

Greenland has a population of 57 000 people. A substantial share of the economy is owned and managed by the Greenland Home Rule Authorities. There is no private ownership of land in Greenland, and the Home Rule Authorities allocates user rights, including to animal herders.

Table 4.6 shows the economic structure of Greenland by 2005, based on improved statistical methods, making comparison with 2002-data of the previous ECONOR report less appropriate.

Education, health and social work is the largest industry in Greenland with a share of 20 per cent of total value added. The resource based industries taken together have a share of 25 per cent, and fishing is the largest resource based sector in Greenland. Within the fishing industry, shrimp is the most important species. The Royal Greenland company owned by the Home Rule Authorities is a dominant supplier of cold-water shrimps at the world market. In recent years the export value of shrimps has decreased as prices have lowered. Table 4.7 shows the development in export of shrimps 2002-2006. All in all, fish and other marine products make up about 85 per cent of total export. The cod fisheries are now of minor economic value due to decline of the resource base. The export of shrimps amounts to about 50 per cent of total export value. Regulations within the fisheries are mainly imposed as individual quotas in combination with other Home Rule regulations. In shrimp fisheries the quotas are transferable.

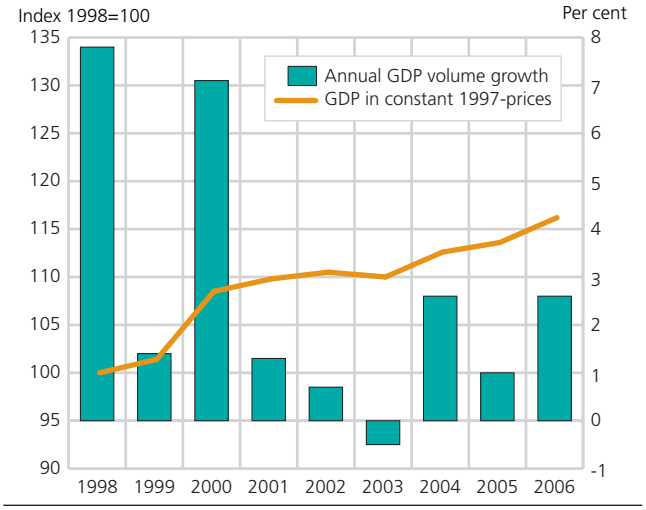
So far there is no petroleum production in Greenland, but according to US Geological Surveys 2008, Greenland has considerable expected (undiscovered) reserves of 46 billion barrels of oil equivalents (bboe). However, the location of these resources provides challenges in terms of ice and storms, and the neighbourhood of a pristine natural environment. Greenland is not expected to be developed in the very near future because the time lag between discoveries and production tend to be considerable in the Arctic.

Table 4.6. **Value added[1] by industry. Greenland. 2005**

	2005	
	Mill. DKK	Per cent
Agriculture	411	4.0
Forestry	0	0.0
Fishing	726	7.1
Coal, lignite and peat extraction	7	0.1
Oil and gas extraction	0	0.0
Other mining and quarrying	620	6.1
Processing of fish	456	4.5
Other manufacture of food	0	0.0
Manufacture of wood and paper	30	0.3
Coal and oil manufacturing; chemicals	0	0.0
Manufacture of basic metals	0	0.0
Other manufacturing	59	0.6
Electricity, gas and water supply	283	2.8
Construction	766	7.5
Transport via pipelines	0	0.0
Public administration and defence	1 052	10.3
Education, health and social work	2 044	20.0
Other services	3 755	36.8
GDP	**10 210**	**100.0**

[1] At basic prices.

Figure 4.25. **GDP index and growth rate. Greenland. 1998-2006**



Since 1992 several licensing rounds have opened for exploration off the west coast. New seismic data have been obtained, and the results are promising, according to the Ministry for Housing, Infrastructure and Minerals and Petroleum. In July 2006 Disko West was opened for exploration. The environmentally sensitive inner Disko Bay was not included in the licensing round. Environmental investigations have been carried out to assess the possible impact on the marine environment in the licensing area. However, environmental interest groups question the sustainability of petroleum activity in the area. According to the authorities, 13 international oil companies applied for prequalification, before the licensing round in Baffin Bay in 2010.

There has been increasing extraction of minerals in Greenland during the last years, particularly encour-

Table 4.7. **Export from Greenland. Mill. DKK**

	2002	2003	2004	2005	2006
Total export	**2 388**	**2 286**	**2 282**	**2 427**	**2 418**
Shrimps	1 360	1 279	1 155	1 333	1 197
Cod	87	82	70	84	129
Halibut	367	456	454	469	511
Other fish and sea products	369	316	305	231	201
Products of other animals	16	25	32	36	48
Gold and other precious metals			131	143	168
Other minerals				11	8
Other products	189	128	135	120	156

aged by the high world market prices on minerals up to 2008. The Home Rule Authorities and Denmark have reached an agreement concerning the sharing of income from future resource extraction. The income of mineral extraction will belong to the Home Rule Authorities, but the grant from Denmark will be reduced corresponding to 50 per cent of the resource revenues exceeding DKK 75 million.

The Home Rule Authorities have established Greenland Development, a new company that will support the commercial use of Greenland's rich hydropower potential. Like in Iceland, the vehicle for using the hydropower potential to generate revenues is to transform energy to metals for export. An agreement is made with the aluminum producer Alcoa on building an aluminum smelter near Maniitsoq.

There has been a marked increase in the exploration of minerals other than mineral fuels, primarily for gold, nickel and diamonds, and lately also molybdenum. A production license for gold was granted in 2003; in 2004 export of gold started up at mill. DKK 131 increasing to mill. DKK 168 in 2006, as shown in table 4.7, corresponding to about 14 per cent the level of total shrimp exports. By the end of 2008, however, the gold mine at Nalunaq was closed due to low economic performance. Olivine-mining started up in 2005, targeting the European market for olivine, which is used as an additive in blast furnace pellets in steel production.

In the years 1998-2006 Greenland experienced annual economic growth of GDP (in fixed prices) at about 2.7 per cent on average (figure 4.25). After 2001 the growth of GDP slowed and even turned into a 0.5 per cent decline in GDP from 2002 to 2003.

Fishing accounts for more than 80 per cent of all exports from the country. In 2006 total exports of goods amounted to mill. DKK 2 418. This compares with total imports of mill. DKK 3 454 for the same year. Notice that data for external trade do not include services. Most goods including food for household consumption are imported. In addition to marketed consumer goods, there is significant consumption of fish and meat harvested by the households themselves (see chapter 6 in this report).

Figure 4.26. **Value added by main industry. Greenland. 2005. Per cent of GDP**

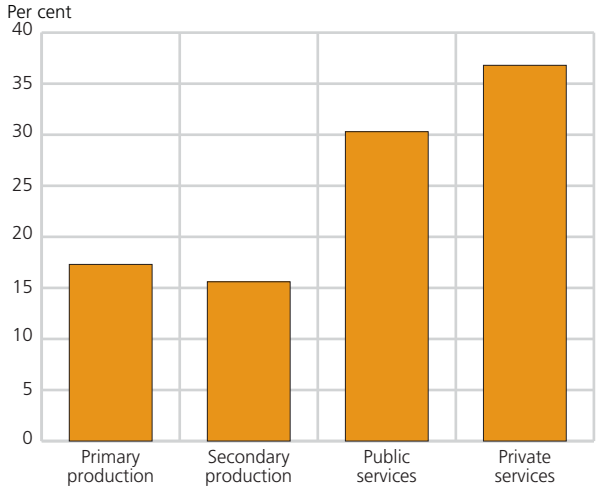


Figure 4.27. **Value added in resource based industries. Greenland. 2005. Per cent of GDP**

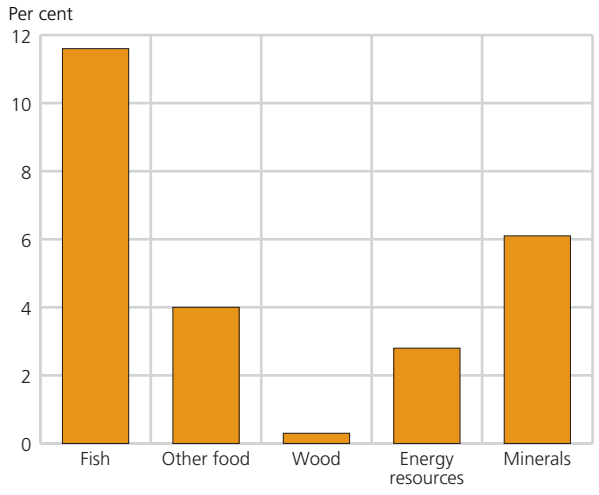
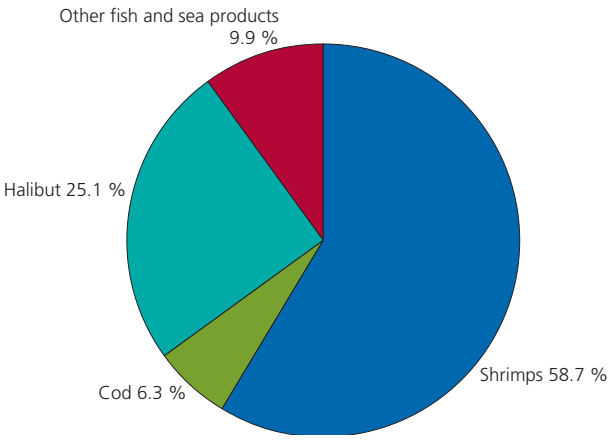


Figure 4.28. **Export share of fish and seafood. Greenland. 2006. Per cent**



Arctic catfish sold at local marketplace, Nuuk, Greenland. Photo: Tom Nicolaysen

Iceland

After a long period of steady resource management and economic growth, Iceland plunged into financial turmoil and economic crisis in 2008. Over time, Iceland has refined its system of fishery management to avoid overfishing and surplus capacity. The financial sector has been less scrutinized for sustainability, and the private banks virtually collapsed in October 2008. The factors behind the recent dramatic turn in the economy of Iceland are discussed in Box 4.2 pages 56-57. Below we focus on the development of the economy during the years 2002-2005, for which there are comparable national account data at circumpolar level.

Traditionally, fishing and fish processing has been a major source of income in Iceland. In 2002, these activities accounted for 11.3 per cent of GDP (table 4.8). By 2005 their share of GDP fell to 6.7 per cent as a result of shrinking sector income, and strong growth in other sectors during the years 2002-2005, when the economy at large experienced rapid economic growth at an annual rate of 4.4 per cent on average. Figure 4.29 shows year by year growth in GDP 1998-2008 in volume terms.

A major driving force behind this development was the boost of the economy generated by a booming housing sector nurtured by offensive lending by public and private banks. Construction thrived on the escalation of the housing industry. Additional pressure was added to the economy by heavy investments in aluminum production. Construction of a new aluminum smelter was initiated in Reidarfjørdur in Eastern Iceland to increase export of energy intensive products and to alleviate unemployment in the region. The investment was the largest single project undertaken by Iceland since settlement. The construction industry increased its share of GDP from 8.1 per cent in 2002 to 9.6 of a considerably higher GDP in 2005. Concerns were raised that the project would crowd out other activities during the investment period, while providing few jobs in the long run.

Private services was stimulated by rapid growth in income and coincided with substantial tax reductions. Further, as the economic policy involved high interest

Table 4.8. **Value added[1] by industry. Iceland. 2002 and 2005**

	2002		2005	
	Mill. ISK	Per cent	Mill. ISK	Per cent
Agriculture	10 666	1.6	12 537	1.4
Forestry	117	0.0	44	0.0
Fishing	54 401	8.3	40 454	4.7
Coal, lignite and peat extraction		0.0		0.0
Oil and gas extraction		0.0		0.0
Other mining and quarrying	823	0.1	869	0.1
Processing of fish	19 627	3.0	17 660	2.0
Other manufacture of food	13 699	2.1	12 590	1.5
Manufacture of wood and paper	3 200	0.5	2 446	0.3
Coal and oil manufacturing; chemicals		0.0	0	0.0
Manufacture of basic metals	10 153	1.6	9 056	1.0
Other manufacturing	39 941	6.1	46 735	5.4
Electricity, gas and water supply	26 262	4.0	28 115	3.2
Construction	52 482	8.1	83 414	9.6
Transport via pipelines		0.0		0.0
Public administration and defence	42 781	6.6	49 737	5.7
Education, health and social work	103 121	15.8	129 433	14.9
Other services	274 402	42.1	435 121	50.1
GDP	651 675	100.0	868 211	100.0

[1] At basic prices.

Figure 4.29. **GDP index and growth rate. Iceland. 1998-2008**

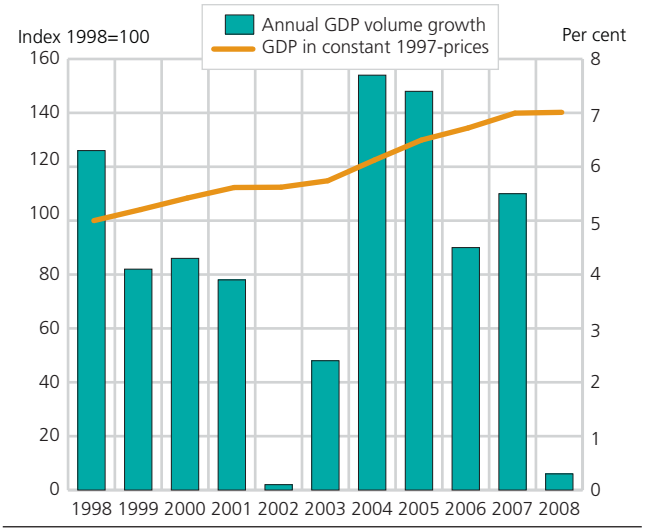
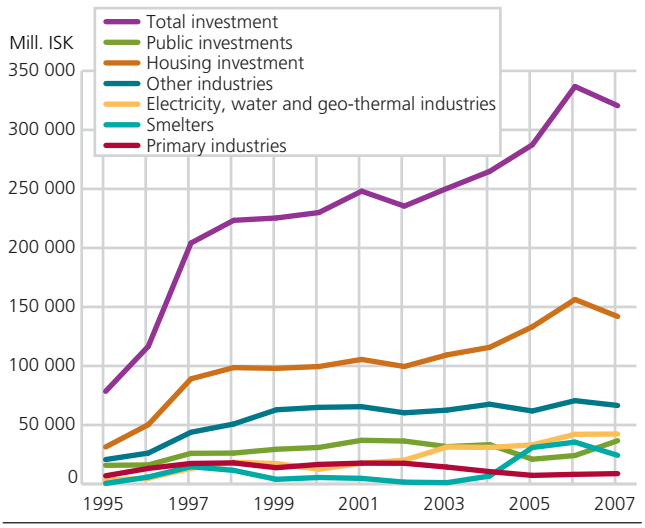


Figure 4.30. **Investment activity by industries. Iceland. 1995-2007**

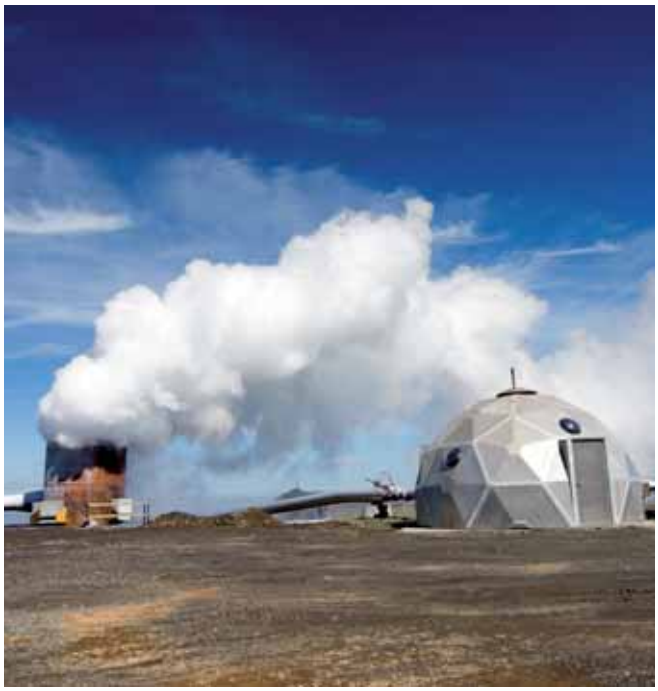


rates to comply with a fixed inflation target, the Iceland króna attracted international investors and stimulated a large financial sector in Iceland.

Primary and secondary industries and public services all declined in relative importance, whereas private services increased from 42 per cent in 2002 to 50 per cent in 2005 (figure 4.31). The financial sector was central in expansion of private services, stimulated by the high interest rates and the large inflow of foreign capital, bringing Icelandic banks into international financial markets.

As illustrated in figure 4.32, the resource based industries generally lost ground to the rest of the economy. However, minerals have increased its share of GDP beyond 2005, due to an increase in both production and export of aluminium. About 70 per cent of total primary energy use is from geothermic or hydro power resources. The reduced contribution of energy to GDP from 2002 to 2005 reflects that Iceland's energy supply is barred from international markets thus preventing Iceland from taking full part in the global price rise on energy. The benefit to Iceland from investments in metal production from rising global energy prices is expected to come in terms of higher prices on e.g. aluminum. However, expansion of the aluminum sector has been met with considerable opposition from environmentalist groups.

Iceland has few proven mineral resources, but has access to vast marine resources and the fishing industry is still a main pillar of the economy.



Nesjavellir geothermal power plant in Iceland. Photo: Crestock

Figure 4.31. **Value added by main industry. Iceland. 2002 and 2005. Per cent of GDP**

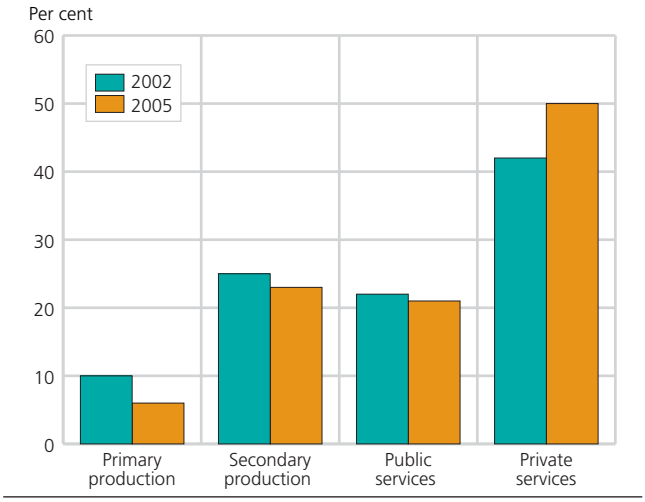


Figure 4.32. **Value added in natural resource based industries. Iceland. 2002 and 2005. Per cent of GDP**

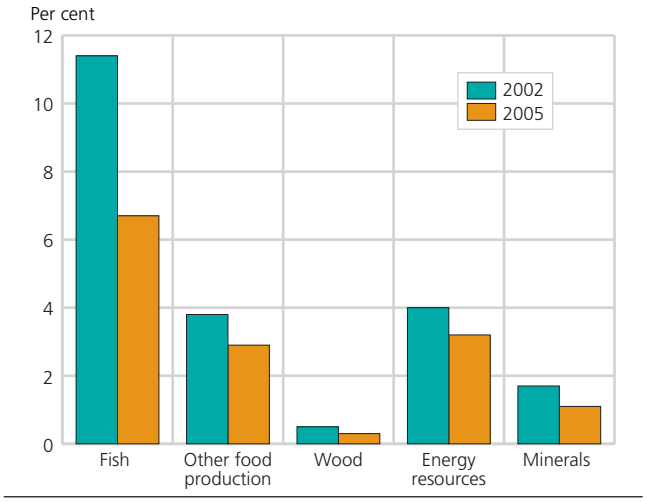
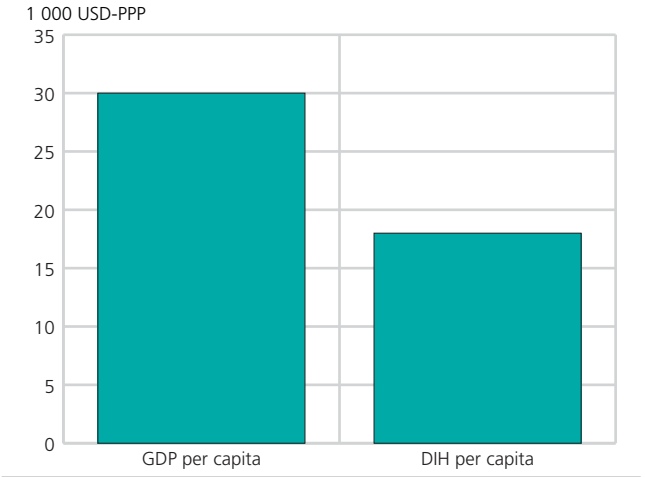


Figure 4.33. **Gross regional product (GRP) per capita and Disposable Income for Households (DIH) per capita. 2005. Iceland. 1 000 USD-PPP**



Box 4.2. Iceland in crisis

The Icelandic economy collapsed in early October 2008. Within a few days the three major banks had collapsed, as did the value of the currency. Bankruptcies of firms as well as unemployment skyrocketed. The inflation rate soared, and the finances of ordinary people were in shatters as the repayment of loans in foreign currency – as well as in indexed króna – increased rapidly.

Did the crisis hit out of the blue, or do Icelanders only have themselves to blame? Could the scope of the crisis have been restricted or could it have been avoided altogether with proper governmental actions?

These questions have been asked, and will continue to be asked in Parliament, in the media, in public and private meetings and in the court of Iceland. It will take time to come to a full understanding of the events that brought the country into crisis.

Below is a brief overview of the economic policy and major economic indicators of Iceland during the past 15-20 years leading up to the recent development.

After World War II Iceland has enjoyed rapid economic growth, bringing the living standards of the average citizen from being close to the bottom of the European scene up to the top of the rank world wide. But inflation has hovered around 20-40 per cent for long periods at a time until the early 1990s when it was brought under a sort of control by strict income policy orchestrated by associations of employers, employees and the government. In 2001 the Central Bank abandoned a hard-to-keep fixed exchange rate regime in favour of a floating rate regime supported by an inflation target. The retail banking-sector, previously mostly state-run, was privatized in the period 1998-2003.

The new monetary policy opened up for revitalization of private banking. During the inflationary period of the 1970's and the 1980's real interest rates were kept negative as usury laws kept the nominal rate below a fixed ceiling. Loans were gifts made possible by massive governmental intervention, and state owned banks totally dominated the bank sector.

Indexation of loans had been introduced as a part of broad-based economic reforms in 1979. Indexation slowly changed the landscape of the credit market, and encouraged savings. Thus, as capital was remunerated and recognized as a factor of production it became clear that state run banks were lacking the capacity to allocate capital efficiently. Several attempts were made to privatize the state-run banks. The foundation was finally laid with the establishment of Íslandsbanki, founded on the ruins of a collapsed state bank and later branded Glitnir. The remaining state-run banks were privatized during the period 1998 to 2003. However, housing loans continued to be managed by a governmental institution, the Icelandic Housing Financing Fund (HFF).

Aluminium smelter at Reidarfjordur, Iceland. Photo: Gérard Duhaime

A right to center coalition government kept their promise from the election campaign of 2003, to finance 90 per cent of the housing costs, up from 80 percent. The newly privatised banks saw their market shrink at the same time as they were trying to increase their market share and reacted by entering the market for housing loans with full force by offering better terms than the HFF already in 2004. As expected the housing prices skyrocketed.

More favourable terms for housing loans was not the only promise given during the election campaign. Eastern Iceland had long suffered from de-population. As a remedy, the State Power Company, the government and municipal bodies came up with plans for an aluminium smelter in Reyðarfjörður. The smelter was the biggest investment project in Iceland since settlement. Economists pointed out that the short term effects of the project could be disruptive to other parts of the economy (crowding-out) during the investment period, while providing few jobs in the long run.

The senior party (Independence Party) of the coalition government in power from 1995 had long had lower taxes on its agenda, and an increased flow of revenue during the expansive period after 2001 pushed that goal higher on the agenda. A series of tax cuts followed, for corporate income, property tax and for personal income.

Each of the goals that the successive Icelandic governments tried to achieve, were clearly achievable if pursued in isolation, but hardly all at the same time. The investment project in Eastern Iceland was a large, governmental project representing a strong fiscal stimulus. Its implementation warranted the contraction of other governmentally induced investment projects and/or an increase in taxes. Lowering tax-rates was thus badly timed and contributed to further increasing the pressure in the economy. The same is true for the increase in the maximum amount for housing loans.

The policy mix offered by the politicians and the government left the Central Bank with few choices, given its newly established inflation goal. The bank had to increase the discount rate and did so repeatedly – paving the way for unintended consequences of the expansionary policies. The interest rate offered in Iceland was among the highest in the world, and foreign issue of bonds nominated in Icelandic krónas as well as demand for Icelandic krónas soared. The value of the króna increased dramatically.

Thorolfur Matthiasson
University of Iceland, Reykjavik

The Icelandic banks had been in bitter fight over domestic market shares and were well positioned to expand abroad. It was their "luck" that foreign loans were also cheap. The world was awash in capital.

Icelanders accumulated foreign assets at an accelerating rate during the last few years of the bubble years. Figure 1 shows that the accumulation of assets was not financed out of internal savings and the net position of the economy was (and is) negative.

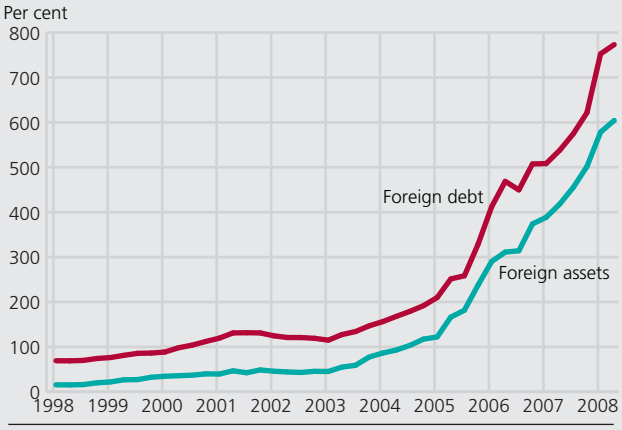
Reports on the deteriorating international position began to appear in 2006. Some were worried that the Icelandic public would be responsible for the repayment of the loans. Economists pointed out that the debt was that of private firms, and if Icelandic private firms were overextending themselves, the loss would not be at the expense of the Icelandic public. These commentators could not know that Landsbanki was to open up IceSave accounts in the UK and other European countries backed by the Icelandic Depositors' and Investors' Guarantee Fund. As a result, the Icelandic taxpayers will probably end up footing a bill amounting to 4-10 per cent of GDP.

Households had increased their debt exposure dramatically after 1990 as there were few incentives to save. On the contrary, consecutive tax-reductions signalled to households that they were likely to control a bigger share of their income in the future. Thus, both the corporate sector and the household sector increased their exposure, in effect tying down an increasing share of their future income as interest payments.

Housing prices increased by almost 70 per cent in real terms from 2000 till 2007. The real jump came after the election in 2003 and the entrance of the newly privatized banks into the market for mortgage loans.

The government fully controlled public investments, investments in power production and in smelters. Furthermore, governmental decisions were instrumental in inducing the onset of the investment boom in housing.

Figure 1. Foreign debt and assets as share of GDP. 1998-2008



Source: Central Bank of Iceland.

The goal of stabilizing inflation between 1 and 4 per cent can hardly be seen as a success. That does not mean that the Central Bank did not try.

The Central Bank responded to the pressure created by sloppy fiscal policy by increasing the discount rate. It was questioned however, if the Central Bank was bold enough when increasing the discount rate and acted fast enough when signs of pressure were on the horizon. The other concern was that discount rate increases were ineffective as policy measures. The discount rate is not the only weapon in the bank's arsenal. It could have restricted credit by increasing the reserve requirement and countered demand in the foreign exchange market by increasing its own holding of foreign assets. It took many economists by surprise when the bank *reduced* the reserve requirement in 2003. The bank also abandoned the reserve requirement that had been mandated for deposits in foreign subsidiaries as late as spring 2008. It is therefore safe to say that the bank could have coordinated its actions with respect to restraining credit growth somewhat better.

In conclusion, it seems safe to suggest that the Central Bank narrowly considered the discount rate as the only weapon in its arsenal suitable to counteract pressure in the economy.

The so-called mini-crisis hit in 2006. Rating agencies voiced concerns that the Icelandic banks relied too heavily on the whole-sale market for loans for meeting their financial needs. Furthermore, many commentators pointed out that the Icelandic banks might be too big to fail and too big for the Icelandic government to come to their rescue. The banks opened up for retail banking (IceSave) in the UK and elsewhere and reduced their exposure to whole-sale banking. Reports commissioned by the Chamber of Commerce concluded that the operation of Icelandic banks was more or less sound, as Icelandic banks did not have the toxic subprime loan bundles on their books. The market seemed to buy those explanations.

Not much later it was clear that well-intended policies aimed at making life easier for house-owners, people living in de-populating areas, and taxpayers turned into misfortune. The mixture of lax fiscal policy and narrow-minded inflation targeting within the smallest floating currency in the world with inadequate foreign reserves proved to be dangerous.

[1] Mishkin, F., & Herbertsson, T. T. (2006). *Financial Stability in Iceland*. Reykjavik: Iceland Chamber of Commerce.

[2] Portes, R., & Baldursson, F. M. (2007). *The Internationalisation of Iceland's Financial Sector*. Reykjavik: Iceland Chamber of Commerce.

[3] Thorolfur Matthiasson (2008): Paper presented at the Nordic Tax research Council, Stockholm 31 October 2008.

Arctic Norway

Except for some oil and gas extraction in the Norwegian sea, Arctic Norway has so far mostly hosted petroleum exploration whereas production has taken place in the North Sea further south. Now the tide might be turning, as fields in the North Sea are being emptied, and prospects for new reserves are found in more northern waters. The first steps into the Barents Sea have been taken and the first signs of petroleum activity can be seen in the regional economy by 2005.

To the purpose of this report, Arctic Norway includes Finmark, Troms, Nordland, the Svalbard Archipelago and Jan Mayen. There are no drastic changes in the economic structure from 2002 to 2005. Private services and education, health and social work were the dominant sectors in the economy of Arctic Norway in 2005 as well as in 2002. Together they contributed 62 per cent of GDP in 2005, slightly lower than in 2002 (65 per cent). The share of Public administration and defence in GRP stayed around 9 percent.

Fishing is still one of the largest industries in the region. The fishing industry generated 5 per cent of GRP in 2005, in 2002 slightly less (4 per cent). The coal mining activity is solely taking place in Svalbard.

Figure 4.34 shows the development in value added by major industry over the period 1997-2005. There has been a smooth growth in total production, however, the sector breakdown reveals considerable fluctuations. Primary productions or extraction of natural resources has buoyed around the trend, with a deep dip in 2003 before rapid growth took over from 2003 and the level was catching up with the trend by 2005. A major contributing factor to this development was a decline in fish catch and an even larger fall in fish prices. Secondary industries (manufacturing) developed closer to the trend until an abrupt decline took place in 2004, before turning into rapid growth by 2005. The surge in production was linked to heavy investments in the petroleum industry from medio 2002 in connection with the new gas field Snøhvit north of the town of Hammerfest. The associated land based LNG plant particularly stimulated the construction industry, as did the growth in hydropower capacity in the northern regions.

Table 4.9. **Value added[1] by industry. Arctic Norway. 2002 and 2005**

	2002		2005	
	Mill. NOK	Per cent	Mill. NOK	Per cent
Agriculture	756	0.9	709	0.7
Forestry	193	0.2	171	0.2
Fishing	3 264	3.7	5 164	5.0
Coal, lignite and peat extraction	258	0.3	409	0.4
Oil and gas extraction	1	0.0	127	0.1
Other mining and quarrying	422	0.5	493	0.5
Processing of fish	1 129	1.3	2 105	2.0
Other manufacture of food	1 241	1.4	1 439	1.4
Manufacture of wood and paper	325	0.4	420	0.4
Coal and oil manufacturing; chemicals		0.0	0	0.0
Manufacture of basic metals	469	0.5	1 432	1.4
Other manufacturing	3 281	3.7	3 348	3.2
Electricity, gas and water supply	4 795	5.4	6 574	6.3
Construction	4 647	5.2	7 106	6.9
Transport via pipelines		0.0	0	0.0
Public administration and defence	8 165	9.2	9 924	9.6
Education, health and social work	20 896	23.6	25 501	24.6
Other services	38 704	43.7	38 714	37.4
GRP	88 546	100.0	103 635	100.0

[1] At basic prices.

Figure 4.34. **Value added by main industy. Arctic Norway. 1997-2005**

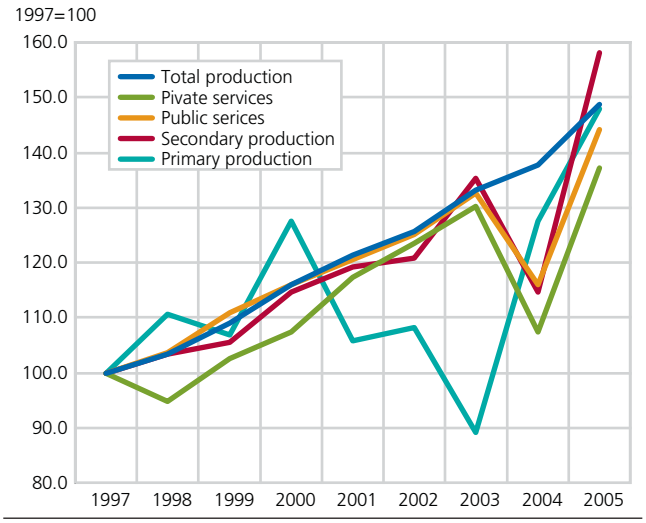


Table 4.10. **Employment by industry. Number of persons. Arctic Norway. 2002 and 2005**

	2002		2005	
	Employment	Per cent	Employment	Per cent
Agriculture, forestry	5 833	2.7	6 612	3.0
Fishing	7 666	3.6	6 214	2.8
Food processing	7 489	3.5	6 283	2.8
Mining	891	0.4	1 092	0.5
Petroleum	15	0.0	237	0.1
Hydroelectric power	1 781	0.8	1570	0.7
Tourism	18 117	8.4	17 357	7.8
Manufacturing	18 916	8.8	22 399	10.1
Services, non-government, excl.tourism	64 635	30.1	70 053	31.6
General government	89 627	41.7	89 665	40.5
Total	**214 970**	**100.0**	**221 482**	**100.0**

Figure 4.35. **Value added by main industry. Arctic Norway. 2002 and 2005. Per cent of GDP**

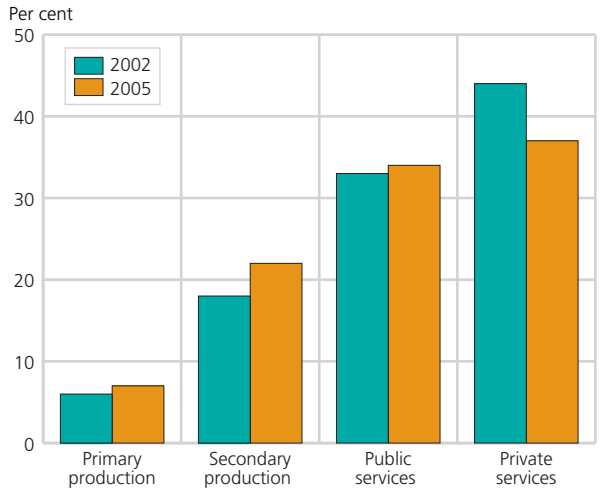


Figure 4.36. **Value added in natural resource based industries. Arctic Norway. 2002 and 2005. Per cent of GDP**

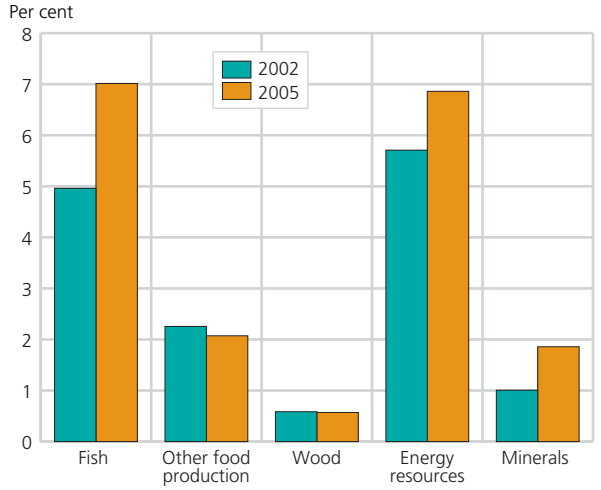


Figure 4.37. **Gross regional product (GRP) per capita and Disposable Income for Households (DIH) per capita. Arctic Norway. 2005. 1 000 USD-PPP**

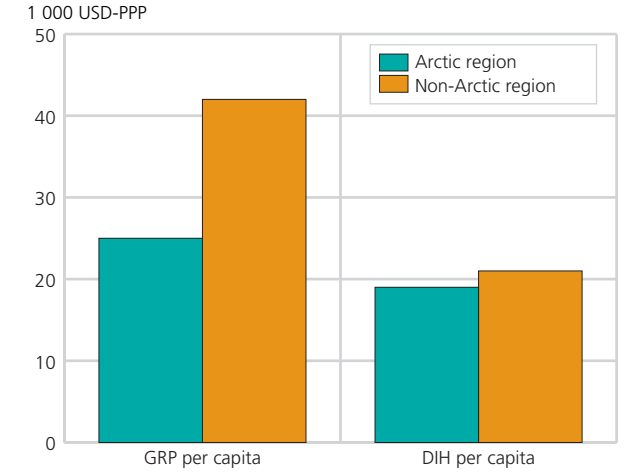


Figure 4.38. **GRP and disposable income by households. Arctic Norway 1997=100**

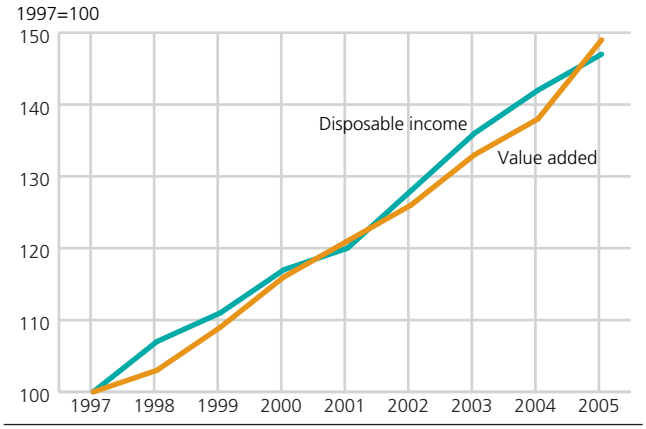


Table 4.10 shows that Agriculture and forestry has surpassed fisheries in numbers of persons employed. Both fisheries and food processing hired less people in 2005 than in 2002, whereas manufacturing employed 18 per cent more persons in 2005, and private services (except tourism) 8 percent more. The number of employed persons in tourism declined by 4 per cent from 2002 to 2005. The government sector is the dominant employer with 40 per cent of employed persons on its payroll.

Figures 4.35 and 4.36 provide snapshots of the industry structure in 2002 and 2005. Private services still dominates with respect to shares of GDP, but lost terrain compared with other main activities. Primary and in particular secondary industries increased their shares due to favourable market development for fish products, energy and construction.

Figure 4.36 illustrates the reliance on main natural resources. Fishing and fish processing increased from 5 to 7 per cent of GRP and generated a slightly higher share of GRP than activities based on energy resources in 2005.

Taking into account that the petroleum activity is mainly located in the North Sea, it is not surprising that GRP per capita is considerably higher outside Arctic Norway (figure 4.37). The level of disposable income of households per capita in northern Norway is about 10 per cent lower than in the rest of the country.

In nominal terms, households' disposable income in Artic Norway increased 47 per cent from 1997 to 2005 (figure 4.38). For Norway as a whole, the growth in households' disposable income in this period was considerably higher (66 per cent).

Figure 4.38 compares the growth in GRP and DIH. After 1997 for Arctic Norway, there has generally been a close race between GRP and DIH, with slightly higher growth in DIH. Factors that may explain this are that around 75 per cent of employment lies in the service sector, where wage levels are easily influenced by the national wage level. And secondly, employees in this

region benefit from special tax deduction. In 2005, GRP overtakes DIH again, an expected change if resource rent plays an increasing role and is transferred to residents outside the region.

The Sámi area

The areas in northern Norway defined as Sámi settlement areas are those areas that qualify for financial support from the Sámi development fund (Samisk utviklingsfond, SUF), in brief, the SUF area.

Table 4.11 shows the income account for the SUF area in 2005, compared to other areas of northern Norway (north of Saltfjellet). Average total income for the SUF area was 238 200 NOK, considerably lower than average total income for other northern areas with 280 900 NOK and the average for Norway with 316 300 NOK.

Note that table 4.11 shows average income for those income earners that have each of the following sources of income: Income from work, property income, taxable transfers, and tax-free transfers. It does not show average across all persons. Average total income thus appears as a weighted average of the income types, weighted by the number of persons receiving the income type.

Average income from work and property income was considerably lower in the SUF area than the average for other northern areas and the average for Norway. Taxable transfers were also lower in the SUF area although the share of population receiving those transfers was higher than in the other areas. Average unemployment benefit in the SUF area is slightly higher than in other northern areas and slightly lower than average for Norway. Child allowance is the only income type that is higher on average for recipients in the SUF area, compared to other areas.

Table 4.11. **Income account per capita above 17 years. All of Norway and north of Saltfjellet. 2005. NOK**

	All of Norway	SUF-area[1]	Other areas in the north[2]
Income from work	282 500	213 500	257 500
Employee income	267 600	202 600	244 300
Net income from self-employment	213 400	132 800	199 400
Property income	41 100	8 800	19 200
Taxable transfers	144 800	127 600	137 400
Social Security benefits	132 700	126 700	130 600
Unemployment benefit	56 500	53 100	50 500
Tax-free transfers	30 700	30 700	30 000
Child allowances	22 200	28 300	23 400
Dwelling support	16 900	13 000	14 200
Social assistance	37 800	20 400	26 600
Total income	316 300	238 200	280 900
Total assessed taxes and negative transfers	80 900	50 400	68 800
After-tax income	241 900	102 600	217 500

[1] SUF-area is defined as areas that qualify for financial support from the Sámi development fund north of Saltfjellet.

[2] Those areas north of Saltfjellet not defined as SUF-area

Source: Samisk statistikk 2008, table 36.

Russian trawler in the Barents sea. © Helge Sunde / Samfoto

Arctic Russia

Arctic Russia is by far the largest among the Arctic regions, both in terms of land area and population. In 2005 the population was 7.1 million, down from 7.9 million in 1995.

The National Accounts of Russia are now based on the European Industry classification (NACE Rev.1.1), facilitating comparison across borders. Comparison with sector data for Arctic Russia as presented in the previous report *The Economy of the North* is generally not possible. However, some sectors can be identified and compared over time.

In 2005 oil and gas extraction more or less dwarfed other industries by generating 50 per cent of GRP all alone, whereas mineral extraction accounted for 4 per cent. The share of education, health and social services was down to 4 per cent in 2005, clearly lower than the share in 2002, which was close to 9 per cent of GRP. In the years 2002-2005 Arctic Russia experienced a rapid annual economic growth at about 8.6 per cent (in fixed USD-prices).

Petroleum

Figure 4.39 shows the development of oil production during the period 1990-2006, distinguishing between production in non-arctic Russia and the Arctic regions. The two largest oil producing arctic regions was above all Khanty-Mansii and to a lesser extent Yamal-Nenets. (See also figure 4.44)

The Yamal peninsula seems to be the focus for further investments in gas extraction as rich reserves are far more accessible there than the giant offshore Stockman gas field.

The total level of oil production in 2006 was approaching the level of 500 million tons in 1990 before the collapse following the break-up of the former Soviet Union. The highest level of production was reached in 1988 with about 530 million tons.

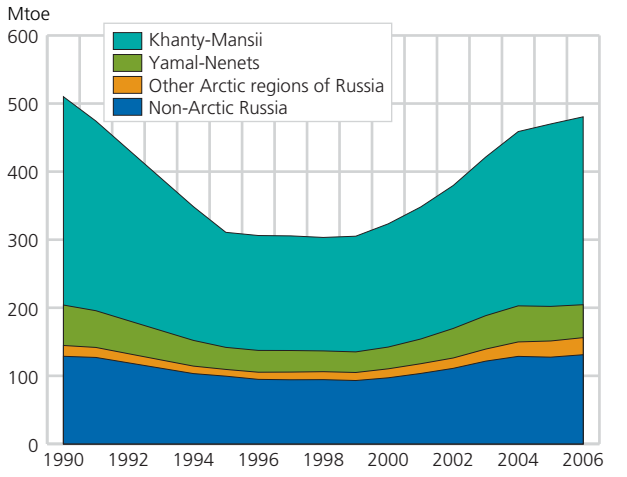
The two Arctic regions of Khanty-Mansii and Yamal-Nenets together produce almost 70 per cent of total Russian output. The production in Khanty-Mansii showed a larger increase than Yamal-Nenets during

Table 4.12. **Value added[1] by industry. Arctic Russia. 2005**

	Mill. Rubles	Per cent
Agriculture and forestry	33 642	1.3
Fishing	15 319	0.6
Coal, lignite & peat extraction	60 355	2.3
Oil & gas extraction	1 337 617	50.2
Other mining & quarrying	117 854	4.4
Processing of fish	117	0.0
Other manufacture of food	11 590	0.4
Manufacture of wood & paper	26 321	1.0
Coal & oil manufacturing	52 814	2.0
Manufacture of basic metals	25 598	1.0
Other manufacturing	22 095	0.8
Electricity, gas & water supply	78 878	3.0
Construction	132 063	5.0
Public administration & defence	54 717	2.1
Education, health & social work	107 149	4.0
Other services	589 936	22.1
GRP	2 666 066	100.0

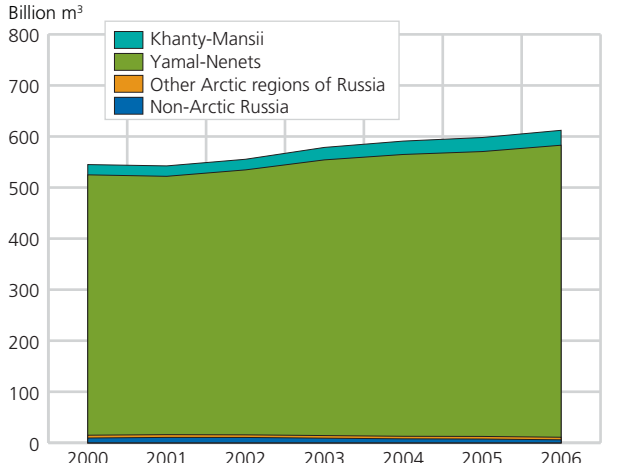
[1] At basic prices.

Figure 4.39. **Russian oil production. 1990-2006**



Source: ArcticStat Circumpolar database, http://www.arcticstat.org

Figure 4.40. **Russian gas production. 2000-2006**



Source: ArcticStat

Figure 4.41. **Value added by main industry. Arctic Russia. 2005. Per cent of GDP**

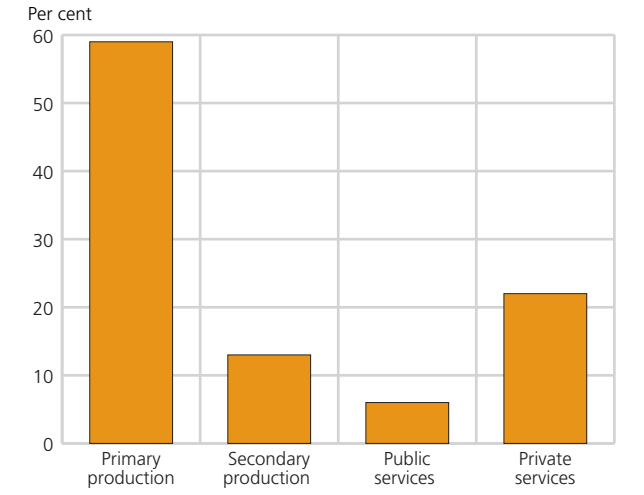


Figure 4.42. **Value added in natural resource based industries. Arctic Russia. 2002 and 2005. Per cent of GDP**

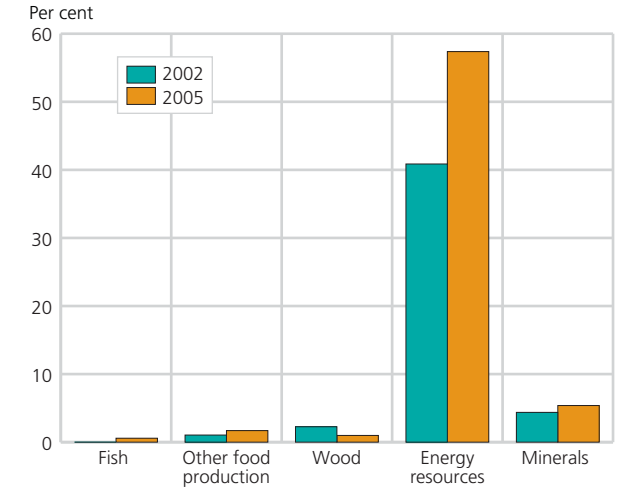


Figure 4.43. **Gross regional product (GRP) per capita and Disposable Income for Households (DIH) per capita. Arctic Russia. 2005. 1 000 USD-PPP**

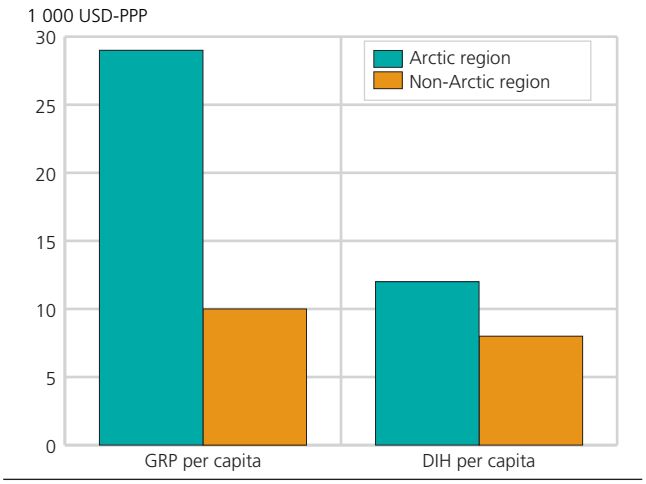
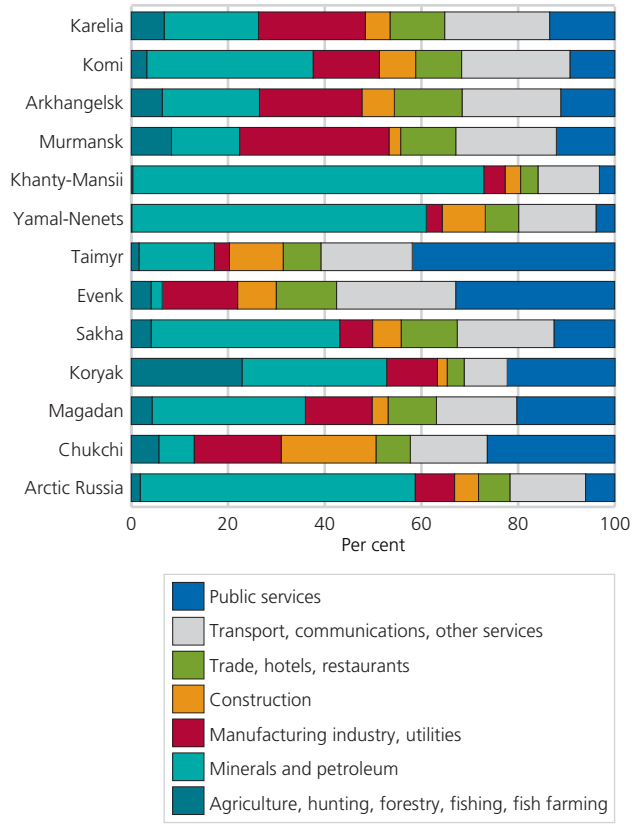


Figure 4.44. **GRP by industry. Arctic Russia. Per cent**



the period 2004-2006. Yamal-Nenets totally dominates Russian gas production, which increased steadily from 2001 to 2006.

Economic structure

Figure 4.41 illustrates how primary production looms in the economy, and that the levels of public services are unusually low even in an Arctic context. Figure 4.42 shows how energy productions have taken an even greater share of GRP since 2002.

When it comes to disposable income, Arctic Russia has almost 70 per cent higher disposable income per capita than in the non-arctic regions. The relatively low number of people in the Arctic together with the booming income of the petroleum sector might explain that disposable income per capita is higher in the Arctic regions, which is untypical, but also occur in Alaska and Arctic Canada, two other Arctic regions with important primary production sectors.

Figure 4.44 shows how different the various subregions are. While the minerals sector only contributes to around 2 per cent of the GRP in Evenk, the share in Yamal-Nenets and Khanty-Mansii is 61 and 73 per cent, respectively.

Arctic Sweden

The two northern counties, Västerbotten and Norbotten, constitute Arctic Sweden. The share of the total population living in the Arctic regions was around 5.6 per cent in 2005, a minor reduction from 2002. The two counties accounted for 5.3 per cent of national GDP in 2005, a small increase from 2002.

From table 4.13 we can see that there have been some significant changes in the economic structure between 2002 and 2005. The relative importance of other mining and quarrying and manufacture of basic metals more than doubled, while forestry and manufacture of wood and paper generated somewhat less of GRP in 2005 compared with 2002. Electricity, gas and water supply and the construction sector increased by 31 and 21 per cent, respectively. Private services and education, health and social services were the dominant sectors in the economy of Arctic Sweden in 2005 as well as in 2002. Together they contributed 56 per cent of GDP in 2005, somewhat lower than in 2002 (63 per cent).

Figure 4.45 shows the industry structure in 2002 and 2005. Even if the private services share of total GDP has declined over the period, it was still the dominant sector compared to other main activities at the end of the period. We also see that primary production had the largest relative increase over the period. In addition, secondary production generally is slightly larger than public services, which is not the case in other Arctic regions (except for Finland and Iceland). The main reason is the relatively huge manufacturing sector of wood and paper as well as basic metals in northern Sweden.

Figure 4.46 compares the importance of the different resource based industries in 2002 and 2005. The food and fish sectors remained small over the period. However, while timber production declined, the mineral sector expanded and became the dominant resource sector in 2005. The second largest sector in 2005 was energy resources, which is due to the relatively large electricity sector in northern Sweden.

Table 4.13. **Value added[1] by industry. Arctic Sweden. 2002 and 2005**

	2002		2005	
	Mill. SEK	Per cent	Mill. SEK	Per cent
Agriculture	706	0,6	636	0,5
Forestry	3 371	2,9	3 038	2,5
Fishing		0,0		0,0
Coal, lignite and peat extraction		0,0		0,0
Oil and gas extraction		0,0		0,0
Other mining and quarrying	2 887	2,5	9 246	7,5
Processing of fish		0,0		0,0
Other manufacture of food	1 207	1,0	1 084	0,9
Manufacture of wood and paper	5569	4,8	4 119	3,3
Coal and oil manufacturing; chemicals		0,0		0,0
Manufacture of basic metals	1 497	1,3	3 666	3,0
Other manufacturing	8 961	7,7	9 676	7,8
Electricity, gas and water supply	6 497	5,6	8 522	6,9
Construction	5 490	4,7	6 671	5,4
Transport via pipelines		0,0		0,0
Public administration and defence	6 727	5,8	7 500	6,1
Education, health and social work	20 836	17,9	24 300	19,6
Other services	52 386	45,1	45 312	36,6
GRP	116 134	100,0	123 770	100,0

[1] At basic prices.

Gross regional product per capita as well as disposable income of households per capita are somewhat lower in Arctic Sweden as compared within all of Sweden (Figure 4.47).

Figure 4.48 shows the development in value-added by major industry over the period 1997-2006. There has been a more or less steady growth in total production from 1997 to 2006. However, secondary production grew faster than the trend up until 2002, before lower growth in the coming years lead it closer to the trend. The most divergent development from the trend is certainly seen in primary production or extraction of natural resources. The volume of primary production was lower in 2002 than in 1997. However, value added more than doubled in volume terms over the next four years. The surge in production is linked to increased mineral extraction.

Figure 4.49 presents growth in GRP and DIH after 1995 in Arctic Sweden, together with the population development. Firstly, we see that the Arctic population declined somewhat up to 2001, but has been more or less constant thereafter. There was a relatively similar growth in both GRP and DIH up to 2003. In the following three years there has been a much higher growth in GRP than DIH, probably as revenues rents in the primary production sector plays an increasing role and is transferred to residents outside the region.

Figure 4.45. **Value added by main industry. Arctic Sweden. 2002 and 2005. Per cent of GDP**

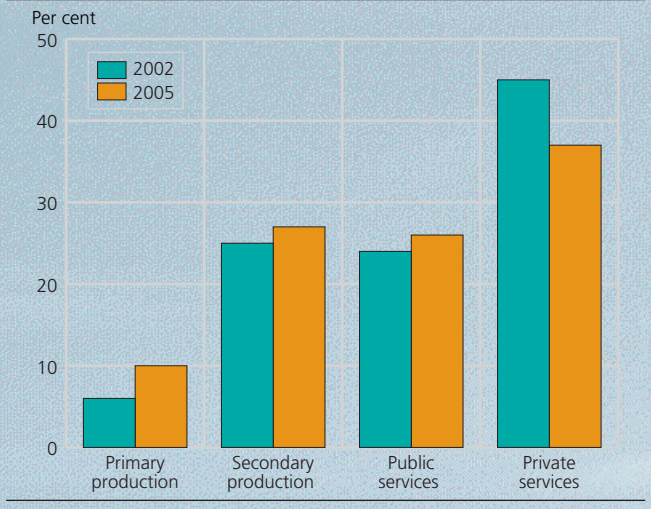


Figure 4.46. **Value added in natural resource based industries. Arctic Sweden. 2002 and 2005. Per cent of GDP**

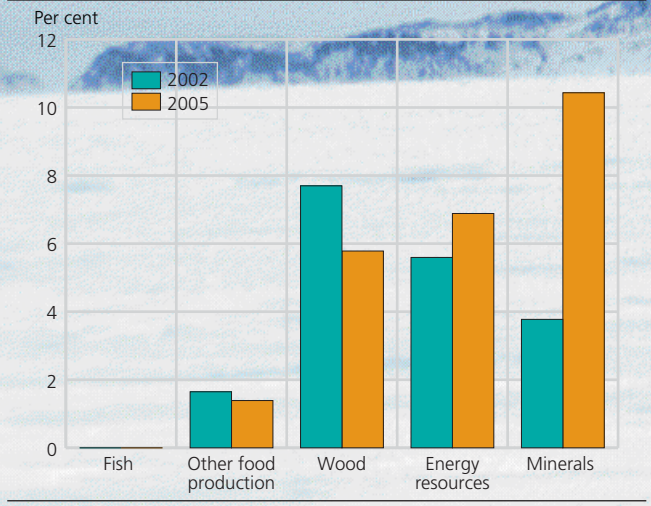


Figure 4.47. **Gross regional product (GRP) per capita and Disposable Income for Households (DIH) per capita. Arctic Sweden. 2005. 1 000 USD PPP**

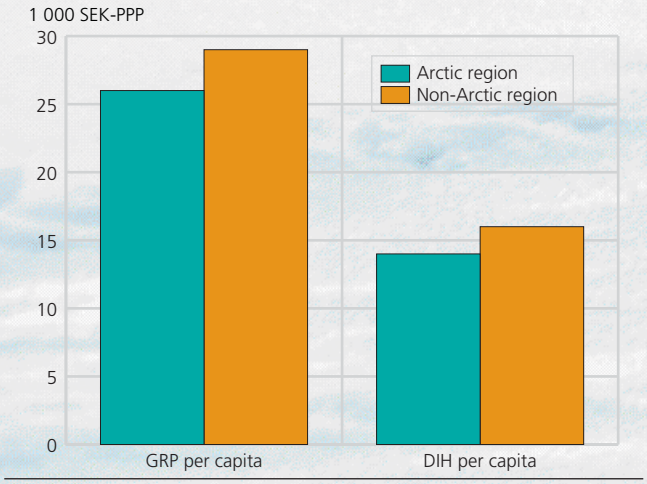
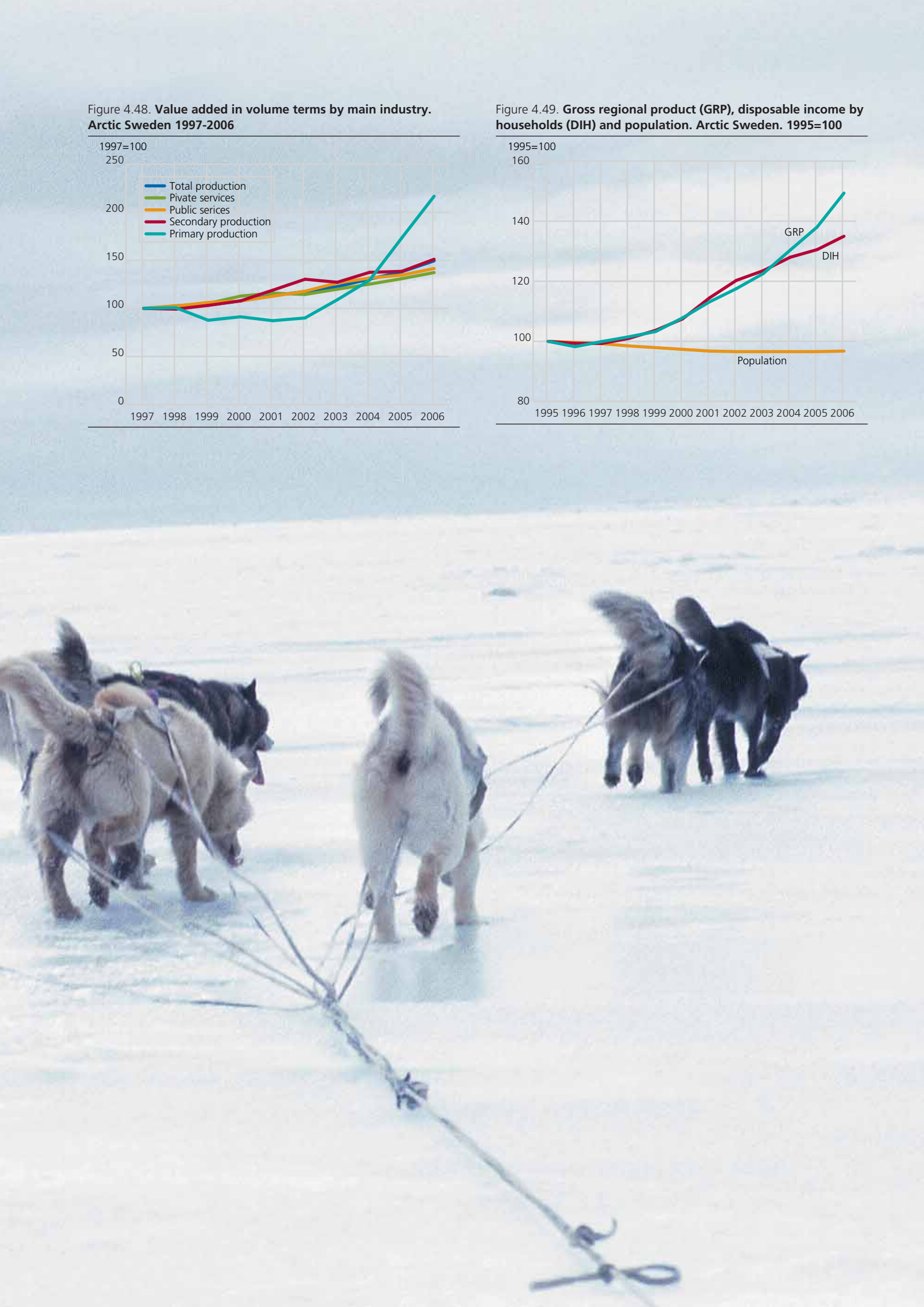


Figure 4.48. **Value added in volume terms by main industry. Arctic Sweden 1997-2006**

Figure 4.49. **Gross regional product (GRP), disposable income by households (DIH) and population. Arctic Sweden. 1995=100**



Circumpolar overview

Although this chapter has mainly focused on the individual Arctic regions, the format og data allows for an overview at circumpolar level.

When looking at the overall picture, the regions emerge as heterogeneous although as some, reckognizable clusters.

Arctic Russia, Alaska and Northern Canada are the main producers within petroleum and other mineral mining. In Arctic Russia, the primary production of mainly petroleum and minerals totally dominate the income generation (figure 4.50). Close to 60 percent of GRP originated in these activities in 2005. Although Arctic Russia clearly takes the lead, the three major petroleum regions have the highest shares of extractive industries in their economies. The same three regions have the lowest percentage contribution to GRP from secondary industries.

Among the other regions, Greenland and Faroe Islands are most dependent on natural resource extraction. In Arctic Sweden and in particular Arctic Finland, the secondary industries or manufacture of goods have the strongest position, to some extent supported by shorter distances to markets and less challenging natural surroundings.

Iceland and Arctic Norway have higher shares of value added from private and public services than all other regions. Iceland, Arctic Norway and Arctic Finland have the lowest contributions to GRP from extractive industries.

The degree of nature based activities is illustrated in figure 4.51. A comparison with figure 4.50 shows the extent to which the resources are processed within the regions. The petroleum and mineral rich cluster rely the most on natural resources. Alaska and Arctic Canada hardly process their extracted resources, Arctic Russia do to some extent, whereas all the other regions do process their resources, which thus have a more important position in their economies than the extraction activities indicate.

Local marketplace, Nuuk, Greenland. Photo: Tom Nicolaysen

Figure 4.50 **Value added by main industry in Arctic regions. 2005. Per cent of regional GDP**

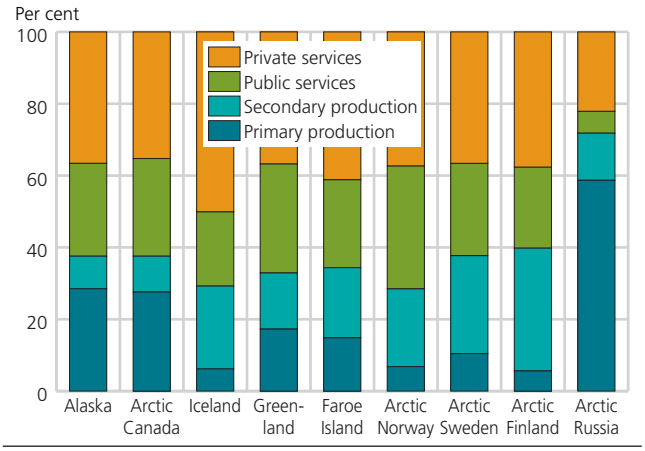
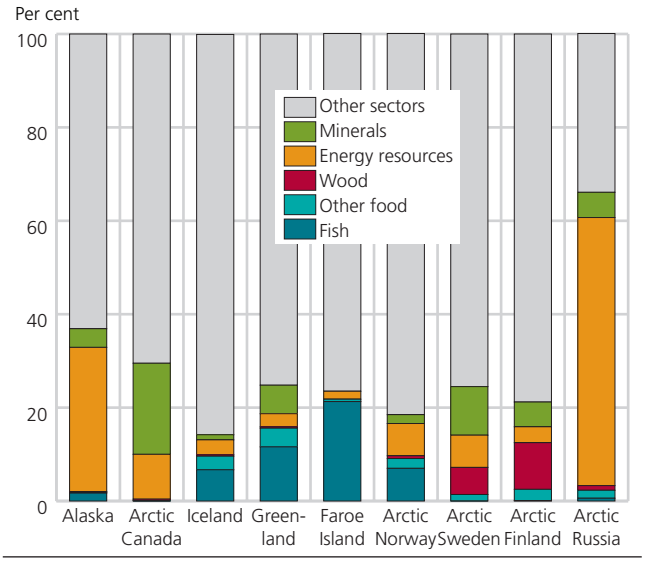


Figure 4.51 **Value added in natural resource based industries in Arctic regions. 2005. Per cent of regional GDP**



Notes

[1] IMF (2009): Primary commodity prices http://www.int.org
[2] Institute of Social and Economic Research. MAP database.
[3] IEA (2005): Resources to reserves, OECD.
[4] EIA – Energy Information Administration, http://www.eia.doe.gov
[5] See note 4.
[6] Szumigala, D. J., Hughes, R. A. and L. A. Harbo (2008): Alaska's mineral industry 2007, Special Report 62, Division of Geological & Geophysical Surveys.
[7] Statistics Finland 2008. Regional accounts of production and employment. http://www.stat.fi/til/atutyo/tau_en.html. Updated 19.3.2008
[8] Finnish Forest Research Institute 2007. Finnish Statistical Yearbook of Forestry. Vammala
[9] Statistics Finland 2008. Energy Statistics. Yearbook 2007. Helsinki
[10] Geological Survey of Finland 2008. Metals and Minerals Production. http://en.gtk.fi/ExplorationFinland/MineralProduction/. Modified: 02.09.2008
[11] Konttinen, J-P. 2006. Matkailun aluetaloudelliset vaikutukset – matkailun alueellinen tilinpito [Regional Economic Effects of Tourism – Regional Tourism Satellite Account}. Ministry of Trade and Industry. Helsinki.

Box 4.3. Regional accounts data sources

Canada
Statistics Canada: Provincial and Territorial Economic Accounts: Data Tables http://www.statcan.gc.ca/pub/13-018-x/2008002/6100256-eng.htm

Faroe Islands
Statistics Faroe Islands: National accounts and balance of payments
http://www.hagstova.fo/portal/page/portal/HAGSTOVAN/Statistics_%20Faroe_Islands/Statistics/National_accounts_and_balance_of_payment

Finland
Statistics Finland: Indicators of regional economy
http://www.stat.fi/til/atind/index_en.html

Greenland
Statistics Greenland: Greenland in figures 2007
http://www.greenlandexpo.com/media(250,1033)/Greenland_in_Figures_2007.pdf

Iceland
Statistics Iceland: National accounts and public finance
http://www.statice.is/Statistics/National-accounts-and-public-fin

Norway
Statistics Norway: Regional accounts, 2006
http://www.ssb.no/fnr_en/

Russia
Goskomstat Russia: Gross Regional Product, 1995, 2000-2005. Available at ArcticStat: http://www.arcticstat.org/Table.aspx/Region/Russian_Federation/Indicator/Regional_Accounts/Table_2008-08-25-13/10911

Goskomstat Russia: Average Per Capita Money Income Of Population, 1990, 1995, 2000-2006. Available at ArcticStat: http://www.arcticstat.org/Statistics.aspx/Region/Russian_Federation/Indicator/Personal!Household_Income/

Goskomstat Russia: Average Annual Employment In The Economy, 1990, 1995, 2000-2006. Available at ArcticStat: http://www.arcticstat.org/Table.aspx/Region/Russian_Federation/Indicator/Labor_Force/Table_2008-08-20-20/10854

Goskomstat Russia: Population Size, 1990, 1995, 2000-2006. Available at ArcticStat
http://www.arcticstat.org/Table.aspx/Region/Russian_Federation/Indicator/Population/Table_2008-08-20-1/10835

Sweden
Statistics Norway: Regional Accounts
http://www.scb.se/Pages/ProductTables____11100.aspx

United States
Bureau of Economic Analysis: Regional Economic Accounts
http://www.statcan.gc.ca/pub/13-018-x/ 2008002/6100256-eng.htm

Greenland. Photo:Photos.com

Box III. The value of having the exclusive right to exploit a natural resource

By Mads Greaker
Statistics Norway

The artic regions are rich in natural resources; Alaska, Khanty-Mansi and Yamalo-Nenets have vast oil and gas deposits, Greenland, Iceland and Northern Norway enjoy access to rich fishing grounds and Canada's Northwest Territories have found large diamond deposits. Furthermore, in other regions like Northern Norway, Murmansk and Arkhangelsk, there are great hopes for discovering oil and gas in the Barents Sea.

The natural resource sectors contribute by a large share to Arctic GDP. On the other hand, it does not follow that without the natural resources Arctic GDP would have been reduced by the same amount. GDP figures include the use of labour and capital to extract resources. Without the natural resources, both the labour and the capital employed could have been utilized in other sectors of the economy, and hence, they would have contributed to GDP anyhow.

In national accounting terms stocks of unexploited natural resources should be viewed as capital assets. The value of a capital asset is usually reckoned as the total discounted net income accruing from it. With respect to natural capital this is usually referred to as a stream of resource rents. The resource rents are thus the additional income a nation/region obtains from having the exclusive right to exploit a natural resource.

With point of departure in the national accounts, Eurostat (2001) and SEEA-2003 defines resource rent in the following way:

Resource rent =
- i) + Basic value of output/production
- ii) - Intermediate uses
- v) - Compensation of employees
- vi) - Return to fixed capital
- vii) - Capital consumption

When calculating compensation of employees and return to fixed capital, the idea is to use wage rates and rates of return that reflect the alternative value of both the workers and the capital employed to extract the resource. For Norway the average wage rate and the average rate of return to capital for all non-natural resource based industries have been used as a measure of the alternative value. However, there is yet no consensus in the literature on the correct measure; for instance, The World Bank uses the average wage paid in the primary sectors as their measure for the alternative value of labour[1]. Below is an example from oil and gas extraction in Norway. All figures connected to oil and gas extraction accrue to a separate «off-shore» sector in the Norwegian national accounts.

The size of the resource rents is very dependent on world market prices of oil and gas. Output price movements can explain the large increase in resource rents from the period 1995-1999 to the period 2005-2008. Note also that the compensation to labour makes up a very small part of gross production, and that the compensation to capital makes up a relatively large, but declining part. To the extent that the figures from Norway are representative for the situation in the Arctic, it is of great interest from an Arctic sustainable development perspective to study further whether resource rents are reinvested in other capital assets located in the Arctic.

Not all natural resources have a positive resource rent. Studies from Norway show that even though Norway has access to rich fisheries, the resource rents are mostly negative. These figures indicate that in organizing the fisheries, the Norwegian authorities do not only maximize the surplus from the fisheries, but also focus on other targets such as providing jobs in remote areas. However, from a resource rent perspective jobs is a cost because labour has an alternative value. As already mentioned, one may of course discuss whether the average wage rate in the non-resource sectors is the correct measure of this value.

Figure 1. **Average decomposition of gross production in the Norwegian oil and gas sector**

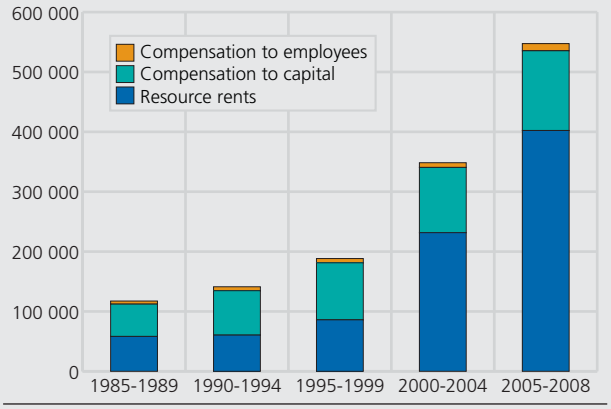
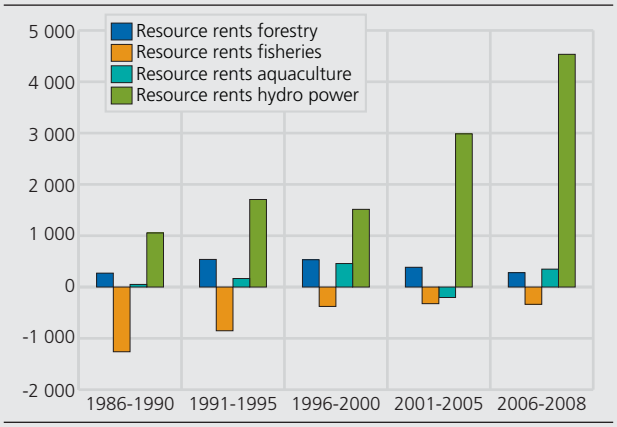


Figure 2. **Five-year average resource rents from the renewable natural resources in Norway[1]**



[1] World Bank (1998): Estimating National Wealth: Methodology and Results, World Bank, Washington D.C.

5. Future production of petroleum in the Arctic under alternative oil prices

Lars Lindholt and Solveig Glomsrød

The Arctic is one of the world's most important petroleum provinces. Obviously, the petroleum resources are important to the Arctic countries and regions as sources of income and resource rent. However, the importance of the Arctic petroleum goes beyond the regional and national economies. Large net-importers of petroleum like the US and the EU look to the Arctic for petroleum to relief stress from dependence on a very limited range of suppliers. However, petroleum production in the Arctic is facing harsh conditions and high costs compared with other producing provinces. Moreover, the challenges will be even higher in the future, as production increasingly takes place offshore and in more remote areas lacking infrastructure for transportation.

The global demand for oil and gas increased considerably until recently as a response to rapid economic growth in population rich countries like China and India. Supply seemed to be be unable to meet demand, facing capacity constraints in oil producing countries outside OPEC and surging maintenance and investments costs associated with the long upswing in the global economy. The IEA Upstream Investment Cost Index doubled from 2000 to 2008[1]. Exploration and investments had lagged behind due to a relatively low oil price in previous years and contributed to the high oil price from 2006 onwards. From July 2008 the oil price fell drastically and the financial crisis and economic downturn brought considerable uncertainty as to future levels of demand as well as supply over the next few years. The generally high cost of petroleum production under harsh Arctic conditions makes the region particularly vulnerable to falling oil prices. However, production activity in areas with available infrastructure like the North Slope of Alaska and West Siberia and Pechora Sea in Russia are less vulnerable.

Family Fishing in Tyonek – A father teaches his sons to pick fish nets outside Tyonek in West Cook Inlet. Although a sometimes tenuous relationship, the oil and gas industry has provided jobs and income to residents of Tyonek for over 50 years. Photo: Davin Holen

The International Energy Agency assumes that the oil price will not stay low for a long time. The IEA World Energy Outlook[2] argues that the oil price will tend to rise again in the near future and average 100 USD per barrel in real 2007-dollars over the period 2008-2015 and further to rise in a broadly linear manner to USD 122 in 2030. IEA adds, however, that rarely has the outlook for oil prices been more uncertain than during fall 2008.

Climate policies are also expected to affect the petroleum industry. In line with The Kyoto Protocol, Annex B countries have committed themselves to reduce emission for the period 2008-2012 compared with the base year 1990. A future agreement on emission reductions is not expected to be in place before the Conference of the Parties of the Kyoto Protocol meet in Copenhagen in 2009 at the earliest. However, the global warming perspectives point to strict future emission control and costly cleaning technologies. Irrespective of policy measures used, the cost of consuming fossil energy will increase and is likely to cause a decline in demand relative to a business as usual scenario. This might

particularly affect high cost regions like the Arctic and adds another reason to develop scenarios for petroleum production in the Arctic.

However, scenarios for petroleum production in the Arctic are important not only to see how petroleum can contribute to income of Arctic countries and to the world's consumption of energy. Petroleum exploration, production and transportation cause considerable emissions to air and are important variables in regional Arctic emission inventories of greenhouse gases being used in climate scenarios. The geographic location of emissions of carbon dioxide (CO_2) has no impact on the warming potential. For particles (black soot) on the other hand, the location of the emissions is important. Black soot from fuel combustion is deposited on snow and ice and reduces the albedo effect, i.e. the capacity of the earth's surface to reflect heat radiation and thus mitigate global warming.

The West Arctic regions are particularly important to the private international oil companies. In these regions the oil companies can buy licenses and thus get access to the petroleum reserves. Globally, the state owned so-called National Oil Companies (NOC) now control the majority of the petroleum reserves, and service contracts rather than reserves are increasingly offered the international companies in many provinces.

Increasingly larger areas that formally were reindeer pastures become detoriorated by oil prospecting and production activities. Varandey area, Nenets Autonomous Okrug. Photo: Yasavey

The petroleum sector is also important to the Arctic region as a source of employment and income, and indirectly as a source of transfers from the Arctic countries to the Arctic sub-regions. The Arctic regions of Russia and Alaska have economies that rely particularly heavily on petroleum. Although the resource rent may to a large extent be transferred out of the regions, there is no doubt that the petroleum activity leaves a marked footprint in the producing regions, through supply chains, taxes and transfers.

Table 5.1. **Estimates of undiscovered oil and gas. USGS2008 vs. USGS2000. Btoe**

Arctic Canada	+ 29
Alaska	+ 31
Greenland	- 33
Arctic Russia	+ 9

Petroleum reserves in the Arctic

Whereas proven reserves are fully identified and economically viable resources, the so-called undiscovered resources are estimated based on geological data and criteria. There is large uncertainty associated with resource estimates in the Arctic, where a substantial share of the resources are under sea and ice, and exploration drilling consequently is costly. During recent years a few comprehensive assessments have been carried out with somewhat different results.

Wood Mackenzie assessed the undiscovered reserves in the Arctic regions and questioned the high importance of the Arctic as one of the last great oil and gas frontiers[3]. For oil, the study concluded that estimated undiscovered resources were only a quarter of earlier estimates made by USGS 2000 for North America and Greenland. However, the estimates for natural gas in West Arctic regions were raised compared with USGS 2000 assessment. The West Arctic region would, according to the assessment, in the most likely scenario peak about 20 years from now at 8 million barrels of oil equivalents per day (boe/d) with 40 percent oil and 60 percent gas. A higher share of gas would mainly consist of remote gas too expensive to transport to markets. According to the Wood Mackenzie assessment, undiscovered reserves are mainly located in either ice-free or seasonal ice-free areas, which require modifications of technology only – not new solutions. Subsea drilling will be used for the greater share of the resources.

In 2008, the USGS completed a Circum-Arctic Resource Appraisal (CARA), which assessed the undiscovered petroleum resources north of the Arctic Circle[4]. The study was limited to areas expected to have more than 10 per cent probability of one or more significant oil or gas resources, i. e. containing more than 50 mill boe. Further, the study excluded resources where production will have to rely on technology that is not yet available, and did not consider the specific challenges associated with the ice cover.

Undiscovered petroleum reserves were estimated by USGS 2008 to be 36 btoe or 8.5 per cent higher than in their 2000 estimate. In particular, estimates for Canada and Alaska have been raised, but the estimate for East Greenland were reduced by half in the 2008 survey.

The effect on Arctic petroleum production of a shift in the oil price

In the following we discuss the potential scale of future petroleum production in the Arctic regions based on a model of the global petroleum market. The FRISBEE-model[5] describes demand and supply of oil globally as

Prudhoe. Alaska Oil Deadhorse. A young grizzly bear ambles through the industrial trappings of Deadhorse, Alaska. Photo: Charles Mason/NYT /Scanpix

a function of the oil price. In the natural gas markets the price is solved endogenously. From these data we derive future production profiles, based on investment and production decisions.

The global petroleum industry is modeled as one single investor, who allocates a share of the annual cash flow to new fields by maximizing net present value of returns. It is important to be aware of the simplification to assume that national oil companies like the Russian apply the same investment rule of profit-maximization as private international oil companies. In general, social and political priorities are perceived to have a stronger hand on the national oil companies.

The model distinguishes between basic investments up-front and later investments in enhanced oil recovery (EOR) to modify the rate of decline in production after the peak level. In the future, a growing share of crude oil production will come from smaller and offshore fields with higher declines rate. Hence, steadily increasing investments in EOR are needed to keep up production recovery rates.

In the study, supply and demand are estimated for 4 field categories in 15 regions. Field categories are defined according to size of reserves, and location onshore or offshore at various depths. There are the 5 Arctic regions, West Russia, East Russia, Arctic Canada, Alaska and Arctic Norway. In the Arctic regions there is one field category only. More than 80 percent of the undiscovered resources in the Arctic are located offshore.

In the model, the OPEC region acts as a residual supplier, who regulates supply to support a certain presumably preferred level of the oil price that is fixed by assumption in the model. The gas price is endogenously determined in regional markets.

The time horizon of this study goes to 2030 and is based on the assumption that the considerable undiscovered resources of East Greenland will not be in production before 2030. Offshore production in these regions has a serious climate and cost challenge, and even depend on new technology development. On this background we assume that East Greenland resources will not be on-stream within the time horizon of our study. Likewise, we assume that the vast majority of

Figure 5.1. **Total Arctic oil production. Reference scenario (80 USD per boe) 2000-2030**

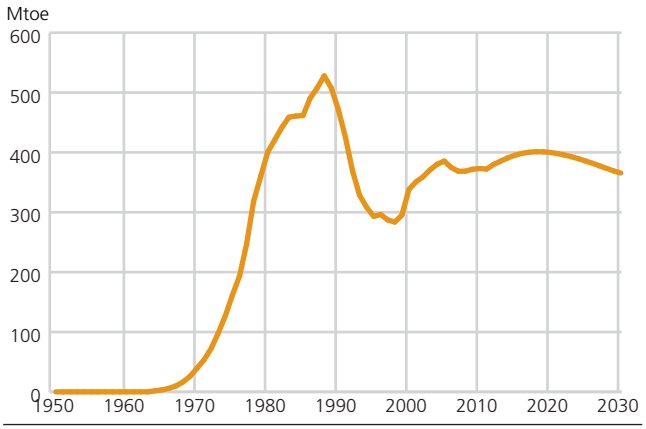


Figure 5.2. **Regional distribution of arctic oil production. Reference scenario**

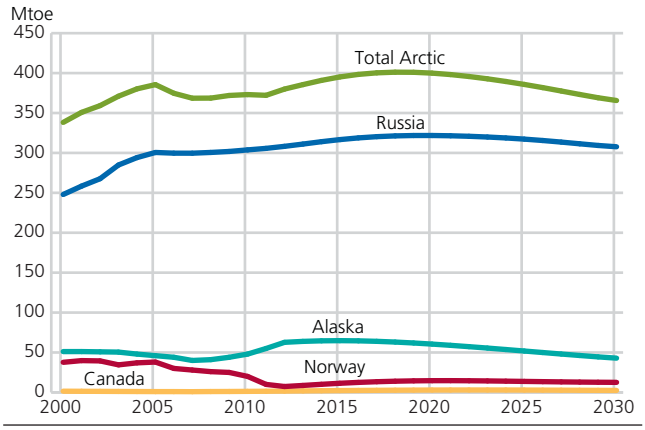


Figure 5.3. **Total Arctic natural gas production - reference scenario**

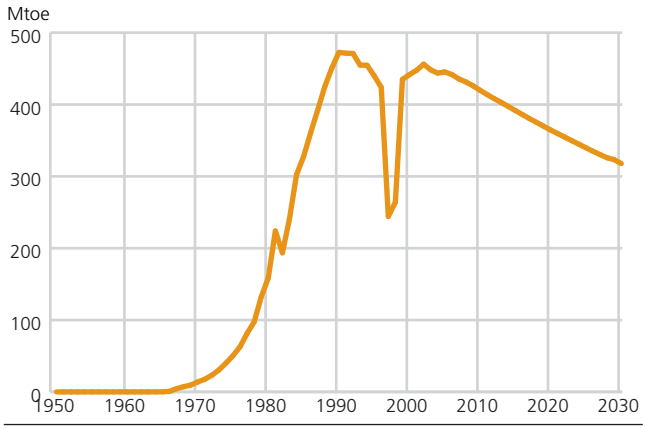
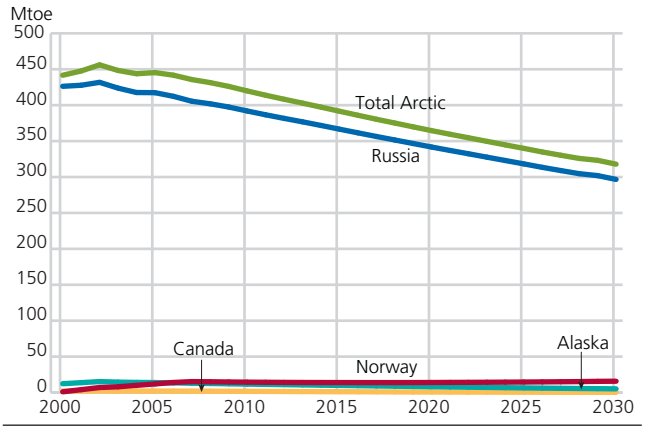


Figure 5.4. **Regional distribution of Arctic gas production. Reference scenario**



Russian production activities will take place in their western parts within our time frame.

The 2008 estimates of undiscovered reserves by US Geological Surveys are used in the model. In a base case scenario, the oil price is assumed to be 80 USD (2000) per barrel, and additional scenarios are run with alternative oil price levels at 40 USD and 120 USD.

Results

Figure 5.1 shows that Arctic oil production really started to increase in the mid-sixties up to around 1988. The break-up of the Soviet Union led to a decline in oil production from then on, before it started to increase in the late 1990s. Due to the dominant share of Arctic Russia in total Arctic oil production, this is clearly reflected in aggregate production at circumpolar level. In the reference scenario of our model simulations, future production of oil in the Arctic never reaches the production levels of the 1980s.

Figure 5.2 shows the future production in the various arctic regions. The estimated production levels fit relatively closely to the observed development in the different regions up to 2007. We see that total production increases somewhat up to 2018 and then falls gradually back to the 2007 level by 2030. Continuously in this process, producing fields are being emptied and new fields are being discovered and developed. Oil production in the Arctic is around 10 per cent of global oil production initially. However, because oil production in other regions increases somewhat, the Arctic share of global oil production is falling to around 7 per cent in 2030. Of total accumulated arctic oil production from 2008 to 2030, around 81 and 14 per cent will come from Russia and Alaska, respectively.

Figure 5.3 shows total Arctic natural gas production. Similar to oil, gas production increased from the mid-sixties to 1988. Production in the beginning of the 2000s was almost as high as the record levels reached

Figure 5.5. **Arctic gas production outside Russia - reference scenario**

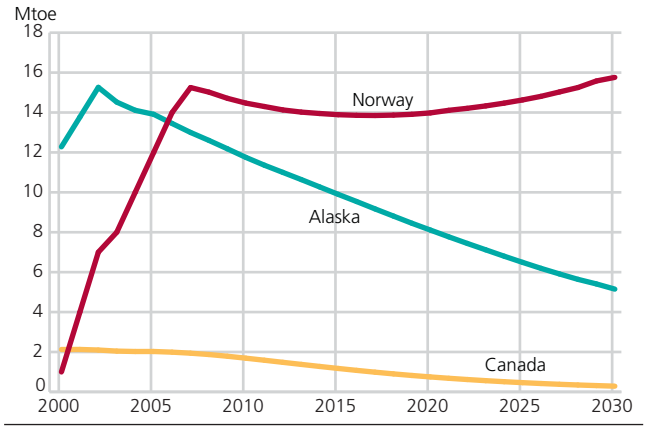
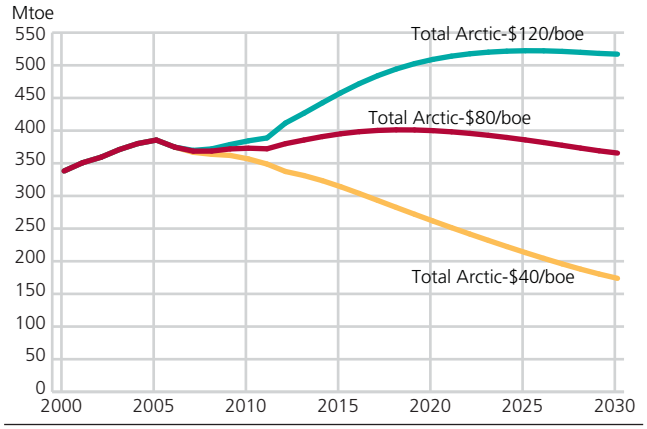


Figure 5.6. **Total Arctic oil production with alternative oil prices**



in the late 1980s. Future gas production declines over the whole projection period in the reference scenario.

In our model projections, global gas production increases in most regions outside the Arctic up to 2030. Hence, the Arctic share of global gas production actually declines from around 21 per cent in 2008 to around 9 per cent in 2030. When it comes to gas, Russia is even more important than for oil. Around 94 per cent of accumulated Arctic production from 2008 to 2030 comes from Russia alone (see figure 5.4). Total arctic gas production in 2030 is slightly higher than presented by Wood Mackenzie.

Figure 5.6 shows the effects on Arctic oil production when future oil prices rise to 120 or decline to 40 USD-2000 per boe. In the high price scenario, the Arctic share of global oil production stays around 11-12 per cent up to 2030. Total accumulated oil production is around 23 per cent higher in the 120 USD scenario than in the reference scenario. The relative increase in production is higher in Russia than in the other Arctic regions.

In the low-price scenario, the Arctic share of global oil production declines from 11 to 5 per cent over the projection period. The oil production in the low price scenario is thus only marginally higher than the production level in 2030 presented in Wood Mackenzie (2006). Total accumulated oil production in our 40 USD-2000 per boe scenario is around 32 per cent lower than in the reference scenario. The relative decline in production is more or less the same across regions.

Concluding remarks

In our model oil and gas producers base their investment and production decisions on profit maximization and detailed information about the access to fields worldwide. The producers might invest in new fields or increased oil recovery from existing fields. The assumption that investments first target the most profitable reserves leads to a geographical spread of oil extraction.

We have focused on the Arctic and examined how different oil prices influence future investment and production in the different regions up to 2030. Different studies have different conclusions about the future of the Arctic as an oil and gas producer. Our study gives a comprehensive description of how future oil and gas prices will affect petroleum production in this region.

Notes

[1] OECD/IEA (2008): World Energy Outlook 2008, Paris
[2] OECD/IEA (2008): World Energy Outlook 2008, Paris
[3] Wood Mackenzie (2006): Future of the Arctic - A new dawn for exploration. Oil&Gas Journal (2006) Nov 13, p. 18-30
[4] USGS (2008): Fact Sheet 2008- 3049, http://energy.usgs.gov/arctic/
[5] Aune, F.R., Glomsrød, S., Lindholt, L. and Rosendahl, K.E. (2004): The oil market towards 2025 - can OPEC combine high oil price with high market share? Mimeo. Statistics Norway

Raipon – The Russian Association of Indigenous People of the North Photo by Gérard Duhaime

6. Interdependency of subsistence and market economies in the Arctic

Iulie Aslaksen, Winfried Dallmann, Davin L. Holen, Even Høydahl, Jack Kruse, Birger Poppel, Mary Stapleton and Ellen Inga Turi

In the mixed cash-subsistence economies of the Arctic, consumption possibilities are usually created by a combination of market participation and subsistence activities. The purpose of this chapter is to give a brief overview of the importance of subsistence activities in different Arctic regions. With some notable exceptions, as in Alaska, subsistence activities are mostly invisible in official statistics, due to lack of data and lack of recognition of how they contribute to livelihood and well-being.

Hunting, herding, fishing and gathering continue to be of major significance to the indigenous peoples of the Arctic in providing food, social relationships and cultural identity.[1] The Arctic Human Development Report[2] stated that: "Customary harvesting practices are not only culturally but also economically important locally, although their role varies by region, ethnic group, urban or rural setting, and generation."

Subsistence activities and the cash economy are mutually dependent on each other for providing consumption possibilities in the Arctic today, and are at the same time part of a lifestyle that represents continuity, sharing and connection to nature.[3] A study by Rasmussen[4] showed that for hunters in Greenland, the estimated value of their production for own consumption was almost as large as the sales value of their production for sale, which is a considerable share of their income. Estimates of subsistence production of indigenous families in Northern Russia indicate that the market value of consumed goods from own production can be as high as several times the annual monetary income.[5]

On the other hand, when traditional hunting and fishing activities take place far away from modern infrastructure and market opportunities, an economic viewpoint will emphasize that high transportation costs can represent a barrier for broader participation in the market and thus limit the benefits provided by the market economy, such as acess to wage income, credit, subsidies and market-related transfer payments.[6]

Indigenous people and other Arctic residents tend to base their livelihood both on subsistence and market activities. Economic activities, like petroleum exploration, mining, transportation, tourism and other services have the potential to alter the Arctic environment and social systems considerably.[7] Sustainable development requires that new economic activity represents additional benefits to indigenous and other local people.[8]

The concept of subsistence has had a prominent position in discussions of indigenous peoples' rights in international legislation, conventions and declarations, as in The United Nations Covenant on Civil and Political Rights, from 1966, and The International Labour Organization (ILO) Convention No 169: The Indigenous and Tribal Populations Convention, from 1989. A crucial issue for indigenous peoples is the recognition of their right to natural resources and land as material basis for their culture. A milestone in the rights of indigenous peoples worldwide was reached on 13 September 2007 when the United Nations Declaration on the Rights of Indigenous Peoples was adopted by the General Assembly.

Box 6.1: Traditional ecological knowledge

Traditional ecological knowledge is defined as the knowledge, practice, and beliefs about dynamic relationships of living beings and the environment, a knowledge based on experience, which has evolved in adaptive processes between humans and nature and has been handed down from generation to generation. In the Arctic, traditional ecological knowledge about animal migrations, ice patterns, vegetation and weather is used for improved hunting and harvesting, and may now supplement and enrich scientific data on climate change impacts. Combining traditional and scientific knowledge about nature is an important part of understanding the resilience capacity of ecological and social systems in the Arctic, enhancing the potential for sustainable development and self-sufficiency.

Reindeer herding provides examples of how traditional ecological knowledge is relevant for adaptation to climate change. The texture of snow and ice is an important determinant of the access of reindeer to food. "Reading" snow and ice is only one element of the ongoing process of observing and evaluating grazing pastures and weather conditions, wind directions, the sequence of changes in nature, all factors which determine access to pastures and the behaviour of the reindeer herd.[1]

[1] Heikkilä, L. (2006): 'The Comparison of Indigenous and Scientific Perceptions of Reindeer Management', in Forbes, B.C. et al. (ed.) Reindeer Management in Northernmost Europe, Springer-Verlag, 73-93. Tyler, N.J.C. et al. (2007): Saami reindeer pastoralism under climate change: Applying a generalized framework for vulnerability studies to a sub-arctic social-ecological system, Global Environmental Change, 17, 191-206.

Understanding the dependence of indigenous peoples on combined subsistence activities is important for legal regulations like, for instance, compensation payments for lost lands. In Russia, when land is allotted to oil companies, reindeer herders only receive compensations for the assumed loss of pastures and reindeer, while the loss of hunting, fishing and gathering grounds, which represent very important subsidiary sources of subsistence, is not compensated.

Documentation is needed on the participation levels and costs of subsistence harvesting activities. Circumpolar and reliable data on subsistence production and consumption are required and should be compiled in a similar way that the United Nations have recommended for "satellite accounts", i.e., supplementary accounts to the national accounts, to make the value of subsistence activities in the Arctic visible in statistics.

Subsistence in Alaska

Davin L. Holen, Division of Subsistence, Alaska Department of Fish and Game

Subsistence in Alaska is a broad-ranging category that refers to both a management regime and a way of life that is meaningful to residents of rural communities. The Alaska Department of Fish and Game defines subsistence as the customary and traditional uses of wild resource for food, clothing, fuel, transportation, construction, art, crafts, sharing, and customary trade. In sum, any resource that can be gathered from the environment for human use or consumption is considered subsistence. But for many people it goes beyond this simple definition of meeting the material needs. The subsistence way of life in Alaska is a complex package that involves harvesting wild resources to meet the needs for personal, family, and community nutrition and wellbeing, as well as spiritual and ritual ties to the land and to the animals, fish, and birds that are harvested. Alaska's Native people have deep ties to the resources and land. In many rural communities both Alaska Native and Non-Native peoples engage in subsistence and share the harvests with their neighbors and family. The only case where ethnicity in Alaska is an issue is in the hunting of marine mammals. Under federal law only Alaska Natives may hunt marine mammals.

Subsistence differs from, but is closely tied to commercial harvesting of wild resources, in particular commercial fishing. Alaska has a robust commercial fishing economy, and participation in commercial harvesting of salmon, herring, pollack, and other fish are important for rural communities. For example, in Bristol Bay in Southwest Alaska, commercial fishing in 2004 comprised 51 per cent of the total available jobs.[9] Commercial fishing accounted for 97 per cent of all wild resource harvests in Alaska combined.[10] In addition, residents of both urban and rural communities in Alaska engage in sports hunting and fishing. Subsistence users consume two per cent of the harvest of wild resources while sport activities account for the other one per cent. Although a resident of a rural community may do a combination of subsistence and sport activities, they both contribute to the overall household harvests. The definition of subsistence and sport activities are defined by laws established under a dual management system in Alaska.

Dual management in Alaska

Subsistence regulations in Alaska are defined by both State and Federal Agencies and referred to as "dual management." Federal lands in Alaska comprise some 60 per cent of Alaska territory (1 030 713 km^2) of which 80 per cent is set aside for public use.[11] Twenty-eight per cent of Alaska (480 999 km^2) is designated State lands. In addition, under the Alaska Native Claims Settlement Act (ANCSA) Alaskan Natives controls 68 750 km^2 considered as private land. Other private lands comprise less than one per cent of the total land area of Alaska. Federal and State regulations differ as to harvest limits and seasons.

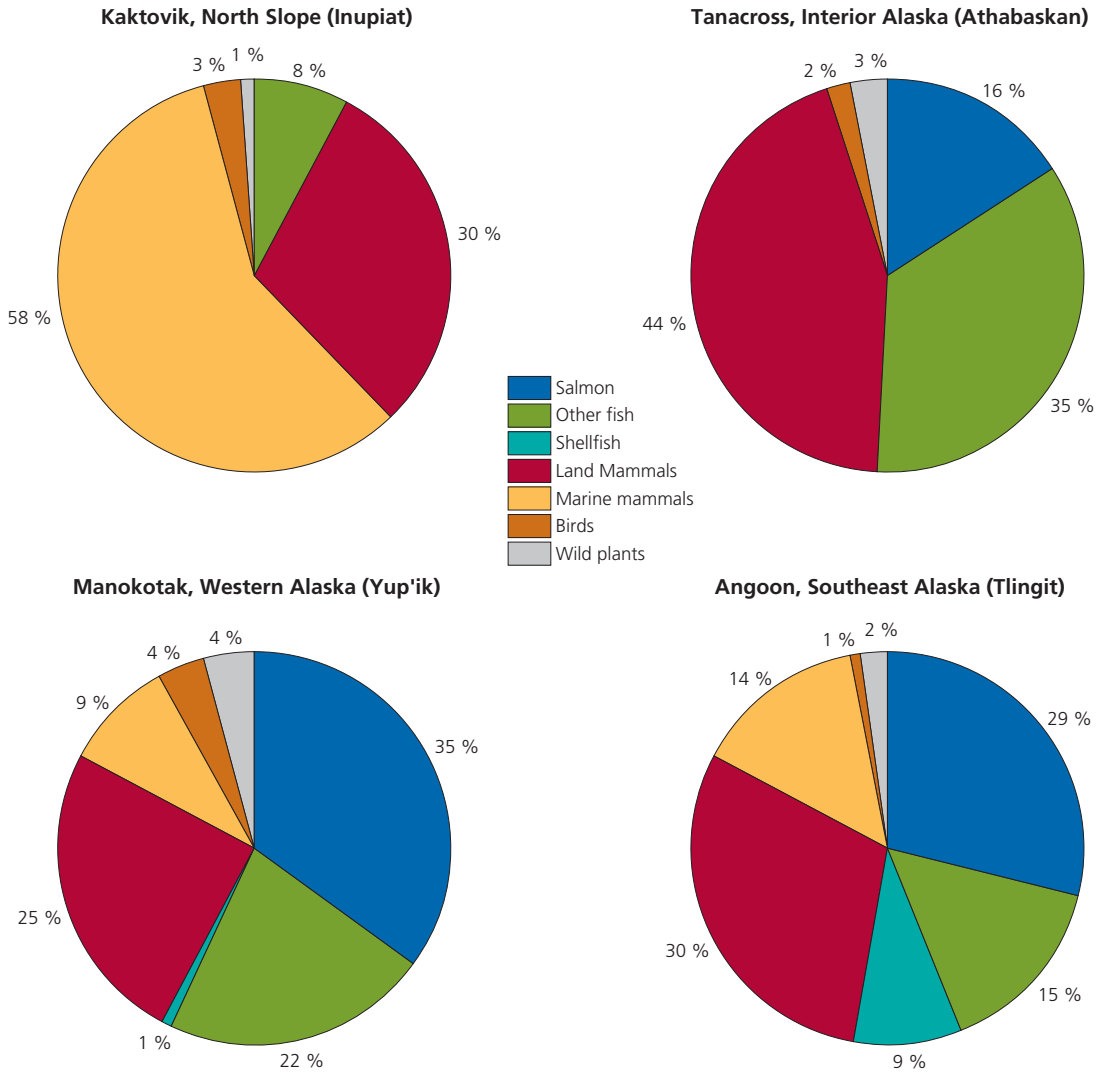
Under Alaska state law all residents of Alaska qualify for participation in subsistence activities and the right to hunt and fish is given regardless of ethnicity or place of residence. In some cases where hunting opportunity is limited by resource availability, a rural priority called Tier II is enacted under state law. This applies to specific populations of animals and a set of criteria based on dependence and history of harvesting the resource. Tier II creates a preferential treatment for access to the limited resource, for example a specific caribou herd, or a moose population within a game management unit. This designation is based on residence, not ethnicity.

The Federal law takes the preferential treatment for access one step further. The Alaska National Interest Lands Conservation Act (ANILCA) enacted in 1980, created 10 new National Parks and Preserves on existing federal lands in Alaska, and a priority was given to residents of rural communities that border these lands. These two competing laws are commonly referred to by Alaskans as the "subsistence dilemma." Whereas all Alaska residents under state law have the right to harvest resources anywhere on public lands, federal law in some cases allows only residents of communities that border federal lands to harvest wild resources on those lands. Federal lands often have hunts that follow state seasons and harvest limits in an attempt to streamline regulations to make them less confusing. However, they also may have subsistence hunts or fisheries that are only open to local residents in an attempt to provide a greater opportunity to local users. This often leads to confusion, as crossing from federal land to state land could mean moving from an area where hunting is open to where it is closed. Varying court cases and efforts by the state of Alaska have tried to amend this impasse.

Subsistence economies throughout Alaska

Although the state of Alaska constitution does not recognize a rural preferential treatment for subsistence, it does recognize that residents of rural com-

Figure 6.1. **Diversity of wild resource harvests in four communities in Alaska. 1990s. Per cent of total quantity**



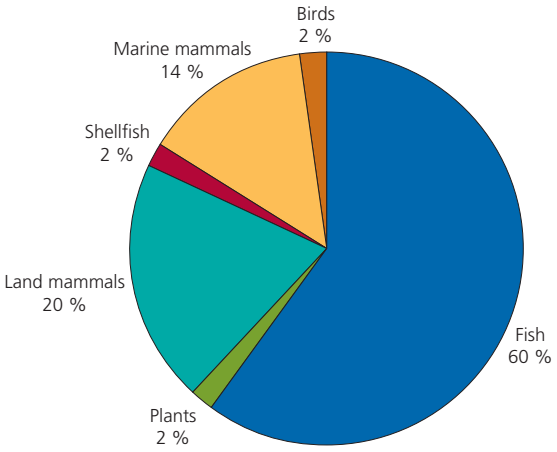
Source: Division of Subsistence, Alaska Department of Fish and Game.

munities have a customary and traditional use of wild resources through the Alaska Subsistence Law. Besides research on traditional ecological knowledge, one of the main tasks of the Division of Subsistence within the Alaska Department of Fish and Game is to scientifically quantify harvests of wild resources by rural residents, as required by Alaska law. Community-wide estimates of wild resource harvests are established, and harvest estimates for communities that rely on a particular stock or population, for example caribou, referred to as the amount necessary for subsistence (ANS). If the population of a caribou herd diminishes, managers must determine the ANS for the population and allow for local residents to have a priority once the available surplus of the caribou reaches this number.

Over the past 30 years the Division's small staff of social scientists has worked in every rural community in Alaska. Surveys are carried out face-to-face in each household to record demographics, harvests, sharing and distribution of wild resources, and the cash economy including jobs and income. The surveys record use, harvest, and sharing for each possible wild resource that could be harvested in an area. The surveys are in English with Alaska Native translations such as Central Yup'ik and Inupiat in communities where Alaska Native languages are still spoken.

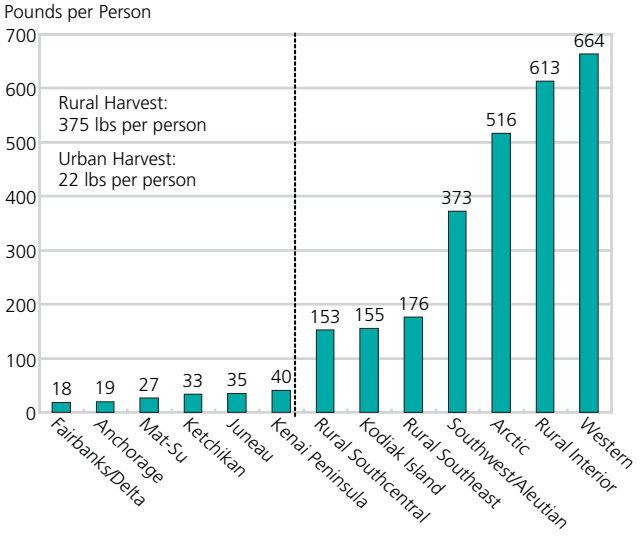
Surveys completed over the past 30 years have found that there is not one subsistence economy in Alaska; there are many subsistence economies. Alaska's ecosystems and available resources are diverse, with environments including the high Arctic, interior Alaska with its boreal forest environment, southwest Alaska with its expansive tundra and multitude of river systems, the rainy windswept islands of the Aleutians, and the temperate rain forests of southeast Alaska.[12] Figure 6.1 shows the diversity of harvests from four communities. Whereas salmon is a major resource for many communities, its importance in the high Arctic along Alaska's northern coast is surpassed by the importance of marine mammals. Shellfish may be important in southeast Alaska but are almost nonexistent in the harvests in the high Arctic. Land mammals, especially moose, caribou, and bears are important sources of food in the interior of Alaska but are less important on the coast. Overall,

Figure 6.2. **Composition of wild food harvests in Alaska. 1990s. Per cent of total quantity**



Source: Wolfe (2000), see endnote 10.

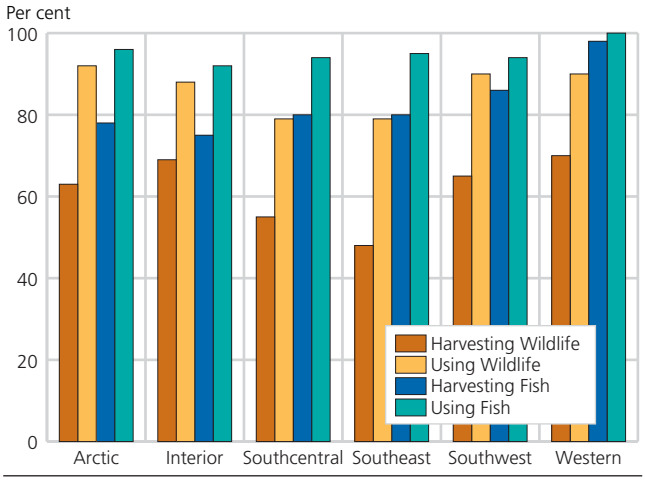
Figure 6.3. **Wild food harvest[1] in Alaska, by area. 1990s**



[1] Average harvest data collected throughout the 1990s. The left side of the figure represents urban areas of Alaska, and the right side represents rural Alaska.

Source: Wolfe (2000), see endnote 10.

Figure 6.4. **Per cent of households participating in subsistence activities in rural areas in Alaska**



Source: Wolfe (2000), see endnote 10.

adding all harvests by rural residents together would demonstrate that fish compose 60 per cent of wild harvests, land mammals 20 per cent, marine mammals 14 per cent, and shellfish, birds, and plants 2 per cent respectively (Figure 6.2).

Harvests are high both within communities and at the household level. In 2005, for example, the per capita harvest of usable wild resources was 899 pounds per person in the southwest interior community of Koliganek on the Nushagak River.[13] Shungnak in the Northwest Arctic Interior had a more comparable harvest to other communities throughout Alaska with an average of 610 pounds per person.[14] Harvests in these isolated interior communities is still high when compared with the average harvest by rural residents in Alaska of 375 pounds per person.

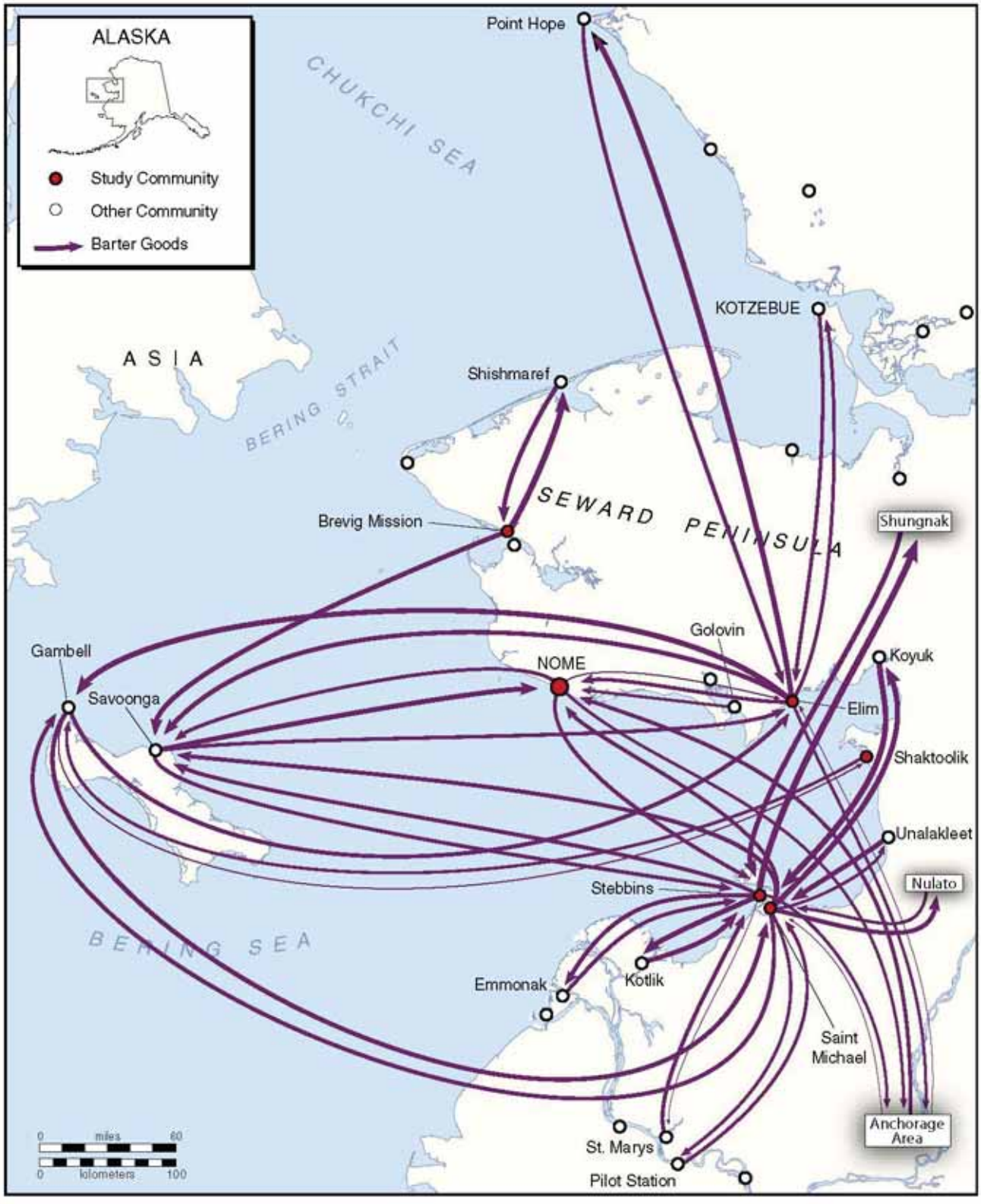
There is a great difference between the harvests of rural residents and those of urban harvesters. In the 1990s urban users harvested 22 pounds per person. However, wild resource harvests averaged at pounds per person is only one measure of the importance of subsistence (Figure 6.3). Participation in subsistence activities is also an important measure. Figure 6.4 gives a statewide overview of participation in harvesting and using wildlife, which includes large and small land mammals as well as birds, eggs, and fish, both salmon and non-salmon species. Fisheries tend to have the highest participation rates, and in Western Alaska 100 per cent of households used fish while 98 per cent participated in harvesting fish. In each case the number of households using wildlife resources is higher than those harvesting. Over the decades a general pattern has emerged in that 30 per cent of households harvest 70 per cent of the resources in a community average. These households tend to have higher incomes and spend more money on subsistence related gear such as boats, snow machines, nets, rifles, and fuel. This high harvest is then shared with family and neighbors in these small rural communities.

Besides simply sharing, resource customary trade and barter is also important in the subsistence economy. There is a significant amount of trade and barter occurring at the village level as well as with neighboring rural communities, regional hubs, and even urban communities.[15] This is indicated in the community of Saint Michael on Alaska's Seward Peninsula in Figure 6.5. These types of trade and barter of wildlife resources enable residents to share subsistence resources across large distances as well as to obtain market goods that assist in continuing the subsistence economy.

Cash and subsistence economy

The cost of living in rural Alaska has risen significantly in recent years, especially due to high prices for transportation. With few year-round ice free ports, most goods must arrive in rural communities by air in winter. In the summer coastal communities receive barges loaded with fuel and supplies from ports on the West

Figure 6.5. **Patterns of trade and barter between neighbouring communities, regional hubs, and urban communities. Data collected between 2004-2006 in six western Alaska communities**



Source: Magdanz et al. (2007), see endnote 15.

Table 6.1. **Wild food harvest in Alaska. 2000. Pounds. Replacement values. USD**

Rural Areas	Annual Wild Food Harvest (per person)	Annual Wild Food Total Harvest	Wild Food Replacement Value @$5/lb	Wild Food Replacement Value $7/lb
	Pounds	1000 Pounds	Mill. USD	Mill. USD
Southcentral	153	1688,5	8,4	11,8
Kodiak Island	155	2061,6	10,3	14,4
Southeast	178	5064,5	25,3	35,5
Southwest-Aleutian	373	5114,5	25,6	35,8
Interior	613	6359,6	31,8	44,5
Arctic	516	10507,3	52,5	73,6
Western	664	12918,6	64,6	90,4
Total Rural Alaska	375	43714,6	218,6	306,0

Source: Wolfe (2000), see endnote 10.

Table 6.2. **Wild food harvest in some Alaska communities: Replacement values. 2005**

	Annual harvest per household	Replacement value per household USD7/lb	Mean household cost of annual food purchases	Annual household income[1]	Percentage of annual cash income spent on food
	Pounds	USD	USD	USD	Per cent
Igiugig	1 584	11 088	8 110	32 755	24.8
Kokhanok	2 136	14 952	7 452	30 007	24.8
Koliganek	2 139	14 973	7 279	34 800	20.9
Levelock	693	4 851	4 213	28 459	14.8
New Stuyahok	871	6 097	7 104	27 572	25.8

[1] Unpublished data
Source: Holen et al. (2008), see endnote 13.

Coast of the United States. Smaller barges transport supplies up major rivers such as the Yukon and Kuskokwim as well, cutting the cost of transportation. Residents must order a year's worth of groceries and other supplies. In addition, during trips to Anchorage or other urban centers rural residents stock up on supplies to be mailed back to their communities as well or pay freight fees on air transportation. Especially in winter, air transportation is the only reliable means to receive goods from urban centers. The cost of aviation fuel has significantly added to the cost increase seen for basic goods. In 2005, prior to the significant rise in gas prices seen in 2007 and 2008, the cost of groceries and basic necessities in Arctic communities in Alaska was 2.47 times higher than in urban Anchorage, and in Subarctic communities in Alaska it was 2.23 times higher as compared to urban Anchorage.[16]

Dividends received from Alaska Native regional and local village corporations established under ANCSA allow Alaska Native residents to invest money back into the subsistence economy. In Tyonek, one of the communities that received payments from Cook Inlet Regional Corporation (CIRI) in 2000, the payout led to new boats, motors, all-terrain vehicles, and investments in fish camps.

Energy costs are a main concern in rural Alaska. At the 2008 Alaska Federation of Natives meeting, the cost of energy in rural Alaska dominated the discussion. High prices for fuel for boats and all-terrain vehicles are limiting the ability of residents of rural Alaska to get out on the land to engage in subsistence. In addition, in many rural homes across Alaska heating oil has replaced wood burning stoves. During the cold winters residents will use several barrels of heating oil throughout the winter. Many homes receive electricity from diesel powered generators and it is not uncommon that residents' spend over half of their cash income during the year on utility costs. Cash incomes in rural communities are significantly lower than in urban areas of Alaska. The 2000 US Census found that median household incomes in Shungnak or Noatak in the Arctic were USD 30 833 compared to Anchorage at USD 55 546 with a lower cost of living.[17] Many residents have only short term summer employment such as working on fire crews, participating in commercial fishing, repairing roads or airports, and doing short term work through grant funded projects in communities. Local governments such as tribal and village organizations provide many of the short term jobs. In Kokhanok in southwest Alaska, 55 per cent of the available jobs in 2005 were with the local government. Commercial fishing supplied an additional 16 per cent, and construction jobs 10 per cent.[18]

Subsistence is therefore a vital part of the economy in rural Alaska communities in maintaining the ability of residents to continue living in areas where jobs are harder to come by and costs of living are higher. Subsistence holds a special place in the maintenance of cultural, as well as the nutritional needs of rural Alaskan residents. A 2000 summary of wild food production in Alaska estimated the cost of replacing the wild food harvest of rural communities at USD 218.6 million dollars at a replacement value of USD 5 per pound.

Prices of transportation and food have risen significantly between 2000 and 2008 so using a more realistic replacement value of USD 7 a pound gives us a total USD 306 million (Table 6.1).

In some communities this replacement value exceeds the amount spent on food by most households (Table 6.2). This wild food harvest is important for sustaining residents in areas where the cost of shipping in store-bought food is expensive.

Most residents spent less than 25 per cent of their income on food, yet their expenses for food were greater than they had realized (Table 6.2). A recent project by the Division of Subsistence in Southwest Alaska have found a small migration of residents leaving communities over recent years to resettle in urban areas where the cost of living is lower. Similar preliminary findings are also being analyzed by a project underway at the Institute of Social and Economic Research (ISER) at the University of Alaska Anchorage[19].

Modern context of subsistence

Subsistence in Alaska today enables residents to continue a livelihood with significant cultural meaning. Culture in Alaska is not static, and residents have had to adapt in order to survive, and thrive in a modern world. Although incomes in rural communities are low, residents of rural Alaska stay in their communities to continue a way of life that is meaningful. Subsistence is a large part of life, contributing to offset the high cost of importing groceries and other goods, but more importantly to continue traditions that are culturally meaningful. Alaska is also undergoing a period of change where commercial resource development is becoming more common, which allows for residents to obtain jobs nearby their natal communities. Long work weeks lead to less time for subsistence, although higher incomes provide the necessary means to pay for the equipment which allows for the traditional subsistence economy to continue into the future.[21]

Interdependency of subsistence and market economies in Northern Canada

Mary Stapleton, Arctic Circumpolar Gateway

The purpose of this section is to give a "snapshot" of Northern Canada in late 2008, reflecting the role of the market and subsistence economies.[20] The Canadian North as referred to in this section includes the three northern territories – Yukon, Northwest Territories (NWT), and Nunavut, plus Nunavik in Québec and Nunatsiavut in Labrador, and comprises about 40 per cent of the land area of Canada. There are significant numbers of indigenous peoples who live across the North, including Inuit, Inuvialuit, Indian and Métis.

Northern Canada's vast spaces have always been widely used by indigenous peoples to hunt and gather seasonal food. The land is better understood by studying indigenous use of its rivers, coast, forests and tundra than by locating towns on conventional maps. Traditional place names reveal the use of land by indigenous peoples for millennia.[21] The cold climate has always allowed travel and trade among northern residents, along a circumpolar infrastructure of ice, and today's languages and cultures reflect this interaction. Life based on the cycle of the seasons implied detailed understanding of the environment in order for peoples to survive and to thrive.

Table 6.3. **Indigenous peoples in the Canadian North. 2006**

Territory	Indigenous population	Total population
NWT		
Dene/Métis and Inuit	20 000	41 000
Yukon		
First Nations/Métis	7 500	30 000
Nunavut		
Mainly Inuit	25 000	29 000

Source: http://www.statcan.gc.ca

Map of Northern Canada[22]

Vast areas of the Arctic continental shelf lie beneath the shallow seas within the Arctic archipelago. With extensive mineral, oil and gas deposits, the North is a place of incredible economic opportunity for Northerners and all Canadians. The North is also on the front line of climate change impacts. The importance of the North continues to increase as sea ice melts and the opening of the Northwest Passage becomes a reality.

Indian and Northern Affairs Canada (INAC) is the primary department of the federal government in the Canadian North, responsible for meeting obligations and commitments to Indians, Inuit and Métis. INAC balances the need to support the North's use of its economic potential with sustainable development and environmental protection.[23]

Who are Canada's indigenous peoples?

The Canadian constitution recognizes three groups of aboriginal people: Indians (commonly referred to as First Nations), Métis and Inuit. Nearly one million people in Canada identify themselves as aboriginal persons, accounting for 3.8 per cent of the total population of Canada (2006 Census). Indigenous people make up a large proportion of total population in each northern territory (Table 6.3).

Most of today's Inuit communities are located on the tundra north of the treeline, and along the Arctic coast. The Inuvialuit of the NWT live along the western coast near the Alaska border. The First Nations people in the Yukon and Northwest Territories are most often Dene or Gwich'in Nations. Métis indicates persons of mixed ancestry. In this section, indigenous, First Nation and aboriginal are used interchangeably. Inuit may be included in aboriginal, as the Government of Canada uses this form. Native is also used to describe indigenous people.

Table 6.4. **Education, employment and income. Indigenous and non-indigenous population of the Canadian North. 2001. Per cent and Canadian dollars**

Selected socio-economic indicators	Métis	Non-Status Indian[1]	Non-aboriginal
	Per cent	Per cent	Per cent
Age 15-19 not in high school	23	24	15
Age 25-44 with university degree	7	6	22
Employment rate (age 15+)	60	56	62
Unemployment rate (age 15+)	14	15	7
Per cent receiving government transfer payments	15	16	12
	Canadian dollar	Canadian dollar	Canadian dollar
Average total income (all sources)	22 395	21 460	30 060
Average employment (full time) income	33 822	33 978	42 619

[1] Non-Status Indian are Indian persons who are not registered as Indians with the Government of Canada.
Source: Statistics Canada and http://www.ainc-inac.gc.ca/ai/ofi/uas/fs/mnsifs-eng.asp.

Table 6.5. **Senior high school graduates by ethnicity. Northwest territories**

Year	Dene	Métis	Inuit	Non-aboriginal	Total
2000	45	20	12	177	254
2001	68	22	26	169	285
2002	67	13	16	148	244
2003	65	22	32	164	283
2004	64	19	34	175	292
2005	104	27	37	175	343
2006	124	28	36	178	366
2007	87	29	48	203	367

Source: www.stats.gov.nt.ca/Statinfo/Labour/Labour%20Trends/2007/Ethnicity.pdf

Socio-economic indicators such as school attendance, post-secondary school completion, employment, and income levels are higher for non-indigenous than for indigenous Northerners. Table 6.4 gives an example.

Table 6.5 shows trends in completing secondary school in the NWT, according to ethnicity. There are many cultural issues with regard to attending and finishing schools, especially in small communities. Although most communities have excellent physical facilities, retaining teachers and maintaining sufficient enrollment is often a problem. Many schools begin to lose students after the fourth or fifth year, when children would traditionally begin to participate in adult subsistence activities. Conventional Canadian curricula may seem irrelevant to Elders who value above all knowledge of the land and tradition.

The obstacles to taking education and training can be easily underestimated by outsiders. Some indigenous students are uncomfortable leaving their home communities, but must do so to attend secondary school. Training is offered for jobs in the oil and gas and other industrial sectors at Aurora Research Institute and Aurora College in Inuvik, NWT; Nunavut Research Institute in Igloolik and Iqaluit, NU; and Yukon College in Whitehorse, Yukon. These are the only post-secondary institutions in the Canadian North. These institutions have the ability to be directly adaptable to current labour market needs.

Land claims, self government, and co-management of resources

The indigenous concept of the land is dramatically different from the Euro-Canadian view. Land is part of the spiritual heritage, and its resources belong to all its users, animal and human. Today the Government of Canada and the territories are trying to create a system of land holding that will respond to market development, as well as protect the environment and acknowledge First Nations' interests and beliefs.

Land in the North is increasingly being regulated according to indigenous land claims and self-government principles. Since 1973, Canada has been negotiating settlements with the First Nations and territorial governments. The objectives of the indigenous peoples in land claim negotiations have been related to self determination and the preservation of their way of life.[24]

Values and interests of First Nations are often not synonymous with those of other stakeholders, such as government resource managers, recreational hunters, conservationists and private resource developers. Under the titles of co-management and joint stewardship, a variety of new institutional approaches to resource management have been gaining momentum in Canada, involving a restructuring of power and responsibilities among stakeholders. This involves moving away from a situation of top-down decisions and lack of coordination among indigenous and governmental resource management to decentralization and collaborative decision-making.

Traditional Ecological Knowledge (TEK) is the term used in Canada for "particular forms of place based knowledge of the diversity and interactions among plant and animal species, landforms, watercourses, and other qualities of the biophysical environment in a given place".[25] Its purpose is to gain a useful understanding of how ecological systems generally work and how key components of the total ecosystem interrelate. TEK has been recognized to some degree by Canadian environmental assessment specialists, especially in regard to achieving sustainable use of renewable resources.[26]

The market economy in Northern Canada

Table 6.6 shows total GDP, population, and per capita GDP in the northern territories of Canada.

GDP per capita in NWT and Yukon is higher than average for Canada due to natural resource extraction. Moreover, government has always been an important employer in the North.

Mining

Diamond mining has large economic significance in the Canadian North, mostly in NWT. Three diamond mines have created more than 10 000 jobs. About 60 per cent of these jobs went to Northerners. In 2008, NWT government and the three large diamond mines signed an agreement, promising to work together to ensure more participation by Northerners.

Under the Indian Act and the Indian Mining Regulations, INAC issues permits and leases for the removal of minerals from First Nation reserve lands. INAC seeks to secure benefits for First Nations in the form of mineral royalties and other economic benefits, environmental protection, and rehabilitation of mines sites.[27]

Oil and gas

It is estimated that Northern Canada is the site of one quarter of Canada's remaining reserves of conventional petroleum and one third to one half of the country's estimated potential. Heightened interest in Arctic oil and gas exploration and development creates economic opportunities for Northern communities and helps to secure Canada's energy supply.

In the NWT, the responsibility for petroleum resource management rests with the INAC. In 1998, the Yukon Territorial Government assumed power to manage and regulate Yukon onshore oil and gas resources. INAC works in partnership with Northern and aboriginal government, to help First Nations gain autonomy over the management of their oil and gas resources.

Transportation

Private vehicle travel is very limited in the North, except in Yukon where the Alaska Highway was built in the 1940's to link Edmonton and Alaskan military sites. Presently winter roads are the only surface transportation available to roadless communities in the NWT and Nunavut. There are ferry service/ice crossings on the Mackenzie, Yellowknife and Dempster Highways between the NWT and Yukon, but these are closed seasonally at freeze and break up. Use of standard automobiles and trucks is limited. Most individuals get around by all-terrain vehicle, snowmobile, and boat. Industries use cat trains and heavy duty trucking on ice roads.

Many "highways" are winter ice roads, engineered from snow and ice. Ice roads play a major economic role for northern industry and have a crucial role in enabling goods to be brought into communities without permanent road access. Air or sea transportation is used at

Box 6.2: The proposed Mackenzie Valley pipeline

When natural gas deposits were found in the Mackenzie Delta and in other locations along the Mackenzie Valley in the 1960s, the Berger Enquiry was set up to determine whether the people of the Northwest Territories would benefit from the exploitation of this natural resource. The commissioner of the enquiry was Justice Thomas Berger. The enquiry was notable for the voice it gave to aboriginal people whose traditional territories the pipeline would cross. The Berger Report concluded that the northern Yukon was too susceptible to environmental harm and cautioned that a gas pipeline would be a precursor to an oil pipeline. The commission recommended that no energy corridor be built in the Mackenzie Delta region. A ten-year moratorium was put on petroleum development in the region. Berger suggested that a number of sanctuaries and protected areas be created for threatened and endangered species. At the same time, the commission saw no significant environmental risk further south through the Mackenzie Valley.

The Berger commission found no significant economic benefit for the region from the project. The report concluded that large-scale projects based on non-renewable energy sources rarely provide long-term employment, and that those locals that did find work during construction could only fill low-skill, low-wage positions. In addition, Berger feared that pipeline development would undermine local economies which relied on hunting, fishing, and trapping, possibly even increasing economic hardship in the area. Berger predicted that the "social consequences of the pipeline will not only be serious—they will be devastating." At the time the report was released, there were several ongoing negotiations over native land claims in the area, and Berger suggested that pipeline construction be delayed until those claims were settled. In addition, land claims were part of a broader native rights issue that needed to be settled between the government and the First Nations. In Berger's view, rapid development in the north would preclude settlement of these important issues due to the influx of non-native populations and growing business interests.

The second Mackenzie Gas Project, is a proposed 1220-kilometre pipeline system along the Mackenzie Valley, linking northern natural gas producing wells to southern markets by connecting to an existing pipeline system in northwestern Alberta. The Aboriginal Pipeline Group (APG) is a corporation of the First Nations in regions affected by the proposed pipeline. Under this plan, large corporations which are producers of natural gas would sign long-term shipping contracts, and pay fixed fees to transport the gas extracted from the Mackenzie Delta and valley. All pipeline owners, including APG members, would receive their share of transportation fees after operating costs of the pipeline have been paid. APG revenue would be paid as dividends to the respective First Nations.

The Mackenzie Valley Environmental Impact Joint Review Board's mission is to conduct environmental impact assessments, in order to protect the environment and the social, economic and cultural well being of the residents of the Mackenzie Valley and all Canadians. Bill C6, not yet in force, would regulate the operation of the pipeline. The Joint Review Panel overseeing this project is expected to submit its final report in the near future. The final outcome of the project has not yet been determined.

Table 6.6. **Gross Domestic Product (GDP) for northern territories in Canada and total Canada. Million Canadian dollar. 2006**

Territory	GDP	Population	GDP per capita
Northwest territories	4 103	41 900	97 923
Nunavut	1 213	30 800	39 383
Yukon	1 596	31 200	51 154
Total Canada	1 439 291	32 623 500	44 118

Source: Statistics Canada.

Table 6.7. **Government employment in Canadian North. 2008**

	NWT	Yukon	Nunavut
Federal government employees	10 000	6 500	5 000
Territorial government employees	4 500	4 000	3 000
Total employees (Territorial)	22 500	17 500	8 400
Total population (Approximate)	41 000	20 000	29 000

Source: Statistics Canada.

other times of the year to bring in food and supplies, but this can be prohibitively costly for bulky goods such as building supplies and heavy equipment. Recent warming has affected the longevity of ice roads' season.

Commercial fishing

Until recently, commercial fishing in the Arctic Ocean has been restricted by sea ice cover and lack of infrastructure. As global warming increases ocean temperatures, Arctic fish stocks may become more accessible. Discussions are under way to negotiate an international agreement for managing migratory and trans-boundary fish stocks in the Arctic Ocean and Northern Atlantic. Commercial whaling ended in this area in the early 1900›s; however, the hunting of bowhead whales has recently been resumed in both the eastern and western Canadian Arctic.

The NWT has established a Fresh Water Fish Marketing Corporation (FFMC) to promote international markets for Northwest Territories fish products. Fresh water fish are abundant all over the North, but are sought after as trophies by tourists, rather than serving a commercial fishery. Fish are dried, smoked, or eaten fresh in all indigenous cultures.

Tourism

Tourism in the North contributes to all the territories' revenues, but is relatively underdeveloped. The potential for growth is great, and progress has been made in the last few years. Much of the North's tourism in the past was based on sports hunting and fishing in fly-in lodges, and did not influence the economy in a significant way. Aboriginal tourism is one of Canada›s unique strengths, in both the domestic and international markets. According to the 2003 National Study on Aboriginal Tourism in Canada, demand for aboriginal tourism is outpacing capacity. There is great potential to increase aboriginal tourism activities and at the same time contribute to the wealth creation, economic development and self-reliance of Aboriginal people and communities in all the territories.

Nunavut aspires to be branded as a place of adventure, nature and Arctic beauty. In 2003, tourism brought CAD 30 million a year into Nunavut, making it one of the territory›s largest economic sectors. Hunting polar bear, caribou or other wildlife brings in the highest revenues, but affect only a few people in a small area. Guide-outfitters say they are feeling the impact of a U.S. ban on polar bear trophies, hides and parts, imposed in 2008, after naming the polar bear a threatened species under its Endangered Species Act. The move was decried by Inuit outfitters in Nunavut, where bears have a healthy population level.

For Yukon in 2000, it was estimated that CAD 164 million in revenue was directly attributable to non-resident tourism. It is estimated that 1 900 jobs are directly dependent on tourism. This represents approximately 11 per cent of all jobs in the Yukon in 2000, where tourism is the largest private sector employer. Although summer brings the highest number of tourists, there is an increasing demand for dog sledding and aurora viewing by winter visitors. Sports fishing and big-game hunting are also popular.

Seal hunting

Most of the world's seal hunting takes place in Canada. Seal hunting is an important source of income and food in small coastal communities. Natsiq (ringed) seals are the most common type hunted for their meat, blubber, and pelts. The Inuit seal hunting accounts for three per cent of the total hunt. The traditional Inuit seal hunting is exempted from The European Commission's call in 2006 for a ban on the import, export and sale of seal products. The natsiq have been the main staple for food, and have been used for clothing, boots, fuel for lamps, containers, igloo windows, and furnished harnesses for dogs. Uses of the natsiq have diminished, but ringed seal is still an essential food source for the people of Nunavut. Sealing is now controlled by quotas based on recommendations from the International Council for the Exploration of the Sea (ICES), and in 2007, the Canadian Department of Fisheries and Oceans (DFO) set a "total allowable catch" (TAC) of harp seals, which are not considered threatened. Ten thousand animals were allocated for hunting by aboriginal peoples. According to Canadian authorities, the value of the 2004 seal harvest was CAD 16.5 million.

Trapping

Aboriginal peoples in Canada have been harvesting animals for thousands of years as a necessary part of their survival. Their understanding of animal behavior, combined with hunting knowledge and skills accumulated over many generations, has enabled indigenous people to capture a variety of animals for food, shelter, clothing, tools and trade. Today many indigenous people with a tradition of trapping have "traplines", a legal arrangement whereby an individual or group has the sole right to trap within a defined area, which they do not own.

Table 6.8. **Annual fur harvested and sold. Number of animals and value. Northwest Territories. 2007-2008**

Species	Annual harvest	Annual sold	Annual sold	Personal consumption
	Number of animals	Number of animals	CAD	CAD
Bear, Black	7	12	945	200
Bear, Grizzly	3	2	1 750	100
Bear, Polar	1	1	2 300	50
Beaver	1 399	1 277	24 914	7 580
Coyote	3	2	60	20
Fisher	27	32	2 004	330
Fox[1]	452	618	15 240	4 500
Lynx	723	725	171 500	17 300
Marten	11 282	11 093	1 019 224	211 522
Mink	704	675	10 817	1 030
Moose Hide	4	4	3 350	0
Muskrat	10 736	4 768	13 886	623
Otter	22	40	1 475	50
Seal, Ringed	309	42	2 489	725
Squirrel and weasel	1 459	946	3 024	469
Wolf[2]	57	54	8 564	450
Wolverine	78	76	19 747	2 750
Total	27 266	20 367	1 301 289	247 699

[1] Fox comprises Cross Fox, Red Fox, Silver Fos and White (Arctic) Fox.

[2] Wolf comprises Boreal Wolf, Arctic Wolf and Tundra Wolf.

The success of Canada's fur trade reflects a centuries-old tradition of responsible and sustainable development. The Fur Institute of Canada, a national non-profit organization, has acted as a round table for fur trade, animal welfare and furbearer conservation issues since 1983, and is the coordinator for overall implementation of the Agreement on International Humane Trapping Standards in Canada.[28] Trapping is highly regulated by the provinces and territories and no endangered species are trapped or used in the fur industry. Trappers play an active role in protecting wildlife habitat from the onslaught of urban development and from excessive and non-sustainable use of renewable resources, while ensuring an economic value for the wildlife resource. Over 70 000 Canadians rely on trapping as a livelihood. For the Northwest Territories, detailed data are available as illustrated in Table 6.8.

Arts and crafts

The arts and crafts of First Nations and Inuit are known around the world for fine workmanship and unique design. Each region has its own style of clothing and boots, jewellery, and traditional household and hunting utensils. Traditional crafts are not done on a large scale, although there are initiatives which produce modern versions and ideas.

Inuit carving has attracted worldwide attention. The first Co-ops in the north were formed in the 1960s to produce and market traditional industries. Today, Arctic co-operatives purchases art from community co-operatives for the wholesale and retail marketing, to secure a fair price and to guarantee authenticity.

The subsistence economies of Northern Canada

The most defining feature of the northern indigenous economy is the harvest and use of wild foods and resources. Despite profound social and economic change, indigenous peoples throughout Canada have maintained an enduring connection with the environment through hunting, fishing and gathering of resources from the land and sea. Subsistence economies continue to demonstrate considerable resilience and remain integral to the health and well-being of northern communities.[29]

Hunting, fishing, and gathering are important activities in the economy of indigenous societies, but people also participate in the wage economy as opportunity arises. Cash exchange has become inextricably enmeshed in the subsistence economy as it is necessary to hunt and fish with modern guns and equipment. Basic hunting and fishing now require boats, snowmobiles, and all-terrain vehicles. Both the equipment and the gasoline require that at some point cash be available within the smallest units of the economy.

Exchange or bartering, or the distribution of extra meat or other resources, are widely used alongside monetary exchange. The mixed subsistence and market economies are now so intertwined that it is difficult to discuss them individually. Subsistence economies are characterized by members' recognition that the community has shared economic needs.

The extent of the market economy cannot fully be described by the specific number or type of jobs held by indigenous peoples. It is essential today for individuals to have money to buy, at the most basic level, food, clothing, housing, fuel and transportation. Jobs in a

village are scarce, usually depending on administrative needs. Working for wages means leaving the community for long or short periods. This is hard for small communities, because they lose the very people who assist with education, hunting and trapping, communication, and other essential services. The tradition of sharing also means that amassing wealth is contrary to community traditions. Some families with members working in mining, for example, consider that the worker's generous pay is the property of all.

Observation would indicate that villagers often do not join the work force permanently, but take on wage employment at different times of their lives. They work for necessities such as boat or snowmobile gas, or to help the family; and then may return to activities which support their families and home communities. Many educated people with valuable market skills feel the obligation to return to support their communities. This pattern can be seen at the current time; the next generation may join the southern Canadian trend towards moving to urban areas. At present, the overall aboriginal employment "snapshot" likely reflects a pattern of carrying on much of private life in a traditional way, with work being a secondary consideration.[30]

The Hunters and Trappers Organizations (HTO) in tiny communities attest to the ubiquity of traditional harvesting and sharing activities. In Nunavut, there is a government program that offers full-time hunters boats, motors, all-terrain vehicles and snowmobiles up to a maximum of CAD 12 000 per hunter, and also subsidizes heavy-duty industrial sewing machines, to encourage traditional lifestyles.

A survey of food use, focused on measuring the amount of traditional foods used by different Northern groups, indicated that subsistence hunting and fishing continue to form a significant part of the diets of all indigenous groups. For Canadian Inuit, intake of country food did not seem to change between 1987-88 and 2003. Traditional country food use by men and women between 20 and 40 years of age was found to be highest in Inuit communities, followed by Dene and Métis of the NWT and First Nations people of the Yukon. It was found that country food consumption increased with age, and average intakes were higher among men than women.[31] The amount of country food consumed in the north is estimated to be 90 to 300 kg per person every year. Most of this is meat and fish.

The cost of market food influences frequency of traditional food use. In more remote areas, retail prices are high. In addition, the small populations of communities only support stores which carry minimum inventories. Arctic Coop Stores and a few independent initiatives provide fresh and frozen vegetables winter and summer, but they have been transported long distances. The calculated cost of feeding a family of four solely from marketed foods was 2.5 times higher in Old Crow than in Whitehorse, Yukon.[32]

The nutritional benefits of country food are substantial, even though country food may comprise only six to 40 per cent of total diet. Research findings have confirmed across the Canadian Arctic that decreasing country food is likely to have negative health consequences. Traditional diets contribute significantly more protein, iron and zinc.[33] Nutritional analysis have been carried out at the Centre for Indigenous Peoples› Nutrition and Environment (CINE), and findings show that an average serving of meat or fish from the land can supply all the recommended daily requirements of a number of essential nutrients.

Four Yukon First Nation communities have been studied extensively to look at what people eat: Virtually all households in the survey used moose and salmon, as well as berries and other plant foods. In total, mammals accounted for about half of the traditional food, fish for one fifth, berries for one-fifth, other plants for one-tenth and birds for one-twentieth. People got most of their food from hunting and fishing. One study shows the typical wide variety (80 species, in this case) of foods used by First Nations. They include moose, salmon, other fish, caribou, hare, ground squirrel, beaver, ducks, grouse, cranberries, crowberries, blueberries and Labrador tea. Virtually all households consumed some or all of these during the year; and country food was eaten approximately once daily in the communities studied.[34]

Heavy reliance on country food seems to reduce the risk for certain health problems. Indigenous groups in the Canadian Arctic have among the lowest age-standardized prevalence of diabetes in the country. Diabetes is one of the most prominent health risks associated with changes to a more "western" diet.

The Canadian Arctic Contaminants Assessment Reports studied impacts and risks to human health from current levels of contamination in key Arctic food species, as well as determining trends of contaminants in key species and air.[35] Persistent environmental contaminants such as PCBs, toxaphene, DDT and mercury are present in considerably higher quantities in human tissue in the Arctic than in the south, reflecting greater consumption of species at the top of the food chains.

The mixed economies

The history, constant change, and present dynamism of Canada's northern economies have resulted in a unique blend of traditional and market activities. All northern communities face ecological pressures such as climate change, industrial pollution, loss of diversity and productivity on the land, and the resulting compromise of traditional livelihood strategies. The life within Arctic communities serves as an illustration of how the connections among ecosystem health and individual livelihoods function today.

While the importance of wages in the northern economy has influenced the social structure of some

indigenous communities, there is ongoing debate on whether it is meaningful to divide subsistence and wage economies into distinct "sectors". Aboriginal involvement in the two economies is most clearly seen as occurring along a continuum with participation at varying points on the scale. The economic makeup of most households is heterogeneous, including a blend of economic activities. Some household members may participate in subsistence harvesting, while others may produce and sell commercial products such as fur, carving and other crafts. Some may receive government transfer payments (employment insurance, social assistance, pensions) and others may be involved in full or seasonal wage-earning labour. Rather than choosing to participate in any one activity, most households attempt to find a balance with household incomes being derived from multiple sources.[36] The complementary nature of subsistence and wage-earning in the northern mixed economy is perhaps the optimal resolution.[37]

Indigenous peoples in the Russian Arctic: Some aspects of subsistence economy

Winfried Dallmann, Norwegian Polar Institute

Who are the indigenous peoples of the Russian North?

The population of Russia as a whole is approximately 142 million inhabitants, of which about 20 per cent belong to more than 100 ethnic groups other than Russians. In the Russian North, Siberia and the Russian Far East, approximately 2 million people have a non-Russian, native ethnic status. These include large peoples with more than 50 000 individuals, as well as members of peoples that form majorities in adjacent states (Koreans, Chinese, etc.).

Since 2002, a number of 40 ethnic groups have the official status as "Indigenous Numerically Small Peoples of the North, Siberia and Far East of the Russian Federation" – increased from 26 peoples during the Soviet Era. About 250 000 individs belong to these 40 approved indigenous peoples with a population of less than 50 000 each. The largest of these, the Nenets, counts about 41 000. Ten out of these 40 peoples count about 1,000 or less each, and their existence as cultural groups is severely threatened.

According to Russian political tradition and the indigenous peoples' own feeling of community the term "Indigenous Numerically Small Peoples of the North, Siberia and Far East of the Russian Federation" is used in Russia and has legal applications. This term includes population in the Russian Federation to the east of the Urals, as well as in the European part to the north of the ethnic Russian core areas. It excludes peoples in southern, mainly European, parts of Russia, which belong to quite different cultural regimes and do not have a clarified status with respect to the definition of indigenous peoples.

Box 6.3: Organisation of traditional occupations

SPK - Agricultural production cooperative

СПК - Сельскохозяйственный производственный кооператив

An SPK is an organization established by agricultural commodity producers and/or private farmers for joint activity on agricultural commodities production, processing and marketing, as well as for other activities not prohibited by legislation. An SPK is based on voluntary membership and on joining member's property shares. Activities of SPKs are based on personal labour of the members.

Tribal community ("Obshchina")

Родовая община

A form of self-organization of indigenous people joint by blood relations, leading a traditional way of life, and occupied with traditional economy. Tribal communities are non-profit organizations.

TTNU - Territories of Traditional Nature Use

Территории традиционного природопользования

Territories of Traditional Nature Use (Land Use) of Indigenous Peoples of the North, Siberia and Far East of the Russian Federation are especially protected natural territories, founded for pursuing traditional nature use and traditional way of life by indigenous peoples of the North, Siberia and far East of the Russian Federation.

compiled by
E. Khmeleva, Rodnik Legal Center
for the MODIL-NAO project

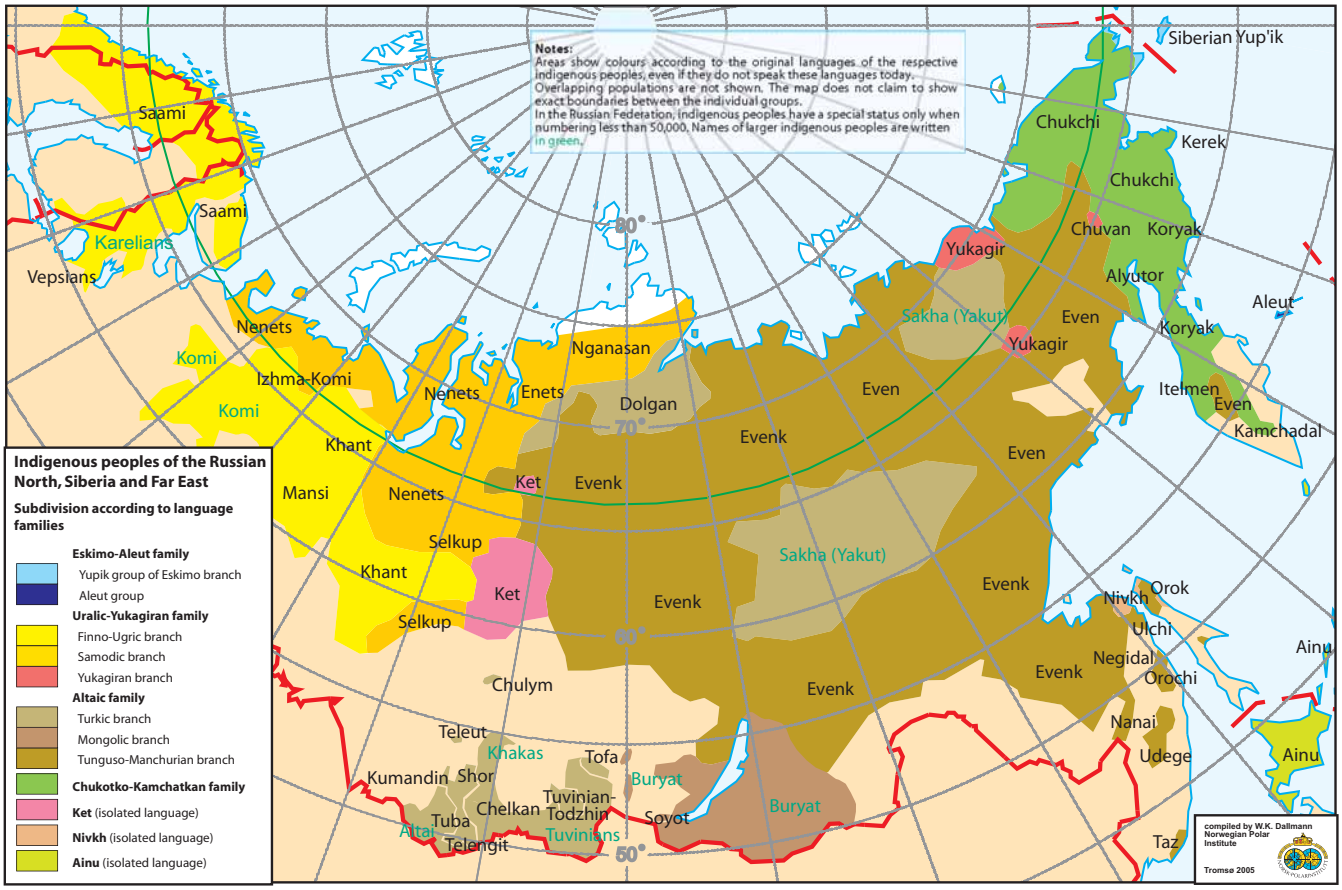
This term excludes also, according to Russian law, large peoples with a population higher than 50 000 individual. This limit has historical significance and is debated, but there is a general accept that large groups (with several hundred thousand individuals like the Yakut, Komi, Karelians, Buryats) do not need a similar strong legal protection to preserve their culture.

The migration of Russians away from the North, Siberia and Far East in the 1990s has led to an increase of the indigenous peoples in many areas. Outside urban areas, especially in sparsely populated rural areas, indigenous peoples often form the majority of the population. Emigration of qualified personnel amplified the economic crisis in the Russian North. For example, the population of the Magadan Region dropped from 391,000 in 1989 to 182,000 in 2002 and further to 165,000 in 2008.

Socio-economic development

The majority of the indigenous peoples of the Russian North live in villages in or close to their traditional land use areas, where they pursue mainly traditional activities like reindeer herding, hunting, fishing and gathering, or, at a smaller scale, vegetable gardening, livestock and fur farming. To a lesser, though increasing degree, they work in the service and trade sectors. They are practically not represented in manufacturing industry.

Figure 6.6. **Indigenous peoples of the Russian North, Siberia and Far East. Compiled and drawn by W. Dallmann**



Large expanses of their homelands have gradually been converted into areas for alien settlement, transportation routes, manufacturing, forestry, mining and oil production. Indigenous peoples have very strong ties to their natural environment. Their cultural identity is dependent on intact ecosystems. This explains the enormous difficulties indigenous peoples have in adopting "modern ways of life", and the social disaster that resulted from the state's attempt to settle nomads, erode traditional social structures and reorganise subsistence into commercial economies.

Russia's socio-economic crisis in the 1990s led to a break-down of most of the public services and transportation system in the remote areas. Having been made dependent on modern infrastructure and product distribution, the people found themselves left alone, lacking supplies and medical care, rising mortality, and without the economic means and legal expertise to deal with the situation. Some of these trends have been reverted since the early 2000s, while others are still continuing. This differs significantly from place to place.

Subsistence economy was the original economy of these peoples in pre-Tsarist times. In Tsarist Russia taxation (*yasak* – mainly a fur tax) was introduced, having a strong impact. For the first time, people had to spend a large part of their life with hunting and trapping for other purposes than subsistence. Still, subsistence economy has retained importance under the socialist conditions of the Soviet Era, in spite of the all-over collectivisation of all traditional economic branches.

Subsistence economy gained renewed importance during the socio-economic crisis of the 1990s, when people had to replace the sudden loss of traded goods and food in the shops. It remains to be an important factor even under the present market-economic conditions, which is not seen in the official statistics.

Subsistence – tradition and necessity

While many Russians – like other Northern nationals – supplement their householding by gathering berries and mushrooms, gardening potatoes and vegetables (partly in greenhouses), or spare-time hunting or fishing, harvesting from nature has a much larger significance for those indigenous peoples living in rural or remote areas. It also has a similar significance for so-called Old Russian settlers (*starozhily*) in Arctic Russia that have led a similar way of life for generations.

Existing studies of subsistence economy are occasional and sporadic, results may be difficult to access and cannot necessarily be compared. A lot of the knowledge is qualitative and based on subjective judgements by individuals. Surveys may be biased due to strategic answering. Authorities may impose quota on fishing and hunting even for personal consumption and regulate such activities in various ways. To avoid penalties, people

Magadan: Each person has permission to catch 50 kg of fish per year without a quota, for their own consumption. This is not much fish to eat for people, whose traditional way of life is fishing for subsistence. *Photo: M. Yashchenko*.

may be tempted not to indicate their real subsistence consumption in questionnaire campaigns. Indigenous people normally perceive harvesting from nature as their traditional right, and see authority regulations as an imposition, because they regard themselves as the original owners of the land and its natural resources. Unemployment, low income or difficult access to high-quality fresh food in shops often make the people exceed the quotas.

Subsistence in the Magadan region

The situation in the village Ola of the Magadan Region can serve as an illustration of the subsistence quota dilemma. In Ola the indigenous people and descendents of early Russian settlers, the 'old residents', subsist and earn a livelihood by fishing. In 2004, 715 persons (11 per cent) belonged to indigenous peoples, mainly the Evens. The official share of unemployed indigenous persons in the Ola District was 16.9 per cent; the exact number of unemployed aboriginals is unknown, as many of them are not registered with the labour administration, but estimates among local residents reached as high as 50 per cent.

There were seven enterprises having official status as 'indigenous enterprises', and six indigenous clan communities. The greatest obstacles to economic development were lack of capital, with no access to low-interest loans, and problems in obtaining catch quotas. To receive a quota, an enterprise must prove adequate resources for catching, storing and transport, and there were few who qualified. Most quotas went to larger Russian companies, which were financially better off. Several catch landing establishments and fish-processing factories along the coast lie today in ruin and spoil the otherwise beautiful coastal landscape.

Each person has permission to catch 50 kg of fish per year without a quota, for their own consumption. This is very little for people who traditionally make their living mainly from fish products, who do not qualify for profit-oriented business quota, and face a very high rate of unemployment.

Survey in the Koryak Autonomous Okrug, Kamchatka

A survey on indigenous livelihoods in Kamchatka was carried out in 2002 by Olga Murashko, anthropologist, as part of a project with the Ethno-ecological Information Centre 'Lach'. The survey was conducted in coastal villages among the sedentary Koryak population (semi-nomadic Koryaks in the interior of Kamchatka pursuing reindeer-breeding). The survey had 350 respondents and is a reliable statistical basis.

Without distinguishing between subsistence and trade economy, people answered in which traditional activities they were engaged, see Table 6.9:

Table 6.9. **Participation in traditional activities and share of output for own consumption. Per cent. Koryak, Kamchatka. 2002**

	Participation in activity	Share of output for own consumption
Fishing	91	100
Gathering	93	100
Hunting	11	20
Sea mammal hunting	9	25
Reindeer herding	1	20

Source: Olga Murashko and Ethno-ecological Information Centre ‹Lach›.

The largest harvest and consumption of fish was noticed for members of fishing communities, and unemployed people. The smallest numbers of caught and consumed fish were noticed among civil servants and municipal workers. This group has the highest incomes within their settlements.

A livelihood survey among 100 respondents of the Itelmen fishing village Kovran revealed that 93 per cent of the local population is engaged in fishing and related activities, like conservation of fish, repairing and manufacturing of fishing tackles.

Sea mammal hunting is carried out in August-September. Quite often the seals are hunted while accompanying the fish swarms. Water fowls are hunted in the autumn and bears in the winter.

Men hardly find time beyond fishing to help the family to plant and harvest potatos, and harvests are small. Women, old men and children are engaged in gathering of wild plants. Reindeer meat is exchanged from reindeer breeders for dried or salted fish, or for the money obtained from the sale of caviar. Licenses of winter hunting on some fur animals are restricted to professional hunters.

The consumption pattern in Koryak is similar to that in the other coastal areas, where own consumption of hunting and reindeer herding is slightly lower, 10 and 15 per cent, respectively.

Nenets family in a nomadic reindeer herders' camp, Cooperative 'Voskhod', village Oma, Nenets Autonomous Okrug. *Photo: Yasavey*

Survey in the Nenets Autonomous Okrug

An ongoing survey among Nenets reindeer herders in the Nenets Autonomous Okrug is mainly aimed at monitoring the influence of oil development on indigenous peoples' livelihoods.[38] Although results are very preliminary at present time, they indicate a clear picture: The respondents are all fully engaged in traditional activities. Reindeer herding is pursued all-year-round, fishing over a 5-6 months period and hunting 2-3 months a year.

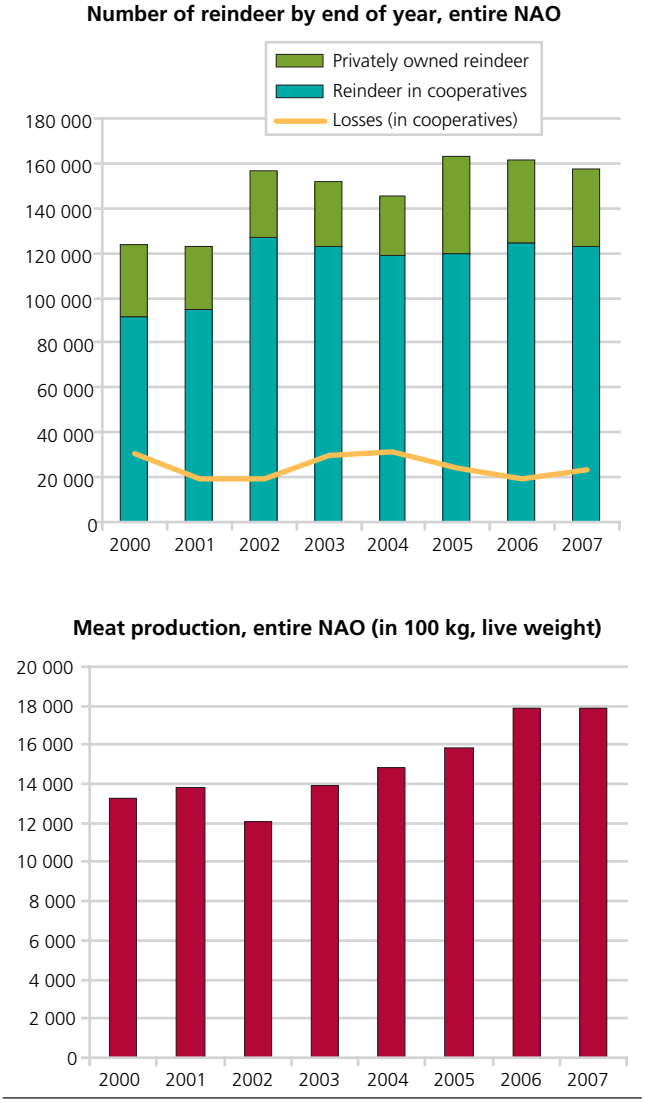
Reindeer meat is consumed daily by more than half of the families, especially in winter, and 3-4 days a week by the others. Almost the same can be said about fish. Half of the families make their own traditional winter clothing themselves, others buy or barter with producers. Still, about 50 per cent of their income is used for food products and 20 per cent for clothes.

Generally for Russia, the contribution of subsistence to the family budget is characteristically underestimated (Murashko). According to the respondents of the questionnaire campaign, production within traditional kinds of activity makes up half of the family income. Although, for a year, salaries, subsidies and other money income of a family may total 200 000 rubles, while the market cost of reindeer meat and fish eaten by this family can make up more than 1 000 000 rubles.

Traditional economies and subsistence facing industrial development and climate change

Reindeer herding by both Nenets and Izhma-Komi people, in the Nenets Autonomous Okrug (NAO), is a good illustration of multiple external factors currently influencing traditional livelihoods. Reindeer herding is the most prominent traditional occupation in the area. The breeders move northward from their settlements close to the winter pastures in the forest tundra belt to the summer pastures in the barren tundra. Even if many are settled or semi-nomads partly working in brigades of collectives, or, subordinate, as private reindeer herders, the vast tundra areas still are roamed by individual groups of fully nomadic reindeer breeders.

Figure 6.7. **Number of reindeer and meat production in the Nenets Autonomous Okrug 2000-2007**



Source: Prepared by W. Dallmann (IPY project MODIL-NAO) from data of the former Agricultural Depart¬ment, Nenets AO.

Nenets and Izhma-Komi participate in commercial fishing. Fishing also provides a subsidiary subsistence-based occupation for reindeer breeders, as well as other traditional occupations like hunting and gathering.

A severe threat towards traditional occupations and the associated cultural values of the indigenous society comes from oil and gas development, mainly because of three reasons:

1. The loss of pasture lands, where intense drilling activities take place.

2. Pollution of rivers, lakes and ground water through released fuels and chemicals.

3. Pipelines cutting off migration routes, although with present, but insufficient over- and underpassages.

The loss of pasture lands is associated with extensive deterioration of tundra ground through driving with

Table 6.10. **Population and lifestock size in the Nenets Autonomous Okrug (NAO)**

	Population total	Population urban (Naryan-Mar/Iskateley)	Nenets population	Komi population	Number of reindeer, total, each 1 January
1989	54 000	26 000 (48 %)	6 500 (12 %)	5 100 (9.5 %)	190 000
1996					180 000
2002	45 000	27 000 (60 %)	8 500 (19 %)	4 600 (11 %)	123 000
2008	41 500	26 600 (64 %)	7 200 (17 %) In urban areas 1 582 (in 2004)		157 000

Source: Numbers are from various sources and may be based on different preconditions; thus they are not assumed to be statistically consistent, but they indicate trends.

heavy vehicles. Russia is the only Arctic country where driving with heavy vehicles on unfrozen tundra ground in connection with oil exploration is still not prohibited.

Since the Russian socio-economic crisis of the 1990s, reindeer herds have been rebuilt and stock numbers are now at a level around 160 000 reindeer (Table 6.10). Although fluctuations occur, partly or mainly due to "bad winters" and problems in the management of collective farms, the overall productivity is still rising.

State subsidies and support programmes have certainly been a major reason for the overall restoration of the reindeer husbandry after 2000. Oil companies also pay compensation for ceded pasture lands. However, these are based on a variety of individual, often confidential agreements, and not captured by the statistics.

Economic losses from oil development seems to be compensated for the time being. Local knowledge of the tundra enable reindeer herders to use the remaining pastures in the best possible way. Of course, there are limits to how far things can be pushed. Just the fact of working and living in – and being dependent on – an area with increasing pollution and environmental degradation triggers a feeling of insecurity and hopelessness among portions of the indigenous population.

The threat of global climate change has not really occurred to the reindeer herders as something that will severely affect them. Of course, breeders realise that we are in a period of warmer weather. Winters start and rivers freeze later. Reindeer herders know how to deel with normal variations in weather, even with periods of abnormal weather through several years. They adjust the usage pattern of the pastures to the conditions. Bad economic outcomes during a period of hard conditions are also considered to be normal, and until now nothing has happened weather-wise that has not happened earlier, too. A winter with wet precipitation resulting in ice formation over large tundra areas only has occurred once, in 1997 or 1998.[39]

Like always, problems will occur when unfavourable factors add up. More unfavourable winter weather and/or an increasing nuisance by insects in summer will make it necessary to change the usage pattern of the pastures. If the availability of pastures is confined through oil development, then problems can arise.

Box 6.4: Okrug target programme to stabilise reindeer industry since 2002:
from A. Degteva, 2005: Oil industry and reindeer herding. MS Thesis, University of Tromsø

- Technical support
- Purchase of slaughtering houses and refrigerators
- Veterinary actions
- Actions agains predators
- Reindeer insurance
- Financial support (130 rubles for each reindeer per year)
- Subsidies of 53.5 rubles/ kg sold meat inside the NAO
- Coverage of 80 per cent of transportation cost for meat to customers

Industrial land use may to a large extent still leave room for reindeer husbandry, but this is conditional on a persisting climate and environmental quality.

Availability of spare pastures seems to be one of the most crucial factors for climate change adaptation. Once pastures are destroyed or polluted, they cannot be used as spare pastures for periods of unfavourable weather conditions. There will be limits to how much subsidies the state will provide. Then we could face a sudden decline of reindeer husbandry – at least in the areas of heavy oil development. Along with people leaving the tundra for other jobs, subsistence-related activities will decline.

Reindeer pastoralism

Ellen Inga Turi, Sámi University College

Reindeer pastoralism is an indigenous livelihood of key importance for more than 20 indigenous groups in the entire Arctic and Sub-arctic area, in the countries of Sweden, Finland, Norway, Russia, Canada, Alaska, Greenland, Mongolia and China. In total the livelihood involves around 100 000 people and around 2.5 million[40] reindeer (*Rangifer tarrandus*) grazing on natural pastures stretching from the North Sea to the Pacific Ocean, covering an area amounting to 10-15 per cent of the entire land area of the world. Reindeer herding is a nomadic livelihood, a consequence of the strategy of securing forage for animals entirely though natural pastures and an adaptation to the natural migration patterns of reindeer, often from coastal grass areas in

the summer to lichen covered inland areas during the winter. The nomadic life has enabled use of barren arctic mountain and tundra areas for food production since time immemorial. The following section provides a brief presentation of reindeer herding in Norway and the circumstances important for the economy of reindeer pastoralism.

Reindeer pastoralism in Norway

Reindeer pastoralism in Norway is predominantly a Sámi livelihood practiced in the Sámi reindeer herding areas stretching from Hedmark in the south to Finnmark in the north. This area makes up 45 per cent of the total land area of mainland Norway and equals around 146 000 km^2. Within these areas around 2900 people, including women, children and elders, are involved in the herding of around 240 000 reindeer[41].

The traditional social organisation of reindeer pastoralism is based on herding partnerships or work communities. In the Sámi reindeer pastoralism this unit is referred to as the *siida*, often defined as an organisation of households cooperating on herding and supervision of reindeer[42], where members work and migrate together, sharing the duties associated with nomadic reindeer herding. The households in a *siida* are usually made up of the core family and perhaps some hired help, but may also include close relatives. The households are independent units responsible for their own economy and work equipment. Further, members of households individually own reindeer and have private earmarks, and thus also have the sole responsibility to make decision concerning their own individual reindeer. The *siida* constellation is thus made up of individuals as owners of reindeer, and households as independent economic units. Although *siidas* are often made up of siblings or relatives, family ties are not necessarily prerequisites for *siida* constellations. Further, *siida* constellations are not necessarily stable or durable, meaning that *siidas* may break up to several units seasonally or change altogether in adaptation to local pasture circumstances or even social or economic conditions.

The traditional organisation of reindeer pastoralism show strong structural similarities across all reindeer herding regions, and is an important feature of the adaptability and vitality of reindeer pastoralism. The organisation gives herders the freedom to determine the structure and size of the herd according to available natural resources, to determine the best strategy for migration. The flexibility of this system is therefore an important factor in ensuring resilience for the livelihood[43].

One of the greatest challenges for reindeer husbandry in Norway is fragmentation of pastures. Over the past decades reindeer pastures have been exposed to bit-by-bit encroachment following from, among other things, development of cabin resorts, infrastructure, hydropower, forestry and mineral exploration, causing increasing problems for reindeer husbandry depended on pasture resources with minimal human activity. The United Nations Environment Programme (UNEP) estimates that if the current rate of encroachment continues, there will be no room for traditional reindeer herding in Norway within less than 50 years as central pasture resources will be fragmented and incompatible with traditional reindeer herding[44]. Fragmentation of pastures represents an economic cost to herders due to loss of reindeer and increased cost for managing herds.

Governance of reindeer pastoralism

Reindeer pastoralism in Norway is formally administered by the Ministry of Agriculture through its administrative bodies. Reindeer pastures in Norway are formally divided into 6 reindeer herding regions, which are in turn divided into almost 80 reindeer herding districts, some of which are year-round districts while others are only seasonal districts. Within the districts are one or more *siida*. Finally, *siida* are formally composed of so-called '*siida* shares' which consist of an individual or a family group. Subsidies are granted to *siida* shares, and it is the owners of *siida* shares that have the formal right to vote in *siida* issues. There is no formal allocation of pastures on the *siida* level, but pastures are often allocated through an informal traditional system.

The main policy instruments for administering reindeer pastoralism in Norway are legal, through the Reindeer Husbandry Act, and economically through the Reindeer Husbandry Agreement. It is through these means that the political goals of an economically, culturally and ecologically sustainable reindeer husbandry are strived for.

The Reindeer Husbandry Act regulates among other things, the formal administration of reindeer pastoralism, the rights to practice reindeer herding, property rights and other general rules. In July 2007 a new and revised Reindeer Husbandry Act came into force in Norway, and reflected the result of a prolonged process of revising and updating the previous act from 1978 which was increasingly criticized as being misfit to the realities of reindeer herding. The new act involved several important changes, the most significant one being that the *siida* was, for the first time in Norwegian legislation, granted formal juridical status.

The Reindeer Husbandry Agreement is negotiated annually between the Association of Sami Reindeer Herders in Norway and the Ministry of Agriculture and Food. The Reindeer Husbandry Agreement for 1 July 2008 - 30 June 2009 has an overall framework of 97 million NOK. The majority of funds are allocated to development and investment, and as direct subsidies to reindeer herders. The subsidies granted through the reindeer husbandry agreement provide significant economic incentives for regulating the size and structure of herds according to politically determined goals.




Photos: Jens-Ivar Nergård

The economy of reindeer husbandry in Norway

Reindeer husbandry in Norway has a strong focus on meat production, and income from selling meat contributes to a considerable portion of the income of reindeer herding families. The Norwegian reindeer husbandry administration produces annual reports of the economy in reindeer husbandry, where production based incomes, governmental subsidies and compensations are estimated. An overview over the composition of income in reindeer pastoralism in Norway in 2005 and 2007 is presented in Table 6.11.

Data from 2005 for value of meat production show that sales of meat to official slaughterhouses make up around 39 per cent of the total income of reindeer pastoralism[45]. As reindeer herding is sensitive to climatic variations and weather patterns, the number of reindeer sold per year may fluctuate considerably. Own consumption and private sales amount to around 6 per cent of total income. The distribution of total meat value between meat production for official sales and for own consumption and private sales is based on the percentage share of animals slaughtered for these purposes, see the previous note for details. The Norwegian reindeer husbandry administration estimates an average of 20 reindeer per year per *siida* share for own consumption and private sales[46]. This number is the basis for the total number of privately slaughtered reindeer used in the distribution of total meat value.

Government subsides provide the second most significant contribution to the income of reindeer pastoralism. Figures from 2005 show that government subsidies make up around 34 per cent of the total income. In addition, compensation for loss of reindeer as well as compensation for loss of area constituted around 14 per cent of the total income of reindeer pastoralism in 2005. Further income from subsidiary activities such as producing *duodji* (handicraft), hunting, fishing, picking berries and even tourism are recognized as an integrated part of the Sámi reindeer herding economy. A common practice is for family members to make handicrafts of reindeer products such as antlers, bones and fur, and sell these to tourists during the summer season. Figures for income from subsidiary activities are at best estimates, and for 2005 the share of income from such activities was estimated at about 2 per cent.

The figures show that even though meat production is the most important activity of reindeer pastoralism in terms of monetary income, other sources of income provide a significant contribution to reindeer herders economy. Further, incomes give only an indication of

Table 6.11. **Composition of income in reindeer pastoralism of Norway. 2005 and 2007**

Type of income	2005		2007	
	Value (1 000 NOK)	Per cent	Value (1 000 NOK)	Per cent
Meat production for official sales	95 594	38.7	117 551	39.8
Own consumption and private sales	15 247	6.2	17 565	5.9
Changes in the value of the herd	-1 668	-0.7	10 155	3.4
Subsiduary incomes	5 758	2.3	5 160	1.8
Other production-based incomes	12 725	5.1	14 703	5.0
Subsidies	84 894	34.3	69 202	23.4
Compensation	34 617	14.0	61 279	20.7
Total incomes	247 167	99.9	295 615	100.0

Source: Reindriftsforvaltningen (2006): Totalregnskap for reindriftsnæringen, Summary table, and Table 2 on p. 128, and Reindriftsforvaltningen (2008): Totalregnskap for reindriftsnæringen, Summary table, and Table 2 on p. 122, see endnote 45.

actual monetary value of different sources of income, and do not give a complete picture of the economic reality of reindeer herding families. Own consumption and private sales, estimated above at 6 per cent of total income, is an important aspect of reindeer pastoralism and an incentive for participation in the livelihood for most families. Further, income from subsidiary activities is extremely difficult to estimate and the figure of about 2 per cent can best be considered as a very rough estimate.

Finally, a significant proportion of available income is not included in such estimates, namely wage income from work in other sectors. The Norwegian reindeer husbandry administration estimates that salary from other sectors in 2005 contributed an annual average of 180 000 NOK to the reindeer herding family's economy, in comparison to 182 000 NOK from meat production[47]. Reindeer herding is not seen as purely an occupation for a member of the family but a lifestyle of the entire family. Apart from providing a significant contribution to the family economy, earnings from other sectors also provide reindeer pastoralism with investment capital for buying transportation equipment. It is, however, extremely difficult to estimate the actual contribution from wage income from other sectors to reindeer pastoralism, a challenge which reflects the dynamic nature of natural subsistence economies.

Number of reindeer

One of the framework conditions from reindeer husbandry regulated by the Reindeer Husbandry Act is the maximum number of reindeer in districts. The most recent recording of the total number of reindeer in Norway is 241 432 in 2007. This number is slightly higher than the allowed maximum number. For reindeer herding regions in Western Finnmark the number of reindeer is particularly higher than the allowed maximum number.

There has been a prolonged discussion on the sustainable size of the reindeer population in Norway, and efforts have been made in order to decrease the population of reindeer by political or economic means[48]. In order to qualify for governmental subsidies a *siida* share is allowed a maximum of 600 reindeer, and a minimum level of meat production must have been achieved.

Photo: Birger Poppel

Norwegian reindeer pastoralism from an international perspective

Compared to other reindeer husbandries, the Sámi reindeer husbandry in Norway, Sweden and Finland is characterised by high density of reindeer, strong focus on meat production, and being highly mechanised. In terms of number of reindeer, the Sámi reindeer husbandry is only outnumbered by the Nentsy reindeer husbandry in North West Siberia.

Although reindeer pastoralism in Norway generates a relatively high income, in comparison to other reindeer husbandries outside the Nordic countries, it is also characterised as perhaps the reindeer pastoralism with the highest level of costs, due to high degree of mechanical equipment.

Finally, reindeer pastoralism in Norway is characterised by intensive regulation in comparison to other reindeer husbandries. A recent comparative study between reindeer pastoralism in Western Finnmark and in Yamal Peninsula of Western Siberia suggests that herders in Norway are constrained by detailed regulation of pasture use and distribution and enjoy relatively lesser autonomy to move within own pasture resources[49].

Sámi statistics in Norway

Even Høydahl, Statistics Norway

The Sámi traditional settlement area is in the North of Norway, Sweden and Finland, and at the Kola Peninsula in Russia. The national statistical offices of the Nordic countries publish population statistics based on census and population registers in each country. With regard to scope and accuracy, Nordic population statistics is considered among the best in the world. However, ethnicity is not included as a dimension in the census, neither for Sámi nor for any other ethnic groups. It is therefore not possible to produce population statistics for the Sámi population from the population registers.

From 1845 to 1930 the census in Norway included estimates of the number of Sámi and *kvener* (people of Finnish descent in Northern Norway). The 1950 census provided estimates of the use of Sámi and Kven language in some villages. The 1970 census was the last time when questions about Sámi language and ethnical background were included, via a supplementary questionnaire distributed to selected municipalities and local communities in the three northern counties in Norway.

The last decades have seen a distinct change in policies and attitudes towards the Sámi people in Norway. Assimilation into the Norwegian society was a clearly stated policy for a long period, lasting long into the post war period. Sámi were expected to give up their language and adopt the way of life of the majority population. Starting around 1980, considerable efforts have been made to reverse the consequences of assimilation and to secure the rights of the Sámi people. A Sámi Parliament has been established, with its first election in 1989. The business of the Sámi Parliament is any matter that, in the view of the Parliament, particularly concerns the Sámi people. One aim of the Sámi Parliament is to support the development and strengthening of Sámi identity and local communities.

While the Sámi Parliament has policy goals and means, there has however been a lack of statistical information basis to describe Sámi society and to evaluate to what extent the political objectives have been achieved. In 2003 the Sámi Parliament commissioned a project with cooperation between Statistics Norway and *Sámi Instituhtta* (Nordic Sámi Institute) to develop a permanent framework for development, production and dissemination of Sámi statistics in Norway.

Since the central population register does not include information on individual ethnicity, as explained, other approaches must be taken to produce Sámi statistics. The solution that has been chosen so far is to produce statistics for selected areas defined as Sámi settlement areas. In practice, this was operationalized by selecting those areas that qualify for financial support from the Sámi development fund (*Samisk utviklingsfond SUF*), called the SUF area.[50] The fund is managed by the Sámi Parliament, and the Sámi Parliament decides which geographical areas that qualifies for support from the fund, irrespective of whether the individual applicant is Sámi or not. The scope and extent of the fund has been extended several times, most recently in 2008.

The geographical approach to Sámi statistics, based on the SUF area, has obvious shortcomings. First, many of the inhabitants in these areas are not Sámi. And equally important, many Sámi live outside these areas. Although old census data give reason to claim that Sámi people are strongly over-represented within the SUF area and under-represented outside the SUF area, the accuracy of the Sámi statistics is far from the level it should have, from the perspective of describing characteristics and development for the Sámi population. The entire SUF area lies north of the Arctic Circle, and none of the large towns and villages of Northern Norway are within the SUF area. To a large extent, the difference between Sámi and non-Sámi areas in the statistics therefore reflects the difference between urban and rural areas, and to some extent the difference between north and south. A statistical approach that would have allowed comparison of Sámi and non-Sámi, independently of place of residence, would have been far better.

Statistics Norway is currently exploring the possibilities to produce Sámi statistics based on individuals. This could be done by using some existing registers where individuals directly or indirectly have declared themselves as Sámi. One such register is the 1970 census. In addition, Statistics Norway has access to the register over persons affiliated with reindeer herding activities, a register owned by the Reindeer Herding Administration. If the Sámi Parliament would allow Statistics Norway to combine data from the 1970 census and the reindeer herding register with the electoral register for the Sámi Parliament, it would perhaps be possible to establish a representative sample of the Sámi population for statistical purposes.

Statistics Norway will nonetheless continue to produce geographically based Sámi statistics. As long as the Sámi Parliament continues to provide funds to particular geographical areas, it will be important to closely follow the development in these areas. So far, two editions of (mainly) geographically based Sámi Statistics have been published, *Samisk statistikk/Sámi statistihkka 2006* and *Samisk statistikk/Sámi statistihkka 2008*, both in Norwegian and Northern Sámi (not in English). The next edition is planned for 2010. The topics of the statistical publication cover elections to the Sámi Parliament, population, education – including the use of Sámi language in schools and kindergartens, income and personal economy, labor market, reindeer herding and agriculture, and fishing and hunting.

Some results from the Survey of Living Conditions in the Arctic (SLiCA)

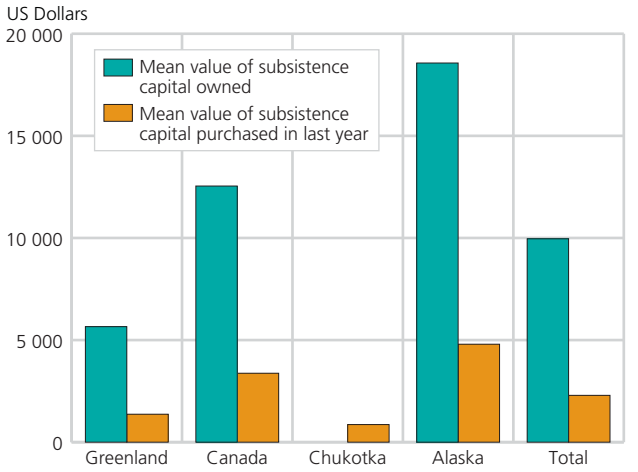
Birger Poppel, Ilisimatusarfik, University of Greenland, and Jack Kruse, University of Alaska Anchorage

The Survey of Living Conditions in the Arctic, SLiCA, has been carried out by an international group of researchers and research institutes in partnership with indigenous peoples of the Arctic. The core questionnaire (www.arcticlivingconditions.org) applied by SLiCA offers opportunities to examine and grasp some of the economic, social, cultural and nutritional significance of subsistence activities. A broad variety of questions have been asked about individual and household activities and behaviour. The importance of a mixed cash and subsistence economy for living conditions in the Arctic is one of the research topics suggested by the indigenous people's representatives participating in SLiCA. The SLiCA study is based on more than 7 000 personal interviews with Inuit adults in Greenland, Canada, Chukotka in Russia, and Alaska[51].

The following section is reprinted from an article by Birger Poppel and Jack Kruse: 'The Importance of a Mixed Cash- and Harvest Herding based Economy to Living in the Arctic – An Analysis on the Survey of Living Conditions in the Arctic (SLiCA)'[52]

Whereas the meat and fish consumed is the result of the harvesting process, hunting and fishing equipment (e.g. boats, dog sleds, skidoos, rifles) is the necessary means to harvesting and thus are production costs. Figure 6.8 illustrates that subsistence activities depend on significant capital investments. Alaskan households rank highest when it comes to owning and purchasing subsistence capital (USD 18 000 and 5 000 respectively). Chukotkan households represent the lowest amount purchased in the last year (USD 2 000).

Figure 6.8 **Mean value of subsistence capital stock and invested previous year. USD**



Source: Reprinted from Fig. 3.1 in Poppel and Kruse (2009), see endnote 52.

The SLiCA survey illustrates that harvesting meat and fish is of importance to the household economies as it substitutes for store bought food. At the same time harvesting requires investments in hunting and fishing equipment and thus, cash income.

The integration aspect – the mix of subsistence and cash activities

As referred to above, one of the themes of analysis highlighted by the indigenous partners of SLiCA was 'The importance of a mixed cash- and harvest herding based economy to living in the Arctic'. An approach to an understanding of the integration aspect is to examine the extent to which households tend to mix cash and subsistence activities.

Table 6.12 groups households on two dimensions: household income and the proportion of meat and fish consumed by the household that was harvested by household mem-

Street business – Siberian women trying to supplement the household budget through street selling. Photo by Gérard Duhaime

People in rural areas, and even in small towns, are often self-sufficient in potatoes. Photo: Winfried Dallmann

Table 6.12. **Percentages of Inuit Households by Combination of Proportion of Meat & Fish Harvested by Household and Total Household Income Adjusted for Purchasing Power**

	$16,000 or less	$16,001-$50,000	More than $50,000	Total
None	29	18	15	20
Less than half	28	36	40	35
About half	21	22	21	21
More than half	23	25	23	24
Total	100	100	100	100

Source: http://www.arcticlivingconditions.org/ SLiCA Results Report/Tables

bers (excluding Canadian Inuit). The left column income category includes households below the poverty line, while the right column income category reflects households above median total household incomes, adjusted for purchasing power.

Households with incomes above the median are just as likely to derive more than half of their meat and fish from household harvest activities as households with poverty level incomes. They are less likely to harvest none of their meat and fish than households with poverty level incomes. The most obvious conclusion is that households do not seem to specialise in one kind of activity, it rather seems that there is a tendency to mix activities.

That it takes money to participate in subsistence activities might also – at least partly – explain the finding from the SLiCA data that the lower income groups do not seem to compensate their low incomes by hunting and fishing.[53] The fact that households with higher cash incomes and high level of subsistence activities also invest more in hunting and fishing gear might indicate that low income households are worse off when hunting and fishing, and that they risk harvesting less due to less optimal equipment.

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Arctic Oil and Gas 2007, Arctic Monitoring and Assessment Programme, Arctic Council, www.amap.no
Aboriginal Population of Canada, http://www.statcan.gc.ca/daily-quotidien/080115/dq080115a-eng.htm. Country Food http://www.angelfire.com/realm/shades/nativeamericans/inuitcountryfood.htm
Canadian Arctic Contaminants Assessment Report II, Northern Contaminants Program, Human Health, Indian and Northern Affairs Canada, Ottawa, 2003; www.ainc-inac.gc.ca
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Interactive Map of the NWT , Prince of Wales Northern Heritage Centre, http://www.lessonsfromtheland.ca/LandTrail.asp?SiteID=S08&lng=English.
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Statistics NWT, http://www.stats.gov.nt.ca/
Statistics Nunavut, www.gov.nu.ca/eia/stats/
Statistics Yukon, www.eco.gov.yk.ca/stats/
Territories of Northern Canada Map http://atlas.nrcan.gc.ca/site/english/maps/reference/provincesterritories/northern_territories/map.jpg
Impact Benefit Agreement Research Network,www.impactandbenefit.com
The Coastal Learning Communities Network, Subsistence Economies Learning Circle, http://clcn.seedwiki.com
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Employment and Training of Aboriginal People, http://www.hrsdc.gc.ca/en/employment/aboriginal_training/index.shtml
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7. Concluding remarks

The purpose of the ECONOR project has been to give a comprehensive overview of the economy in the Arctic, including the subsistence economy of the indigenous people and other local people of the region. In order to achieve this goal we have utilized data from the statistical agencies of the Arctic nations and from other sources when relevant. *The Economy of the North 2008* has updated the earlier version and demonstrated that there is potential for both regularly update and expanded coverage. The overview of the Arctic economy provided by this report in terms of scale, composition and structure may help policy makers to better see the position of various stakeholders; the large scale commercial interests, the local and central governments, the indigenous peoples and the citizens of the Arctic as a whole.

There are large differences in the GDP per capita levels among the Arctic regions and nations. However, in natural resource based economies, using GDP figures to evaluate the wealth or well-being of the population can be especially misleading. Since a large part of GDP in such economies comprises return to fixed capital and resource rents that theoretically can be taken out of the region as income to owners situated elsewhere, it is hard to know without a more in-depth analysis what share of GDP is actually available in the region for consumption and investments. In this updated ECONOR report, data for household disposable income have been obtained, in addition to GDP data, in order to give a better picture of consumption possibilities and well-being.

In the Arctic, with its population of indigenous people, subsistence activities are very important for providing local food, as well as maintaining social relationships and cultural values. Subsistence activities contribute to consumption possibilities over and above what is measured as recorded consumption in the national accounts. As more attention is brought to the intertwined nature of the market economy and subsistence economy and its importance for the well-being of the Arctic people, an important challenge for analysts and policy-makers is to establish systematic monitoring of the subsistence activities of indigenous people, for example in the form of sustainable development indicators, or as supplementary or so-called "satellite accounts" to the national accounts.

A crucial question that we have not been able to answer in this report is to what extent climate change impacts and other environmental impacts, such as long range transported pollution, will limit the possibilities for traditional subsistence activities in Arctic. Since environmental impacts of economic activity are not included in GDP, it is a challenge to develop environmental statistics and environmental indicators that can be applied complementarily with economic indicators. The environmental and social sustainability of production needs to be addressed with the need for precautionary approaches in mind, given the substantial environmental uncertainty.

To conclude, we recommend a continued effort by Arctic statistical agencies and researchers to extract and compile economic, environmental and social statistics for the Arctic regions. There is a clear potential for establishing a wider set of useful data and indicators for the circumpolar Arctic. We recommend that the ECONOR project is followed up by more focused studies with a more direct sustainable management application. In particular, we suggest:

- Establish a permanent institutional and administrative basis for a statistical network for providing statistical information on economy, environment and livelihood in the circumpolar Arctic.
- Include and continue dialogue with statistical agencies of Arctic nations in order to enhance statistical cooperation.
- Improve statistical indicators to give a better indication of social well-being, and provide time series to give a better indication of development within Arctic regions, in order to assess the sustainability of Arctic communities.
- Facilitate research on how climate change will affect the Arctic economy by formatting the statistics, such as providing gridded data on population, capital assets and nature based activities to make knowledge compatible with output from regionally downscaled output from climate models.
- Establish statistical indicators for the subsistence economy of indigenous and other local people of the Arctic. These indicators should be comparable with national account concepts in the format of satellite accounts (supplementary accounts). Indicators for subsistence production should provide assessment of welfare implications of climate change impacts and trans-boundary pollution.

The list above does not at all aim to be complete, and there are certainly more areas that need further study. Taking into account that economic statistics and economic analysis of the circumpolar Arctic hardly have been produced earlier, there are many tasks that deserve further efforts. However, a stronger focus on the income and welfare issues, resource dependence and sustainable management is to be regarded as a synthesis of the main recommendations from the ECONOR project.

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